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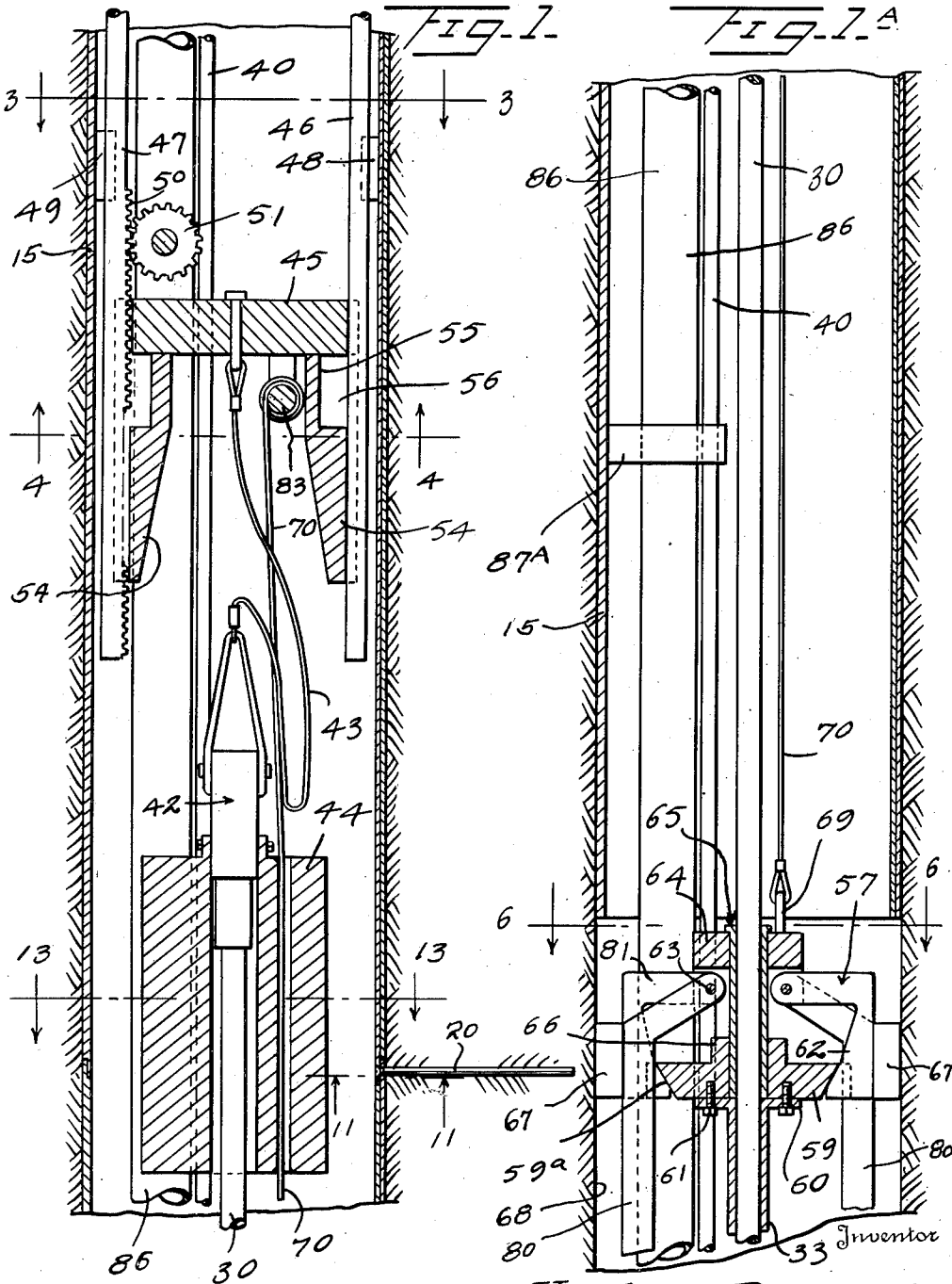
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DEEP WELL DRILLING DEVICE

Filed Sept. 24, 1945

5 Sheets-Sheet 1



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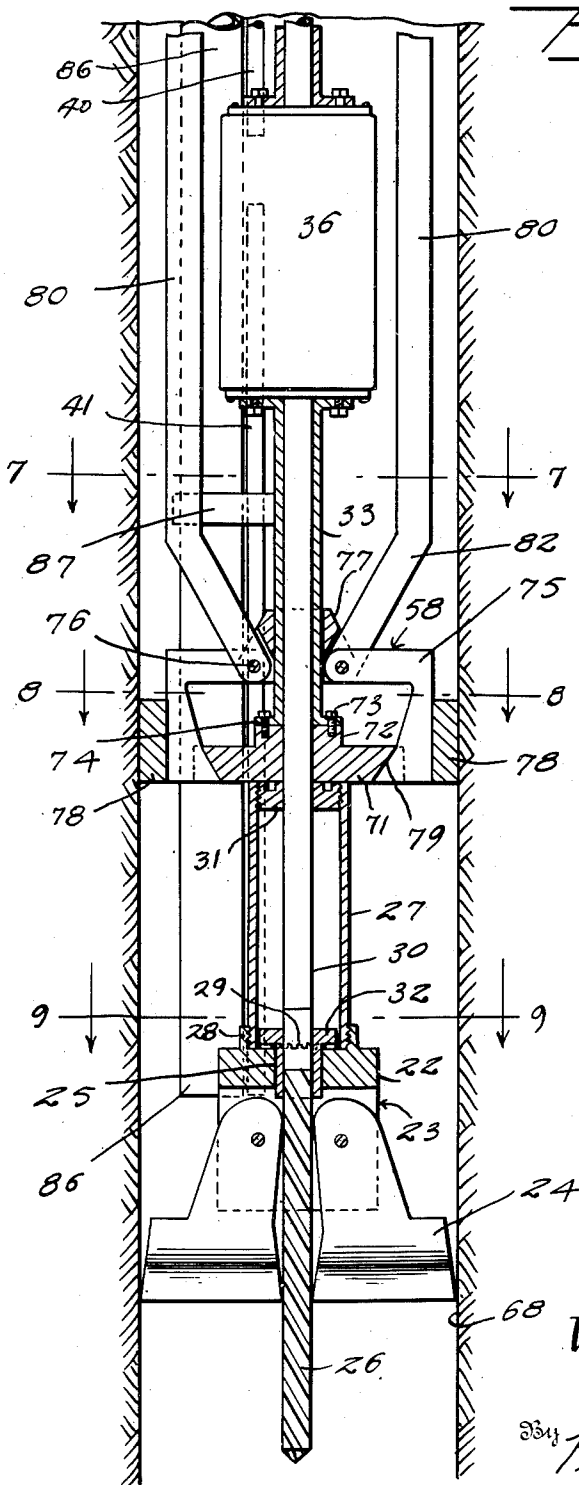


FIG. 1

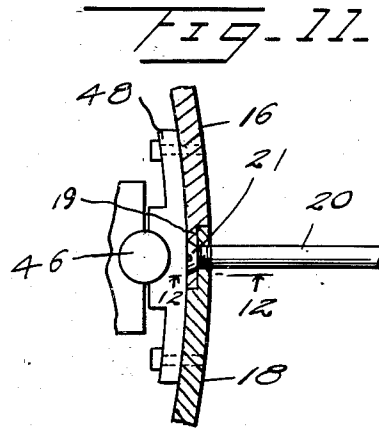
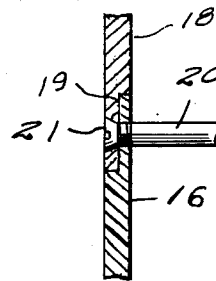


FIG. 11

FIG. 12



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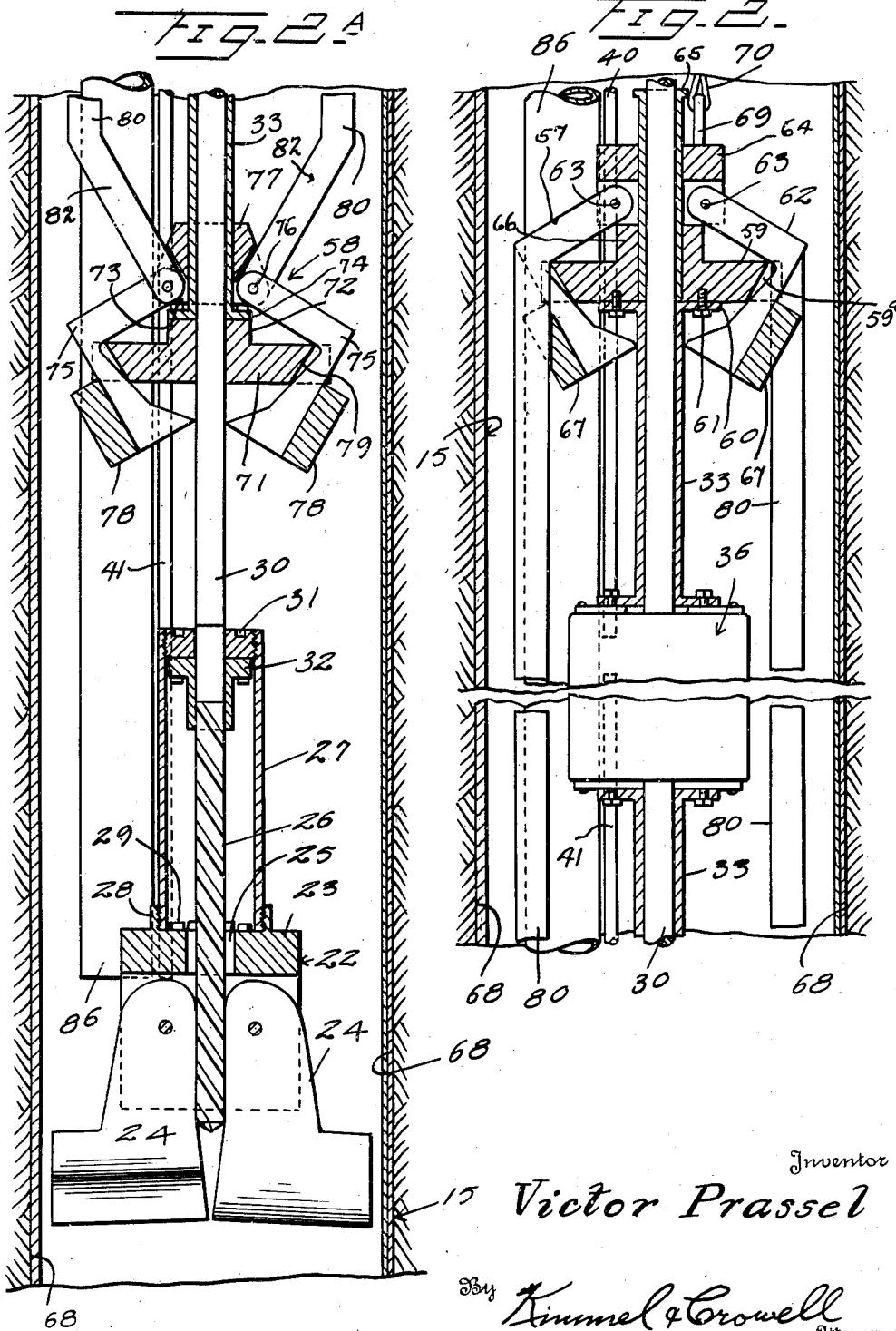
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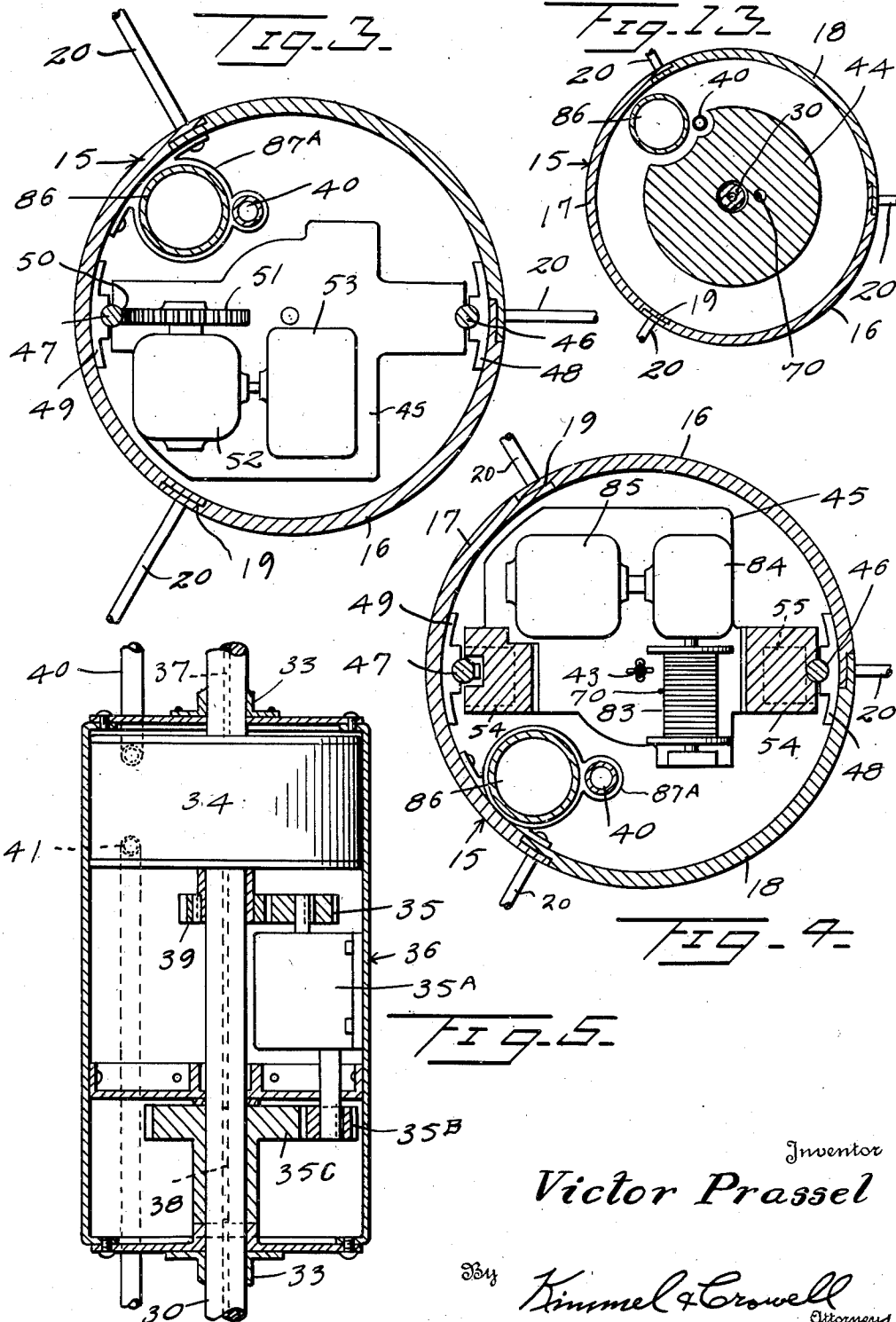
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DEEP WELL DRILLING DEVICE

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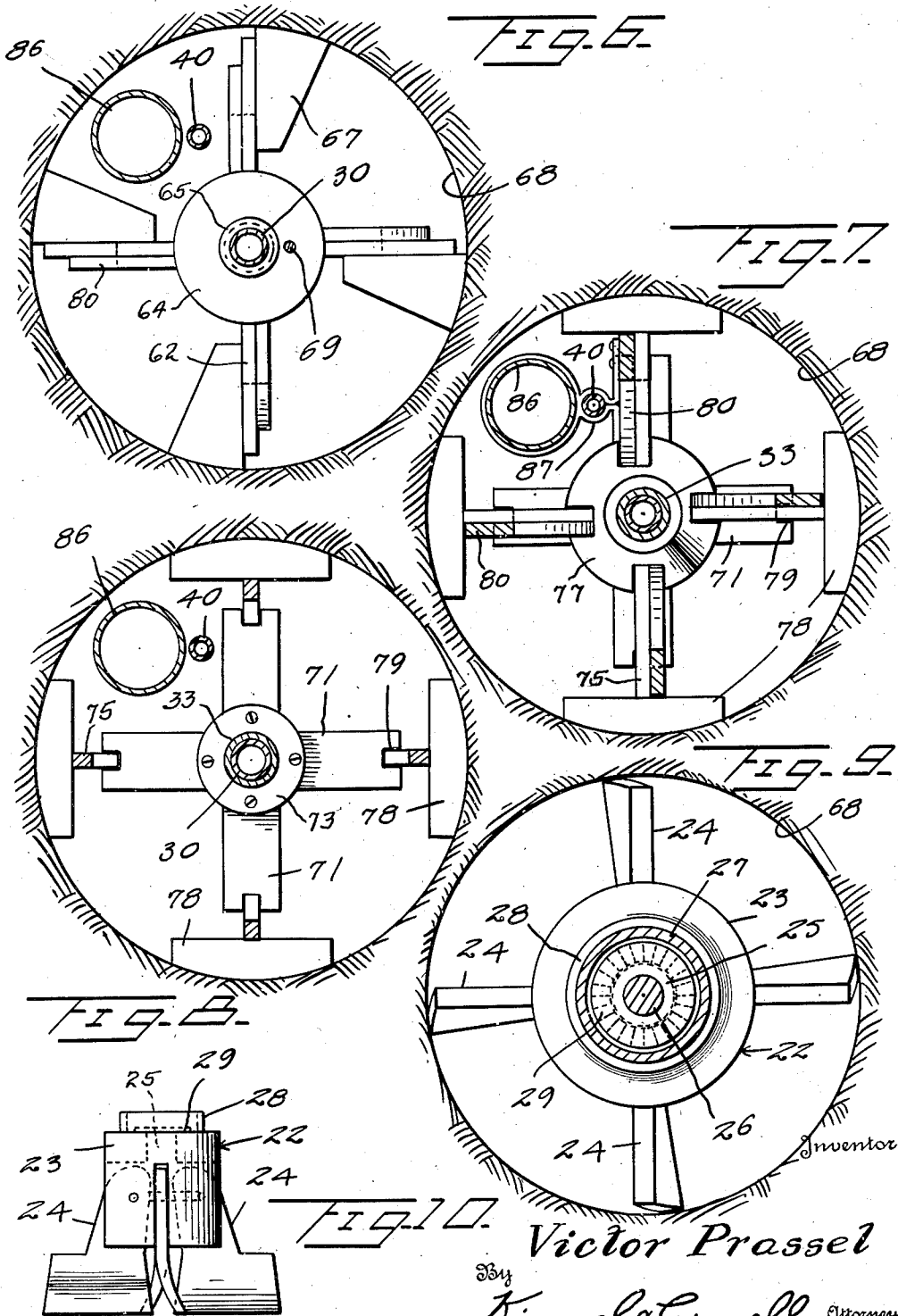
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DEEP WELL DRILLING DEVICE

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## UNITED STATES PATENT OFFICE

2,463,420

## DEEP WELL DRILLING DEVICE

Victor Prassel, San Antonio, Tex.

Application September 24, 1945, Serial No. 618,255

2 Claims. (Cl. 255—19)

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This invention relates to well-drilling apparatus.

An object of this invention is to provide an improved well drilling means for drilling large diameter holes wherein the operator for the drill bit is disposed closely adjacent the bit and is adapted to be progressively shifted downwardly as the drilling proceeds.

Another object of this invention is to provide drilling apparatus of this kind wherein the casing may be formed in segments and applied to the bore or hole in progression and in sections, and each section being firmly anchored in the bore.

A further object of this invention is to provide drilling apparatus of this kind including an improved means for supporting the drilling mechanism which is so constructed and arranged that the supporting means may be collapsed and withdrawn through the casing.

A further object of this invention is to provide drilling apparatus of this kind embodying the use of an air turbine operator for the drill bit.

A further object of this invention is to provide an improved casing for a large diameter well which is formed of segments overlapping each other at their longitudinal edges, and the overlapping edges of the segments are secured together by the inner end of anchoring rods which are extended from the casing into the substrata so that each completed casing section is self-supported within the well opening.

A further object of this invention is to provide a casing which is inserted into the well opening from the interior thereof, the succeeding sections being inserted below the preceding sections.

A further object of this invention is to provide an improved drill bit which includes a centrally disposed pilot bit which, after initially preceding the main bit, is adapted to be coupled or clutched to the main bit for operation therewith, and which acts to keep the main bit in a straight path so that the main bit will not be deflected when contacting rock or other hard substances.

With the foregoing objects in view, and others which may hereinafter more fully appear, I have invented the novel construction combination and arrangement of parts, as will be more specifically described, and illustrated in the accompanying drawings wherein are shown embodiments of the invention, but it is to be understood that changes, variations and modifications may be resorted to which fall within the scope of the invention, as claimed.

In the drawings:

Figures 1, 1A and 1B are fragmentary longitudinal sections of a well drill apparatus constructed according to an embodiment of this invention.

Figures 2 and 2A are fragmentary longitudinal

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sections of the lower portion of the drilling apparatus showing the latter in collapsed or released position.

Figure 3 is a sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a sectional view taken on the line 4—4 of Figure 1.

Figure 5 is a fragmentary longitudinal section of the air turbine and reduction gearing.

Figure 6 is a sectional view taken on the line 6—6 of Figure 1A.

Figure 7 is a sectional view taken on the line 7—7 of Figure 1B.

Figure 8 is a sectional view taken on the line 8—8 of Figure 1B.

Figure 9 is a sectional view taken on the line 9—9 of Figure 1B.

Figure 10 is a detail side elevation of the main drilling bit.

Figure 11 is a fragmentary sectional view taken on the line 11—11 of Figure 1.

Figure 12 is a sectional view taken on the line 12—12 of Figure 11.

Figure 13 is a sectional view taken on the line 13—13 of Figure 1.

Referring to the drawings the numeral 15 designates generally a casing section which is formed of a plurality of segmental members 16, 17 and 18. The segmental members 16, 17 and 18 are provided with rabbeted opposite longitudinal edges 19, so that the inner and outer surface of the casing segments will be flush and form a substantially perfect cylinder. A plurality of outwardly extending anchoring members 20 extend from the joints between the segmental sections 16, 17 and 18 being secured to the joints of these segments by fastening means 21, which also provide a means for securing the segmental members together. The anchoring members 20 are adapted to be extended outwardly or radially into the substrata of the earth so as to support the casing section which is formed up of the segmental members 16, 17, and 18.

A drill bit, generally designated as 22, is rotatably mounted within the casing 15, and includes a body 23 having pivotally secured thereto a plurality of cutting blades 24. The body 23 is formed with a central opening 25 through which a pilot drill bit 26 is adapted to loosely and rotatably engage. The body 23 has extending upwardly therefrom, a pipe or sleeve 27 which is threaded into an annular flange 28 carried by the upper side of the body 23. A plurality of clutch teeth 29 are carried by the upper side of the body 23 forming one clutch element with which the drill bit 22 is adapted to be coupled for rotation thereof.

A drill rod 30 extends axially upwardly from the sleeve or cylindrical member 27, engaging through a bearing 31 carried by the upper end of

the sleeve 27. A clutch collar or element 32 is fixed to the lower end of the drill rod 30, and when the bit 26 is in its lowermost extended and operative position clutch member 32 is adapted to engage the clutch member formed by the teeth 29 so as to rotate the drill bit 22 with the bit 26 when the latter is in its extended or pilot position. The drill rod 30 is slidably and rotatably mounted in a centrally disposed tube 33 and a turbine 34 is interposed in the length of the tube 33 and connected to the drill rod 30 for operation thereof. The turbine 34 is of conventional construction being of the type operated by air pressure. It is disposed within housing 36 and includes a spur gear 39 keyed on its main shaft. Said shaft is hollow for receiving rod 30 therein.

Gear 39 meshes with gear 35 fastened to the input shaft of reductor 35A. On the output shaft of said reductor pinion 35B is fastened and meshes with gear 35C which is provided with a long hub, in which key 38 is installed and engages keyway 37 provided on rod 30. The purpose of the above named gears and reductor is to reduce the speed generated by the turbine so that rod 30 may be operated at low speed.

The gear 35C is disposed about the rod 30 and provides a means whereby the rod 30 may be rotated while this rod may be moved endwise as will be hereinafter described. The turbine 34 is connected to an air pressure line 40 which is extended above the surface of the ground and an exhaust air line 41 extends from the turbine 34 and terminates at a point above the drill bit 22.

The drill rod 30 has secured to the upper end thereof, a swivel 42 with which a flexible cable 43 is connected. A weight, or hold down member 44 is secured on swivel 42 and provides a means whereby the drill rod will be moved downwardly at the same time that it is being rotated. The cable 43 is connected at its upper end to a platform 45 disposed within the casing 15. The platform 45 engages vertically disposed guide rods 46 and 47 which are fixed by mounting members 48 and 49 respectively to the inner surface of the casing 15. The guide member 47 is formed with a toothed rack 50 extending lengthwise thereof with which a gear 51 is adapted to mesh. The gear 51 is connected to a reduction gearing 52 which is operated from a motor 53.

The platform 45 has extending downwardly therefrom, a pair of elongated members 54 which are formed with a chamber 55 within which a magnetic brake 56 is positioned. The magnetic brake 56 is of a conventional type which comprises a coil and a core that can be electrically energized for the purpose of setting up a magnetic field which magnetic field resists the movement of the brake and the platform 45 relative to the immediately adjacent members of the casing 15. The clutch 56 is correlated with the guide members 46 and 47 for providing a means to hold the platform 45 in adjusted position. The turbine 34 is adapted to be adjustably supported at a point below the casing 15, by means of upper and lower supporting assemblies, generally designated as 57 and 58. The upper assembly 57 includes a plurality of radially arranged arms 59 secured to an annular flange 60 carried by the upper end of the tubular member 33 by fastening members 61.

The arms 59 are slotted, as at 59a, at their outer ends, for slidably receiving the lower ends of bell crank members 62. The bell crank members 62 are pivotally mounted, as at 63, on a collar 64 disposed about the tubular member 65, which is

secured at its lower end in a hub 66 carried by the radial arms 59. The bell crank members 62 have secured to their outer ends, pressure heads 67 which are adapted to engage the inner surface of the opening, or hole 68, which is formed by the drill bit 22. The collar 64 is slidable on the tubular member 65 and has secured to its upper side an eye 69 with which the lower end of a releasing cable 70 is connected. The lower supporting assembly 58 includes a plurality of radially arranged arms 71 carried by a hub 72 which is secured by fastening members 73 to the flanged lower end 74 of the tubular member 33. A plurality of bell crank members 75 are rockably mounted on pivot members 76, carried by a collar 77 which is slidable on the tubular member 33, and the bell crank members 75 have secured to one side thereof a pressure or clamping head 78. The arms 71 are provided with slots 79 in their outer ends in which the bell crank members 75 are adapted to loosely engage. The two collars 64 and 77 are connected together by a plurality of elongated connecting bars 80. The connecting bars 80 are provided at their upper ends with right angular, inwardly extending extensions 81, which are mounted on the pivot members 63. The lower ends of the bars 80 are bent obtusely inwardly as at 82, and are mounted on the pivot members 73. When the upper collar 64 is raised upwardly the outer vertical sides of the bell crank members 62 and 75 will be forced outwardly to a substantially vertical position by sliding engagement of the inner edges of the bell cranks with the inner ends of the slots 59a and 79.

To release clamping heads 67 and 78 from their clamping position, drill rod 30 is raised by cable 43. This operation will cause the clutch member 32 to contact bearing 31 which will push arms 71, tube 33 and arms 59 upwardly. When said arms are so pushed, heads 67 and 78 will rock downwardly and inwardly by their own weight.

The supporting members or assemblies 57 and 58 provide a means for holding the drill bit and turbine concentrically of the well opening, and provide for the straight boring of the drill and pilot bits. The cable 70 is wound about a drum 83 which is mounted on the lower side of the platform 45, and operatively connected to a reduction gearing 84 connected to a motor 85.

In order to provide a means for removing the loose material which is loosened by the drill bit 22, I have provided a suction pipe 86 which is extended downwardly through the casing 15 to a point adjacent the drill bit 22. The upper end of the suction pipe 86 may be connected with suitable suction means, such as a pump or the like, for withdrawing the loosened material as the drill 22 progresses in the well opening.

The pipe 86 and the air supply pipe 40 are supported at one side of the axial center of the casing, and well opening, by bracket means 87 shown in Figures 1B and 7 which is secured to one of the connecting bars 80. Also by bracket means 87A shown in Figures 1A and 3 secured to casing 15.

When turbine 36 is lowered, additional pieces of pipes 40 and 86 are installed between said brackets 87 and 87A.

In the use and operation of this invention, when the drill apparatus is initially started in the ground the pilot bit 26 is first moved downwardly and when this bit moves down to its extended position, which is the position shown in Figure 1B, the clutch member 32, carried by the drill rod 30,

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will engage clutch elements 29 carried by drill bit body 23. The drill bit 22 will thereupon rotate with the pilot bit 26. The entire assembly is firmly supported within the drilled opening 68 by moving collar 64 upwardly thereby shifting the upper and lower clamp assemblies 57 and 58 to their outer clamping positions. After the drill bit 22 has moved downwardly for a predetermined distance, the drilled opening is then lined with the casing segments. These casing segments form sections of the casing which are inserted one below the other as the drill proceeds rather than forcing the uppermost or first casing downwardly into the hole as the drill progresses.

This device has been designed for drilling relatively large holes which are big enough for a man to enter and to apply the casing segments which are anchored as they are assembled by anchoring members 20.

The exact configuration illustrated is regarded as the optimum, but some of the desirable results inherent in this disclosure may be obtained by various slight modifications, including some departure from the exact configuration shown, and it is, therefore, requested that the scope of the invention should be regarded as limited only by the terms of the claims.

What I claim is:

1. A well drilling means comprising a casing, a platform in said casing, means on said platform engaging means on said casing for slidably mounting said platform in said casing, a drill rod in said casing below said platform, means connecting one end of said drill rod to said platform adapted to support said drill rod, a tubular member surrounding a portion of said drill rod, drill rod operating means carried by said tubular member for rotating said drill rod, a pair of vertically spaced apart arms fixed on said tubular member each having an upwardly and outwardly inclined cam surface thereon, a collar slidably carried by said tubular member above each of said arms, connecting bars having the opposite ends thereof connected to said collars, rock levers pivotally mounted on said collars and having inwardly projecting means at the lower portions thereof adapted to engage said cam surfaces for rocking said levers to outward supporting position upon sliding of said collars upwardly relative to said tubular member, and a winding means carried by said platform and connected to one of said collars for sliding said collars upwardly on said tubular member.

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2. A well drilling means comprising a casing, a plurality of vertically extending guide members carried by said casing, a platform in said casing engaging said guide members for slidably mounting said platform relative to said casing, gear means on said platform engaging gear means on at least one of said guide members for effecting vertical adjustment of said platform relative to said casing, a drill rod in said casing below said platform, means connected to said platform and to said drill rod for rotatably supporting said drill rod from said platform, a tubular member surrounding a portion of said drill rod, drill rod operating means carried by said tubular member adapted to effect rotation of said drill rod, a pair of vertically spaced apart arms fixed on said tubular member each having an upwardly and outwardly inclined cam surface formed thereon, a collar slidably carried by said tubular member above each of said arms, flange means at the top of said tubular member for limiting the sliding movement of the upper one of said collars, connecting bars having the opposite ends thereof connected to said slidable collars, rock levers pivotally mounted on each of said collars, pressure clamping heads on said rock levers, upwardly and outwardly inclined portions formed on said rock levers adapted to engage said cam surfaces for rocking said levers and said pressure clamping heads to outward supporting position upon sliding said collars upwardly relative to said tubular member, and a winding means carried by said platform and connected to said upper one of said collars for sliding said collars upwardly relative to said tubular member.

VICTOR PRASSEL.

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