

Jan. 4, 1944.

M. C. WILSON

2,338,370

CEMENT RETAINER

Filed July 29, 1940

2 Sheets-Sheet 1

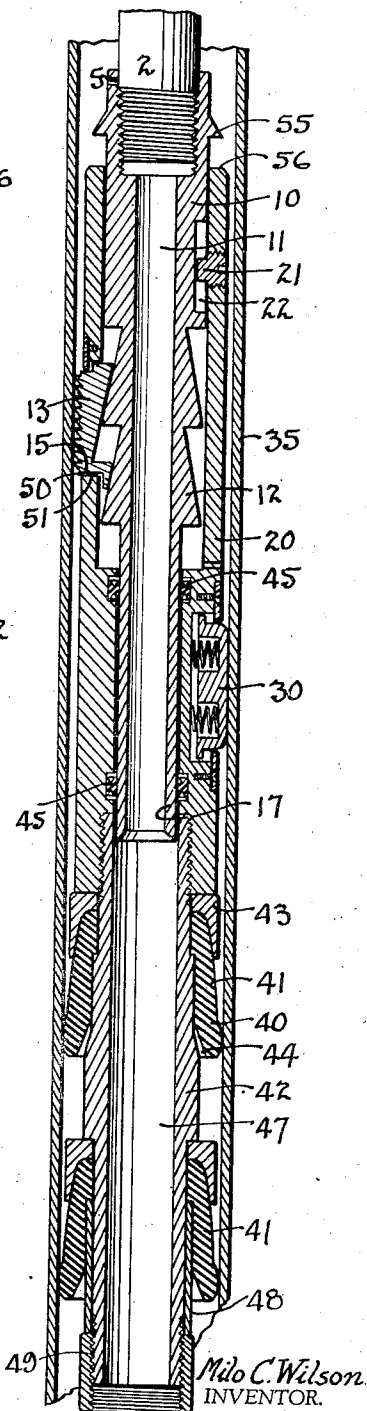
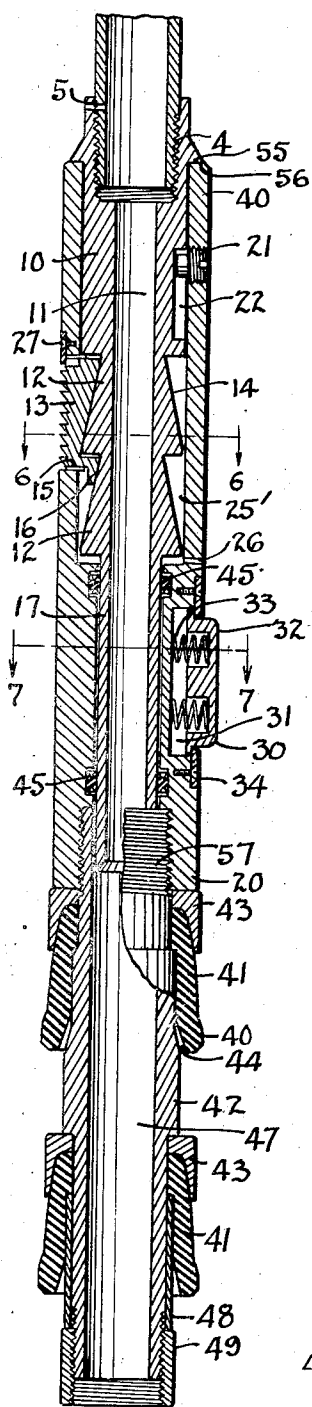
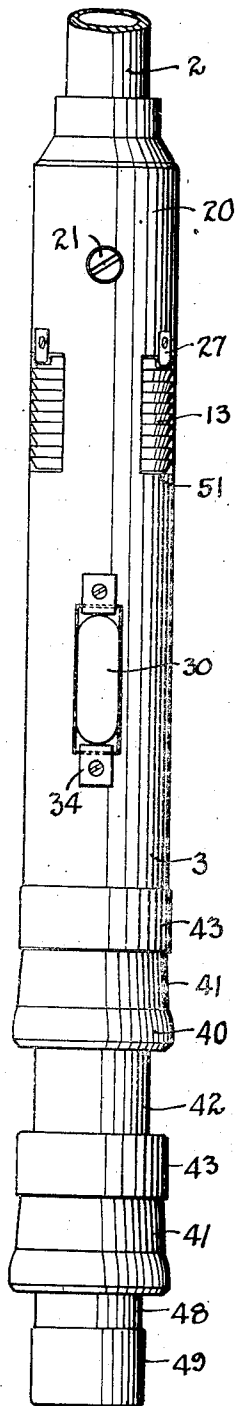


Fig. 1.

Fig. 2.

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Fig. 3.

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2 Sheets-Sheet 2

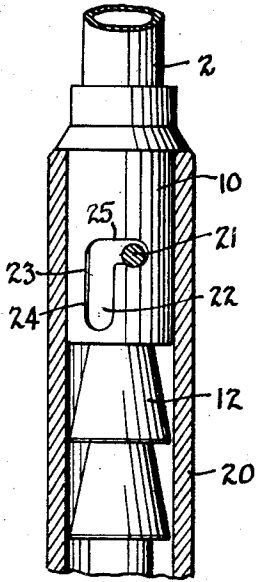


Fig. 4.

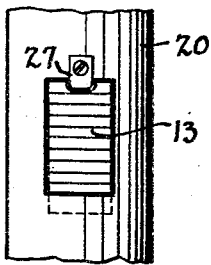


Fig. 5.

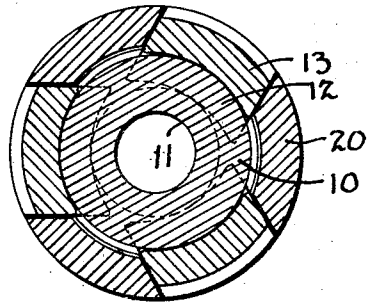


Fig. 6.

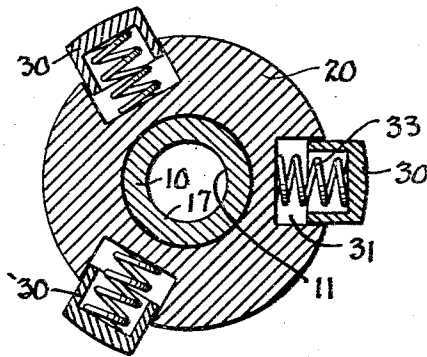


Fig. 7.

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UNITED STATES PATENT OFFICE

2,338,370

CEMENT RETAINER

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Application July 29, 1940, Serial No. 348,146

2 Claims. (Cl. 166-12)

The invention relates to cement retainers which are in the form of a plug lowered into the pipe in a well bore so as to form a restriction whereby pump pressure and cement may be introduced into the well bore and pressure applied to the formation of the well bore.

Cement retainers of this type are usually lowered into the well bore on a string of pipe anchored in position and the pressure then applied thru the operating or setting pipe. It is the function of the cement retainer to become firmly lodged in the pipe so as to withstand any upward thrust caused by the pressure applied thru the operating pipe. In other words, the cement retainer merely anchors the lower end of the pipe in the well so as to facilitate the application of pressure to the formation, regardless of whether the cement is discharged from the lower end of the pipe or casing or thru perforations in the pipe or casing.

It is one of the objects of the present invention to provide a cement retainer which can be lowered into the well bore and firmly anchored by a partial rotation of the operating pipe and an upward pull thereon which merely acts to set the slips and has no setting action so far as a packing or seal is concerned.

Another object of the invention is to provide a combination of an anchoring device and a pressure operated packer wherein the thrust on the packer is exerted against the slips and not against the wedging means which initially sets the slips so that the slips do not become locked in position due to the cement pressure.

Another object of the invention is to provide a cement retainer which is not self actuating and which can be readily removed from the well bore.

Still another object of the invention is to provide a cement retainer which is not self actuating and which can be readily knocked loose by a downward movement of the operating pipe.

A still further object of the invention is to provide a cement retainer which can be anchored by an initial pull on the operating pipe to set the slips and wherein the slips will be urged into gripping action by the pressure applied to the tool from below so as to avoid placing an excessive force on the wedging tool.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings in which:

Fig. 1 is a side elevation of the cementing tool.

Fig. 2 is a vertical section of the tool of Fig. 1

taken on a section line perpendicular to the sheet of the drawings and illustrating the tool in contracted position as it will be lowered into the well bore.

Fig. 3 is a section similar to Fig. 2 but showing the cement retainer as having been anchored or set in position.

Fig. 4 is a side elevation of the J-latch connection between the mandrel and housing of the tool.

Fig. 5 is a broken detailed elevation of the slip construction.

Figs. 6 and 7 are sections taken on the lines 6-6 and 7-7 respectively of Fig. 2.

In Fig. 1 an operating pipe 2 is shown and this pipe is usually in the form of a drill stem. The cementing tool 3 is connected therewith by the threads 4 as seen in Figs. 2 and 3. The threads 4 are preferably a left hand thread so that the pipe 2 may be backed out of or unscrewed from the tool by rotation in a clockwise direction. A shear pin 5 normally prevents such unscrewing and is adapted to be sheared only when a predetermined torque is exerted on the pipe 2 while the tool 3 is anchored. Under most circumstances this pin 5 will be of such strength that it will shear only in event the tool 3 is stuck and cannot be removed in the manner normally intended, as will be hereinafter pointed out.

The tool 3 is made up of a mandrel 10 whose upper end is connected to the pipe threads. This mandrel has a passage 11 extending throughout its length and is provided with upwardly tapered wedges 12 which are arranged to set the slips or jaws 13 which have complementary inclined faces riding on the face 14 of the wedge. Each slip 13 has a shoulder 15 adjacent its lower end and a heel 16 extending inwardly from the shoulder 15 and arranged to engage the lower wedge 12. The slips are slidably mounted in openings 50 in a housing 20 surrounding the mandrel 10.

Below the wedges the mandrel 10 is reduced in external diameter to provide a pipe 17 which is open at its lower end.

Positioned around the mandrel 10 is a sleeve or housing 20 which is normally connected to the mandrel for relative sliding movement limited by the latch pin 21 and slot 23 of the J-latch 22. This latch is seen in side elevation in Fig. 4 and comprises a slot 23 in the mandrel having a vertical portion 24 and a horizontal portion 25 so that the pin 21 when positioned in the horizontal portion 25 will prevent relative longitudinal movement between the mandrel and the housing

but when the mandrel is rotated in a counter-clockwise direction as seen in Fig. 4 the slot portion 25 will move around on the pin 21 to bring the vertical portion 24 of the slot in line with the pin. The mandrel can then be raised relative to the housing to raise the upwardly tapered wedges 12 to engage and extend the slips 13 into engagement with the well casing. Lowering the mandrel will tend to retract the wedges from the slips and permit them to be loosened from the casing. In order to equalize the pressure of liquid in the well and in the slip chamber 25 a port 26 is provided in the housing underneath the wedges 12. This port 26 also allows the washing out of any sediment which may work into the tool. The slips 13 are retained against displacement from the housing by the hold-down plates 27 secured to the housing and the heels 16 on the slips.

In order to create a drag on the housing so as to facilitate the setting and releasing of the slips 13 the drag bars 30 are provided. Three of these bars are seen in Fig. 7 and they are disposed in the slots 31 in the housing and normally urged outward by the springs 32. The tips 33 of these bars are confined by the stop plates 34 which are affixed to the housing. These bars normally project beyond the diameter of the housing as seen in Figs. 2 and 7, to engage the pipe 35 in the well bore in which the tool is to be set. In this manner there is a tendency for the housing 20 to remain stationary except when it is caused to move by movement of the mandrel 10.

With the parts in the position shown in Figs. 4 and 7 with the latch preventing relative movement of the mandrel in the housing, the assembly will be lowered into the well bore. A partial rotation of the operating pipe 2 and the mandrel 10 release the J-latch so that the mandrel may be pulled upwardly relative to the housing. The drag bars 30 tend to hold the housing stationary and this resistance is sufficient to permit the mandrel moving upwardly relative to the housing to extend the slips into gripping engagement with the well casing.

A packer support 42 is threaded into the lower end and forms a part of the housing 20 as seen in Figs. 2 and 3 and this support may carry a plurality of fluid pressure operated packings 41 each of which is in the form of a downwardly facing packing cup 40 which is retained by the cap 43. In this manner a lip type of packing is provided by the recess 44 under the packing so that pressure from below will expand the packing and cause it to seal with the pipe 35. The packings 45 carried by the inside of the housing 20 form a seal between the mandrel and the housing. The packer support 42 has a passage 47 therethrough which is a continuation of the passage 11 in the mandrel. A retainer nipple 48 in the couplings 49 tend to hold the lower packer in place.

Particular attention is directed to the fact that the slip jaws 13 are freely floating in the openings 50 in the housing 20 as seen in Figs. 2, 3 and 5, and also to the fact that the shoulder 51 on the housing is arranged to engage the shoulder 15 on the lower portion of the slip. This construction is provided so that when the tool is set as shown in Fig. 3, a pump pressure applied thru the operating pipe 2 and the passages 11 and 47 to force liquid or cement into the well bore, is also applied to the packers 41, tending to move these packers upwardly.

Inasmuch as the packers are mounted on the housing 20 it seems obvious that there would

also be a tendency to move the housing upwardly. This upward movement of the housing causes the shoulder 51 to abut the shoulder 15 on the slips so that any pressure exerted on the housing of the tool itself is transmitted to the slips to assist in maintaining them in set position but attention is called to the fact that this same pressure does not tend to drive the wedges 12 against the slips because the movement of the housing 20 can be independent of the mandrel 10 after the J-latch has been released. This feature is believed to be of importance because of the fact that in other types of cement retainers the pressure applied thru the retainer to the liquid is exerted on the retainer, tending to drive the wedges more firmly against the slips and inasmuch as tremendous pressures can in this manner be attained, it seems obvious that the wedges would be driven against the slip with such a tremendous pressure that in some instances it has been found that a release could not be obtained. In the present device, however, this pressure is not exerted on the wedges but is exerted on the housing and the slips. The wedges are thus forced against the slips with only the pressure exerted by a pull on the operating pipe so that it seems clear that the slips can be released by merely lowering on the operating pipe with the assurance that the wedges will move out from under the slips and will not have been permanently wedged into position by the pumped pressure thru the tool.

To insure that the slips will be released from their gripping engagement with the pipe 35 when the wedges 12 are moved downwardly a flange 55 has been provided on the upper end of the mandrel and projects outwardly so that it is adapted to engage the shoulder 56 on the top of the housing. When the mandrel is pulled upwardly this flange 55 will move away from the housing and assume the position shown in Fig. 3. When, however, the tool is to be released, the lowering of the mandrel will lower the flange 55 and should the jaws 13 not release, additional downward movement of the operating pipe 2 will cause the flange 55 to rap the shoulder 56 which will readily dislodge the slips by knocking the housing downwardly.

As pointed out above if the tool should become lodged in the pipe 35 or stuck with cement, the threads 4 can be released and the operating pipe 2 removed, due to the fact that the threads 4 are a left hand thread.

An additional left hand thread 57 is used to connect the packer support 42 with the lower end of the housing and this thread is also a left hand thread so that if the lower end of the tool including the packer support 42 should become lodged in the well, the remainder of the tool, including the housing 20 above the packer support 42 could be readily unscrewed and removed due to this left hand thread 57.

When the cementing operation is completed it is desirable to remove the cement from the tool before it sets. To do this the circulation may be reversed and the flow would be down inside of the pipe 35 and against the packings 41. This will depress the rubber and allow the pressure to flow up thru the tool. The cement can in this manner be washed out and the tool ready for removal.

Broadly the invention contemplates a cement retainer which can be set by a slight upward movement of the operating pipe but wherein the anchoring device is not self actuating, due to the pressure applied to the tool and wherein the

tool may be readily released should the occasion require.

What is claimed is:

1. A cement retainer for wells including an operating pipe, a mandrel thereon, a housing about said mandrel, an inverted J-latch connecting said housing and mandrel, slips carried by said housing and a slip wedge on said mandrel so that upon release of said latch relative movement of the mandrel and housing sets said slips, a packer carried by said housing and having a lip thereon facing downwardly to be expanded by fluid pressure from below, a continuous open passage thru said mandrel and housing, drag means on said housing tending to resist movement of the housing in a pipe in the well, and means on said mandrel to contact said housing on downward movement of said mandrel so as to knock said housing and slips loose from the pipe when said mandrel and the slip wedges are moved downwardly. 20

2. A cementing tool comprising an operating pipe, an open hollow mandrel thereon, a housing about said mandrel, a latch means connecting said housing and mandrel and operable to permit movement of said mandrel relative to said housing, a set of upwardly facing tapered faces on said mandrel, a set of slips carried by said housing, tapered faces on said slips to cooperate with said mandrel faces whereby to move said slips into anchoring position by upward movement of said mandrel relative to said housing and slips to anchor the tool in the well, packer means on said housing to effect a seal therearound upon application of pressure through said mandrel, and means on said mandrel to engage said housing upon relative downward movement so as to knock said housing and slips loose from anchored position.

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