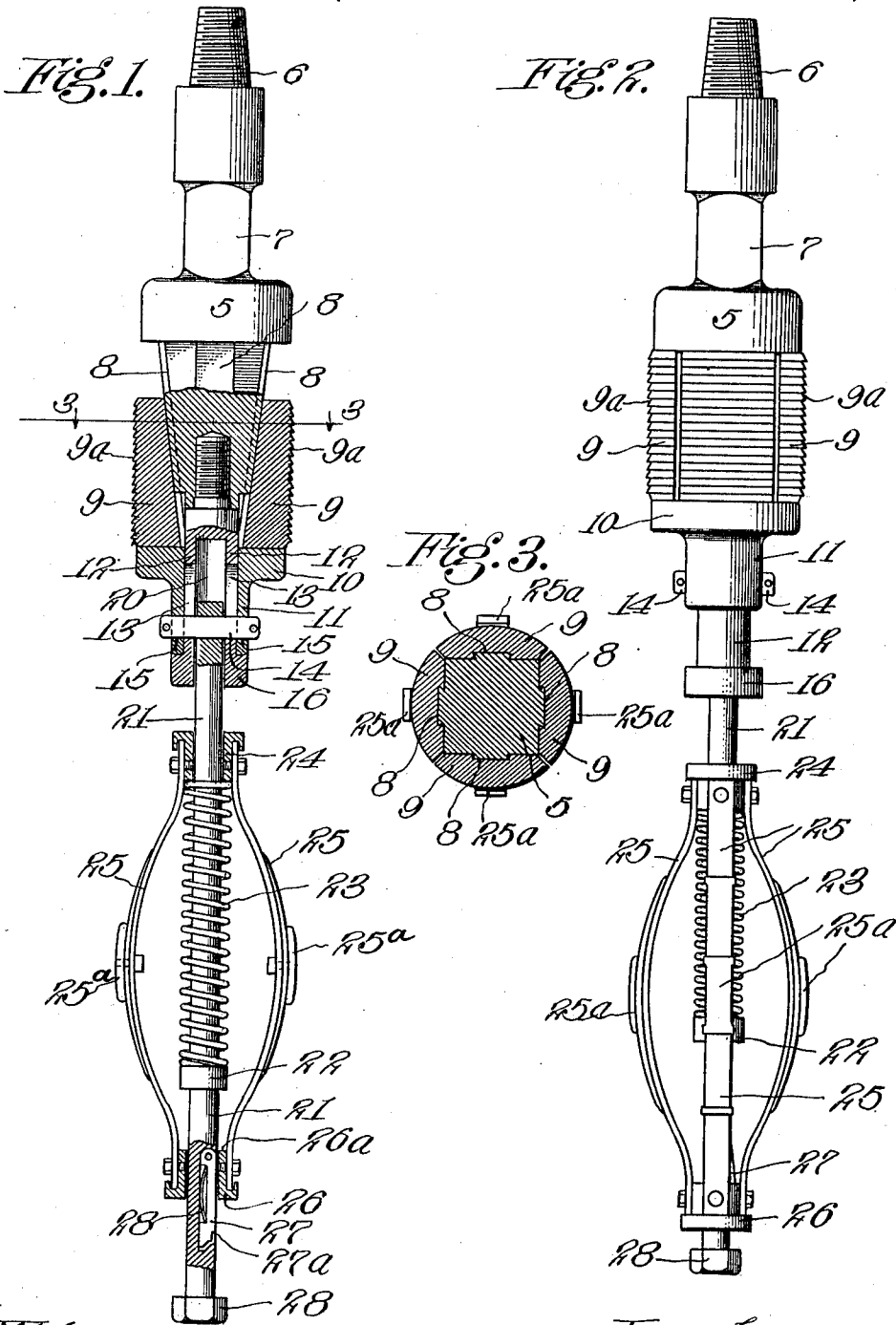


E. L. MILLS.
 DRIVE-DOWN CASING SPEAR.
 APPLICATION FILED MAY 23, 1911.

1,021,205.

Patented Mar. 26, 1912.



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UNITED STATES PATENT OFFICE.

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Specification of Letters Patent. Patented Mar. 26, 1912.

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To all whom it may concern:

Be it known that I, EDWARD L. MILLS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles, State of California, have invented new and useful Improvements in Drive-Down-Casing Spears, of which the following is a specification.

This invention relates to a spear adapted for use in driving down casing or other pipe of large diameter within a well.

Heretofore the driving of casing has been done from the top of the casing (by means of a suitable hammering device) or it has been done through the medium of a spear adapted to engage with the casing at a point above and near the impediment. It is especially desirable to engage the casing near the point of friction with the walls of the well, as the imposition of strain upon the remainder of the casing is thus avoided. In the large majority of cases the difficulty in lowering the casing is caused by the filling in of loose material around the casing and thus causing an amount of friction sufficient to keep the casing from lowering by its own weight. In some instances it is necessary to force the casing to a considerable degree before it will move freely.

The chief object of my present invention is to provide a simple and efficient structure which will engage with the inner surface of the casing at any desired point, the engagement being effected by a simple operation.

To this end my construction embodies an upper mandrel provided with upwardly spreading inclined guide-ways on which the engaging slips are adapted to move. The engaging slips expand by moving upwardly on the guide-ways. They may be of any desired number, preferably two or four; and in the drawings I have shown four—the more efficient form. By using four slips the casing is engaged more uniformly around its circumference with less liability to deformation. And one of the advantages of my construction is its adaptability to the use of any number of slips; the only pieces needing to be changed being the upper mandrel and the slips. A lower mandrel is mounted below the upper mandrel, and arrangement is made for the longitudinal (vertical) movement of the lower mandrel to move the slips vertically along the guide-ways. The movement of the lower man-

drel is effected through the medium of a spring mechanism which frictionally engages with the inner surface of the casing, means being provided for locking this frictional mechanism in working position when the whole device is lowered to the desired point in the well. This and other minor features of construction will be best understood from the following specification taken in connection with the accompanying drawings, in which:

Figure 1 is a longitudinal section of my device as it appears out of the well. Fig. 2 is an elevation showing the device as it appears when in operation within the casing. Fig. 3 is a cross section taken on line 3—3 of Fig. 1.

In the drawings 5 designates an upper mandrel provided with the ordinary means for being secured to a string of tools, and with squared portion 7 for engagement by a wrench. Below these portions are located convergent guide-ways 8, being shown as four in number. It will be understood that these guide-ways, and the slips moving thereon, may be of any desired number; two being preferable with small spears and four with the larger ones. Slips 9 are provided in the configuration shown in Figs. 1 and 3, and are made to slide longitudinally on ways 8, the shape of the ways and of the corresponding parts of the slips being such as to prevent any outward movement of the slips from the ways. The lower ends of the slips rest upon a collar 10 which forms the upper portion of a sleeve 11 slidably mounted on stud 12. Stud 12 extends downwardly from upper mandrel 5, being screw threadedly engaged therewith. A transverse slot 13 is cut through stud 12, and a suitable key 14 passes through slot 13 and also passes tightly through openings 15 cut in sleeve 11. Sleeve 11 is thus allowed a vertical movement of stud 12 measured by the length of slot 13 minus the width of key 14. The lower end of stud 12 is also provided with a head 16 which limits the downward movement of sleeve 11. An internal bore 20 is provided in stud 12, and the upper end of lower mandrel 21 enters the bore. The upper end of mandrel 21 also engages tightly with key 14, so that sleeve 11 has a vertical movement identical with any movement which mandrel 21 may have.

Mounted on lower mandrel 21 at some distance below head 16 is a collar 22. A spring

23 surrounds the mandrel and rests upon collar 22, the upper end of the spring supporting a sleeve 24, to which curved springs 25 are attached. Springs 25 are also attached to a similar sleeve 26 at their lower ends, the sleeves and springs being thus formed into a more or less rigid whole which will move as one piece along mandrel 21; with the exception that springs 25 are adapted to be sprung inwardly at their central portions and to thereby slightly increase the distance between sleeves 24 and 26. Springs 25 are of such configuration that they must be slightly pressed toward each other in order for placement within the casing, so that they will exert a certain amount of frictional engagement between their shoes 25^a and the inner surface of the casing. In the lower end of mandrel 21 a small pivotal catch 27 is placed with a spring 28 for pressing it outwardly. Catch 27 is so placed and is of such configuration that its shoulder 27^a will catch over upper face 26^a of sleeve 26 whenever the sleeve is moved below the catch. A nut 28 on the lower end of mandrel 21 prevents any of the sleeves from passing off the end of the mandrel.

In operation the device is placed within the casing in the relative position shown in Fig. 1. Springs 25 must be slightly pressed inwardly to do this, and they then exert a certain frictional engagement with the inner surface of the casing. As the device is moved down the hole the frictional engagement of the springs with the casing will force the springs and their connected sleeves upwardly on mandrel 21 until sleeve 24 engages head 16. With this exception, the whole device moves down the casing in the position shown in Fig. 1. When the desired point within the casing is reached, the downward movement is stopped and the spear moved upwardly a few inches. The springs tend to remain stationary with respect to the casing, and mandrel 21 moving upwardly will draw catch 27 to a point where it will catch over the upper surface of sleeve 26. Sleeve 26 is thus locked so that it cannot move upwardly without moving mandrel 21 upwardly. The spear is then moved downwardly and the frictional engagement of the springs with the casing then tends to hold mandrel 21 in a stationary position while the upper portions of the device move down. The result is the upward movement of sleeve 11 on stud 12 and the upward and outward movement of slips 9 on ways 8. The slips are thus moved out into engagement with the inner surface of the casing, their teeth 9^a preventing further downward movement of the device as soon as they have completely engaged. A further downward movement of upper mandrel 5 will tend merely to expand the slips and cause them to

engage more tightly with the casing. The driving of the casing may then be effected in the ordinary manner by means of a set of jars and the usual string of tools. When it is desired to remove the spear from the well it is only necessary to pull directly upwardly on it. The slips will be pulled down to their original position by their own engagement with the casing and by the engagement of the springs with the casing. In order to be reset for another operation, the spear must be entirely removed from the hole.

There are several advantages to which I wish to call special attention. First, I have provided sleeve 11 with a long bearing on rigid stud 12; and this provides that any unequal strain upon the two or more slips will not cause the stud 12 to be bent or broken. Another advantage resides in the provision of the spring mechanism easily disconnectible from the upper slip mechanism so that it may be renewed or adjusted when necessary. And, in general, my spear is easily and simply operated, being composed of but few parts; and the movements within the casing necessary for its operation are small.

Having described my invention, I claim:

1. A casing spear, comprising a mandrel having downwardly converging ways thereon, slips adapted to move longitudinally on the ways, a cylindrical member depending from the lower end of the mandrel, a sleeve slidably mounted on said member and having a flange on its upper end on which the slips rest, and means for frictionally engaging with the casing to move the sleeve on the cylindrical member.

2. A casing spear, comprising an upper mandrel provided with ways thereon converging downwardly toward each other, slips adapted to move longitudinally on the ways, a cylindrical member depending from the lower end of the upper mandrel and having a transverse slot therethrough and having a vertical bore therein, a sleeve of some vertical extent slidably mounted around the cylindrical member and having a flange on its upper end on which the slips rest, a lower mandrel having its upper end in the bore in the cylindrical member and extending downwardly therefrom, a key engaging tightly with both the sleeve and the lower mandrel and passing through the slot in the cylindrical member, a resiliently expandible member slidably mounted on the lower mandrel, and means to lock said member in place on the lower mandrel.

3. A casing spear, comprising an upper mandrel having ways thereon converging downwardly toward each other, casing engaging slips adapted to move longitudinally on the ways, a cylindrical stud projecting downwardly from the lower end of the man-

drel and having a transverse slot and a longitudinal vertical bore therein, and having an enlarged head on its lower end. a lower mandrel having its upper end loosely
5 entered into the said longitudinal bore, a transverse key passing tightly through the sleeve and the upper end of the lower mandrel and through the transverse slot in the stud, a resiliently expansible member loosely
10 mounted on the lower mandrel, spring

means for supporting said member on the mandrel, and catch means for locking the expansible member from upward movement.

In witness that I claim the foregoing I have hereunto subscribed my name this 15th 15 day of May 1911.

E. L. MILLS.

Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."