

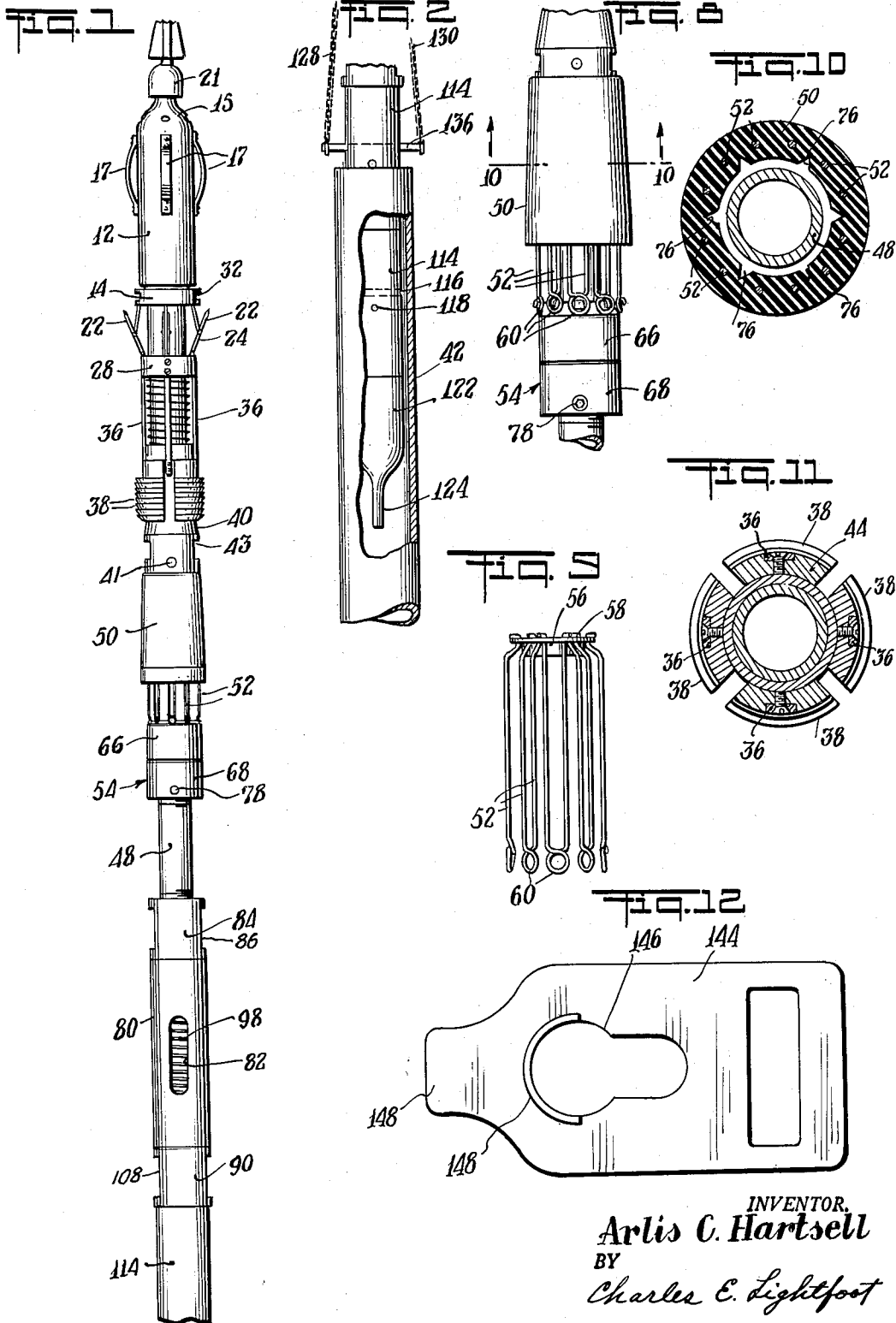
March 27, 1956

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WELL FLUID STABILIZER

2,739,652

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3 Sheets-Sheet 1



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FIG. 3

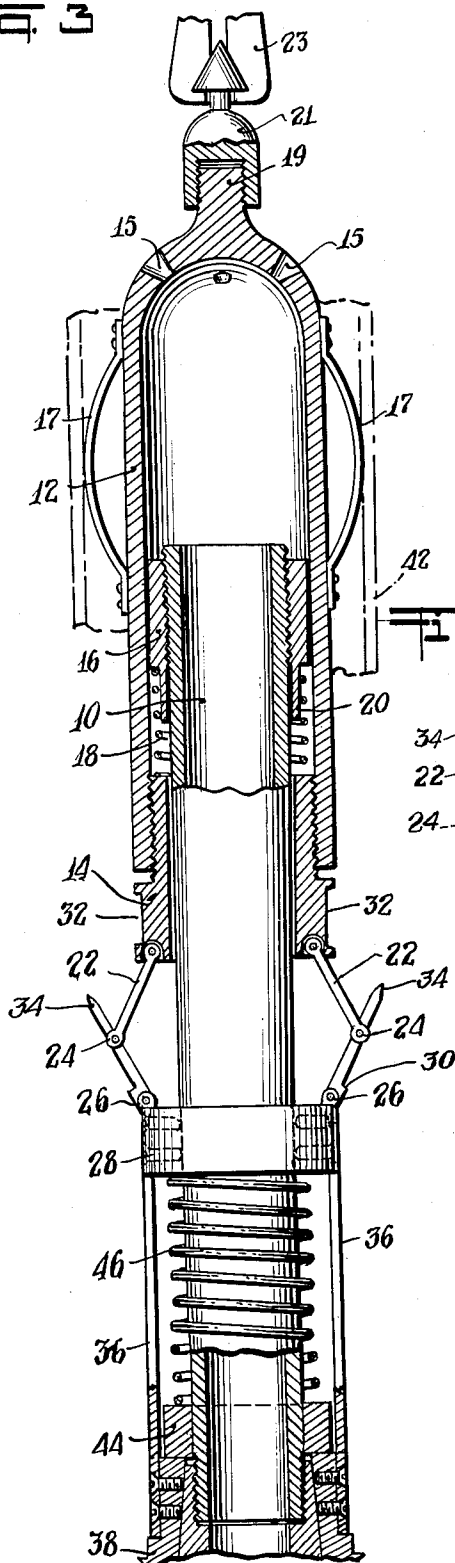


FIG. 4

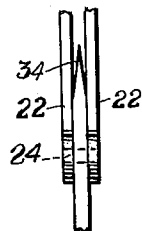
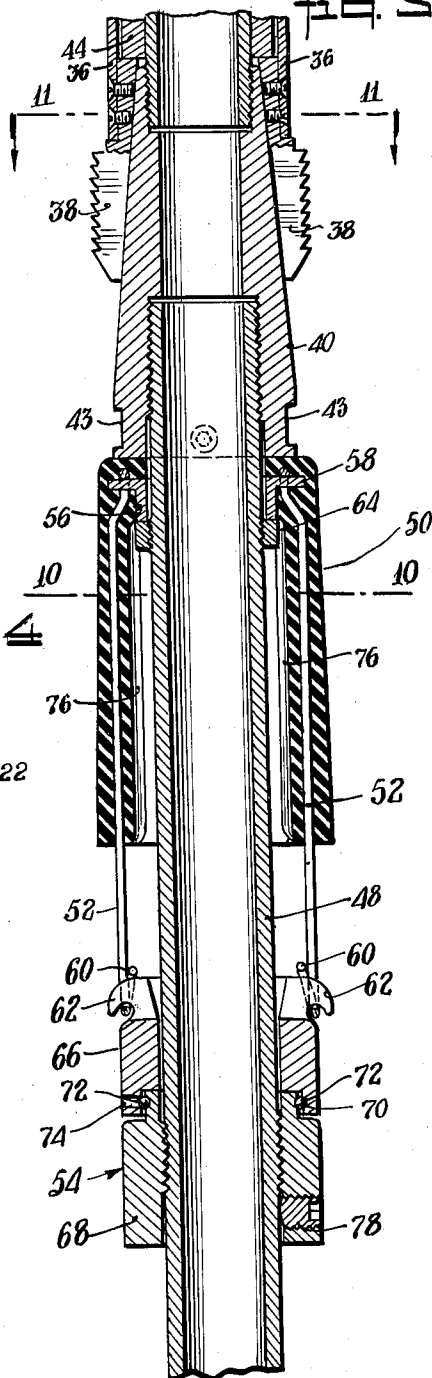


FIG. 5



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FIG. 6

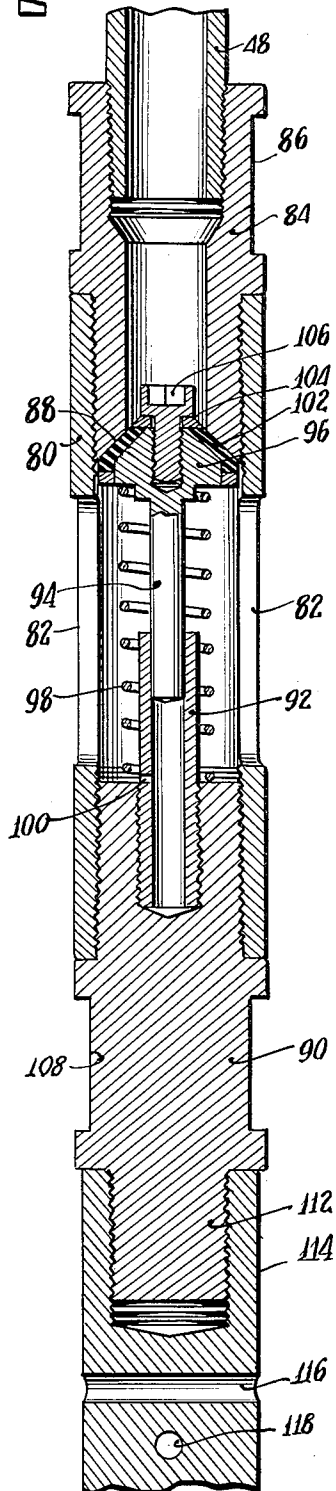
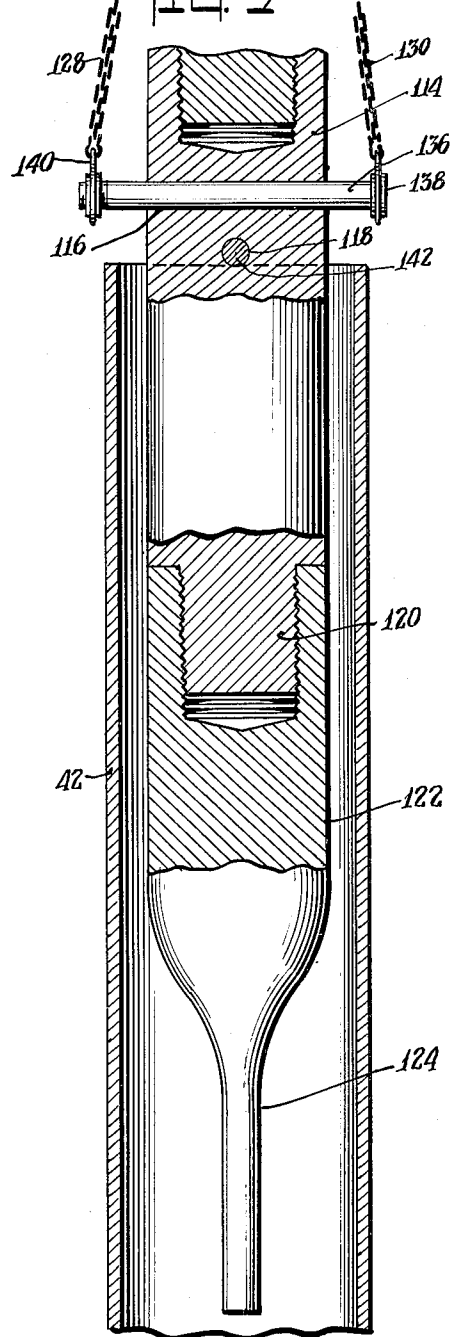


FIG. 7



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WELL FLUID STABILIZER

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Application March 21, 1950, Serial No. 150,831

6 Claims. (Cl. 166—121)

This invention relates to a well fluid stabilizer, and more particularly to a stabilizer capable of being positioned at any desired point in a well and which may be readily recovered therefrom.

The invention includes certain improvement over the stabilizer structures disclosed in applications filed by this applicant in the United States Patent Office on June 4, 1949, Serial Number 97,278, now Patent No. 2,641,322, June 9, 1953, and on July 3, 1949, Serial Number 107,715, now Patent No. 2,633,202, March 31, 1953, of which applications this application is a continuation-in-part.

The present invention relates more particularly to certain improvements in the type of packer assembly employed, to the structure by which the weight of the stabilizer is controlled, and to the means by which the device is recovered from the well.

It is an object of this invention to provide a stabilizer or plunger assembly embodying improved means for varying the transverse diameter of the packer or plunger body in accordance with the inside diameter of the pipe in which the stabilizer is to be operated.

Another object of the invention is the provision in a stabilizer structure of recovery head and slip anchor linkage arm means operable to secure the stabilizer at the desired point in the well, and releasable therefrom when it is desired to move the stabilizer to a different position or recover the same from the well.

A further object of the invention is to provide a well stabilizer device having means for adjusting the weight of the assembly to any desired amount and without interference with the recovery means therefor.

A still further object of the invention is the provision in a well stabilizer of unitary packer structure which is capable of application as a well packer or swab, or in connection with other types of apparatus where one or more adjustable packer units can be used to advantage.

Other objects and advantages of the invention will be apparent from the following description constituting a specification of the same when considered in conjunction with the annexed drawings wherein—

Figure 1 is an elevational view of the invention showing the same in assembled condition;

Figure 2 is a fragmentary elevational view showing weights in assembled condition and inserted in the well, the well casing being partly broken away to show the weights therein;

Figure 3 is a vertical cross-sectional view of a portion of the upper end of the stabilizer showing the recovery head and the slip anchor linkage arm assembly thereof;

Figure 4 is a fragmentary detail view showing the manner in which the slip anchor arms are connected with the operating links for the same;

Figure 5 is a vertical cross-sectional view of a portion of the stabilizer, showing one of the packer units of the same;

Figure 6 is a vertical cross-sectional view of a portion

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of the invention, showing the backpressure valve of the same;

Figure 7 is a vertical cross-sectional view of the lower end portion of the invention, showing the manner in which the weights are assembled and inserted in the well casing;

Figure 8 is an elevational view of one of the packers and the tensioning sleeve mechanism therefor;

Figure 9 is an elevational view of the packer anchoring means and tensioning wires separated from the packer;

Figure 10 is a cross-sectional view taken along the line 10—10 of Figure 8, looking in the direction indicated by the arrows;

Figure 11 is a cross-sectional view taken along the line 11—11 of Figure 5, looking in the direction indicated by the arrows; and

Figure 12 is a plan view of a retainer plate employed in supporting the assembled stabilizer on the well casing prior to releasing the same therein.

The invention is of the same general character as those disclosed in the applications referred to above, and includes certain improvements in the packer and tensioning means therefor, in the back pressure valve means, and in the weighting means for the stabilizer assembly, as well as the addition of recovery means for retrieving the assembly from the well.

The invention in the present illustration of the same is in the nature of an assembled stabilizer mechanism including a recovery head at the top, which head is operable to release slip anchor means through the intermediation of linkage arms. The slip anchor means and linkage arms for releasing the same are attached below the recovery head, the slip anchor means including a conical member by which the same is operated. One or more packer units are disposed in the assembly beneath the slip anchor means, which units are adjustable to fit various sizes of pipes. Below the packer units is attached a back pressure valve which prevents upward flow of fluid through the stabilizer when the same is in operating position in the well. Sinker bar weights are attached below the back pressure valve increasing the weight of the stabilizer to any extent desired to assure downward movement of same in the well to the desired point.

Referring to the drawings in greater detail, the stabilizer assembly has a tubular supporting body 10, over the upper end of which a recovery head member 12 is slidably positioned, the head having holes 15 therein. The head 12 carries a threaded extension 19 at its upper end, upon which an overshot device 21 is screwed for recovering the stabilizer from the well. Centering devices 17 may also be carried on the recovery head 12, if desired, for maintaining the same centered in the pipe in which the stabilizer is inserted. The head 12 is internally threaded at its lower end for attachment of an anchor arm linkage nut 14 thereto, which nut is slidable on the body 10 and engages a collar 16 threaded thereon to limit upward movement of the nut. A resilient member 18 is disposed inside the head 12 between the nut 14 and collar 16 to urge the head downwardly on the body 10. The collar 16 may have a sleeve portion 20 of reduced diameter to engage the nut 14 to prevent the resilient member from going solid.

Links 22 are pivotally secured to the nut 14 extending downwardly therefrom for pivotal engagement on the opposite sides of slip anchor arms 24 mediate the ends thereof. The anchor arms 24 are secured by hinges 26 to a collar 28, and the hinges may be provided with shoulders 30 to limit outward swinging movement of the anchor arms.

The nut 14 is provided with flat portions 32 at opposite sides for a purpose later to be made apparent.

The anchor arms have their outer ends 34 directed

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upwardly to engage a coupling inside the pipe to prevent upward movement of the stabilizer therein.

Fastened to the collar 28 there are the flexible arms 36, whose lower ends are secured to wedge-shaped jaws or pipe-engaging jaws 38 which ride against the tapering surface of a coupling 40 on the body 10. The coupling 40 may have opposite flat surfaces 43 similar to the surfaces 32 of the linkage nut 14, and for a like purpose. The outer surfaces of the jaws 38 are toothed so as to engage the inside of the pipe 42 when the jaws are expanded. A stop collar 44 is secured to the body 10 above the jaws 38 for engagement therewith to limit upward movement of the jaws and the collar 28, so that after the jaws have engaged the stop collar further upward movement of the recovery head 12 will operate the slip anchor arm linkage to retract the slip anchor arms 24, thus releasing the stabilizer from the casing.

A resilient member 46 is positioned between the collar 28 and the stop collar 44, which opposes the resilient member 18, and these members may be so proportioned and related as to maintain the slip anchor arms 24 in outwardly extended positions while the stabilizer is positioned in the pipe, but permitting the arms to be moved inwardly upon engagement of the jaws with the stop collar 44 by upward movement of the recovery head 12.

The lower end of the coupling 40 is internally threaded for attachment to a tubular member 48 forming a downward continuation of the body member 10, and may have a set screw 41 therein for locking the same on the member 48. The member 48 serves as the supporting member of a packer unit, one or more of which may be combined in the stabilizer or which may be utilized as a packer unit in other types of apparatus, such as pumps, swabs, well packers or the like.

The packer unit comprises the tubular member 48, upon which is carried an adjustable packer 50, of rubber or other suitable material, having tension rods or wires 52, attached to and operated by a tension nut 54. The packer is slightly tapered, being of larger diameter at the bottom than at the top, and has the tension wire embedded therein. Within the top portion of the packer an annular member 56 is embedded, having an out-turned flange 58 thereon which is perforated to receive the upper ends of the tension wires 52. The tension wires are formed at their lower ends with loops 60 formed by crossing each pair of wires, and each of the loops is attached to one of the hooks 62 of the tension nut 54. The tension wires 52 and the annular member 58 are best seen in Figure 9.

A stop collar 64 is fixed on the member 48 upon which the annular member 56 engages to prevent downward movement of the packer and permitting tension to be applied to the same through the tension wires 52.

The tension nut 54 is formed in two interfitting parts 66 and 68 having a ball race 70 therebetween into which ball bearings 72 are inserted through a hole 74 so that the parts may have relative rotary movement but cannot separate. The part 68 is threaded upon the member 48 while the part 66 is freely moveable thereon. As will be seen in Figure 5, the part 68 of the tension nut may be screwed downwardly on the member 48 carrying with it the part 66 which through the hooks 62 pulls on the loops 60 of the tension wires 52. Because of the crossing of the tension wires at the loops the wires are drawn together laterally and pull downwardly on the annular member 56 against the stop collar 64, thus contracting the packer to any desired degree.

The packer is formed interiorly with grooves 76, as best seen in Figures 5 and 10, and the tension wires are in pairs, one groove between each pair of wires, so that tension on the wires will contract the grooves and reduce the diameter of the packer. A set screw 78 is provided in the part 68 to lock the tension nut in adjusted position.

The lower end of the tubular member 48 has attached thereto a back pressure valve which is housed in a box

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or casing 80. The box 80 is internally threaded at both ends and has the elongated slots 82 spaced about its midportion, so that the box is the same at both ends and cannot be attached wrong end up. A coupling member 84 is threaded into the upper end of the box for attaching the same to the member 48, this coupling having the opposite flat surfaces or straights 86 thereon, and being formed at its lower end with a valve seat 88 within the box. The box 80 is closed at its lower end by a coupling member 90 having a sleeve 92 threaded therein, which sleeve extends into the box and receives therein the stem 94 of a valve 96 seating on the valve seat 88. A coil spring 98 surrounds the valve stem and the sleeve to maintain the valve closed. A small hole 100 is provided in the sleeve 92 to permit the escape or entrance of air or fluid as the valve stem moves in the sleeve. The valve is conveniently provided with a seating portion 102 for close fitting seating engagement with the seat 80, which is retained on the valve by a plate 104 held in position by a screw 106. The coupling 90 may have flat surfaces or straights 108 thereon similar to those on the coupling 84.

From an examination of Figures 3, 5 and 6, it will be seen that fluid may be passed down through holes 15 in the recovery head, through the member 10, the tapered coupling 40, member 48, and coupling 84, to move the valve 96 open against spring 98 and pass out through the slots 82 of the box 80. The passage of fluid in the opposite direction is prevented by closing of the valve 96.

The lower end of the coupling 90 has an externally threaded extension 112 thereon to which a weight bar or sinker bar 114 is attached. The sinker bar is provided with diametrical holes 116 and 118 therethrough for a purpose later to be made apparent.

As many of the sinker bars 114 may be applied to the stabilizer as may be necessary or desirable, each of the bars having a threaded extension 120 thereon similar to the extension 112, so that the bars may be attached one to another. To the lowermost bar 114 a foot piece 122 is attached, which has an extended lower end portion 124 of reduced diameter, so that the stabilizer will not obstruct the foot valve or other device in the pipe should it come into contact with the same.

The stabilizer is assembled and inserted in the pipe by the use of a hoist of conventional design, not shown, which may have chains 128, 130 depending therefrom, as seen in Figures 2 and 7 and preparatory to lowering the device into the pipe the same may be supported thereon by a special suspension plate 144, whose structure is best indicated in Figure 12.

The stabilizer may be assembled by placing the resilient member 46 on the tubular member 10 in engagement with the stop collar 44 thereon, and then passing the member 10 between the jaws 38, and through the collar 28 and nut 14. Resilient member 18 is then placed on the member 10, the collar 16 threaded on the member 10, the recovery head placed thereover and nut 14 threaded into the head. Tapered coupling 40 is then inserted between jaws 38 and attached to member 10. The parts thus assembled constitute the recovery head unit of the stabilizer.

The packer unit is next put together by threading the tensioning nut 54 on the member 48, placing the packer 50 thereover with the annular member 56 in engagement with collar 64, and connecting the loops 60 to the hooks 62. The tensioning nut is then adjusted to bring the packer to the desired diameter and locked in adjusted position by tightening screw 78. The packer unit thus assembled is attached to the recovery head unit previously described by threading the member 10 into coupling 40. Additional packer units may be added as found desirable or necessary, by coupling the same together successively below the recovery head unit.

To assemble the required number of sinker bars for attachment to the stabilizer, a sinker bar is lifted by

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the hoist, by inserting the pin 136 through the hole 116 in the bar, the pin having its head rotatably secured in a link 138 of the chain 130 and being threadable at its opposite end into a nut carried by the link 140 of the chain 128. The foot piece 122 is attached to the lower end of the bar and the same is then lowered into the pipe 42 and a pin 142 inserted through the hole 118 therein to support the bar on the top of the pipe. Thereafter the pin 136 may be removed and another bar lifted in the same manner. The next bar has its lower end threaded into the upper end of the preceding bar, whereupon the pin 142 may be removed and both bars lowered into the pipe. The pin 142 is inserted in the hole 118 in the second bar so that both bars are now supported on the top of the pipe. In this manner as many bars may be assembled as are needed.

The stabilizer, assembled as previously described, is elevated by hoisting means carrying the over shot 23 which is coupled to the portion 21 of recovery head 12. The lower end of the coupling 90 is threaded into the upper end of the topmost sinker bar, and the pin 142 removed, after which the stabilizer and its weights is lowered into the pipe. The entire assembly is supported by a releasing plate 144 whose structure is best seen in Figure 12. This plate has a key-hole slot 146 therein bordered by an upstanding flange 148 partly about the large end of the slot. The large end of the slot is of a size for the stabilizer to pass therethrough and when positioned on the stabilizer the narrow part of the slot may be brought into engagement with the flat surfaces 32 of the linkage nut 14 or with the similar flat surface 41 of the tapered coupling 40 or those of the couplings 34 and 90.

The releasing plate rests on the top of the pipe 42 with the narrow part of the slot engaging the flat surfaces on the stabilizer assembly whereby the entire assembly is supported on the pipe. Upon striking the reduced end 148 of the plate, the same may be driven to bring the large end of the slot into registry with the stabilizer thus releasing the same into the pipe. The flange 148 prevents the stabilizer from becoming caught in the large end of the slot.

The stabilizer may be properly weighted and released free in the well as indicated above, or it may be lowered into the pipe on a cable, polish rod or in some other suitable manner. In the case of failure of a valve or other device associated with a flowing well, the stabilizer can be introduced into the pipe by way of the Christmas tree and allowed to move downwardly therein by gravity, or be forced down by a polish rod or the introduction of pressure fluid above the stabilizer.

When the stabilizer has been set in the pipe upward movement of the packer unit therein caused by pressure below the packer moves the tubular body of the stabilizer upwardly carrying therewith the tapered coupling 40 which forces the jaws 38 outwardly into tighter contact with the pipe, thus more securely retaining the stabilizer in place. The anchor arms 24 are retained in outwardly extended position by the resilient members 18 and 46 which urge the nut 14 and collar 28 toward each other sufficiently to extend the arms.

The valve 96 serves to prevent upward flow of fluid through the stabilizer, but permits the passage of fluid downwardly therethrough. Should the pressure of fluid above the packer in the pipe become too high to be accommodated by passage through the body 10, the fluid may pass over the packer, between the packer and wall of the pipe.

Should it become necessary to recover the stabilizer or move it to a different position in the well, this may be accomplished by engaging the overshot 23 with the recovery head and lifting up on the same. The recovery head 12 then moves upwardly against the resilient member 18 carrying with it the nut 14. By reason of the engagement of the jaws 38 with the stop collar 44, the

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collar 28 is held against upward movement with the nut 14, thus operating the linkage mechanism and drawing the anchor arms inwardly to release the stabilizer from the pipe.

It will be understood that the device as described above may be used as a stabilizer or as a packer and that the packer units may be employed for many other purposes such as to form a swab or pump element which is adjustable to fit the pipe as desired.

While the invention is described in connection with particular embodiments of the same, these are intended for purposes of illustration only and numerous modifications can be made in the structure and relationship between the various parts without departing from the spirit of the invention or the scope of the appended claims.

Having thus shown and described the invention, what is claimed and desired to secure by Letters Patent is:

1. A well fluid stabilizer comprising, a tubular support, a tubular head slideable longitudinally on the support, a collar around the support and slideable longitudinally thereon beneath said head, pipe-engaging slips carried by the collar, means on the support engageable with the slips upon upward movement of the support relative to the collar to actuate the slips into engagement with a surrounding well pipe, anchor arms pivotally connected at their lower ends to said collar for swinging movement into and out of engagement with said pipe and whose free ends are upwardly directed, means pivotally connected to said arms mediate the ends of the arms and to said head and operable to move said arms into engagement with the pipe upon downward movement of said head relative to the collar and out of engagement with said pipe upon upward movement of said head relative to said collar and means engageable with the support and collar to yieldingly resist downward movement of the collar relative to the support.

2. A well fluid stabilizer comprising, a tubular support, a tubular head slideable longitudinally on the support, a collar around the support and slideable longitudinally thereon beneath said head, means cooperable with the support and head to yieldingly urge the collar upwardly relative to the support, pipe engaging slips carried by the collar, means on the support engageable with the slips to actuate the slips into engagement with a surrounding well pipe upon upward movement of the support relative to the collar, anchor arms pivotally connected at their lower ends to the collar for radial swinging movement into and out of contact with the pipe and whose free ends are upwardly directed, and means pivotally connected to said arms mediate the ends of the arms and to said head and operable to move said arms into engagement with the pipe upon downward movement of the head relative to the collar and to move said arms out of engagement with the pipe upon upward movement of the head relative to the collar.

3. A well fluid stabilizer comprising, a tubular support, a tubular head slideable longitudinally on the support, a collar around and slideable longitudinally relative to the support beneath the head, yieldable means on the support urging said head and collar toward each other, pipe engaging slips carried by the collar, means on the support engageable with the slips to actuate the slips into engagement with a surrounding well pipe upon upward movement of the support relative to the collar, anchor arms pivotally connected at their lower ends to the collar for radial swinging movement into and out of engagement with the pipe and whose free ends are upwardly directed, and means pivotally connected to the arms mediate the ends of the arms and to said head to move said arms into engagement with the pipe upon movement of the head and collar toward each other and to move said arms out of engagement with the pipe upon movement of the head and collar away from each other.

4. A well fluid stabilizer comprising, a tubular support, a tubular head slideable longitudinally on the support, a

collar around the support and slideably moveable thereon beneath the head, means engageable with the support and collar to move the collar upwardly with the support, pipe-engaging slips carried by the collar, means on the support engageable with the slips to actuate the slips into engagement with a surrounding well pipe, upon upward movement of the support relative to the collar, anchor arms pivotally connected at their lower ends to the collar for radial swinging movement into and out of engagement with the pipe and whose free ends are upwardly directed, means pivotally connected to said arms mediate the ends of the arms and to said head to move the arms into engagement with the pipe upon upward movement of the collar relative to the head and out of engagement with the pipe upon upward movement of the head relative to the collar and means on said head frictionally engageable with the casing to resist longitudinal movement of the head in the pipe.

5. A well fluid stabilizer comprising, a tubular support, a tubular head slideable longitudinally on the support, a collar around the support and slideable longitudinally thereon beneath the head, pipe-engaging slips carried by the collar, slip actuating means on the support engageable with the slips upon upward movement of the support relative to the collar to actuate the slips into engagement with a surrounding well pipe, anchor arms pivotally connected at their lower ends to the collar for radial swinging movement into and out of engagement with the pipe and whose free ends are upwardly directed, means pivotally connected to the arms mediate the ends of the arms and to said head and operable to move the arms into engagement with the pipe upon upward movement of the collar relative to the head, means on the head frictionally engageable with the pipe to resist longitudinal movement of the head in the pipe, and packer means on and movable with the support beneath said slip actuating means and sealingly engageable with the casing to move the support upwardly upon an increase of fluid pressure in the casing beneath the packer means.

6. A well fluid stabilizer comprising, a tubular support, a tubular head slideable longitudinally on the support, a collar around the support and slideable longitudinally thereon beneath the head, pipe-engaging slips carried by the collar, slip actuating means on the support engageable with the slips upon upward movement of the support relative to the collar to actuate the slips into engagement with a surrounding well pipe, anchor arms pivotally connected at their lower ends to the collar for radial swinging movement into and out of engagement with the pipe and whose free ends are upwardly directed, means pivotally connected to the arms mediate the ends of the arms and to said head and operable to move the arms into engagement with the pipe upon upward movement of the collar relative to the head, means on the head frictionally engageable with the pipe to resist longitudinal movement of the head in the pipe, packer means on and movable with the support beneath said slip actuating means and sealingly engageable with the casing to move the support upwardly upon an increase of fluid pressure in the pipe beneath the packer means and weight means carried by said support and operable to move the support downwardly upon a decrease of fluid pressure in the pipe beneath the packer means.

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