Aug. 31, 1954 R. C. BAKER 2,687,913

JUNK CATCHER AND FEELER FOR WELL BORES

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Fig. 1.

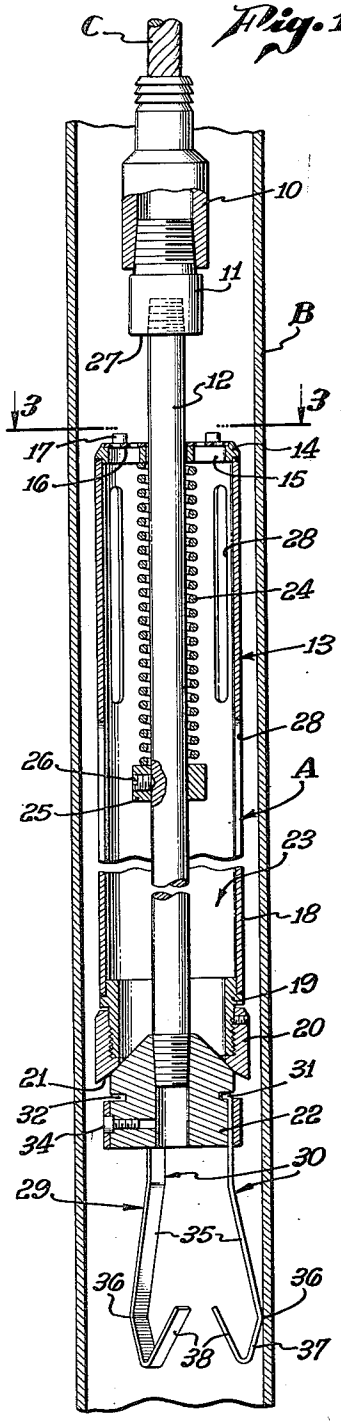

Fig. 2.

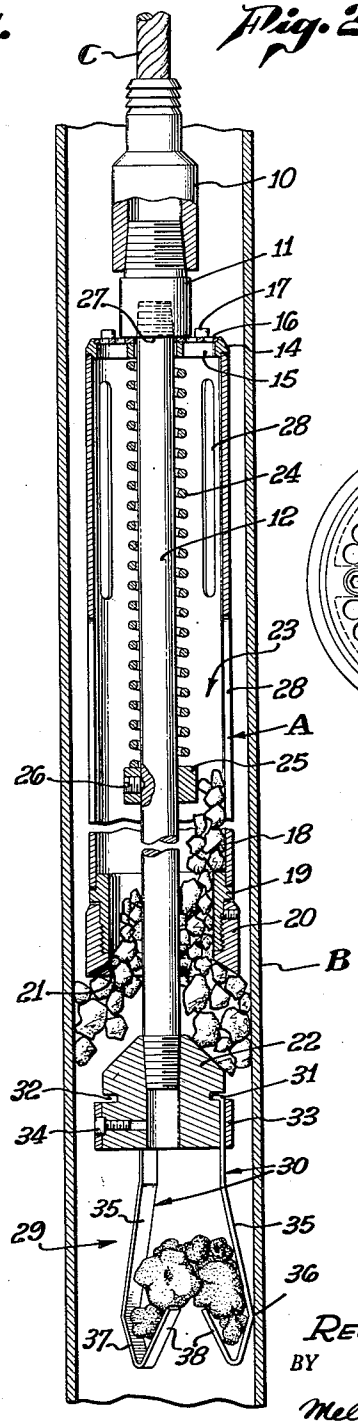

Fig. 3.

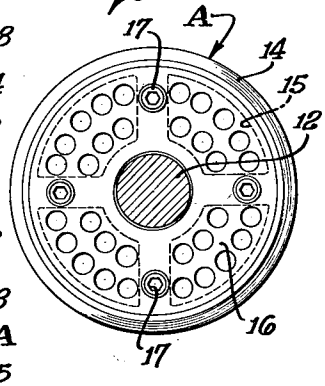

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Fig. 4.

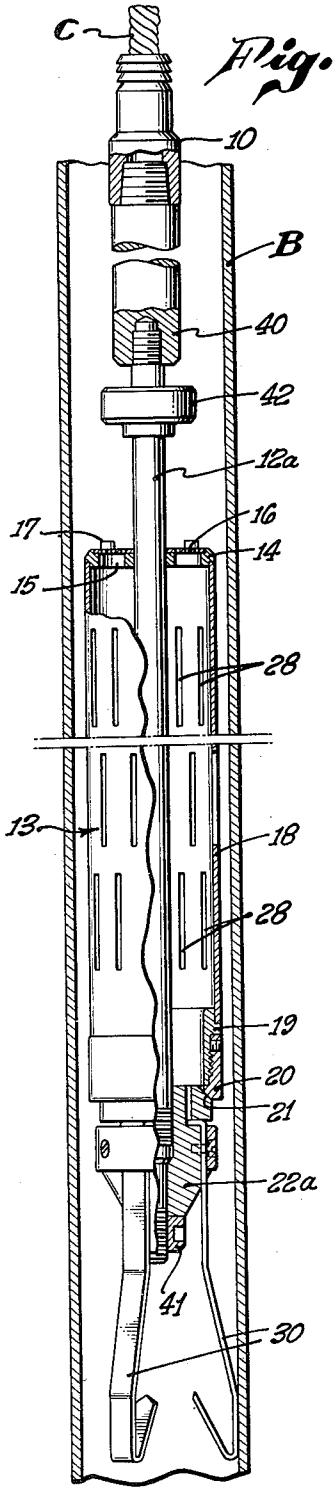


Fig. 5.

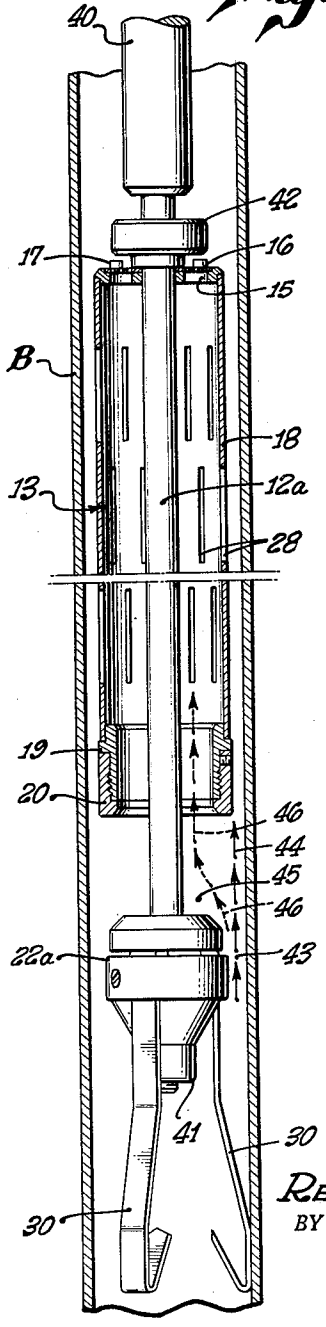
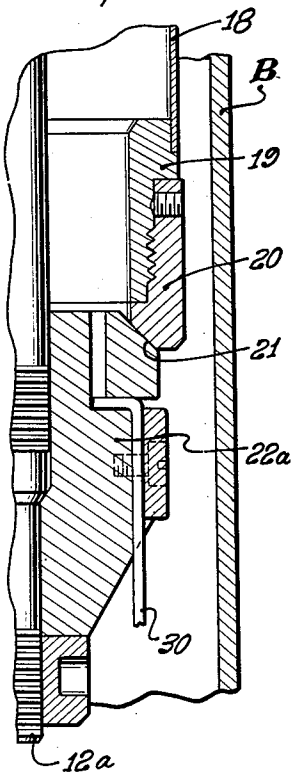


Fig. 6.



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Patented Aug. 31, 1954 2,687,913

UNITED STATES PATENT OFFICE

2,687,913

JUNK CATCHER AND FEELER FOR WELL BORES

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Application February 7, 1950, Serial No. 142,747

12 Claims. (Cl. 294—86)

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The present invention relates to apparatus employed within oil and gas wells, and more particularly to devices for cleaning a well casing, liner, or similar conduit, of debris, and for determining the existence of any restrictions in the well conduit which might preclude subsequent passage of other subsurface apparatus.

This application is a continuation-in-part of my application for "Junk Basket and Feeler for Well Bores," Serial No. 13,724, filed March 8, 1948, and now abandoned.

An object of the present invention is generally to improve devices of the character above indicated.

Another object of the invention is to provide a junk catcher or basket and feeler capable of picking up and retrieving large, as well as small, objects in a well casing or bore.

Yet another object of the invention is to provide a junk catcher capable of being elevated to open position by the well fluid, while being run down through the well bore, and of closing automatically upon being elevated, to entrap solid substances and the like therein.

A further object of the invention is to provide a basket employed in a well bore, which is capable of being elevated to open position by junk and the like weighing only a small fraction of the upwardly movable portion of the basket.

Still a further object of the invention is to provide a junk catcher in which the velocity of the fluid flowing relatively past the catcher during its descent in the well bore is utilized to direct solid substances, junk and the like into the catcher, where it can be entrapped for withdrawal from the bore.

This invention has other objects that will become apparent from a consideration of the embodiments shown in the drawings accompanying and forming part of the present specification. These forms will now be described in detail to illustrate the general principles of the invention, but it is to be understood that such detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the claims appended hereto.

Referring to the drawings:

Figure 1 is a longitudinal elevational and sectional view of a junk basket or catcher and feeler disposed in a well casing, or similar conduit, with the parts in closed position;

Fig. 2 is a view similar to Fig. 1, with the parts in open position;

Fig. 3 is an enlarged cross-section, taken along the line 3—3 on Fig. 1;

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Fig. 4 is a longitudinal section, partly in elevation, of another embodiment of the invention, with the catcher parts in closed position;

Fig. 5 is a view similar to Fig. 4, with the parts in open position;

Fig. 6 is a fragmentary longitudinal section, on an enlarged scale, through the valve portion of the device illustrated in Fig. 4.

The junk basket or catcher and feeler A disclosed in the drawings is adapted to be run through a well conduit B, such as a string of well casing, on the end of a running-in string C, like a wire line, extending to the top of the well bore.

The apparatus A is particularly adapted to retrieve junk and debris contained in the well casing B, or suspended in the liquid in the well casing, of a size which can interfere with the subsequent running of other well tools through the casing. As an example, a well packer equipped with slips ordinarily does not have a very large clearance with the well casing when its packing and slips are in retracted positions. Junk suspended in the drilling mud in the casing may become lodged between the slips and casing and effect premature setting of the packer during its lowering in the well bore. To obviate this possibility, the junk catcher and feeler A is first run through the casing. The maximum external diameter of the apparatus A is preferably no less than the retracted maximum external diameter of the well packer, or other apparatus, to be subsequently run through the casing. Accordingly, any objects which the junk catcher and feeler encounters while being run preliminarily down through the well casing will arrest, or tend to arrest, further descent of the apparatus, providing an indication to the operator of a restriction or barrier in the well casing through which the well packer would probably fail to pass. Such restriction will also open the junk catcher A of the present invention, which would then allow entry of the restricting material thereinto. The well fluid itself can elevate the catcher parts to open position.

Objects of relatively large size can be grasped by the apparatus A for retrieval and conveyance to the top of the well bore. Any objects of relatively small size, such as particles which would not preclude downward passage of the well packer or other tool, need not necessarily enter the present apparatus. As a matter of fact, the apparatus can be so designed as to permit escape therefrom of such relatively small objects or particles.

As specifically disclosed in Figs. 1 to 3, inclusive, the apparatus A includes a socket 10 to which the lower end of the wire line or rope C may be attached in the usual manner. An adapter 11 is threaded into the lower end of this socket, and is threadedly attached to the upper end of a relatively long mandrel 12 extending downwardly into and through a cylinder or barrel 13. The cylinder 13 is movable longitudinally along the mandrel 12 because of its attachment, as by welding, to a cylinder head or spider 14 slidable on the mandrel. The openings 15 through the spider are preferably restricted by a screen 16, or perforated disc, attached to the spider by screws 17, or the like.

The lower end of the sleeve portion 18 of the cylinder is welded, or otherwise secured, to a sleeve 19 on which a valve seat and gauge ring 20 is threaded. This seat has a tapered end 21 engageable with a companion tapered head 22 threaded, or otherwise secured, on the lower end of the mandrel 12. When the valve head 22 and seat 20 are in engagement, the lower end of the cylinder 13 is closed, which prohibits entry of any matter into the annular space 23 between the mandrel and cylinder. Such closing also prevents dropping of any junk, or other debris, contained within the cylinder 13, out of its lower end.

It is apparent that the weight of the cylinder 13 would normally hold the valve seat 20 in engagement with the valve head 22 attached to the mandrel 12. Any debris encountered in the well casing B during lowering of the tool therewithin would have to overcome the weight of the cylinder before elevating it and opening its lower end to permit passage of the debris into the cylinder 13. For the purpose of offsetting the weight of the cylinder, its spider 14 is caused to bear upon the upper end of a helical spring 24 encircling the mandrel 12. The lower end of the spring rests upon a collar 25, or spring seat, attached to the mandrel 12 in any suitable manner, as by means of a headless screw 26.

It is preferred that the spring 24 sustain almost entirely the weight of the cylindrical section or barrel 13. The spring, however, should be insufficient in strength to normally maintain the cylinder in elevated position, which would always maintain its valve seat 20 above the head 22, or in open condition. As indicated above, the spring 24 does not overcome or offset all of the weight of the cylinder, but almost its entire weight, which still allows a certain portion of the cylinder weight to move it gravitationally downward and engage its seat 20 with the head 22. However, only a relatively light upward force on the cylinder is necessary to elevate the seat from the head.

In the embodiments disclosed in the drawings, the seat 20 extends laterally outward a greater distance than the head 22 and, for that matter, all other parts of the apparatus with the exception noted below.

The external diameter of the valve seat is preferably made no less than the maximum external diameter of the well packer, or other tool, to be run subsequently down through the well casing. Accordingly, the valve seat 20 will normally have a nominal clearance with the casing wall. During lowering of the apparatus through the well casing B on the wire line C, the cylinder 13 is normally in a down position to close the valve 20, 22. Any small particles in the casing fluid of less size than the clearance space between the valve seat 20 and casing B will not prevent descent of the apparatus A. Relatively large particles, however, will engage the outwardly projecting valve seat 20 and, in view of the relatively small force required to elevate it from the head 22 (because of the assistance of the spring 24) shift it upwardly to a maximum position limited by engagement of the screen 16 with the lower shoulder 27 on the adapter 11 (Fig. 2). The junk basket is now open, and the relatively large particle or object can pass upwardly into the cylinder 13. The casing fluid and any small particles entering the cylinder can pass outwardly from it through longitudinal slots 28 in the cylinder sleeve 18, and also through the perforated screen 16 on the cylinder head 15.

If lowering of the apparatus A in the well casing B continues, more and more large particles can enter the cylinder 13. When no particles are present to engage the valve seat 20 and hold it from the head 22, the cylinder will gravitate to place the seat in engagement with the head. Any particles or objects within the cylinder 13 will rest primarily on the head 22, and cannot drop out of the cylinder. Lowering of the apparatus is continued at least until the depth is reached at which the well packer, or other tool, is to be set or operated in the well casing B. Thereafter, the wire line C is elevated to remove the apparatus to the top of the well bore, where the contents of the cylinder 13 are dumped. If substantially nothing is contained in the cylinder, evidence is had that the well casing is relatively free from junk and other debris. If the cylinder is full, another trip, or repeated trips, in the well casing should be made until the latter is relatively free from any objects that might forestall lowering and operation of other well equipment in the well casing.

The cylinder 13 and mandrel 12 may be made of any suitable length. As an example, the cylinder may be three to six feet in length, or longer, and will be capable of entrapping a comparatively large quantity of junk or debris during its trip through the well casing.

Oftentimes, rather large objects are found suspended in the casing fluid, such as pieces of rubber drill pipe protectors. Such particles are too great to enter the annular space 23. Accordingly, a gripping or catching device 29 is secured to the head 22 of the apparatus. This device consists of angularly spaced leaf springs 30 disposed around the lower portion of the head 22. The upper ends 31 of the springs are bent inwardly for reception within a circular head groove 32. The springs are attached to the head 22 by virtue of the location of the ends 31 in the groove 32, and by a collar 33 which encompasses them, the collar being secured to the head by one or more screws 34.

Each leaf spring 30 has an intermediate, downwardly and outwardly diverging leg portion 35, terminating in a heel 36 adapted to bear upon the wall of the well casing B. From the heel, the spring has a foot portion 37 inclined downwardly and inwardly. The lower end of the foot 37 is integral with the lower end of a finger 38 inclined inwardly and upwardly, in effect forming a hook adapted to catch under the part of the rubber protector, or other large object, encountered in the well casing.

Large objects in the well casing will engage the inclined fingers 38 and spring them outwardly until the object is disposed above the fingers within the confines of the legs 35. The fingers 38 thereupon spring inwardly to their initial posi-

tion, and prevent dropping of the article (Fig. 2).

It is thus apperent that the leaf springs 30 are capable of entrapping large objects encountered in the well, and that the cylindrical section 13 is capable of entrapping a large quantity of smaller objects encountered in the well casing. In addition, the springs 30 serve the purpose of centering the device in the well casing B, in view of their bearing against the casing wall.

In the form of the invention illustrated in Figs. 1, 2 and 3, the spring 24 is utilized to offset a portion of the weight of the cylinder 13, for the purpose of facilitating its opening during descent of the catcher through the well casing B. It has been found that the spring 24 may be eliminated, provided that the cylinder 13 is not made too heavy, and that the latter will still open during descent of the well tool in the well casing B. Opening of the cylinder 13 occurs not only as a result of debris or junk encountering its outwardly projecting valve seat 20, but is also caused by the velocity of the well fluid flowing relatively along the catcher in an upward direction while the junk catcher is being lowered through the fluid in the casing. Such upward elevation is enhanced by making the slots 28 in the cylinder sleeve 18 relatively small and narrow, in order to prevent fluid from readily escaping from the interior of the barrel.

The arrangement just described is disclosed in Figs. 4 to 6, inclusive, in which the upper end of the central mandrel 12a is threaded into the lower end of a sinker bar 40, that may be of suitable length and weight to insure downward movement of the mandrel 12a through the fluid in the well casing B. The upper end of the sinker bar is threaded into the socket 10, to which the wire line or rope C is attached.

The outer cylinder or barrel 13 is essentially the same as disclosed in the other form of the invention, including the upper cylinder head or spider 14 to which the perforated disc 16 is secured. The perforated cylinder sleeve 18 is welded at its upper end to the head and has the sleeve 19 welded, or otherwise secured, to its lower end, a valve seat and gauge ring 20 being threaded onto this seat for engagement with a tapered valve head 22a threaded onto the lower portion of the mandrel 12a. This valve head 22a is locked on the mandrel by a suitable lock nut 41 threaded on the lowermost end of the mandrel.

As in the other form of the invention, the leaf springs 30 are secured to the valve head 22a for the purpose of entrapping large objects encountered in the well bore, and for centering the device in the well casing.

Upward movement of the cylinder 13 along the mandrel may be limited by engagement of the cylinder head 14 or screen 16 with a suitable ring 42 welded to the mandrel 12a an appropriate distance above the head 16 when the valve seat 20 engages the valve head 22a.

The cylinder skirt 18 has relatively narrow slots 26 formed therein, so as to prevent ready escape of the drilling mud or other well fluid in the casing, and also to prevent relatively thin elements, such as discs and the like, present in the drilling mud as a result of a jet perforating operation on the casing, from passing through the cylinder wall. The fluid, however, can escape, but in a comparatively slow manner.

Since the gauge ring 20 threaded on the cylinder sleeve 18 is selected to have an outside diameter closely approximating the inside diameter of the casing string B, most of the fluid in the well will tend to pass upwardly into the cylinder or barrel 13 through its valve seat and gauge ring 20. During descent of the tool through the casing fluid, the fluid must all flow around the valve head 22a, and, in so doing, will accelerate in velocity, the force of the fluid being sufficient to engage the valve seat 20 and elevate the cylinder 13 along the mandrel 12a to an extent limited by engagement of the cylinder head 16 with the mandrel stop ring 42. A substantial portion of the fluid can then flow upwardly into the cylinder 13, but cannot escape too readily through the cylinder slots 28. As a result, the fluid within the cylinder 13 tends to buoy the latter in an upward direction and holds its valve seat 20 elevated from the valve head 22a.

In view of the tendency of the fluid to retard descent of the cylinder 13 and the entire apparatus through the casing fluid, the sinker bar 40 should be made sufficiently heavy to overcome this tendency, and to insure the descent, in a comparatively rapid manner, of the device in the well casing. Inasmuch as the fluid itself maintains the cylinder 13 elevated along the mandrel 12a, or in the position illustrated in Fig. 5, the cylinder is constantly open during lowering of the apparatus in the well casing for the entry of foreign substances that might be disposed in the well casing, or suspended in the well fluid. These substances will enter the cylinder 13 and come to rest at its upper end, continually building up until the entire cylinder is full (provided, of course, that sufficient junk and debris is present in the well casing to do so).

After the descent of the apparatus in the well casing ceases by bringing the apparatus to rest, the weight of the cylinder 13 is sufficient to cause it to drop along the mandrel 12a and move its valve seat and gauge ring 20 into closed position against the tapered valve head 22a mounted on the lower end of the mandrel 12a. When in this closed position, the solids contained in the cylinder 13 are prevented from dropping therefrom.

The apparatus may be withdrawn from the well casing by elevating the wire line C. The fluid in the well casing B tends to move downwardly relative to the cylinder and acts upon the exterior of the cylinder to hold it in closed position against the valve head 22a. Thus, the fluid force supplements the gravitational pull on the cylinder 13 to hold it in closed position, and to insure against loss of the cylinder contents during its elevation in the well casing.

In both forms of apparatus illustrated in the drawings, the well fluid itself tends to direct the junk and debris transversely into the barrel 13, rather than causing such debris to tend to jam or wedge between the exterior of the cylinder 13 and the wall of the well casing B. As the apparatus is lowered through the fluid in the well casing, the latter fluid must accelerate in flowing past the valve head 22a, since all of the well fluid must bypass around the apparatus by flowing through the annular restricted area 43 between the valve head 22a and the well casing. Due to the acceleration of the well fluid in flowing relatively past the valve head, it accumulates substantial velocity, such fluid tending to continue moving in a straight line direction after it passes relatively upward beyond the valve head, as indicated by the arrows 44. This velocity action of the fluid creates a vacuum condition in the region 45 immediately above the valve head 22a and adjacent the mandrel 12a. As a result, there is a low pressure region 45 provided in the apparatus above

the valve head 22*a*, and towards the mandrel axis, which tends to suck or draw junk and debris inwardly toward the mandrel 12*a*, insuring that such debris will pass upwardly along the mandrel and into the perforated or slotted cylinder 13, as indicated by the broken line arrows 46.

It is, accordingly, apparent that junk catchers and feelers for well bores have been provided in which the well fluid, as well as the junk, tends to maintain and actually maintains the cylinder 13 in open position during descent of the equipment in the well casing, the cylinder automatically dropping down along the mandrel 12*a* to closed position, upon elevation of the apparatus in the well casing. The manner in which the fluid flows around the lower portion of the equipment induces the junk and debris to move inwardly toward the mandrel and thence upwardly into the well casing.

The inventor claims:

1. In apparatus for entrapping junk encountered in a well bore: a central mandrel adapted to be lowered in the well bore on a running-in string; a valve head fixed to said mandrel so that said mandrel and head move together as a unit and cannot move longitudinally with respect to each other; a barrel member surrounding and longitudinally movable along said mandrel, said barrel member having longitudinal slots extending from substantially its lower end to substantially its upper end; a valve seat threaded on the lower end of the barrel member and extending laterally outward of said valve head, said seat providing a circumferentially continuous lower inlet into said barrel member when said seat is raised by said barrel member above and out of contact with said head; means substantially closing the upper end of said barrel member to greatly restrict the flow of fluid therethrough; said barrel member and valve head having a weight sufficient to hold said barrel member and valve seat normally downward of said mandrel with the valve seat engaging the valve head to close the lower end of said barrel member; said valve seat having its lower end inclined in a downward and outward direction; said valve seat being engageable by substances in the well bore to elevate said valve seat and barrel member along said mandrel and above said valve head to open the lower end of the barrel member, said closing means and the total area of said slots being proportioned to restrict relative upward flow of fluid in the well bore through said closing means and slots while the apparatus is being lowered in the well bore, in order that such fluid maintains said barrel member in an upward position along said mandrel with said seat elevated above said head.

2. In apparatus for entrapping junk encountered in a well bore: supporting means adapted to be lowered in the well bore on a running-in string; a first valve member fixed to said supporting means so that said member and means move together as a unit and cannot move longitudinally with respect to each other; a barrel member surrounding and longitudinally movable along said supporting member, said barrel member having relatively narrow longitudinal slots extending from substantially its lower end to substantially its upper end, said barrel member having a second valve member on its lower terminus disposed externally of said barrel member and providing a downward and outwardly inclined valve seat at the periphery of said barrel member forming a circumferentially continuous lower inlet into said barrel member when said second valve member is raised by said barrel member above and out of contact with said first valve member; means substantially closing the upper end of said barrel member to greatly restrict the flow of fluid therethrough and to entrap debris in said barrel member; said barrel member and its second valve member having a weigth sufficient to hold said barrel member and said second valve member normally downward of said supporting means with the seat of the second valve member engaging the first valve member to close the lower end of said barrel member, said barrel member being engageable by substances in the well bore to be elevated thereby along said supporting means to elevate said second valve member and seat from said first valve member and open the lower end of the barrel member, said closing means and the total area of said slots being proportioned to restrict relative upward flow of fluid in the well bore through said closing means and slots while the apparatus is being lowered in the well bore, in order that such fluid maintains said barrel member in an upward position along said supporting member with said second valve member elevated above said first valve member.

3. In apparatus for entrapping junk encountered in a well bore: a central mandrel adapted to be lowered in the well bore on a running-in string; a valve head fixed to said mandrel so that said mandrel and head move together as a unit and cannot move longitudinally with respect to each other; a barrel member surrounding and longitudinally movable along said mandrel, said barrel member having perforations therethrough extending from substantially its lower end to substantially its upper end; a valve seat threaded on the lower end of the barrel member and extending laterally outward of said valve head, said seat providing a circumferentially continuous lower inlet into said barrel member when said seat is raised by said barrel member above and out of contact with said head; means substantially closing the upper end of said barrel member to greatly restrict the flow of fluid therethrough; said barrel member and valve head having a weight sufficient to hold said barrel member and valve seat normally downward of said mandrel with the valve seat engaging the valve head to close the lower end of said barrel member; said valve seat having its lower end inclined in a downward and outward direction; said valve seat being engageable by substances in the well bore to elevate said valve seat and barrel member along said mandrel and above said valve head to open the lower end of the barrel member, said closing means and the total area of said preforations being proportioned to restrict relative upward flow of fluid in the well bore through said closing means and perforations while the apparatus is being lowered in the well bore, in order that such fluid maintains said barrel member in an upward position along said mandrel with said seat elevated above said head.

4. In apparatus for entrapping junk encountered in a well bore: a supporting member adapted to be lowered in the well bore on a running-in string; a valve element fixed to said member so that said member and element move together as a unit and cannot move longitudinally with respect to each other; a barrel member surrounding said supporting member and having means engageable with said element to close the lower end of said barrel member and to normally sup-

port said barrel member; means substantially closing the upper end of said barrel member to greatly restrict the flow of fluid therethrough and to entrap debris in said barrel member; and means including instrumentalities engageable with said barrel member for sustaining a portion, but not all, of its weight, in order that said barrel member will float upwardly along said supporting member away from said valve element during lowering of said apparatus through fluid in the well bore.

5. In apparatus for entrapping junk encountered in a well bore: a mandrel adapted to be lowered in the well bore on a running-in string; a valve head fixed to said mandrel so that said mandrel and head move together as a unit and cannot move longitudinally with respect to each other; a cylindrical member having perforations through its side wall surrounding and laterally spaced from said mandrel to form an annular chamber therewith; a valve seat on the lower end of said member engageable with said head, said valve seat being disposed below said perforations; means substantially closing the upper end of said cylindrical member to greatly restrict the flow of fluid therethrough and to entrap debris in said cylindrical member; and means including instrumentalities engageable with said member for sustaining a substantial portion, but not all, of its weight, in order that said cylindrical member will float upwardly along said mandrel to carry its valve seat away from said valve head during lowering of said apparatus through fluid in the well bore.

6. In apparatus for entrapping junk encountered in a well bore: a mandrel adapted to be lowered in the well bore on a running-in string; a valve head fixed to said mandrel so that said mandrel and head move together as a unit and cannot move longitudinally with respect to each other; a perforate cylindrical member surrounding and laterally spaced from said mandrel to form an annular chamber therewith; a valve seat on the lower end of said member engageable with said head; means substantially closing the upper end of said cylindrical member to greatly restrict the flow of fluid therethrough and to entrap debris in said cylindrical member; and spring means bearing upon said mandrel and member for sustaining a substantial portion, but not all, of the weight of said member, in order that said cylindrical member will float upwardly along said mandrel to carry its valve seat away from said valve head during lowering of said apparatus through fluid in the well bore.

7. In apparatus for entrapping junk encountered in a well bore: a mandrel adapted to be lowered in the well bore on a running-in string; a valve head fixed to said mandrel so that said mandrel and head move together as a unit and cannot move longitudinally with respect to each other; a perforate cylindrical member surrounding and laterally spaced from said mandrel to form an annular chamber therewith; a valve seat on the lower end of said member engageable with said head, said seat extending outwardly beyond said head; means substantially closing the upper end of said cylindrical member to greatly restrict the flow of fluid therethrough and to entrap debris in said cylindrical member; and spring means bearing upon said mandrel and member for sustaining substantially the entire portion, but not all, of the weight of said member, in order that said cylindrical member will float upwardly along said mandrel to carry its valve seat away from said valve head during lowering of said apparatus through fluid in the well bore.

8. In apparatus for entrapping junk encountered in a well bore: a supporting member adapted to be lowered in the well bore on a running-in string; a valve element fixed to said member so that said member and element move together as a unit and cannot move longitudinally with respect to each other; a barrel member surrounding said supporting member and having means engageable with said element to close the lower end of said barrel member; said means and valve element forming a circumferentially continuous annular entrance therebetween when said means is elevated above said valve element; means substantially closing the upper end of said barrel member to greatly restrict the flow of fluid therethrough and to entrap debris in said barrel member; and means carried by said supporting member and engageable with said barrel member for sustaining a portion, but not all, of the weight of said barrel member, in order that said barrel member will float upwardly through said supporting member away from said valve element during lowering of said apparatus through fluid in the well bore.

9. In apparatus for entrapping junk encountered in a well bore: supporting means adapted to be lowered in the well bore on a running-in string; a first valve member fixed to said supporting means so that said member and means move together as a unit and cannot move longitudinally with respect to each other; a barrel member surrounding and longitudinally movable along said supporting member, said barrel member having a second valve member on its lower terminus disposed externally of said barrel member and providing a circumferentially continuous lower inlet into said barrel member when said second valve member is raised by said barrel member above and out of contact with said first valve member; means substantially closing the upper end of said barrel member to greatly restrict the flow of fluid therethrough and to entrap debris in said barrel member; said barrel member and its second valve member having a weight sufficient to hold said barrel member and said second valve member normally downward of said supporting means with the second valve member engaging the first valve member to close the lower end of said barrel member, the weight of said barrel member being such that fluid in the well bore will act upon said barrel member and elevate said barrel member along said supporting means to elevate said second valve member from said first valve member and open the lower end of the barrel member, during lowering of the apparatus in the well bore.

10. In apparatus for entrapping junk encountered in a well bore: supporting means adapted to be lowered in the well bore on a running-in string; a first valve member fixed to said supporting means so that said member and means move together as a unit and cannot move longitudinally with respect to each other; a barrel member surrounding and longitudinally movable along said supporting member, said barrel member having perforations extending from substantially its lower end to substantially its upper end, said barrel member having a second valve member on its lower terminus disposed externally of

said barrel member and providing a circumferentially continuous lower inlet into said barrel member when said second valve member is raised by said barrel member above and out of contact with said first valve member; means substantially closing the upper end of said barrel member to greatly restrict the flow of fluid therethrough and to entrap debris in said barrel member; said barrel member and its second valve member having a weight sufficient to hold said barrel member and said second valve member normally downward of said supporting means with the second valve member engaging the first valve member to close the lower end of said barrel member, the weight of said barrel member being such that fluid in the well bore will act upon said barrel member and elevate said barrel member along said supporting means to elevate said second valve member from said first valve member and open the lower end of said barrel member, said closing means and the total area of said perforations being proportioned to restrict relative upward flow of fluid in the well bore through said perforations while the apparatus is being lowered in the well bore, in order that such fluid maintains said barrel member in an upward position along said supporting member with said second valve member elevated above said first valve member.

11. In apparatus for entrapping junk encountered in a well bore: supporting means adapted to be lowered in the well bore on a running-in string; a first valve member fixed to said supporting means so that said member and means move together as a unit and cannot move longitudinally with respect to each other; a barrel member surrounding and longitudinally movable along said supporting member, said barrel member having relatively narrow longitudinal slots extending from substantially its lower end to substantially its upper end, said barrel member having a second valve member on its lower terminus disposed extrenally of said barrel member and providing a circumferentially continuous lower inlet into said barrel member when said second valve member is raised by said barrel member above and out of contact with said first valve member; means substantially closing the upper end of said barrel member to greatly restrict the flow of fluid therethrough and to entrap debris in said barrel member; said barrel member and its second valve member having a weight sufficient to hold said barrel member and said second valve member normally dowwnard of said supporting means with the second valve member engaging the first valve member to close the lower end of said barrel member, the weight of said barrel member being such that fluid in the well bore will act upon said barrel member and elevate said barrel member along said supporting means to elevate said second valve member from said first valve member and open the lower end of the barrel member, said closing means and the total area of said slots being proportioned to restrict relative upward flow of fluid in the well bore through said closing means and slots while the apparatus is being lowered in the well bore, in order that such fluid maintains said barrel member in an upward position along said supporting member with said second valve member elevated above said first valve member.

12. In apparatus for entrapping junk encountered in a well bore: a central mandrel adapted to be lowered in the well bore on a running-in string; a valve head fixed to said mandrel so that said mandrel and head move together as a unit and cannot move longitudinally with respect to each other; a barrel member surrounding and longitudinally movable along said mandrel, said barrel member having longitudinal slots extending from substantially its lower end to substantially its upper end; a valve seat threaded on the lower end of the barrel member nad extending laterally outward of said valve head, said seat providing a circumferentially continuous lower inlet into said barrel member when said seat is raised by said barrel member above and out of contact with said head; means substantially closing the upper end of said barrel member to greatly restrict the flow of of fluid therethrough and to entrap debris in said barrel member; said barrel member and valve seat having a weight sufficient to hold said barrel member and valve seat normally downward of said mandrel with the valve seat engaging the valve head to close the lower end of said barrel member; said valve seat having its lower end inclined in a downward and outward direction; said valve seat being engageable by substances in the well bore to elevate said valve seat and barrel member along said mandrel and above said valve head to open the lower end of the barrel member, said closing means and the total area of said slots being proportioned to restrict relative upward flow of fluid in the well bore through said slots while the apparatus is being lowered in the well bore in order that such fluid maintains said barrel member in an upward position along said mandrel with said seat elevated above said head.

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