

Oct. 24, 1944.

O. HAMMER

2,361,094

SETTING TOOL FOR USE IN WELLS

Filed May 9, 1941

5 Sheets-Sheet 1

Fig. 1

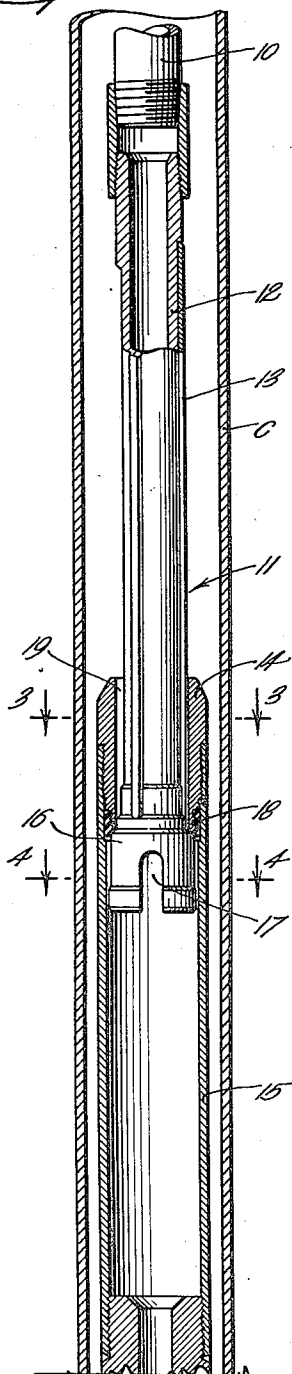


Fig. 2

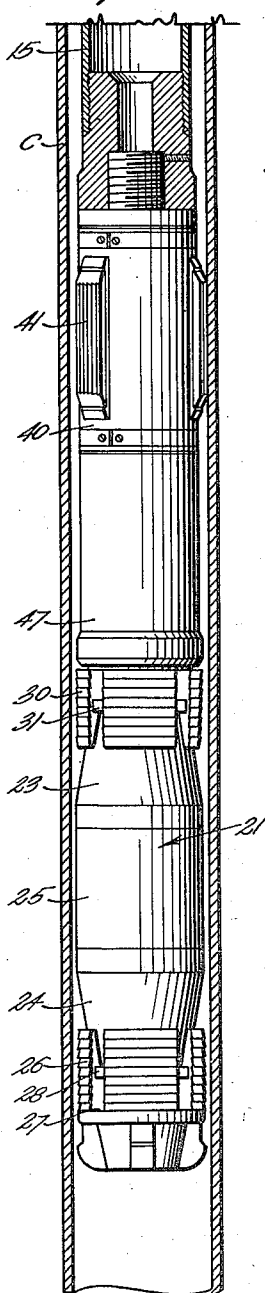


Fig. 3

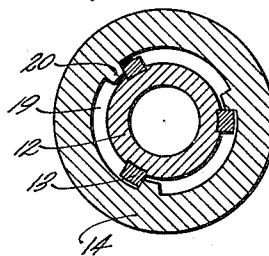
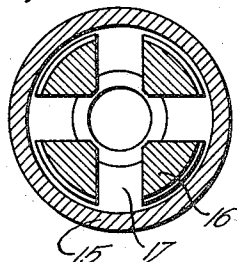


Fig. 4



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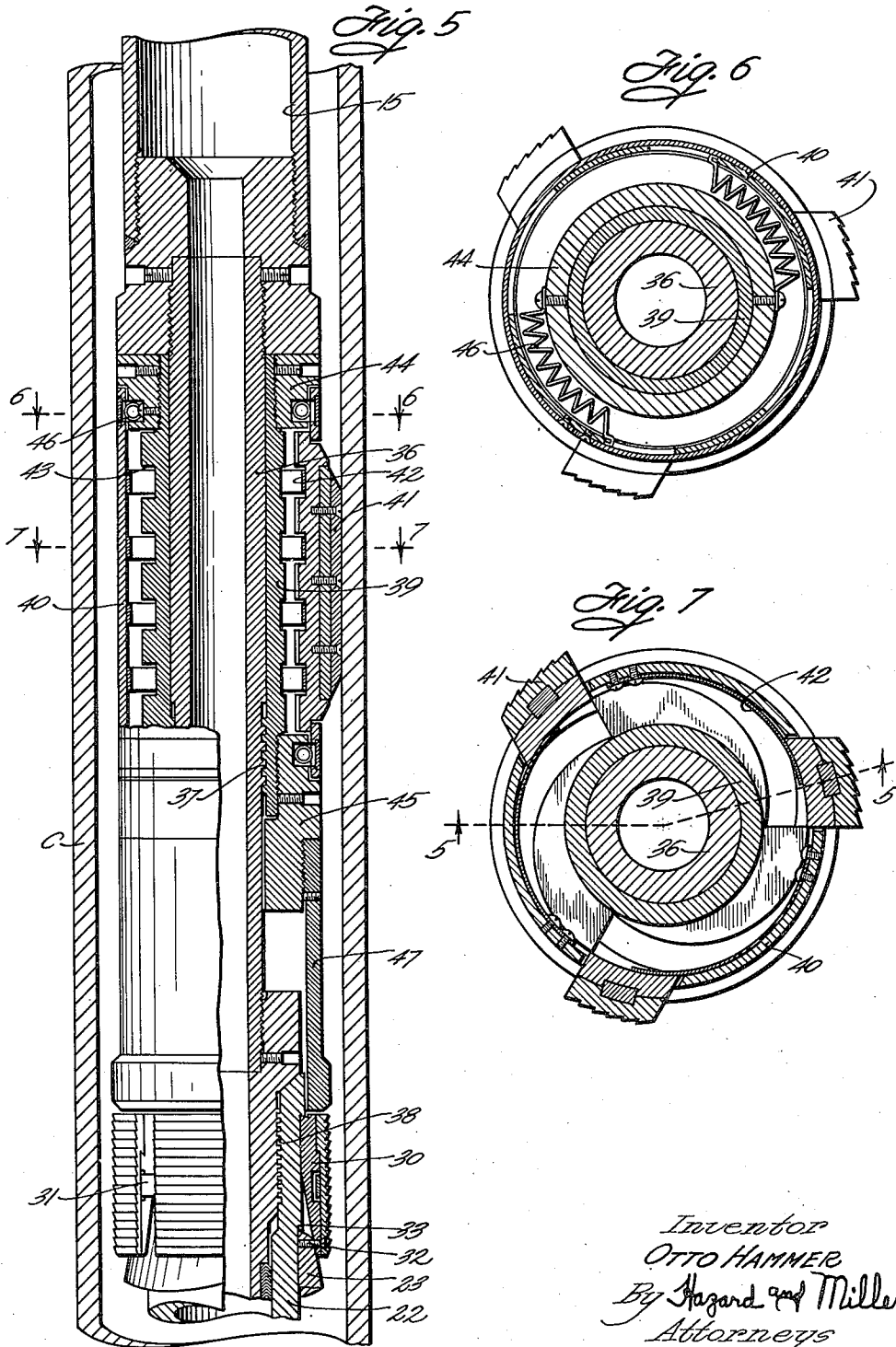
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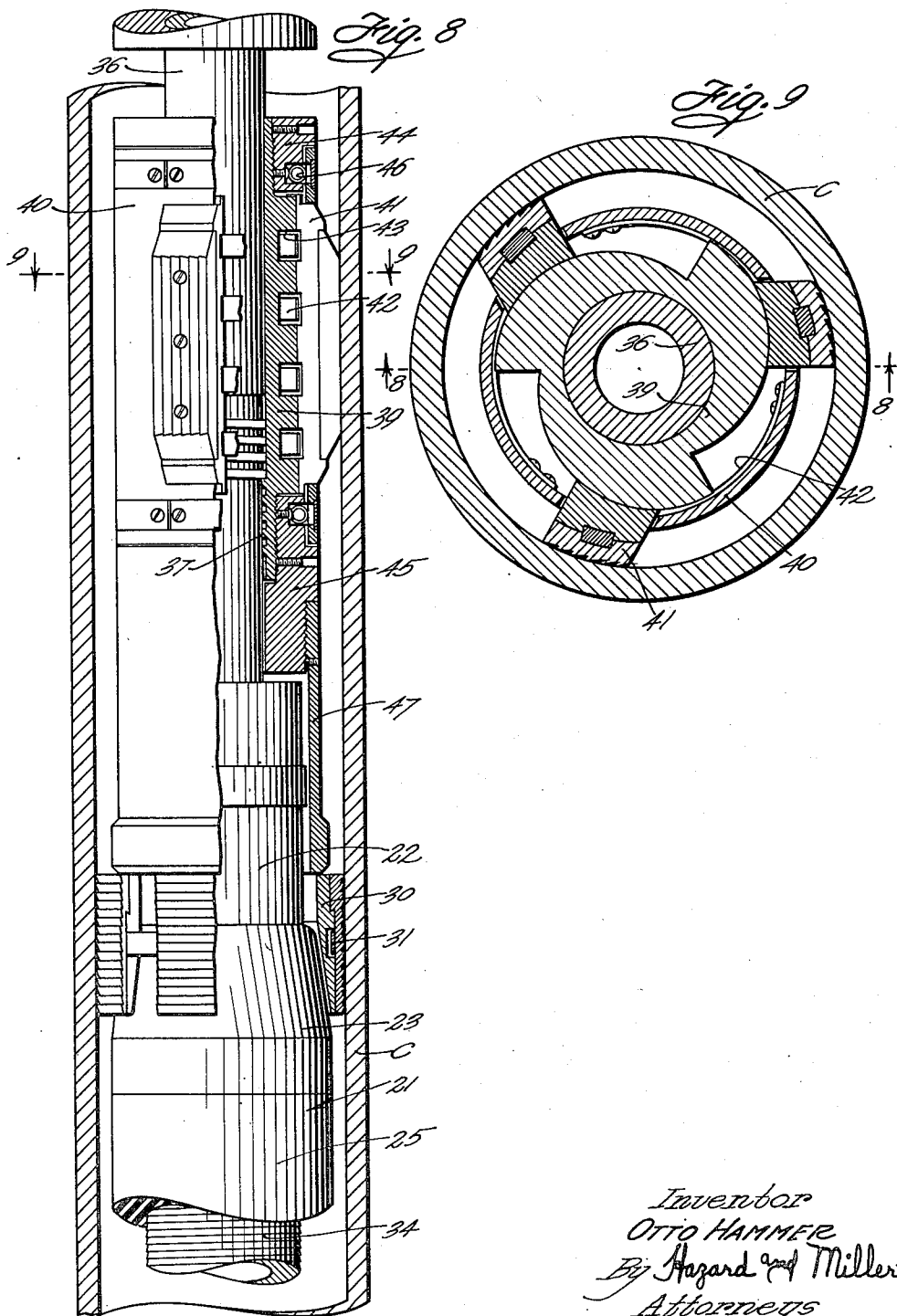
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Fig. 10

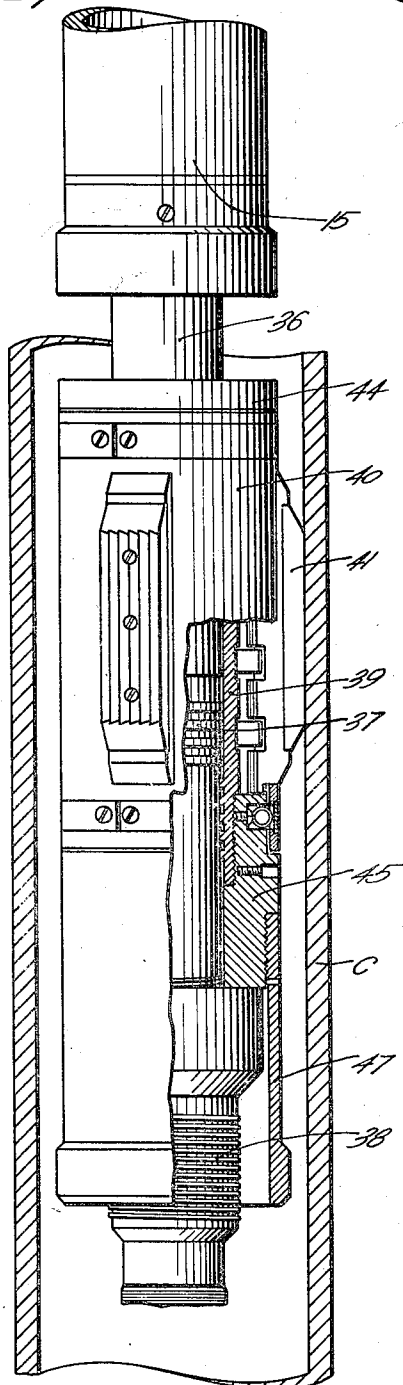
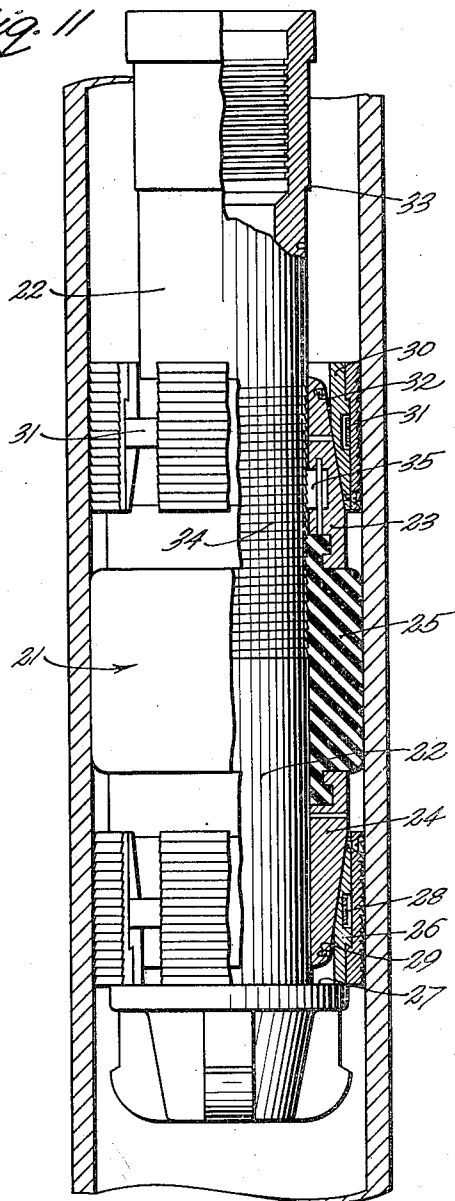


Fig. 11



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Fig. 12

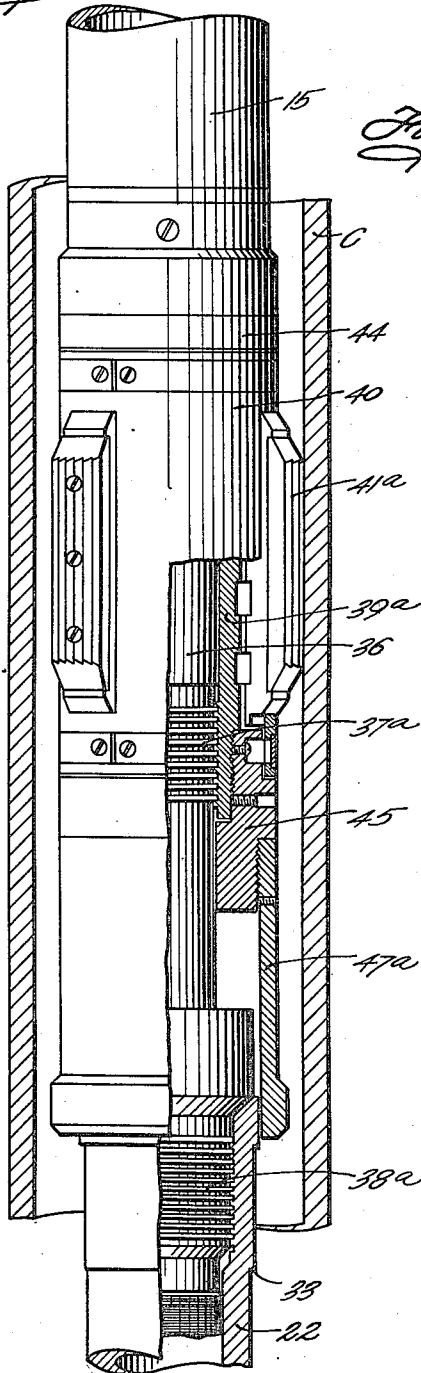


Fig. 13

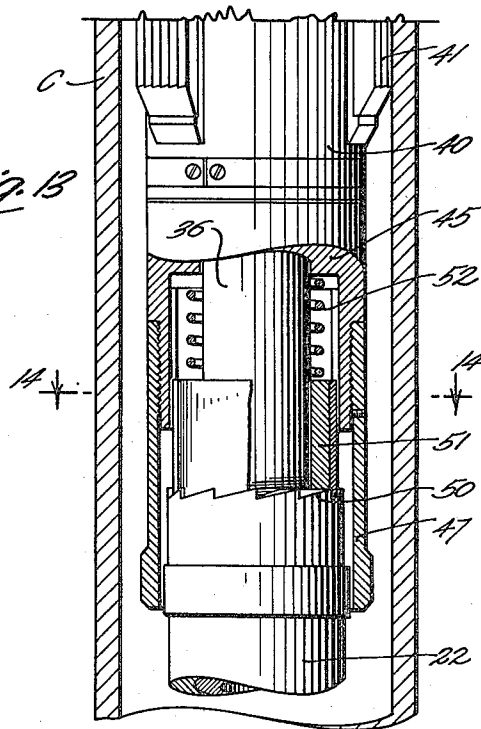
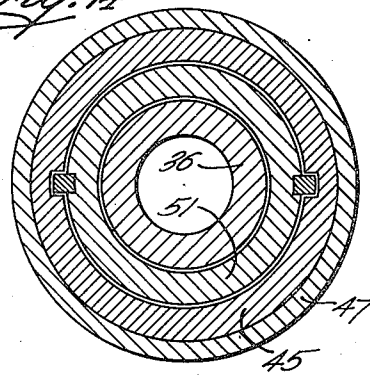


Fig. 14



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UNITED STATES PATENT OFFICE

2,361,094

SETTING TOOL FOR USE IN WELLS

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Application May 9, 1941, Serial No. 392,671

6 Claims. (Cl. 166—12)

This invention relates to a device for use in wells, and in particular to a device that may be advantageously used as a setting tool for setting all types of packers and other accessories in wells and which may be advantageously used for performing other functions in wells.

An object of the invention is to provide an apparatus which may be attached to and lowered into a well by a run-in string of pipe which is operable by rotation of the run-in string of pipe to effect relative vertical movement between parts of the apparatus to accomplish a setting of a packer or other construction and which is also releasable therefrom after the packer has been set, the release being accomplished by rotation of the run-in string of pipe. In many instances in well operations it is highly desirable to be able to effect relative vertical movement of parts of an apparatus in the well to accomplish the setting of a packer or to perform some other function wherein the relative vertical movement is performed by merely rotating the run-in string of pipe.

In other instances, it is sometimes desirable to secure the relative vertical movement at a very low rate of speed that can be carefully controlled from the surface.

The apparatus embodying the present invention serves to admirably perform all of these functions in that the run-in string of pipe can if desired be allowed to remain suspended from the well derrick at a stationary elevation. Then, on rotation of the run-in string of pipe an extremely firm grip may be secured between the apparatus and the interior of the well casing and relatively vertical movement between the parts can be accomplished by continued or further rotation of the run-in string of pipe. In this way the relative vertical movement accomplished is positive and may be carefully controlled and although relatively slow as compared with bodily lifting the run-in string by means of the derrick hoist, it is with high mechanical advantage.

Heretofore it has been customary to equip various types of packers and other accessories used in wells with bowed friction springs which are intended to frictionally engage the interior of the casing to be frictionally held thereby against movement relative to the casing. These bowed friction springs are usually held in inoperative position while they are being lowered to the desired level in the well by means of a bayonet joint. On reaching the desired level the run-in string of pipe is manipulated to release the bayonet joint and movement of the run-in string

and mechanism attached thereto relative to the friction springs accomplishes a setting of the tool or packer. As the friction springs must depend entirely on their frictional engagement with the interior of the casing so as to be held stationary thereby, their ability to resist being moved by the run-in string of pipe is somewhat limited. By means of the present invention not only is a much firmer grip capable of being secured on the interior of the casing than can be accomplished by bowed friction springs, but in addition, the run-in string of pipe can be manipulated relatively to the gripping means with much greater force without affecting the grip to accomplish the setting of the packer or the performing of some other function.

Another object of the invention is to provide a setting tool for packers and the like that can be lowered into a well by means of a run-in string of pipe and which is highly advantageous in that there is very little if any danger of the tool becoming prematurely operated or tripped prior to its reaching its desired level. Heretofore, when friction springs were employed and bayonet joints used there was some danger of premature operation. In that class of packers that are hydraulically operated or set by forcing fluid down through the run-in string of pipe there was a constant danger of a hydraulic pressure building up within the packer as it was being lowered to the desired level. This pressure frequently became sufficient to prematurely operate or set the packer. The present construction is so designed that danger of premature operation while the device is being lowered into the well is practically entirely eliminated.

The primary object of the invention may therefore be summarized as to provide a device for setting packers in wells or to accomplish other functions therein wherein a firmer grip may be secured with the interior of the casing than that which can be accomplished by means of bowed friction springs. There is little or no danger of premature setting or operation. The setting or operation of the device is accomplished by mere rotation of the run-in string of pipe and rotary movement of the run-in string of pipe is converted or translated into relative vertical movement between the parts which can be carefully controlled to accomplish the setting of the packer or the performance of some other function. Thereafter, release of the run-in string of pipe is accomplished by mere rotation of the run-in string.

With the foregoing and other objects in view,

which will be made manifest in the following detailed description and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a vertical section through a casing in a well illustrating the run-in string in position therein and a wash joint attached thereto which is frequently interposed between the bottom of the run-in string and the top of the apparatus embodying the present invention;

Fig. 2 is a continuation of the bottom portion of the casing shown in Figure 1; illustrating the apparatus embodying the present invention in side elevation therein and illustrating it as carrying a packer, the packer illustrated being but one of a number of different types of tools or devices that may be lowered, set, and/or operated by the apparatus embodying the present invention and subsequently released or detached from the run-in string of pipe;

Fig. 3 is a horizontal section through the wash joint and may be considered as taken substantially upon the line 3—3 upon Fig. 1;

Fig. 4 is a horizontal section through the wash joint and may be considered as taken upon the line 4—4 upon Fig. 1;

Fig. 5 is a sectional view through the casing and through the apparatus or setting tool embodying the present invention, the upper portion of the illustrative packer being shown in the bottom of this figure;

Fig. 6 is a horizontal section taken substantially upon the line 6—6 upon Fig. 5;

Fig. 7 is a horizontal section taken substantially upon the line 7—7 upon Fig. 5;

Fig. 8 is a view similar to Fig. 5 but illustrating the apparatus in a position wherein it has effected relative vertical movement between the parts accomplished by rotating the run-in string of pipe and has thereby accomplished a release of the upper slips of the packer;

Fig. 9 is a horizontal section taken substantially upon the line 9—9 upon Fig. 8;

Fig. 10 is a view similar to Fig. 8, but illustrating the apparatus embodying the present invention as having accomplished a complete setting of the packer and as having been released therefrom preparatory to being withdrawn from the well leaving the packer in set position therein;

Fig. 11 is a continuation of the lower portion of the casing shown in Fig. 10 illustrating the packer as having been set in position in the well and as having been disengaged or released by the apparatus embodying the present invention;

Fig. 12 is a view similar to Fig. 5, but illustrating a modified form of construction;

Fig. 13 is a sectional view through a portion of the apparatus embodying the present invention and illustrating a mechanism which may be optionally used to facilitate effecting a release of the apparatus from the casing. This form of construction may be optionally employed on the apparatus illustrated in Fig. 5 and if desired by a mere reversal of the shape of the clutch teeth this form of construction may be employed on that form of construction illustrated in Fig. 12; and

Fig. 14 is a horizontal section taken substantially upon the line 14—14 upon Fig. 13.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the casing in a well

has been illustrated in the various views and designated by the reference character C within which is disposed a run-in string of pipe 10 which may be drill pipe or any other pipe that will serve as a run-in string. 11 generally designates a wash joint which may be of any preferred design or construction. This wash joint is preferably incorporated in the run-in string of pipe or attached to its lower end immediately above the apparatus embodying the present invention. The wash joint that is illustrated comprises a splined hollow stem 12 having splines 13 which extend through a collar 14 threaded into the upper end of the shell or sleeve 15. The stem 12 has a head 16 ported as at 17 and designed to seat on a seating ring 18 when in its uppermost position. The collar 14 has wide passages 19 between its keys or splines 20 so that when the head 16 is in any position lower than that shown in Fig. 1, circulation fluid may be forced down through the run-in string of pipe and discharged through the head 16 flowing upwardly through these wide spaces or passages 19. When the head 16 is in its uppermost position escape of circulation fluid through passages 19 is prevented. Under these circumstances, flow of circulation fluid downwardly through the run-in string of pipe is caused to continue downwardly through the shell or sleeve 15 and downwardly through the apparatus that embodies the present invention. It is finally discharged outwardly through the packer or other tool that is to be set or operated by the apparatus that embodies the present invention.

For purposes of illustration I have shown the tool or device that is to be set or operated as being a packer generally designated at 21 although it will be understood that the present invention is in no way restricted in its use to the setting of packers or to the setting of this particular form of packer but may be used for other analogous purposes, such as setting other devices in wells or operating them or both where such operation or operations can be accomplished by relative vertical movement between parts.

The packer illustrated as clearly shown in Fig. 11, comprises a body 22 having upper and lower slip cones 23 and 24 between which there is packing 25. The packing may be rubber or any equivalent thereof. On the lower slip cone there are slips 26 shouldered on a shoulder 27 on the body 22. These slips are originally held in their lowermost and contracted positions by means of shear pins or shear screws 29 which are illustrated in Fig. 11 as having been sheared. A split spring ring 28 extends through all of the slips 26 and urges them into contracted position around the slip cone. The wickers or teeth on the lower set of slips are directed downwardly to resist downward movement of the packer when these slips are set. The upper slip cone 23 is provided with upper slips 30 which are urged into outermost or expanded positions by a split spring ring 31 which extends through all of the slips of this set. These slips are initially held in their uppermost and contracted positions by means of shear pins or shear screws 32 which are also shown in Fig. 11 as having been sheared. The wickers or teeth on the upper slips 30 are upwardly directed and serve to prevent upward displacement of the packer within the casing. The upper slip cone is slidably mounted on the body 22 and has its upward movement limited by its engagement with a shoulder 33 formed on the body. The body is equipped with teeth 34 shown as being helically

arranged and shaped in a manner similar to a buttress thread. These teeth are engageable by a spring actuated locking jaw 35 which is positioned within a recess in the inner wall of the upper slip cone 23 and locks the upper slip cone in position on the body against upward movement but permits downward movement as shown in Fig. 11.

It will be understood that the packer above described is not the only form of construction that may be advantageously set or operated by means of the apparatus embodying the present invention. This form of packer has been described herein for purposes of illustration only of how the setting apparatus embodying the present invention may be advantageously used.

The apparatus embodying the present invention is illustrated in its preferred form in Fig. 5 and comprises a hollow mandrel 36 attachable to the bottom of the sleeve or shell 15 of the wash joint. On this mandrel there is cut a relatively short length of left-hand threads 37 and below these threads the mandrel is of reduced external diameter. The upper portion of the mandrel however has an external diameter substantially equal to the diameter across the tops or crests of the threads. The lower end of the mandrel is adapted to be connected to the top of the packer body 22 by means of left-hand threads indicated at 38 but which are of a finer pitch than the left-hand threads 37. Surrounding the mandrel is a cam member 39 having cams formed thereon as indicated in Fig. 9. This cam member is disposed within an outer slip sleeve or shell 40 in which vertical openings are formed for the reception of anti-rotational slips 41.

The anti-rotational slips present on their outer surface vertical wickers or teeth which as shown in Figs. 6 and 7 are directed so that upon engagement with the interior of the casing C they will resist rotation in a right-hand direction. The anti-rotational slips are urged into outermost positions by means of leaf springs 42 secured to the interior of the slip sleeve or barrel opposite horizontally extending grooves 43 formed at vertically spaced intervals on the exterior of the cam member 39. The slip sleeve or barrel 40 has its top and bottom rotatably mounted upon collars 44 and 45 which are screwed onto the top and bottom respectively of the cam member 39. Within these collars there are housed tension springs 46. One end of each tension spring is attached to the slip sleeve or barrel 40 and the other end of each tension spring is attached to its collar, the collars being in turn rigidly fastened to the cam member 39. The purpose of these tension springs is to urge the slip sleeve and cam member into the position illustrated in Fig. 7 wherein the anti-rotational slips can be forced inwardly against the action of the leaf springs 42 opposite the low points of the cam member 39. Thus, if the cam member is shifted relatively to the anti-rotational slips 41 and the slip sleeve 40 so as to assume the position shown in Fig. 9, additional tension is imposed upon the tension springs 46 so that upon release of the slips these springs will return the parts to the position shown in Fig. 7 wherein the anti-rotational slips can be forced inwardly if required and the frictional grip relieved.

The lower collar 45 has secured thereto a skirt 47 which is engageable with the tops of the upper slips 30 of the packer. It will be understood, however, that if the tool that is to be set or operated by the apparatus embodying the present

invention does not have slips or has some other construction that is to be operated by relative vertical movement, then some other form of construction may have to be substituted for the skirt 47 in order to transmit forces to effect such operation.

The above-described construction operates as follows: The device is assembled and lowered into the well by means of the run-in string of pipe 10 and is initially caused to assume the position shown in Figs. 1 and 2. During the lowering movement the vertical teeth or wickers on the anti-rotational slips 41 merely slide downwardly in engagement with the interior of the casing C. These slips are gently urged outwardly into engagement with the casing by means of the leaf springs 42. On reaching the desired level in the well whereat it is desired to set the packer 21 the run-in string of pipe 10 is rotated toward the right. The rotational movement is transmitted to mandrel 36 through the wash joint. The mandrel 36 on being rotated toward the right tends to cause the cam member 39 to rotate sympathetically with it, thus shifting its cams from the position shown in Fig. 7 to the position shown in Fig. 9 wherein they bear against the inner faces of the anti-rotational slips locking them in their outermost or casing-engaging position. As soon as the cams engage the interior surfaces of the anti-rotational slips further rotation of the cam member sympathetically with the mandrel 36 is arrested. Continued rotation of the run-in string and consequently of mandrel 36 in a right-hand direction causes the mandrel to unscrew its threads 37 from the complementary threads on the interior of the cam member so that the mandrel will then be slightly elevated. It will be recalled that the threads 37 are left-hand threads so that right-hand rotation of the mandrel will effect an unscrewing or lifting of the mandrel. Lifting of the mandrel is easily accomplished in that the weight imposed thereon is not the entire weight of the run-in string of pipe but merely the weight of the shell 15 of the wash joint and the weight of the packer. Upward movement of the mandrel continues during this right-hand rotation of the run-in string of pipe until the threads 37 completely disengage the threads on the interior of the cam member. During such upward movement of the mandrel the anti-rotational slips and the skirt 47 remain stationary so that the relative vertical movement between the mandrel 36 and the skirt 47 is accomplished with great mechanical advantage.

The lifting of the packer body by means of the upward movement of the mandrel 36 forces the tops of the upper packer slips 30 into engagement with the bottom of the skirt 47 with sufficient force to effect a shearing of the upper shear pins 32. Whenever the upper packer slips contact the bottom of the skirt 47 rotation of the packer body with the rotating mandrel is of course stopped. As the threads 38 are also left-hand threads the mandrel will consequently tend to unscrew from the packer body at these threads. However, these threads are of much lesser pitch than the left-hand threads at 37 so that complete disengagement of the mandrel from the packer body does not take place prior to a shearing of the shear pins, which releases the upper slips.

In the above-described operation it has been assumed that nothing impedes or stops rotation of the packer prior to the engagement of the tops

of the upper slips with the bottom of skirt 47. This is not always the case, however, for the packer for one reason or another may be held against rotation with the mandrel even prior to the unscrewing of the threads at 37. Even under these circumstances the rotation of the mandrel to the right causes the upper threads 37 to disengage completely prior to the complete disengagement of the threads at 38. This is due to the difference in the pitch between the two sets of threads, the upper threads 37 having a much greater pitch than the threads at 38. Thus, should both sets of threads start to unscrew simultaneously, if the pitch of the threads 37 is double the pitch of threads 38, the threads 37 will completely disengage prior to the complete disengagement of threads 38 and although there will be simultaneous unscrewing at both points the unscrewing will take place at double the rate at threads 37 than the threads 38. Consequently, although there may be some unscrewing action between mandrel 36 and the packer body at threads 38 the packer body will nevertheless be lifted so as to force the tops of the upper slips against the bottom of skirt 47 to effect a shearing of the shear pins. In this way it will be understood that if the packer body is free to rotate with the mandrel the tops of the slips will be brought into engagement with the bottom of the skirt 47 quite rapidly due to the high pitch of threads 37. On the other hand, if the packer body is not free to rotate with the mandrel so that unscrewing action immediately starts at threads 38 the packer body will nevertheless be lifted to force its upper slips against the bottom of the skirt 47 although the rate of upward movement under these circumstances is slower being equivalent to merely the differential between the pitch of threads 37 and threads 38.

Whenever the upper slips are brought into engagement with the bottom of the skirt so that there is a tendency on the part of the shear pins to resist relative vertical movement between the mandrel 36 and the skirt 47 this is effective through threads 37 to cause the cam member to rotate sympathetically with the mandrel with greater force, thus expanding the anti-rotational slips into firmer engagement with the casing and thus to effect a greater grip resisting rotation. It will be understood that the arrangement of parts is such that during the lowering of the device into the well the tops of the upper slips of the packer are either in engagement with the bottom of skirt 47 or are spaced from it only a short distance so that under all circumstances sufficient relative vertical movement will take place between the tops of the slips and the bottom of the skirt to assure a complete shearing of the shear pins prior to a complete unscrewing of the threads 37.

When the upper packer slips have been released by the shearing of the shear pins the spring 31 becomes immediately effective to expand these slips into engagement with the casing. The threads 37 having been completely unscrewed from the complementary threads on the interior of the cam member the run-in string of pipe can then be pulled upwardly lifting the packer body 22 in an upward direction. This can be accomplished even though there may have been a partial unscrewing of the threads 38 as above described.

The upward pull transmitted to the packer body is first effective to lift the lower slip cone, the lower slips, the packing ring 25, and the

upper slip cone in an upward direction. As the upper slips have been expanded by spring 31 into engagement with the casing and are thus frictionally held against the interior of the casing C, these slips will remain stationary while the upper slip cone moves upwardly within them. The upward movement of the upper slip cone causes the upper slips to bite firmly into the casing, resisting any upward movement on the part of these slips. A continued upward pull on the run-in string of pipe serves to compress and expand the packing ring 25 and when the upward pull is sufficient the shear pins 29 of the lower slips are sheared and the lower slips can then be forced upwardly relatively to the lower slip cone. As the lower spring 28 is a contraction spring urging the lower slips into contracted position around the lower slip cone 24, these slips will be elevated together by shoulder 27 and forcibly expanded so that they will be set simultaneously without danger of one slip being set in advance of the others.

It will be understood that as the packer body is drawn upwardly during the continued upward pull after the setting of the upper slips the teeth 34 merely ratchet past the locking jaw 35 which serves to lock the upper slip cone and the packer body in their telescoped position so as to hold the packing ring 25 in its compressed and expanded position. As the wickers or teeth on the upper and lower slips are oppositely directed, displacement of the packer in either upward or downward direction is effectively prevented.

The setting mechanism and run-in string of pipe is then in a condition to be detached from the packer and withdrawn from the well. This is accomplished by rotating the run-in string of pipe 10 in a right-hand direction which rotation is transmitted to mandrel 36 through the wash joint and causes the mandrel to unscrew from the packer body by means of the left-hand threads at 38. These threads may have already been partially unscrewed as above described. When the threads at 38 are completely disengaged the packer is left in a set condition as illustrated in Fig. 11 and the setting mechanism and run-in string of pipe can be withdrawn as illustrated in Fig. 10.

Ordinarily rotation of the run-in string of pipe in a left-hand direction after detachment of the mandrel from the packer body will sufficiently loosen the anti-rotational slips 41 to permit of withdrawal. Frequently, even rotation in a left-hand direction is unnecessary. However, if desired additional precautionary measures to accomplish this may be taken by incorporating mechanism as shown in Fig. 13. As illustrated in this figure, the lower portion of the mandrel 36 may be equipped with upwardly facing clutch teeth 50 which are directed in a left-hand direction. Above these clutch teeth there is a collar 51 having complementary clutch teeth. This collar is urged downwardly by means of a spring 52 and is splined or slidably keyed to the interior of the lower collar 45 which is enlarged to accommodate collar 51. This construction as disclosed in Fig. 13 is designed to permit the establishment of a driving connection between the mandrel 36 and the collar 45, together with all associated structure whenever the mandrel is turned toward the left. Thus, positive left-hand rotation may be imparted to the anti-rotational slips in a left-hand direction to loosen these slips following detachment of the

mandrel from the packer body preparatory to withdrawal.

In Fig. 12 there is illustrated a slightly modified form of construction which is very similar to that previously described but which has embodied therein the following differences. In this form of construction the vertical teeth or wick-ers of the anti-rotational slips 41a are directed toward the left instead of toward the right as in the construction previously described. The cam member 39a has its cams shaped in a reverse direction from that illustrated in Fig. 9 so that the cams will engage the anti-rotational slips on being rotated toward the left. The springs corresponding to springs 46, see Fig. 6, are so attached to the slip sleeve and cam member as to urge the slip sleeve toward the left with respect to the cam member when these springs are under tension. The threaded connection at 37a between the mandrel and the cam member, instead of being left-hand threads as in the case of threads 37, are right-hand threads and like threads 37 are relatively coarse and have a comparatively great pitch. The threaded connection between the bottom of the mandrel and the packer body indicated at 38a is formed with left-hand threads but these threads instead of being finer or of a lesser pitch than the pitch of threads 37a as in the case of threads 38 may if desired be of the same pitch. In other words, as threads 38a are left-hand threads whereas threads 37a are right-hand threads it is immaterial whether these two sets of threads have the same or different pitches. In practically all other respects the type of construction illustrated in Fig. 12 is the same as that previously described.

The operation of this form of construction is as follows. When the setting mechanism illustrated in Fig. 12 and the packer suspended thereby has reached the desired level in the well, the run-in string of pipe is rotated toward the left. This left-hand rotation causes the cam member 39a to rotate sympathetically in a left-hand direction to engage the anti-rotational slips 41a. When further rotation of the cam member 39a is prevented rotation of the mandrel relatively thereto is effective to unscrew or back off the mandrel at its threaded connection 37a, these being right-hand threads. This causes the mandrel to move upwardly with respect to the skirt 47a to engage the upper slips on the packer and to effect a shearing of their shear pins. When the upper slips are thus released and expanded into engagement with the casing the packer can then be set by pulling upwardly on the run-in string of pipe and when the packer has been set in this manner as previously described detachment of the mandrel can be accomplished by rotating the run-in string of pipe in a right-hand direction until the threads 38a which are left-hand threads have been completely disengaged. If desired, a mechanism such as that shown in Fig. 13 may be incorporated in the setting mechanism illustrated in Fig. 12, in which case the clutch teeth at 50 and the clutch teeth on collar 51 would be reversely directed from the positions in which they are illustrated in Fig. 13 so as to be capable of transmitting right-hand rotation of the run-in string of pipe to the anti-rotational slips to back them out of the bites they may have taken on the interior of the casing.

From the above-described constructions it will be appreciated that an improved and advantageous setting or operating mechanism has

been provided for use in wells. The anti-rotational slips 41 or 41a afford a gripping means capable of engaging the casing and being held against rotation with much greater facility than that afforded by bowed friction springs. When these anti-rotational slips have been set and locked or expanded by the cam member, rotation of the run-in string of pipe is converted into vertical movement of the mandrel which is accomplished with great mechanical advantage sufficient to easily shear all of the shear pins 32. Consequently, these shear pins may be made quite heavy to resist their being sheared accidentally while the packer is being lowered through tight spots or partially collapsed portions of the casing. The arrangement is such as to afford a very fine control of the movement of the mandrel relatively to the skirt 47 when effecting a shearing of the shear pins. Also, by means of the present construction packers can be used in wells which are so designed as to be firmly set therein and locked against displacement in either direction. At the same time there is no danger of accidental or premature setting of any slips on the packer prior to an intentional setting of these slips which is accomplished by rotating the run-in string of pipe for at least several revolutions. If the packer is to be used for cementing purposes the wash joint may be advantageously employed to empty the run-in string of pipe of circulation fluid prior to the cement slurry being forced down through the packer. Under these circumstances, the wash joint is held in an open position to permit the circulation fluid to be expelled through the opening 19, and when the cement slurry reaches the wash joint, the wash joint may then be closed to cause the slurry to be forced downwardly through the packer. These operations of course take place between the setting of the packer and the detachment of the mandrel from the packer body.

The construction illustrated in Figs. 1 to 11, inclusive, is preferred in that the setting operation as well as the detachment from the packer are accomplished by rotating the run-in string of pipe to the right, thus avoiding any danger of unscrewing any joints in the run-in string of pipe. The construction illustrated in Fig. 12 while requiring left-hand rotation of the run-in string of pipe requires this only to effect a shearing of the shear pins on the upper slips of the packer. Ordinarily, this is not sufficient to endanger the unscrewing of any joints of the run-in string. However, as the construction illustrated in Figs. 1 to 11 eliminates even this danger, it is preferred.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A device for setting tools in wells including a mandrel, anti-rotational slips, means for holding the anti-rotational slips about the mandrel in positions to normally engage the interior of a well casing, and a cam having a threaded engagement with the mandrel adapted to have the mandrel screw relatively thereto and adapted to lock the anti-rotational slips in expanded position and to be held thereby against rotation while the mandrel is being screwed relatively thereto.
2. A device for setting tools in wells including a mandrel, anti-rotational slips, means for holding the anti-rotational slips about the mandrel

in positions to normally engage the interior of a well casing, and a cam on the mandrel adapted to engage the slips and be held thereby against rotation, said cam having a limited threaded engagement with the mandrel whereby upon rotation of the mandrel the mandrel will screw relatively thereto for a limited distance and thereafter rotate without screw action.

3. A device for setting tools in wells comprising a mandrel, a slip holder about the mandrel, anti-rotational slips held by the slip holder in positions to normally engage the interior of a well casing, a cam adapted to engage the slips to lock them in casing engaging position and to be held thereby against rotation, said cam and mandrel having threaded engagement with each other whereby when the cam is held against rotation and the mandrel rotated relatively thereto the mandrel may screw relatively to the same.

4. A device for setting tools in wells comprising a mandrel, a slip holder about the mandrel, anti-rotational slips held by the slip holder in position to normally engage the interior of a well casing, a cam adapted to engage the slips to lock them in casing engaging position and to be held thereby against rotation, said cam and mandrel having threaded engagement with each other whereby when the cam is held against rotation and the mandrel rotated relatively thereto the mandrel may screw relatively to the same, and spring means urging the slip holder and cam into positions wherein the slips will be released by the cam.

5. A device for setting tools in wells comprising a mandrel, a slip holder about the mandrel, anti-rotational slips held by the slip holder in positions to normally engage the interior of a well casing, a cam adapted to engage the slips to lock them in casing engaging position and to be held thereby against rotation, said cam and mandrel having a limited threaded engagement with each other whereby when the cam is held against rotation and the mandrel is rotated relatively thereto the mandrel may screw relatively to the cam a limited distance and thereafter merely rotate relatively thereto without screw action.

6. A device for setting tools in wells comprising a mandrel, a slip holder about the mandrel, anti-rotational slips held by the slip holder in positions to normally engage the interior of a well casing, a cam adapted to engage the slips to lock them in casing engaging position and to be held thereby against rotation, said cam and mandrel having a limited threaded engagement with each other whereby when the cam is held against rotation and the mandrel is rotated relatively thereto the mandrel may screw relatively to the cam a limited distance and thereafter merely rotate relatively thereto without screw action, and spring means urging the slip holder and cam into positions wherein the slips will be released by the cam.

OTTO HAMMER.