Feb. 11, 1964 E. A. ANDERSON 3,120,872

JUNK RETRIEVER

Filed Feb. 19, 1960

Fig. 1A

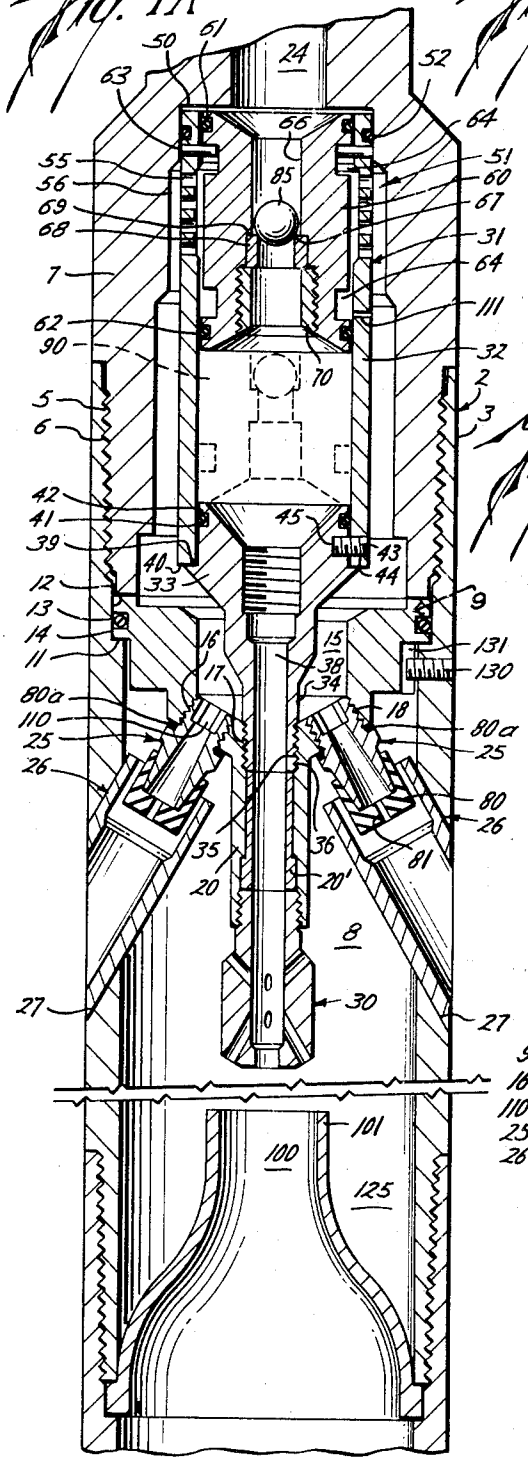


Fig. 1B

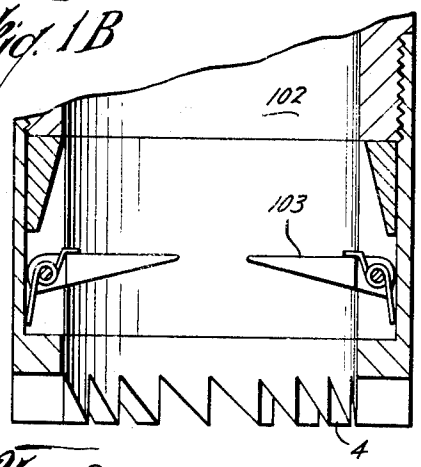
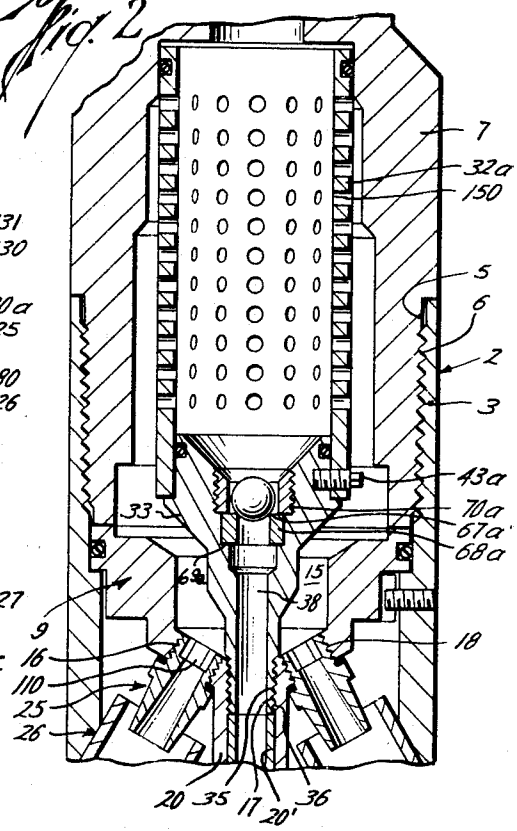


Fig. 2



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JUNK RETRIEVER

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The present invention relates to a junk retriever and more particularly to a hydraulically actuated junk retriever.

The present invention relates to and is an improvement on the invention disclosed in my prior co-pending application entitled "Junk Retriever" bearing Serial No. 662,431 and filed on May 29, 1957, now Patent No. 3,023,810.

During drilling operations it is not uncommon for debris and objects to collect in the well bore. For example, tools may be accidentally dropped in the well bore from the earth's surface, or a drilling bit cone may get knocked off and lost in the well bore. Other objects may become lost in the well bore, and it is desirable to recover any objects from the well bore which might interfere with normal drilling operations.

As a well bore is being drilled, well fluids are circulated in the well bore to accomplish certain desirable results. Generally speaking, it is undesirable to stop the circulation of drilling fluids even for a short period of time because certain problems are encountered when circulation is stopped that increase the problems and the costs in drilling the well bore.

Various tools have been proposed for removing objects from the well bore, and for circulating fluid in the well bore in a predetermined manner during such operations. Generally speaking, most of the tools presently in use have certain disadvantages. For example, in those well tools or junk baskets which are used at the present time to collect debris or objects from the well bore which permit the circulation of well fluid as the tool is lowered and as it is being actuated in the well bore, the fluid is circulated in the well bore and around the tool in a manner so that the fluid follows the path of least resistance and tends to inhibit the collection of objects or debris in the well tool.

It can be appreciated that the "fishing" operation for lost debris in a well bore may occur one, two or three, or even more miles below the earth's surface, which of course increases the problem of not only recovering the lost objects, but in maintaining proper circulation during the operation of the tool.

Additionally, the well fluids circulated in the well bore may have foreign particles such as clay, straw, lost circulation material, pieces of rubber, small pebbles or other matter which may tend to clog or restrict the proper flow of mud fluids in the junk basket.

An object of the present invention is to provide a junk retriever which does not interfere with the proper circulation of well fluids in the well bore and through the tool to maintain circulation in the well bore as the tool is being lowered into the well bore.

Another object of the present invention is to provide a junk retriever which not only maintains proper circulation of the drilling fluid as it is being lowered, but which incorporates means for filtering the drilling fluid prior to the time that it is discharged through the hydraulically operated part of the junk retriever to inhibit clogging of the junk retrieving apparatus by foreign particles in the mud.

Yet a further object of the present invention is to provide a hydraulically actuated junk retriever wherein jet pump means are mounted in the well tool so as to create a reduced pressure area within the tool whereby mud fluid is circulated into the tool from the well bore to aid in carrying junk into the tool, the junk retriever also including a filtering means for inhibiting clogging of the jet pump means by the well fluid during operation thereof.

Another object of the present invention is to provide a well tool through which well fluid may be separated as it is being lowered into the well bore, which tool is constructed and arranged so that fluid may be discharged into the tool to inhibit the collection of shale and foreign objects in the tool, and which is provided with means whereby well fluid may be selectively circulated to a jet pump means after it is positioned in the well bore so as to create a reduced pressure area in the well tool to aid in the collection of junk in the tool from the well bore.

Still another object of the present invention is to provide a hydraulically actuated junk retriever which is provided with jet pump means to create a reduced pressure area within the well tool so that objects within the well bore may be drawn into the well tool by fluid flowing toward the reduced pressure area, said well tool also incorporating the means whereby fluid may be selectively circulated to the interior of the well tool as it is lowered into the well bore to inhibit the collection of shale and other foreign matter therein.

Yet a further object of the present invention is to provide an improved form of hydraulically actuated junk retriever.

Still another object of the present invention is to provide a junk retriever wherein well fluids may be circulated thereinto as it is being lowered into the well bore in a manner to maintain proper circulation of the well fluids in the well bore, and to inhibit collection of shale or other foreign matter in the well tool as it is being lowered to inhibit clogging of the operating parts of the junk retriever.

Other objects and advantages of the present invention will become more readily apparent from a consideration of the following description and drawing wherein:

FIG. 1A is a vertical sectional view illustrating the preferred embodiment of the upper portion of the tool;

FIG. 1B is a vertical sectional view which is a continuation of FIG. 1A and illustrating the lower end of the tool; and,

FIG. 2 is a sectional view illustrating an alternate modification of a filtering means which may be used in the well tool.

In FIG. 1A the junk retriever is generally indicated by the numeral **2** and is illustrated as including the body **3** which may be of any suitable length. The body **3** is illustrated as being an elongated hollow tubular member which has the lower open end **4** through which junk in the well bore is adapted to be moved by the well tool, and is provided with the open upper end **5** which may be threaded on a portion as illustrated at **6** so that the body **3** can be connected by its end coupling or member **7** to the drill string which extends upwardly to the earth's surface and provides a means for positioning the well tool in the well bore and removing it therefrom as well as for conducting fluids in the well bore as the tool is being lowered, as it is being actuated, and as it is being removed from the well bore.

The elongated tubular body **3** defines or forms a chamber **8** therein between the ends of the body and beneath the fitting, designated generally by the numeral **9**. The fitting **9** is illustrated in the drawings as being positioned adjacent the upper end of the elongated tubular housing or body **3**. More particularly, it is illustrated as resting on the annular shoulder or ledge **11** which is formed at the lower end **12** of the threaded portion **6**. A suitable seal such as an O-ring as illustrated at **13** may be provided in the annular edge of the fitting **9** for abutting the adjacent surface **14** of the tubular body **3** for forming a seal therebetween.

The fitting **9** is provided with a central recessed portion

as illustrated at 15, and a plurality of passages are provided as illustrated at 16, 17 and 18 in the bottom of the central recessed portion 15 of the fitting 9.

Some of the passages such as those represented by the numerals 16 and 18 are spaced radially and directed in a particular manner for a purpose which will become more fully apparent. The passage 17 is illustrated as extending substantially axially through the central depressed portion 15, and through the projection 20 which is integrally formed on the bottom of the central depressed portion 15, as shown in FIG. 1A of the drawings.

Four radially spaced passages such as shown at 16 and 18 may be provided in the bottom of the central depressed portion 15, so that each passage is 90° apart; however, it can be appreciated that any suitable number of similar passages may be provided without departing from the scope of the invention. Two of the passages are illustrated in the drawings.

It will be noted that the passages 16 and 17 and 18 provide a means for communicating the well string 7 and fluid conducted through the bore 24 thereof from above the fitting 9 to the well tool body 3 below the fitting 9. More particularly, nozzles such as illustrated generally by the numeral 25 are adapted to be positioned in the radially spaced passages such as illustrated at 16 and 18 and are directed in a manner so as to be aligned to discharge within the venturi nozzles or tubes illustrated generally by the numeral 26 which nozzles or tubes 26 can be mounted by any suitable means such as welding or the like in the passages 27 in the tool body 3.

As can be seen in the drawings, the nozzles 25 are spaced annularly in relation to the venturi tubes 26 so that when fluid is discharged from the well string 7 through the fitting 9 and then discharged from the nozzles 25 within the venturi nozzles 26, a reduced pressure area is created in the chamber 8 of the tool body 3 so that objects in the well bore will tend to move up into the lower open end 4 of the tool body 3 as fluid flow occurs from outside the tool body 3 into the lower open end 4 to the reduced pressure area in the chamber 8. The construction of the present invention provides a jet pump means whereby objects in the well bore are urged or moved into the junk retriever.

When fluid is circulated from the well string 7 above the fitting 9 through the passage 17 it is discharged through the sprayhead or flushing nozzle designated generally by the numeral 30 and into the space 8 and it may then flow directly out the lower open end 4 of the well tool body 3. Valve means designated generally by the numeral 31 are provided for selectively controlling the flow of fluid through passages 16, 18 and the nozzles 25 and venturi nozzles 26, or through the passage means 17 to be discharged directly into the chamber 8 through the sprayhead or flushing nozzle 30.

As previously noted, it is desirable to maintain circulation of well fluid as a well bore is being drilled, and the present invention permits the well fluid to be circulated as the junk retriever 2 is being lowered into the well bore, and permits the well fluid to be circulated in a manner in the tool body 3 so as to inhibit the collection of shale or other foreign matter therein which might otherwise clog or foul the operation of the nozzles 25 and venturi nozzles 26. The valve means 31 selectively flows the fluid from the passage 24 in the well string 7 to the passage 17, or to the passages 16 and 18 when the junk retriever 2 is to be actuated.

The valve member 31 is shown in the drawings as including a tubular member 32 which is shown in the drawings as being supported on a separate base 33. The base 33 includes a projection 34 which is threaded at its lower end as shown at 35 to engage with the threads 36 in the upper end of the passage means 17 in the central depressed portion 15 of the fitting 9. The threads 35 and 36 are adapted to engage to position the base 33

in position in the passage means 17, and it will be noted that the base 33 is provided with a passage 38 which communicates with the passage 17 in the projection 20 of fitting 9.

The passage 17 in projection 20 is adapted to receive a hollow landing bushing 20' therein against which the lower end of base 33 abuts when threaded in the threads 36 of the upper end of opening 17. This assures proper threading and seating of the base 33 in fitting 9. The flushing nozzle 30 threads against the lower end of the landing bushing 20' as shown in the drawings.

An annular ledge 39 is provided on the base for receiving the lower end 40 of the tubular member 32, and suitable seal means may be provided as illustrated at 41 in the annular periphery 42 of the base member for sealing between the tubular member 32 and the base. The tubular member 32 may be positioned and held on the base 33 by any suitable means and such means is illustrated in the drawings as including the Allen screw 43 threadedly secured through the opening 44 in the tubular member 32 and adapted to be engaged in the threaded opening 45 in the base 33. When the tubular member 32 is seated on the base 33, the Allen screw 43 is threadedly secured through the tubular member 32 and into the threaded opening 45 to hold the tubular member 32 and base 33 together. The tubular member 32 is of suitable axial extent so that it terminates adjacent the end 50 of the enlarged passage designated generally as 51 in the lower end of the drill string section 7 secured to the upper end of the tool body 3. Suitable seal means as illustrated at 52 are provided for sealing between the upper end of the tubular member 32 and the adjacent drill string 7 so that fluid flow is conducted downwardly through the interior of the tubular member 32 from the passage 24 in the drill string 7.

Openings 55 are provided in the upper end of the tubular member 32 and communicate with the portion 56 of the enlarged passage 51, which portion 56 is of larger diameter than the outer diameter of the tubular member 32 so that a passage means is defined along the section of the drill string which interfits the tool body 3, which passage 56 communicates with the recessed portion 15 in the fitting 9 as shown in the drawings. The openings 55 may be of a size somewhat smaller than the size of the orifice in the nozzles 25 so that they will act as a filter to filter the flow of fluid to inhibit clogging of the nozzles 25 when the device is in operation.

A sleeve or piston 60 is shown in the drawings as covering or spanning the ports 55, such sleeve having the seal means 61 and 62 thereon at each end for sealing off between the sleeve and the tubular member 32 in which it slidably fits. Shear means as illustrated at 63 are provided for fitting in the groove 64 of the sleeve 60 to releasably hold the sleeve 60 in position in the tubular member 32 to initially cover the ports 55 whereby fluid from the drill string 7 is conducted from the passage 24 through the port 66 in the sleeve 60 and then through the tubular member 32 to be discharged through the base 33 and the passage means 17 formed in the projection 20 on a fitting 9. It will be noted that sleeve piston 60 is provided with a groove 64 at each end so that either end of the sleeve can be inserted into member 32 and shear pin means 63 engaged in the groove 64 adjacent thereto.

The passage 66 in the sleeve 60 is provided with a valve seat as illustrated at 67 on ring 68 which may be formed of a wear-resistant material which ring is held in position on the annular edge 69 formed in the passage 66. Suitable means such as the threaded ring member 70 may be provided for releasably holding the hardened valve seat ring 68 in position in the passage 66 whereby the seat ring 68 may be replaced when necessary.

It has been discovered that a great deal of difficulty is encountered with hydraulic junk retrievers in that well fluids may contain foreign materials such as particles of clay, straw, lost circulation material, pieces of rubber,

small pebbles and other foreign objects which may tend to clog the operating parts of a hydraulic junk retriever. Also, as the tool is lowered into the well bore it may bump against the well bore wall and may otherwise come in contact with material which would settle in the junk retriever and prevent the normal operation thereof when it is positioned in the well bore to recover junk. In order to overcome this, the valve means **31** initially flows the fluid from the passage **24** in the drill string **7** through the tubular member **32** and then through the opening **17** in the projection **20** to be discharged through the sprayhead **30**. The discharge of the well fluid in this manner inhibits the collection of debris in the chamber **8** as the well tool is being lowered into the well bore and in effect it keeps it cleaned out while maintaining proper circulation of the drilling fluid. To further inhibit damage to the operating parts of the mechanism as the device is lowered into the well bore rubber caps as illustrated at **80** may be provided over each of the nozzles **25**. The caps **80** may be provided with a bore **81** of reduced cross-section to permit the escape of fluid which may collect therein, and the caps **80** will be blown off by hydraulic pressure when the fluid is discharged through the nozzles **25** after the valve means **31** has been actuated to permit the flow of fluid through the well tool to communicate with the passages **16** and **18** in the fitting **9**.

The caps **80** may not be used in cased holes, but it is generally desirable to use them in open holes to prevent clogging of the nozzles **25**.

Suitable seals **80***a* are provided adjacent the nozzles **25** to prevent leakage of fluid therearound.

After the well tool has been lowered to the bottom of the well bore, or has been positioned at a desired location in the well bore for operation, a ball or other suitable member as illustrated in dotted line at **85** may be lowered through the well string, or may be dropped into the well string so that it seats on the seat ring **68**. This prevents further flow of fluid through the sleeve **60**, and in effect forms a piston with the hydraulic pressure from the drill string **7** acting thereon, and when the pressure is built up by the pump pressure at the earth's surface, the pins **63** shear and the sleeve **60** moves to the position illustrated in dotted line at **90**. When the sleeve **60** is in this position, further flow through the passage **17** and the projection **20** is inhibited and fluid thereafter flows through the ports **55** and through the passage means **56** to be discharged through the radially spaced passages **16** and **18** and the nozzles **25** connected therewith. This flow of fluid will blow off the caps **80** from the ends of nozzles **25** and recirculate them downwardly along the outside of the tool so that they will be gathered up with the other junk being picked up by the junk retriever, or they will circulate into the well fluid column and out of the well bore. It is to be noted that the nozzles **25** are threaded at their inner ends whereby they may be engaged with suitable threads provided on the surface surrounding radially spaced passages **16** and **18**. If desired, the nozzles **25** as well as the venturi nozzles **26** and the sprayhead **30** may all be formed of wear-resistant material such as ceramic, metallic carbide or the like. A bleeder hole **111** is provided in the tubular member **32** for bleeding off pressure between seals **61** and **62** when the member **32** has moved to dotted line position as shown at **90**.

The arrangement and relationship of the nozzles **25** to the venturi nozzles **26** is such that a reduced pressure area is created in the chamber **8** in the interior of the well tool body **3** in relation to the pressure of the well fluid existing in the well bore externally of the tool. This causes objects to move upwardly through the lower open end **4** of the junk retriever, and the lighter weight objects will move on up through the opening **100** in the bell shaped member **101**, while the larger objects will remain in the lower portion **102**, and will be held in position therein by reason of the spring fingers **103**. The

flow of the well fluid will be through the nozzle **25** to the exterior of the tool body **3** to the bottom of the well bore and into the lower end of the junk retriever, and then up into the tool. This circulation will be continued until all of the devices have been recovered.

The openings **55** in valve member **31** are of a size somewhat smaller than the opening in the end **110** of the nozzles **25** and thereby act as a filtering means for preventing the nozzles from becoming stopped up by debris or foreign objects in the mud.

The sleeve **60** may be slipped from the end of the tubular member **32** and the valve member **31** reassembled and new shear pins inserted in position prior to its next use.

In FIG. 2 an alternate modification of the invention is illustrated and it will be noted that the tool body illustrated at **3**, the nozzles **25**, venturi nozzles **26** and the fitting **9** are of the same general configuration as previously described. Passages **16**, **17** and **18** are provided in the central recessed portion **15** of the fitting **9** as previously described.

In FIG. 2, the tubular member **32***a* is seated in the tool as described with regard to tubular member **32** in FIGURE 1A. The base **33** is secured in fitting **9**, and in turn the tubular member **32***a* is engaged therewith by any suitable means such as a screw **43***a*.

However, it will be noted that tubular member **32***a* is perforated throughout its length as illustrated at **150**. The perforations **150** are smaller than the openings in nozzles **25** and thereby filter the flow of fluid prior to its passing to the nozzles **25**.

The base **33** is provided with a valve seat **67***a* on ring **68***a* formed of wear-resistant material and which is held in position on ledge **69***a* formed in passage **38**. Suitable means such as threaded ring member **70***a* may be provided for holding the hardened valve seat ring **68***a* in position.

When the device is being lowered through the well bore, fluid will circulate downwardly through the well string **7** and discharge through the passages or perforations **150** as well as through the passage **38** in base **33**. The fluid conducted through the passage **38** will be communicated to the passage **17** in the projection **20** of the fitting **9** and then to the spray nozzle or flushing nozzle **30** to be discharged through the openings therein. This inhibits collection of material in the tool in the manner as described with regard to the FIG. 1A modification.

When the tool has reached its position in the well bore at which it is to be operated, the member **85** may be dropped therein so as to close off the passage **38** whereupon all flow of fluid is directed through the perforations **150** in member **32** to the nozzles **25** to create a reduced pressure area or suction in the chamber **8** to accomplish the function of the device as described with regards to the FIG. 1A modification.

From the foregoing description it can be seen that the present invention provides a filtering means for filtering flow of fluid to inhibit clogging or restriction of flow through the orifice **110** of each of the nozzles **25** which restriction would inhibit proper operation of the device. Also, the form of the invention shown in FIG. 1A provides a valve means whereby fluid may be flowed selectively to the interior of the well tool body below the fitting **9** to inhibit collection of debris therein as the device is being lowered into the well bore without interfering with proper circulation of the well fluid in the well bore, and the valve means thereafter enables the well fluid to be selectively flowed to the jet pumps communicated with the radial passages in fitting **9** to effect actuation of the device.

The flushing of debris by the sprayhead or flushing nozzle **30** enables silt, sand, mud and debris to be washed or circulated off the junk to be picked up. This is extremely advantageous because it enables the tool to be located properly over the junk to pick it up.

In some circumstances a suitable length of well pipe may be connected to the lower open end 4 of the tool so that the tool is retained in spaced relation off the bottom of the well bore. When used in this manner the tool will still function to create a reduced pressure area in the chamber 8 of the device and will move objects through the portion of the well string connected into the lower open end 4 of the tool to collect them in the well tool body in the chamber 125 or in the portion 102 above the fingers 103.

In order to properly seat fitting 9 as it is positioned in the body 3 so that the nozzles 25 are properly aligned and spaced relative to nozzles 26, a pin 130 may be provided in one member such as the body 3, and a matching groove 131 in the other member to aid in aligning the fitting 9 in the body and to thereby position the nozzles properly. Of course, while four nozzles have been described in the operation of the present tool, additional or fewer, nozzles 25 and 26 may be provided in the tool as desired and as necessary.

It should be noted that while 7 has been referred to herein as the lower end of the drill string, that the bore 50 may be formed in a top connection 7 which has the drill string secured to the upper end thereon.

Also, the invention has been described in detail with a plurality of passages and jet nozzles secured therein; however, it can be appreciated that the invention will function satisfactorily with just one passage, such as a passage 16. The nozzle 25 would be mounted in the end thereof and one nozzle 26 secured in a single opening 27 in the body 3, and of course the functioning of the invention with only a one nozzle arrangement would be similar to that described herein in connection with a plurality of passages and nozzles.

Broadly the invention relates to a hydraulic junk retriever and more particularly to a hydraulic junk retriever incorporating therein jet pump means for creating a reduced pressure area within the tool to form a suction to draw objects into the tool, which hydraulic junk retriever incorporates a valve means for selectively flowing the fluid in a desired manner and for filtering the fluid prior to discharging through the jet pump means.

What is claimed is:

1. A well tool for securing to a well string to be lowered into a well bore to recover objects therein including, an elongated hollow body open at its upper and lower ends, a fitting in said body, said fitting having a plurality of radially spaced passages and a central passage for communicating with the well string thereabove whereby fluid may be conducted from the well string to said central passage and to said radially spaced passages, a valve member in said body to selectively communicate said radially spaced pasages and said central passage with the well string whereby fluid may be conducted selectively to said central passage and to said radially spaced passages, said valve member initially positioned to close off fluid flow to said radially spaced passage and to communicate said central passage with the well string whereby fluid may be circulated into said body, said valve member being adapted to receive a ball member dropped in the well string to close off flow through said central passage and build up fluid pressure on said valve member to move it in said body whereupon said radial passages communicate with the well string, nozzles mounted in the discharge end of said radial passages of said fitting, venturi nozzles mounted on said body to communicate exteriorly of said body and into which said first mentioned nozzles are directed, there being a space between said first mentioned nozzles and venturi nozzles whereby fluid discharged from said first mentioned nozzles into said venturi nozzles develops a suction within said hollow body to draw the fluid from the well bore into the lower open end of said body to bring objects from the well bore into said body.

2. A junk retriever for securing to a well string to be lowered into a well bore to recover objects therein including, an elongated hollow body open at its upper and lower ends, a fitting in said body, said fitting having a plurality of radially spaced passages and a central passage for communicating with the well string thereabove whereby fluid may be conducted from the well string to said central passage and to said radially spaced passages, a screen mounted in said body between the fitting and the well string for filtering fluid from the well string prior to its discharge through said radial passages, nozzles mounted in the discharge end of said radial passages of said fitting, venturi nozzles mounted on said body to communicate exteriorly of said body and into which said first mentioned nozzles are directed, there being a space between said first mentioned nozzles and venturi nozzles whereby fluid discharged from said first mentioned nozzles develops a suction within said hollow body to draw the fluid from the well bore into the lower open end of said body to retrieve junk from the well bore into said body.

3. A junk retriever for securing to a well string to be lowered into a well bore to recover objects therein including an elongated hollow body open at both its upper and lower ends, a fitting in said body, said fitting having a plurality of passages for communicating with the well string thereabove whereby fluid may be conducted to said passages, nozzles mounted in the discharge end of said passages, a screen mounted in said body between the fitting and the well string for filtering fluid passing from the well string to said passages to inhibit clogging of said nozzles, valve means for closing off flow to said screen, shear means holding said valve means in position to close off flow through said screen, additional passage means in said fitting, passage means in said valve means communicating said additional passage means in said fitting with the well string whereby fluid may be circulated downwardly through said passages, said valve passage means adapted to be closed off by a member lowered through the well string whereupon fluid pressure shears said shear means to enable said valve means to move and uncover said screen for fluid flow therethrough, venturi nozzles mounted to communicate exteriorly of said body and into which said first-mentioned nozzles are directed, there being a space between said first-mentioned nozzles and venturi nozzles whereby fluid discharged from said first-mentioned nozzles to said venturi nozzles develops a suction within said hollow body to draw the fluid from the well bore into the lower open end of said body to retrieve junk from the well bore into said body.

4. A junk retriever for securing to a well string to be lowered into a well bore to recover objects therein including, an elongated hollow body open at its upper and lower ends, a fitting in said body, said fitting having a plurality of radially spaced passages and a central passage for communicating with the well string thereabove whereby fluid may be conducted from the well string to said central passage and to said radially spaced passages, a tubular member supported on said fitting, perforations in said member forming a screen for filtering fluid from the well string prior to its discharge through said radial passages, nozzles mounted in the discharge end of said radial passages of said fitting, venturi nozzles mounted in said body to communicate exteriorly of said body and into which said first mentioned nozzles are directed, there being a space between said first mentioned nozzles and venturi nozzles, means to selectively close off said central passage in said fitting whereby said radially spaced passages may be communicated with the well string whereby fluid discharged from said first mentioned nozzles develops a suction within said hollow body to draw the fluid from the well bore into the lower open end of said body to retrieve junk from the well bore into said body.

5. A junk retriever for securing to a well string to

be lowered into a well bore to recover objects therein including, an elongated hollow body open at its upper and lower ends, a fitting in said body, said fitting having a plurality of radially spaced passages and a central passage for communicating with the well string thereabove whereby fluid may be conducted from the well string to said central passage and to said radially spaced passages, a tubular member supported on said fitting, perforations in said member throughout its length forming a screen for filtering fluid from the well string prior to its discharge through said radial passages, nozzles mounted in the discharge end of said radial passages of said fitting, venturi nozzles mounted in said body to communicate exteriorly of said body and into which said first mentioned nozzles are directed, there being a space between said first mentioned nozzles and venturi nozzles, means to selectively close off said central passage in said fitting whereby said radially spaced passages may be communicated with the well string whereby fluid discharged from said first mentioned nozzles develops a suction within said hollow body to draw the fluid from the well bore into the lower open end of said body to retrieve junk from the well bore into said body.

6. In a fluid operated junk retriever adapted to be lowered into a well bore for collecting junk from the well bore, a body, there being fluid passage means in said body for circulating fluid through said body to inhibit collection of debris in said body as it is lowered in the well bore, additional fluid passage means in said body, jet pump means mounted in said body and communicated with said additional fluid passage means whereby fluid from the well string may be circulated through said jet pump means and then discharged into the well bore so as to create a reduced pressure area in said tool body for aiding in moving junk into said body and means for selectively controlling the flow of fluid to said passage means to circulate fluid in said body and thereafter close off flow to said passage means and direct flow to said additional fluid passage means to actuate said jet pump means when desired.

7. The invention recited in claim 6 including a filter means in said body for filtering fluid flow to said passage means and to said additional passage means.

8. A well tool for securing to a well string to be lowered into a well bore to recover objects therein including, an elongated hollow body open at its upper and lower ends, a fitting in said body, said fitting having a plurality of radially spaced passages and a central passage for communicating with the well string thereabove whereby fluid may be conducted from the well string to said central passage and to said radially spaced passages, a valve member in said body to selectively communicate said radially spaced passages and said central passage with the well string whereby fluid may be conducted selectively to said central passage and to said radially spaced passages, said valve member initially positioned to close off fluid flow to said radially spaced passages and to communicate said central passage with the well string whereby fluid may be circulated into said body, said valve member adapted to receive a closure member to close off flow through said central passage and build up fluid pressure on said valve member to move it in said body whereupon said radial passages communicate with the well string, nozzles mounted in the discharge end of said radial passages of said fitting, venturi nozzles mounted on said body to communicate exteriorly of said body and into which said first mentioned nozzles are directed, there being a space between said first mentioned nozzles and venturi nozzles whereby fluid discharged from said first mentioned nozzles into said venturi nozzles develops a suction within said hollow body to draw the fluid from the well bore into the lower open end of said body to bring objects from the well bore into said body.

9. A circulating tool comprising,
(*a*) a body,
(*b*) said body having a fluid passage communicating with its upper end,
(*c*) said body having a chamber which opens at its lower end to the exterior of said body,
(*d*) said body having passage means extending through the side thereof,
(*e*) means formed in said body for conducting fluid from the upper fluid passage opening of said body to the exterior of said body through said side passage means,
(*f*) said fluid conducting means including jet pump means, said jet pump means including,
(1) nozzles for receiving fluid discharge from said fluid passage in the upper end of said body,
(2) venturi nozzles mounted in said passage means, there being a space between said first named nozzles and venturi nozzles whereby fluid discharged therethrough creates a reduced pressure in said chamber, and
(*g*) filter means in said body for filtering fluid from the upper fluid passage opening in said body prior to its discharge to said jet pump means.

10. A circulating tool comprising,
(*a*) a body,
(*b*) said body having a fluid passage communicating with its upper end,
(*c*) said body having a chamber which opens at its lower end to the exterior of said body,
(*d*) said body having passage means extending through the side thereof,
(*e*) means formed in said body for conducting fluid from the upper fluid passage opening of said body to the exterior of said body through said side passage means,
(*f*) said fluid conducting means including jet pump means, said jet pump means including,
(1) nozzles for receiving fluid discharge from said fluid passage in the upper end of said body,
(2) venturi nozzles mounted in said passage means, there being a space between said first named nozzles and venturi nozzles whereby fluid discharged therethrough creates a reduced pressure in said chamber, and
(*g*) valve means for selectively closing off flow through said side passage means while circulating fluid through said body.

11. A circulating tool comprising,
(*a*) a body,
(*b*) said body having a fluid passage communicating with its upper end,
(*c*) said body having a chamber which opens at its lower end to the exterior of said body,
(*d*) said body having passage means extending through the side thereof,
(*e*) fitting means formed in said body for conducting fluid from the upper fluid passage opening of said body to the exterior of said body through said side passage means,
(*f*) said fluid conducting means including jet pump means, said jet pump means including,
(1) nozzles for receiving fluid discharge from said fluid passage in the upper end of said body,
(2) venturi nozzles mounted in said passage means, there being a space between said first named nozzles and venturi nozzles whereby fluid discharged therethrough creates a reduced pressure in said chamber,
(*g*) valve means for selectively closing off flow through said fitting for shutting off flow to said jet pump means while circulating fluid through said body,
(*h*) said valve means including,
(1) a hollow tubular member secured to said fitting,

(2) seal means between the upper end of said tubular member and said body,

(3) said tubular member having a smaller outer diameter than the inner diameter of said body to define a passage therebetween,

(4) a ported sleeve in said tubular member whereby said upper fluid passage opening of said body may communicate with at least one of said passages in said fitting through the lower end of said tubular member,

(5) a plurality of openings in said tubular member adjacent the upper end thereof whereby said upper fluid passage opening of said body may communicate with other of said passages in said fitting,

(6) shear means holding said sleeve over said plurality of openings in said tubular member to close off fluid flow therethrough, and

(7) said ported member being adapted to seat a member therein whereby fluid pressure thereagainst shears said shear means to move said sleeve and uncover said plurality of openings for fluid flow therethrough.

12. A junk retriever for securing to a well string to be lowered into a well bore to recover objects therein including,

(*a*) a body,

(*b*) said body having a fluid passage communicating with its upper end,

(*c*) said body having a chamber which opens at its lower end exteriorly of said body,

(*d*) a fitting in said body,

(*e*) said fitting having a plurality of radially spaced passages and a central passage communicating with said upper fluid passage opening in said body,

(*f*) valve means carried by said body for initially directing fluid flow to said central passage,

(*g*) said valve means being operable to selectively close off flow to said central passage and direct flow to said radially spaced passages,

(*h*) jet pump means including nozzles mounted in said radially spaced passages,

(*i*) said nozzles terminating within said chamber and being directed outward of said body, and

(*j*) venturi nozzles mounted on said body and into which said first mentioned nozzles are directed, said venturi nozzles and said first mentioned nozzles being spaced whereby fluid from said passages is discharged exteriorly of said body to develop a reduced pressure within said chamber to draw fluid from the well bore into said chamber to retrieve junk from the well bore.

13. A junk retriever for securing to a well string to be lowered into a well bore to recover objects therein including,

(*a*) a body,

(*b*) said body having a fluid passage communicating with its upper end,

(*c*) said body having a chamber which opens at its lower end exteriorly of said body,

(*d*) a fitting in said body,

(*e*) said fitting having a plurality of radially spaced passages and a central passage communicating with said upper fluid passage opening in said body,

(*f*) valve means carried by said body for initially directing fluid flow to said central passage,

(*g*) said valve means being operable to selectively close off flow to said central passage and direct flow to said radially spaced passages,

(*h*) jet pump means including nozzles mounted in said radially spaced passages,

(*i*) said nozzles terminating within said chamber and being directed outward of said body,

(*j*) venturi nozzles mounted on said body and into which said first mentioned nozzles are directed, said venturi nozzles and said first mentioned nozzles being spaced whereby fluid from said passage is discharged exteriorly of said body to develop a reduced pressure within said chamber to draw fluid from the well bore into said chamber to retrieve junk from the well bore,

(*k*) shear means supporting said valve means within said body, and

(*l*) means releasing said valve means when a predetermined fluid pressure is acted thereon to open said jet pump means to fluid flow to create a reduced pressure in said body.

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