Aug. 8, 1933. L. S. HAMER 1,921,522

WELL BORE FEELER

Filed March 7, 1928

Fig.1.

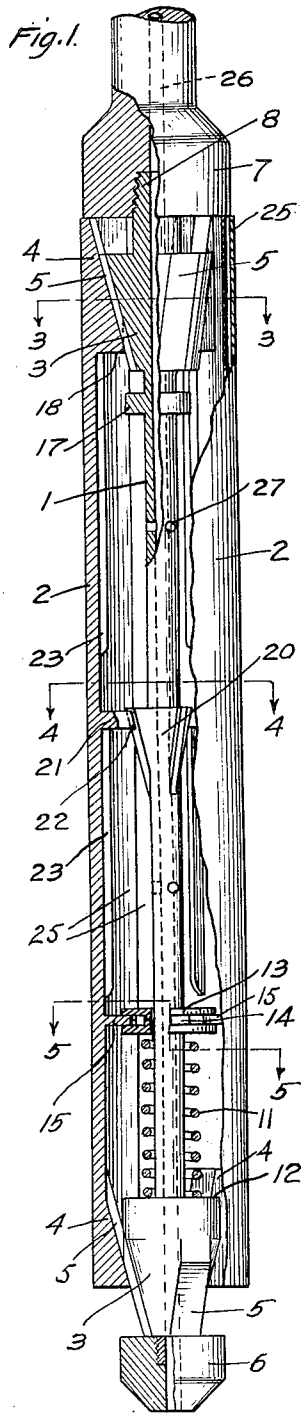


Fig.2.

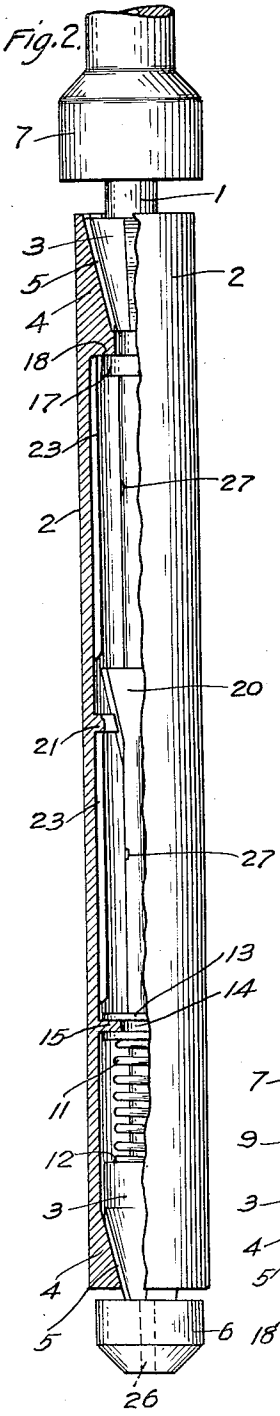


Fig.3.

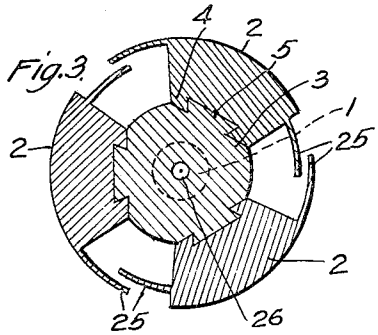


Fig.4.

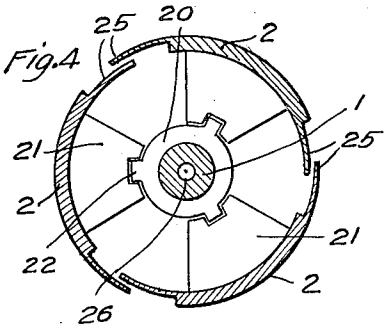


Fig.5.

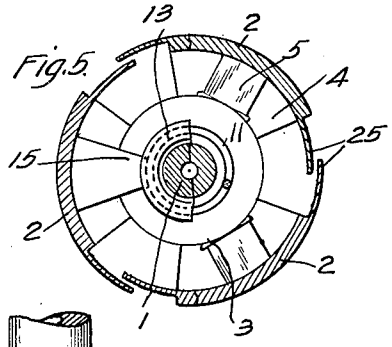
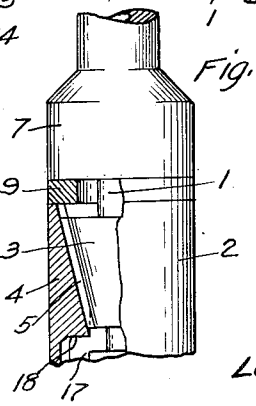


Fig.6.



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WELL BORE FEELER

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Application March 7, 1928. Serial No. 259,667

12 Claims. (Cl. 33—178)

This invention is a tool for feeling a well bore in order to locate irregularities or obstructions so that such faults may be corrected prior to running the well casing; and it is the object of the invention to provide a yieldably expanded feeler which will normally slidably engage the wall of the bore but the periphery of whch is readily contractible to release it from binding engagement in the event that such an obstruction or irregularity is met as will cause the feeler to stick in the bore.

It is a further object of the invention to provide a construction the periphery of which will immediately re-expand to normal position as soon as the tool is released from binding engagement in the well bore, and which is adapted for jarring for insuring release of the tool, with the means whereby the tool is adapted for jarring preferably cooperating with the yieldable expanding means so as to provide an alternate expansion and contraction of the periphery of the feeler for gradually working it loose in the event that it becomes badly stuck.

It is a still further object of the invention to provide means for limiting the maximum expansion of the periphery of the tool so as to adapt it to well bores of different sizes, and to also provide for expansion and contraction which will eliminate the possibility of sand or the like clogging the tool.

It is a still further object of the invention to provide for circulating a washing medium through the feeler so as to assist in working it loose in the event it becomes badly stuck, and to also utilize the circulating medium for preventing clogging action by mud or the like.

It is a still further object of the invention to provide a structure which is extremely durable and positive in its operation, and which may be inexpensively and simply constructed.

Further objects of the invention will be readily understood from the following description of the accompanying drawing, in which:

Fig. 1 is a side elevation of the tool, partly in axial section, and showing its periphery in normal expanded position.

Fig. 2 is a similar view showing the periphery of the tool contracted.

Figs. 3, 4, and 5 are transverse sections on the lines 3—3, 4—4 and 5—5 of Fig. 1.

Fig. 6 is a fragmentary view similar to Fig. 1, showing the means for limiting the normal expansion of the periphery of the tool.

The tool comprises a supporting medium and contact members carried thereby with the periphery of an annular structure which is formed by the contact members adapted for radial expansion and contraction, and said periphery of the annular structure being normally expanded so that the tool is adapted for relatively snug sliding fit in a well bore in order to indicate the absence of any obstruction in the bore as long as the tool may be freely lowered in the well, and the periphery of the annular structure being readily contractible by exerting a lifting force on the tool in the event of it becoming stuck in the well bore as a result of meeting an obstruction.

As an instance of such a construction, the supporting medium is shown as a mandrel 1 and the contact members are preferably elongated arcuate structures 2 which cooperate to form a closed annulus surrounding the mandrel. This annular structure is radially expansible and contractible with relation to the mandrel, preferably by means of a wedging engagement which is shown as comprising tapering wedging surfaces 3 at the respective ends of the mandrel and inclined interior surfaces 4 of the arcuate members engaging these wedging surfaces so that lowering and elevating the mandrel with relation to the arcuate members 2 will respectively expand and contract the periphery of the tool as shown in Figs. 1 and 2.

The arcuate members 2 may be held against radial disengagement from the mandrel by dovetail tongue and groove connections 5 at the cooperating tapering surfaces 3—4, and the parts may be held longitudinally in assembled relation by a nut 6 threaded on the lower end of the mandrel and a head 7 adapted for threaded engagement with a pin 8 which projects from the upper end of the mandrel. The pin 8 preferably spaces the head 7 from the upper wedging surfaces 3 so that maximum expansion of the annular structure which is formed by members 2 is limited by abutment of said members against the head as shown in Fig. 1, and in order to adapt the tool for use in a smaller well bore the maximum expansion of its periphery may be reduced by mounting a collar 9 beneath the head 7 on the pin 8 as shown in Fig. 6, so that the longitudinal movement of members 2 with relation to the mandrel is reduced by the thickness of the collar.

The members 2 are normally elevated with respect to the mandrel so as to expand the annular structure which is formed by said members, but the elevating means is adapted to yield if the annulus defined by members 2 becomes stuck in a well bore. As an instance of this arrangement

a coil spring 11 may be mounted on the mandrel so as to seat upon the shoulder 12 formed at the upper end of the lower tapering surfaces 3, with the upper end of the spring engaging a slidably mounted collar 13 in order to yieldably elevate the collar with relation to the mandrel, and the slidable collar has an annular recess 14 operatively engaging internal flanges 15 on the arcuate members 2, for longitudinally shifting the arcuate members with the collar.

It will thus be seen that the members 2 are normally held in position whereby the annular contact structure is expanded by spring 11, so that the tool may be lowered in a well bore by suspending head 7 from a usual string of pipe, and the tool will slide freely through the bore as long as no obstruction is met. If the tool becomes stuck in the bore it denotes the presence of an obstruction which must be removed before the well casing is lowered in the well, and in order to withdraw the tool to permit correction of such a fault in the bore it is only necessary to slightly elevate the head 7, thereby causing spring 11 to yield so as to permit upward movement of mandrel 1 with relation to the members 2 which are held against longitudinal movement by their binding engagement with the obstruction in the bore. The wedging surfaces 3 are thus retracted relative to the cooperating inclined surfaces 4 and the arcuate members 2 are consequently radially inwardly shifted so as to release their binding engagement in the bore. The tool is then free for withdrawal from the well, and as soon as members 2 are released from their binding engagement the spring 11 will again radially outwardly shift the arcuate members so that if desired the tool may be again lowered in an attempt to remove the obstruction from the bore.

Means are preferably provided whereby the tool may be jarred when the mandrel is elevated to radially inwardly shift the members 2, and for this purpose an abutment collar 17 on the mandrel is adapted to strike the shoulders 18 at the lower ends of upper inclined surfaces 4, so that the resulting jarring action will assist in disengaging the members 2 in the event that they are tightly stuck in the well bore. It will thus be seen that by alternately exerting and releasing upward strain on the mandrel, a series of jarring blows may be imparted to the stuck members 2 for releasing the same, and such operation will also tend to alternately expand and contract the annular structure which is formed by the members 2 so as to gradually work the tool free from its binding engagement in the well bore.

The arcuate members 2 are preferably positively braced with relation to the mandrel while at the same time permitting them free radial shifting, and for this purpose an annular enlargement 20 intermediate of the ends of the mandrel may engage cooperating interior flanges 21 on the members 2, with the said cooperating surfaces tapered in accordance with the inclination of surfaces 3—4 so as to maintain a bracing engagement for the arcuate members during expansion and contraction of the annular structure which is formed by said members. A circumferential bracing engagement is preferably also provided at the cooperating surfaces 20—21, as for example by providing said surfaces with cooperating tongues and grooves 22. To still further insure the provision of a sturdy and rigid structure, the interior surfaces of members 2 may be longitudinally ribbed as shown at 23 in order to provide additional bracing means.

It is desirable that the tool be so constructed as to prevent mud, sand, or the like clogging its action, and to prevent such a clogging medium entering the annulus defined by members 2, the adjacent edges of these arcuate members preferably slidably overlap as shown at 25 so as to maintain substantially closed joints between the arcuate members while at the same time permitting their free radial shifting for expanding and contracting the annular structure which is formed by said members. Clogging action may be further avoided by circulating a fluid washing medium, and for this purpose the mandrel 1 and head 7 may be provided with an axial circulating bore 26 communicating with the bore of the string of pipe from which the tool is suspended, with the lower end of the circulating bore opening through the nut 6 which is preferably tapered as shown in Fig. 1 to provide a guide for the tool, so that the washing medium may be discharged into the well bore below the tool. To free the interior of the tool of any clogging material which may work its way into the annulus defined by members 2, and to also keep the slidably overlapping edges 25 to clear of such clogging material, the bore 26 may be provided with lateral openings 27 adapted for discharge of a part of the washing medium radially through mandrel 1 and into the space in back of members 2.

I have thus provided a feeler for a well bore of extremely simple but sturdy construction, the periphery of which is adapted to readily contract when an obstruction is met and then reexpand to normal position as soon as the tool is free of its binding engagement at the obstruction, with the contractible structure including means whereby the tool is adapted for jarring for insuring loosening of the tool if it is badly stuck, and the parts being readily assembled and retained in operative relation by the dove-tail engagements and the end abutments 6—7, and the cooperative relation between tapering surfaces 3—4 preventing disassembly of the parts except by first removing the head 7 at the upper end of the tool, so that there is no possibility of the arcuate members 2 becoming disengaged from mandrel 1 and lost in the well bore even if the nut 6 should work loose and be lost.

I claim:

1. A device of the character described comprising a mandrel, arcuate members defining an annulus surrounding the mandrel, and means for radially shifting the arcuate members for expanding and contracting the periphery of the annulus, the mandrel having a circulating bore opening therethrough.

2. A device of the character described comprising a mandrel, arcuate members defining an annulus surrounding the mandrel, and means for radially outwardly projecting or radially inwardly contracting the arcuate members, the mandrel having a circulating bore opening therethrough and having lateral outlets from said bore in back of the arcuate members.

3. A device of the character described comprising a mandrel, suspension means for inserting the mandrel in a well bore, and arcuate members on the mandrel, the mandrel and the arcuate members having cooperating inclined contacting surfaces adapted to radially outwardly project the arcuate members by axial depression of the mandrel relative thereto and adapting the arcuate members for radial inward retraction by elevation of the mandrel relative thereto, said radial

outward projection of the arcuate members adapting the same for free sliding fit in the well bore and said radial inward retraction of the arcuate members releasing the same from binding engagement in the well bore in the event of the arcuate members becoming stuck, and the mandrel being adapted for elevation relative to the stuck arcuate members for said radial inward retraction of the arcuate members by a lifting force exerted on the suspension means.

4. A device of the character described comprising a mandrel, suspension means for inserting the mandrel in a well bore, arcuate members on the mandrel, the mandrel and the arcuate members having cooperating inclined contacting surfaces adapted to radially outwardly project the arcuate members by axial depression of the mandrel relative thereto and adapting the arcuate members for radial inward retraction by elevation of the mandrel relative thereto, and yieldable means for normally depressing the mandrel relative to the annulus, said radial outward projection of the arcuate members adapting the same for free sliding fit in the well bore and said radial inward retraction of the arcuate members releasing the same from binding engagement in the well bore in the event of the arcuate members becoming stuck, and the mandrel being adapted for elevation relative to the stuck arcuate members and against the tension of said yieldable means for said radial inward retraction of the arcuate members by a lifting force exerted on the suspension means.

5. A device of the character described comprising a mandrel, and arcuate members on the mandrel, the mandrel and the arcuate members having cooperating inclined contacting surfaces adapted to radially outwardly project the arcuate members by axial depression of the mandrel relative thereto and adapting the arcuate members for radial inward retraction by elevation of the mandrel relative thereto, and the mandrel and arcuate members having cooperating abutments providing a jarring engagement between said parts by elevation of the mandrel relative to the arcuate members.

6. A device of the character described comprising a mandrel, arcuate members on the mandrel, the mandrel and the arcuate members having cooperating inclined contacting surfaces adapted to radially outwardly project the arcuate members by axial depression of the mandrel relative thereto and adapting the arcuate members for radial inward retraction by elevation of the mandrel relative thereto, and means for limiting axial depression of the mandrel relative to the arcuate members so as to limit radial outward projection of the arcuate members.

7. A device of the character described comprising a mandrel, suspension means for inserting the mandrel in a well bore, and arcuate members on the mandrel, the mandrel and the arcuate members having cooperating inclined contacting surfaces adapted to radially outwardly project the arcuate members by axial depression of the mandrel relative thereto and adapting the arcuate members for radial inward retraction by elevation of the mandrel relative thereto, said cooperating inclined contacting surfaces having means for preventing radial disengagement of the arcuate members from the mandrel, said radial outward projection of the arcuate members adapting the same for free sliding fit in the well bore and said radial inward retraction of the arcuate members releasing the same from binding engagement in the well bore in the event of the arcuate members becoming stuck, and the mandrel being adapted for elevation relative to the stuck arcuate members for said radial inward retraction of the arcuate members by a lifting force exerted on the suspension means.

8. A device of the character described comprising a mandrel, suspension means for inserting the mandrel in a well bore, and arcuate members on the mandrel, the mandrel and the arcuate members having cooperating inclined contacting surfaces adapted to radially outwardly project the arcuate members by axial depression of the mandrel relative thereto and adapting the arcuate members for radial inward retraction by elevation of the mandrel relative thereto, said cooperating contacting surfaces being arranged in sets axially spaced along the arcuate members for bracing the arcuate members relative to the mandrel, said radial outward projection of the arcuate members adapting the same for free sliding fit in the well bore and said radial inward retraction of the arcuate members releasing the same from binding engagement in the well bore in the event of the arcuate members becoming stuck, and the mandrel being adapted for elevation relative to the stuck arcuate members for said radial inward retraction of the arcuate members by a lifting force exerted on the suspension means.

9. A device of the character described comprising a mandrel, suspension means for inserting the mandrel in a well bore, arcuate members on the mandrel, means for radially shifting the arcuate members with respect to the mandrel, and means for normally actuating said shifting means so as to radially outwardly project the arcuate members, said shifting means being adapted for actuation when the arcuate members are held stationary in the well bore, so as to radially inwardly contract the arcuate members by a lifting force exerted on the suspension means.

10. A device of the character described comprising a mandrel, suspension means for inserting the mandrel in a well bore, arcuate members on the mandrel, means for radially shifting the arcuate members with respect to the mandrel, means for connecting the shifting means to the arcuate members whereby the shifting means positively and selectively shifts the arcuate members both radially inwardly and radially outwardly, and means for normally actuating said shifting means so as to radially outwardly project the arcuate members, said shifting means being adapted for actuation when the arcuate members are held stationary in the well bore, so as to radially inwardly contract the arcuate members by a lifting force exerted on the suspension means.

11. A device of the character described comprising a mandrel, suspension means for inserting the mandrel in a well bore, arcuate members on the mandrel, means for radially shifting the arcuate members with respect to the mandrel, means for normally actuating said shifting means in one direction so as to radially outwardly project the arcuate members, said shifting means being adapted for actuation in the opposite direction when the arcuate members are held stationary in the well bore, so as to radially inwardly contract the arcuate members, and an abutment on the mandrel adapted for jarring impingement against the arcuate members by an upward jerk upon the suspension means.

12. A device of the character described comprising a mandrel, suspension means for insert-

ing the mandrel in a well bore, arcuate members on the mandrel, means for radially shifting the arcuate members with respect to the mandrel, means for normally actuating said shifting means so as to radially outwardly project the arcuate members, said shifting means being adapted for actuation when the arcuate members are held stationary in the well bore, so as to radially inwardly contract the arcuate members by a lifting force exerted on the suspension means, and an abutment on the mandrel adapted for jarring impingement against the arcuate members as a result of said lifting force exerted on the suspension means.

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