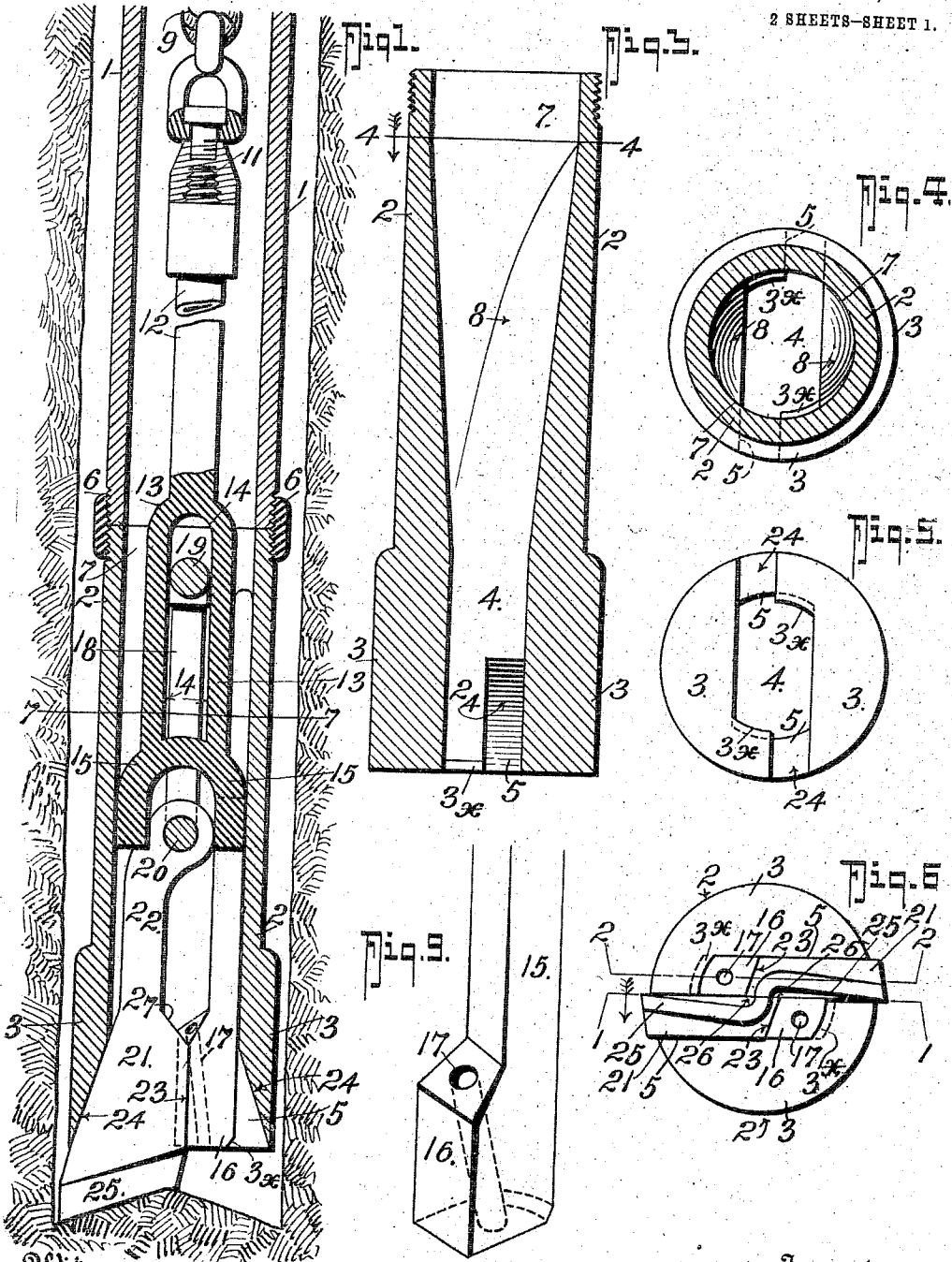


C. E. FREDERICKSON.
 SELF ADJUSTING ROTARY BIT.
 APPLICATION FILED OCT. 10, 1910.

995,064.

Patented June 13, 1911.

2 SHEETS-SHEET 1.



Witnesses

John J. Schrott
 Charles H. Wagner.

Inventor
 Clayton E. Frederickson.

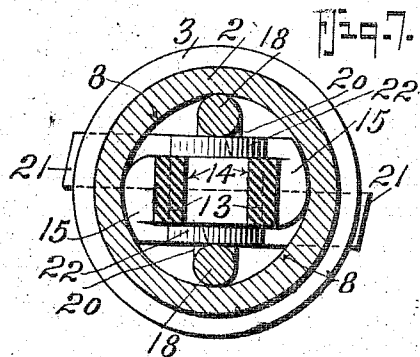
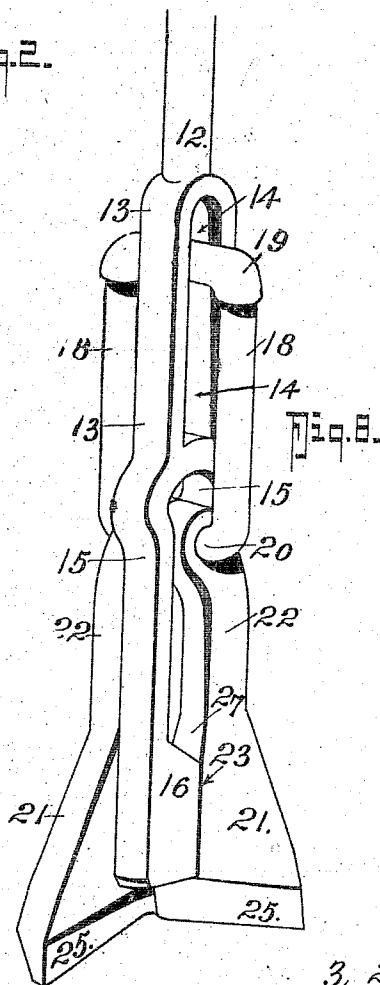
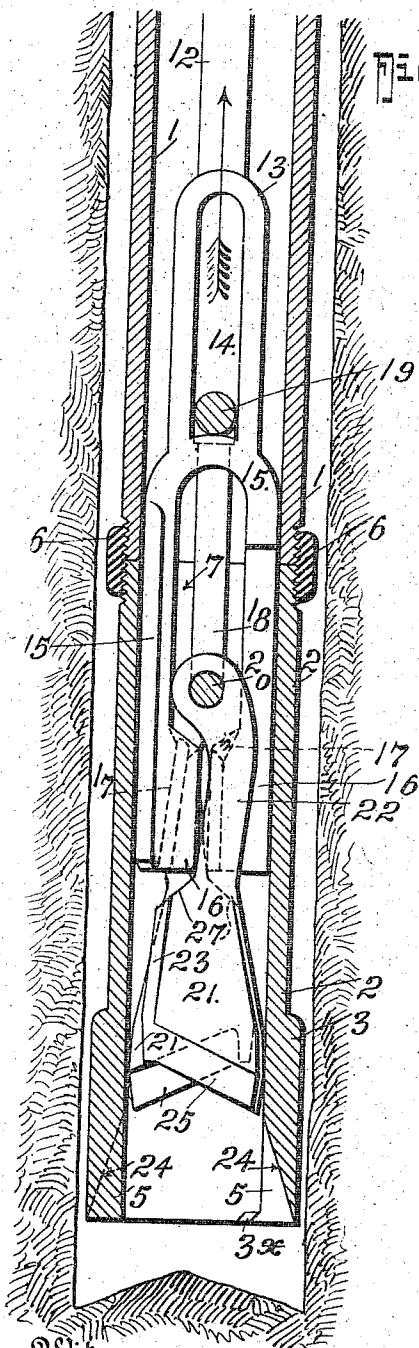
By
 Fred S. Dietrich
 Attorney.

C. E. FREDERICKSON.
 SELF ADJUSTING ROTARY BIT.
 APPLICATION FILED OCT. 10, 1910.

995,064.

Patented June 13, 1911.

2 SHEETS-SHEET 2.



Witnesses

John T. Schrott
 Charles H. Wagner

Clayton E. Frederickson.

Inventor

Fred S. Dietrich
 Attorney

UNITED STATES PATENT OFFICE.

CLAYTON E. FREDERICKSON, OF COALINGA, CALIFORNIA, ASSIGNOR OF ONE-FOURTH
TO HOLMES H. HENSHAW, OF COALINGA, CALIFORNIA.

SELF-ADJUSTING ROTARY BIT.

995,064.

Specification of Letters Patent. Patented June 13, 1911.

Application filed October 10, 1910. Serial No. 586,337.

To all whom it may concern:

Be it known that I, CLAYTON E. FREDERICKSON, residing at Coalinga, in the county of Fresno and State of California, have invented certain new and useful Improvements in Self-Adjusting Rotary Bits, of which the following is a specification.

In the art of well drilling as usually practiced at the present time, the well drilling bit or cutter is secured to the lower end of a rotatable pipe that is fed into the well and through which water, compressed air or other fluid is forced to wash or blow out the cuttings. When the bits become worn the entire tubing or rotary pipe must be removed from the well before the bits can be reached for repairs or sharpened.

My invention therefore has for one of its objects to provide an improved bit that may be lowered through the rotatable pipe and will automatically adjust itself into position at the lower end of the drilling mechanism and which may be readily removed for sharpening or repairs without disturbing the position of the rotatable pipe in the well.

Generically, the invention includes a cutter shoe or sleeve that is secured to the lower end of the rotary pipe or casing that is provided with bit receiving slots and a special passage for guiding the bits to the slots, a bit carrying and locking frame on which the bit holder is mounted and by means of which the bits, when in place, are forced radially downward into the shoe slots to assume their cutting position, and by means of which the bits are locked in such position.

In its more detailed nature the invention also resides in those novel features of construction, combination and arrangement of parts, all of which will be first fully described, then be specifically pointed out in the appended claims and illustrated in the accompanying drawings, in which,

Figure 1, is a central section and part side elevation of a rotary drill casing or tubing of a well with my invention applied, the bits being in their cutting position, the section being taken on line 1—1 on Fig. 6. Fig. 2, is a similar view on the line 2—2 on Fig. 6, the bits being shown as withdrawn from the shoe and in elevation. Fig. 3, is an enlarged central vertical longitudinal section of the shoe. Fig. 4, is a cross section on the line 4—4 of Fig. 3. Fig. 5, is an

end view of the shoe taken from the lower end. Fig. 6, is an end view of the shoe with the bits locked in place. Fig. 7, is a cross section on the line 7—7 of Fig. 1. Fig. 8, is a perspective view of the bit holder and its carried parts, *per se*. Fig. 9, is a detail perspective view of a part of the wedge member.

Referring now to the accompanying drawings, in which like letters and numerals of reference indicate like parts in all of the figures, 1 designates the rotatable pipe, such as is now in common use in well drilling machines and to the lower end of which the shoe 2, which forms a part of my invention, is attached by the threaded collar 6.

The shoe 2, which is of a peculiar construction, has a shank whose external diameter is substantially the same as that of the pipe 1 and it carries a head 3 of a greater diameter, nearly equal to that of the well to be bored. The head 3 has a transversely elongated longitudinal bore or passage 4 which merges with seats 5 having bevel surfaces 24 for the bits or cutters hereinafter again referred to. The upper end of the shoe 2 has a central circular bore 7 of the same diameter as the internal diameter of the pipe 1, the bore 7 merging with spiral surfaces 8 that terminate at the entrance of the head bore 4 to direct the bits into the bore 4 as will be hereinafter more clearly apparent.

9 is a rope having a swivel pin screwed onto the shank 11 of the rod 12 which carries the locking mechanism and supports the bit holder. The rod 12 at its lower end joins with a channeled member 13, which in turn terminates in forks 15 off-set to lie in different but parallel planes, the forks 15 terminating at their lower ends in locking keys 16 having water passing bores 17 for a purpose hereinafter apparent.

18 is the bit carrier which is in the form of a link, the upper transverse portion 19 of which moves in the slot 14 of the member 13 and the lower transverse portion 20 of which serves as a pivot on which the shanks 22 that carry the cutter heads 21 are swung. The cutter heads or bits 21 have side edges 23 that are engaged by the keys 16 when the cutters are in their operative position to hold the cutters with their bevel outer side edges 24 in the sockets or recesses 5 of the shoe

head 3, as clearly shown in Fig. 1. The cutter heads 21 have their lower ends formed into cutting edges 25 and they overlap one another as at 26 so that the two cutter head sections 21 may be considered as a single cutter. Each cutter head 21 has a recessed portion 27 to receive the keys 16 when the cutter heads 21 are being withdrawn.

In practice the parts are normally positioned as shown in Fig. 1 of the drawings, by reference to which it will be observed that the keys 16 lock the cutter heads 21 in the pockets or sockets 5 of the shoe head 3 so as to hold the same radially in position to be turned when the shoe is turned by the rotary motion of the pipe 1. Water, compressed air, or other suitable fluid may be forced through the pipe 1, shoe 2 and passages 17 and fed to the cutters to carry out the abraded material, which passes upwardly around the outside of the shoe 2 and pipe 1 and is discharged from the well in the usual manner. When it becomes necessary or desirable to remove the cutters it is only necessary to pull on the rope 9 when the keys 16 will be withdrawn from engagement with the cutter heads 21 and be brought into alinement with the cutaway or recessed portions 27 of such cutters. By this time the bridge 19 of the link or carrier 18 will rest at the bottom of the slot 14 and be lifted as the rope 9 is pulled up farther. The further upward pull on the rope 9 causes the cutter heads 21 to move into the shoe head 3 and fold up against one another, as clearly shown in Fig. 2 of the drawings to permit of the withdrawal of the same.

In inserting the cutters into the shoe 2, it is only necessary to lower them through the pipe 1 when they will be guided by the surfaces 8 into proper position to enter the bore 4 of the shoe head 3 and project below the bottom of the shoe. A further lowering of the rope 9 will permit the keys 16 to assume their locking position, as shown in Fig. 1 of the drawings. If desired, the downward movement of the keys 16 may be arrested by the provision of beveled shoulders 3* so that the keys 16 will not project beyond the lower edge of the shoe, although I do not consider this as an essential feature.

From the foregoing description taken in connection with the accompanying drawings, it is thought the complete construction, operation and advantages of my invention will be readily understood by those skilled in the art to which the invention appertains.

What I claim is:—

1. In a well drilling apparatus, a rotary pipe, a shoe secured to the lower end and forming an extension of said pipe, said shoe having a longitudinal passage terminating in cutter receiving pockets, a cutter carrier and cutters pivotally carried thereby, and a single means for lowering said cutter car-

rier through said pipe into said shoe, means engaging said cutters below their pivots for moving said cutters into the cutter pockets of said shoe, and locking said cutters in said pockets, said single lowering means comprising a cable from which said cutter carrier, said cutters and said cutter moving means are suspended.

2. In a drilling mechanism for wells, a rotary pipe, a shoe secured to the lower end of said pipe and having a central passage, said shoe having cutter head receiving pockets merging with said central passage, a rope adapted to be lowered through said pipe, a rod suspended from said rope, a drill carrier supported by said rod, drilling cutters carried by said carrier and including cutter heads that are adapted to enter said shoe pockets when lowered in said shoe, and means carried by said rod for engaging the heads of said cutters and forcing said cutter heads in said pockets and sustaining them therein.

3. In an apparatus of the class described, a shoe for attachment to the rotatable pipe of a drilling apparatus, said shoe having a head provided with a transversely elongated longitudinal passage, and also having cutter receiving slots merging with said passage, means carried by said shoe for directing cutters into said head passage, a forked body adapted to enter said shoe and having key portions at its lower end, said forked body having a slotted portion, a cutter carrier mounted on said forked body and having movement in said slotted portion, a pair of cutters carried by said cutter carrier, said cutters being insertible into said shoe to project through the lower end of the same and adapted to enter said pockets of said shoe head and project out of said shoe head, said cutters having portions to be engaged by said keys to retain said cutters in said shoe head pockets.

4. In a well drilling apparatus, a rotatable pipe, a shoe having a shank secured to said pipe at its lower end and forming an extension of the same, said shoe shank having an entrance of a bore equal to that of the interior of said pipe, said shoe including a head having a longitudinal passage transversely elongated, said shoe shank including means for directing cutters into said head passage from said entrance, said shoe head having a cutter pocket merging with said shoe head passage, a cutter having a cutter head adapted to pass through said pipe into said shoe and having its head directed into said shoe head passage, means for sustaining said cutter and lowering it into said shoe to pass through said shoe and project out of said head passage at its lower end, means directly engaging the cutter head for forcing said cutter into said shoe pocket when projected to project laterally a greater

distance from the central longitudinal axis of said shoe than the external diameter of said shoe.

5 In a well drilling apparatus, a rotatable pipe, a shoe having a shank secured to said pipe at its lower end and forming an extension of the same, said shoe shank having an entrance of a bore equal to that of the interior of said pipe, said shoe including
10 a head having a longitudinal passage transversely elongated, said shoe shank including means for directing cutters into said head passage from said entrance, said shoe head having a cutter pocket merging with
15 said shoe head passage, a cutter having a cutter head that is adapted to pass through said pipe into said shoe and be directed into said shoe head passage, means for sustaining said cutter and lowering it into said shoe to
20 pass through said shoe and project out of said head passage at its lower end, and means directly engaging said cutter head for forcing said cutter into said shoe pocket

when projected to project laterally a greater distance from the central longitudinal axis 25 of said shoe than the external diameter of said shoe and simultaneously locking said cutter head in position.

6. In a well drilling apparatus a rotatable pipe, said pipe having cutter pockets at its 30 lower end and having a central passage, a slotted rod having a bifurcated end for lowering into said pipe, a pair of pivotally mounted cutters, a link suspending said cutters from said rod, said link passing 35 through said rod slot, said cutters having cutting heads for engaging the ends of said bifurcated rod when said cutters are in position, in virtue of which said bifurcated rod ends will force said cutters with their 40 heads into said pockets and retain the same therein.

CLAYTON E. FREDERICKSON.

Witnesses:

HOLMES H. HENSHAW,

H. R. CROZIER.