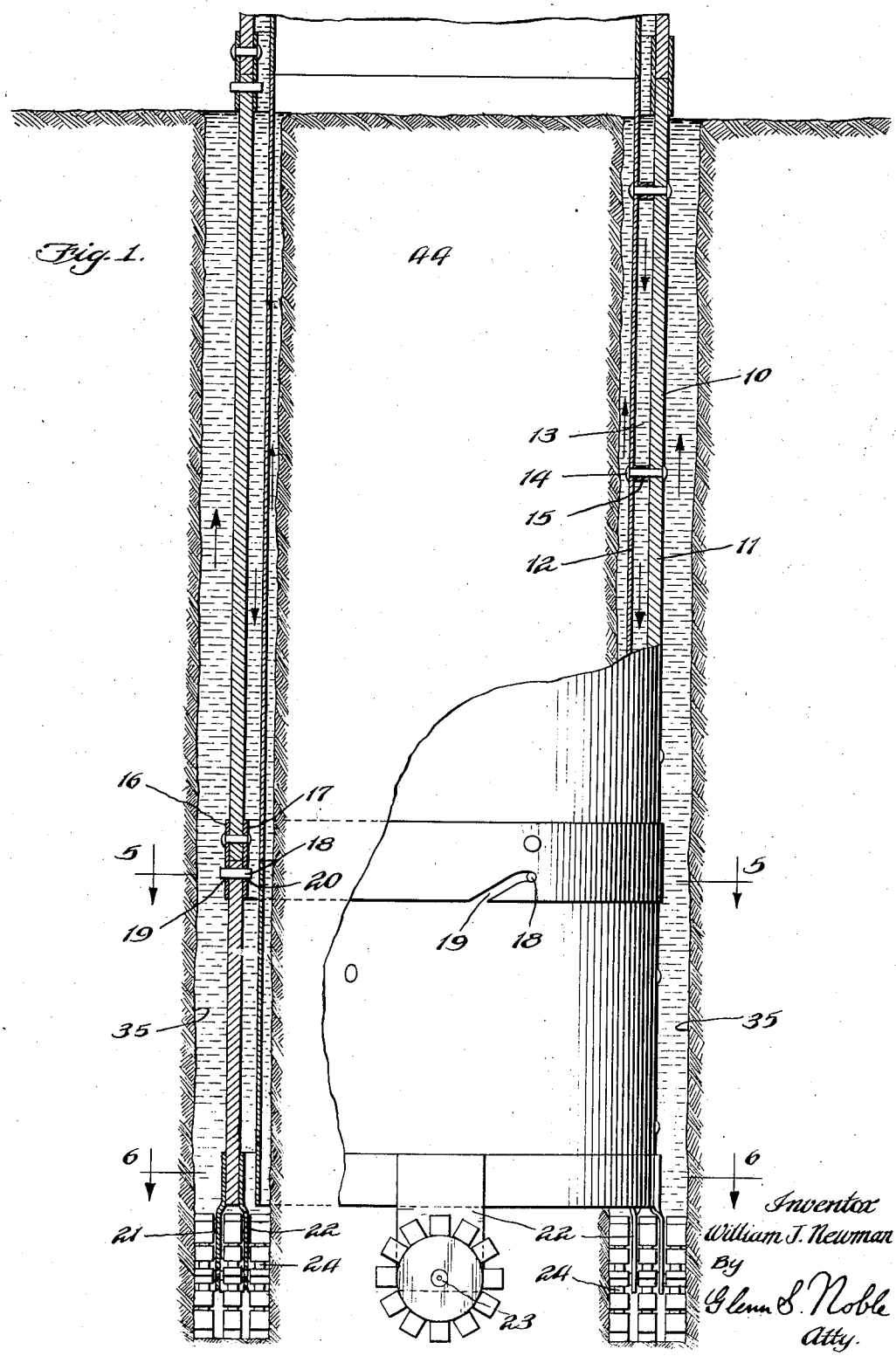
Jan. 16, 1940. W. J. NEWMAN 2,187,092

APPARATUS FOR DRILLING WELLS

Filed April 21, 1937 3 Sheets-Sheet 1



Jan. 16, 1940. W. J. NEWMAN 2,187,092

APPARATUS FOR DRILLING WELLS

Filed April 21, 1937 3 Sheets-Sheet 2

Fig. 2.

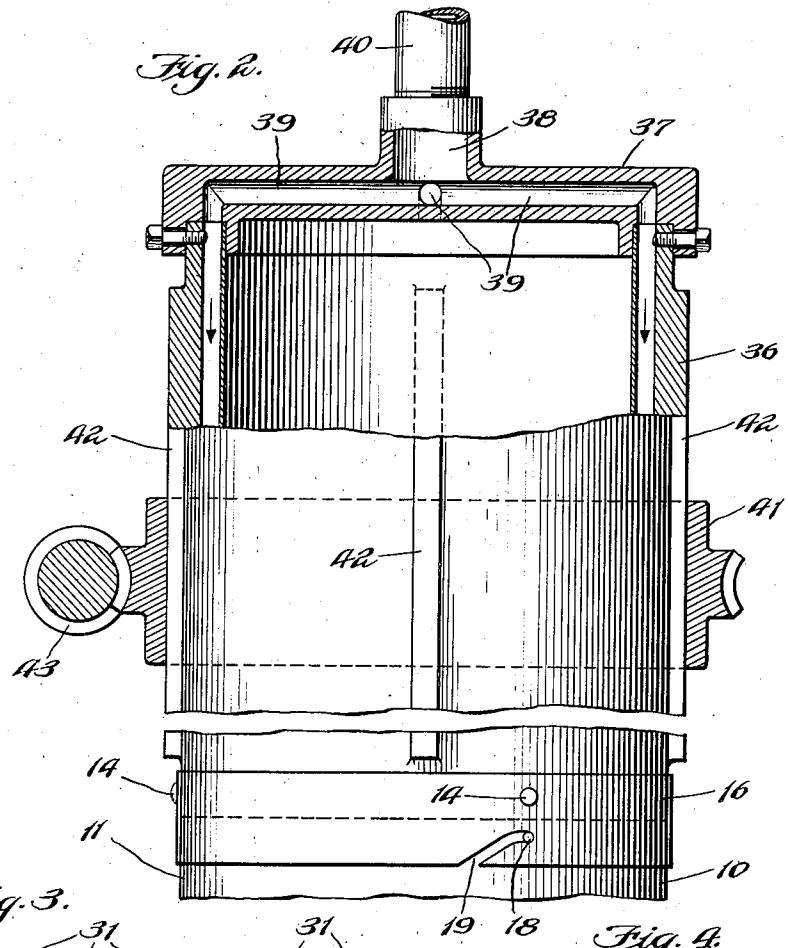


Fig. 3.

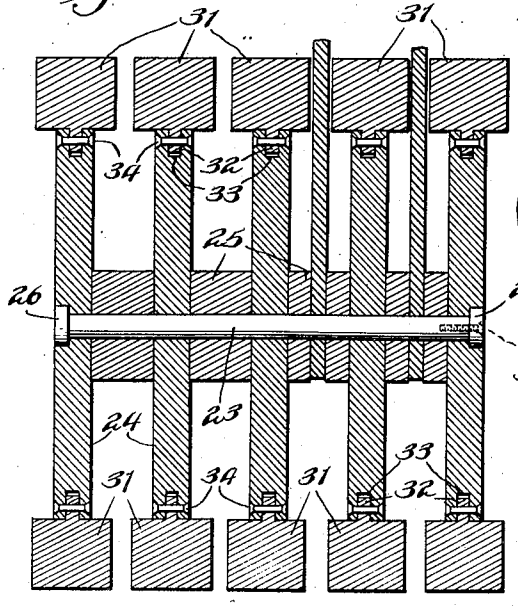
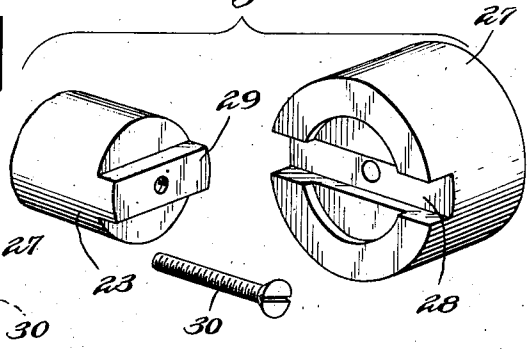


Fig. 4.



Inventor
William J. Newman
By Glenn S. Noble
Atty.

Jan. 16, 1940. W. J. NEWMAN 2,187,092

APPARATUS FOR DRILLING WELLS

Filed April 21, 1937 3 Sheets-Sheet 3

Fig. 5.

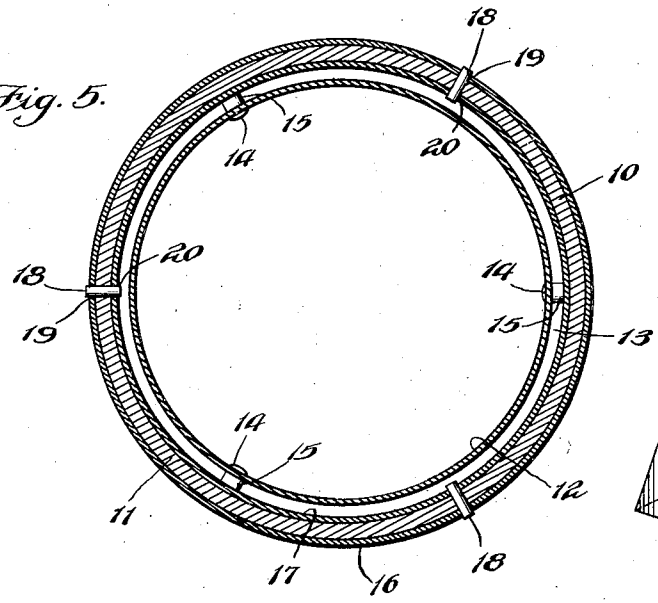


Fig. 8.

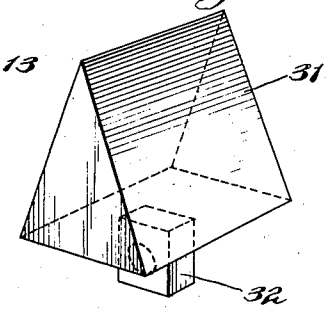


Fig. 6.

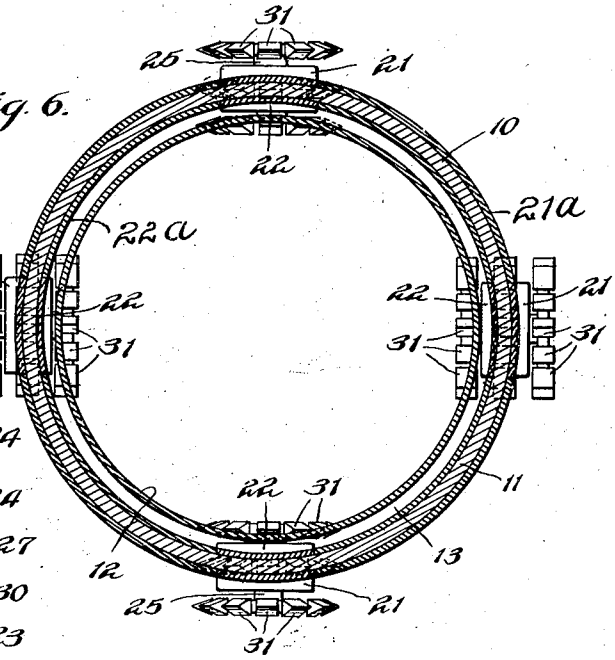
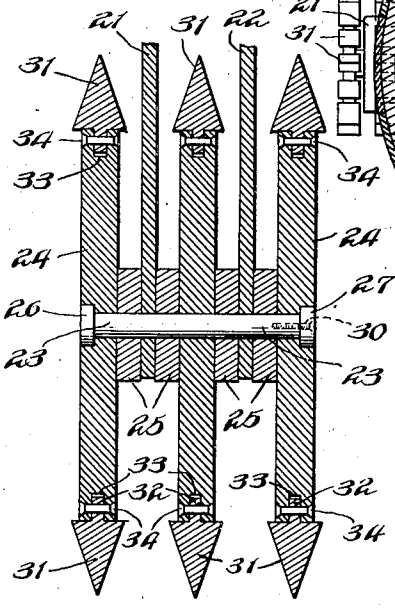


Fig. 7.



Inventor
William J. Newman
By Glenn S. Noble
Atty.

Patented Jan. 16, 1940 2,187,092

UNITED STATES PATENT OFFICE

2,187,092

APPARATUS FOR DRILLING WELLS

William J. Newman, Chicago, Ill.

Application April 21, 1937, Serial No. 138,152

1 Claim. (Cl. 255—72)

This invention relates to the drilling of large wells or holes such as commonly used for preparing foundations, these wells being frequently up to eight feet or more in diameter and down to one hundred feet or more in depth. While such wells were formerly sunk by manual labor I have more recently utilized power drills for excavating the same, these drills being constructed so that they cut out all of the material in the well. In some cases this method has been found objectionable, particularly where rocks or boulders are encountered which make it difficult to cut or dispose of the same.

In accordance with the present invention I excavate a kerf in the form of an annulus, the outer diameter of which corresponds to the outer diameter of the well, leaving a core which may be taken out in any desired manner, as by means of a bucket, clam-shell or the like. This is accomplished by means of a specially constructed hollow drill provided with suitable cutters for loosening or excavating the earth; water, air or other fluid being used for softening the material and also for carrying away the excavated or loosened matter.

In general the objects of this invention are to provide an improved method of drilling large wells or holes and to provide novel and efficient apparatus for drilling the same.

Other objects are to provide a method of drilling wells whereby an annulus of material may be excavated, leaving a relatively large central core, the arrangement being such that a minimum amount of material may be excavated by the drill; to provide a method of drilling a well wherein an annular hole is excavated, leaving a central portion and the central portion is then removed; to provide an improved drill for carrying out such method; and to provide such other improvements in drilling processes and improvements in drills or excavating machines as will appear more fully from the following description.

In the accompanying drawings illustrating this invention,

Figure 1 is a vertical sectional view showing a portion of the drill or cutting apparatus in operating position in the hole;

Figure 2 is a vertical sectional view illustrating the head or driving portion of the drill;

Figure 3 is an enlarged sectional detail of one of the cutting members;

Figure 4 is a perspective view of one end of the shafts for the cutting members showing the head or means for holding the parts together;

Figure 5 is a cross section taken on the line 5—5 of Figure 1;

Figure 6 is a cross section taken on the line 6—6 of Figure 1;

Figure 7 is a sectional view similar to Figure 3 showing another gang of cutters; and

Figure 8 is a perspective view of one of the cutting teeth.

In my previous patents, Nos. 1,928,947 and 1,943,835, I have shown the drilling apparatus having a driving head or turning a drill pipe or tubing, which apparatus may be utilized with some modification for the present drill and therefore such driving apparatus is omitted from the present illustration, as it will be readily understood by those familiar with machines of the character set forth. In accordance with the present invention I use a large cylindrical drill or cutter carrying means designated generally with the numeral 10. This member is preferably of several feet in diameter or sufficiently large to leave a core that may be excavated by manual labor or by other digging apparatus, such as a clam shell or the like, and while it resembles a casing more than an ordinary drill rod it must be made sufficiently heavy and strong to withstand the torsional strains and will for convenience be designated as a drill tube or cylinder. This tube consists of an outer section 11 and an inner section or tube 12 which is spaced therefrom to leave an intermediate passageway 13 for water or other fluid. The outer and inner sections may be fastened together in any desired manner as by means of rivets 14 and spacers 15. The drill tube is also made in sections for convenience in operation. These sections are detachably connected by any suitable means such as a bayonet joint which comprises outer and inner rings 16 and 17 which are secured to the lower end of each section as shown in Figure 1, and which extend down over and embrace the upper end of the next lower section of the tube 11 which has pins 18 that engage with angular slots 19 and 20 in the rings. The arrangement is such that when the upper section is turned in one direction relative to the lower section the ends of the adjacent tubes will be brought closely together and a comparatively tight joint will be formed. The parts may be separated or disengaged by relative rotation in the opposite direction. The ends of the adjacent tubes 12 are brought into abutting engagement in order to provide a continuous wall and thus provide a double walled tube as above stated.

The cutters are carried by the outer tube 11

and may be of various kinds or forms. In the drawings I have shown four gangs or sets of rotary cutters. Each set comprises brackets or bearing members 21 and 22 which extend downwardly from the lower end of the tube and carry a shaft 23 upon which is mounted the rotatable cutter discs 24. Spreaders or separators 25 are provided for holding the parts in proper position on the shaft. In order to prevent undue wear on the heads of the shaft, one head 26 which is formed integrally with the shaft is counter-sunk in the adjacent disc. The other head 27 which is detachable has a slot 28 for receiving a tongue 29 on the end of the shaft and is held in engaging position by a set screw 30 which is also preferably counter-sunk or depressed to prevent undue wear on the same.

The discs 24 carry the cutters or bits which may be of various forms but I prefer to make them in wedge or chisel shape as shown by the cutters 31 in Figure 8. These cutters have relatively large bases which fit against the outer peripheries of the discs and are provided with tangs or projections 32 which engage with holes 33 in the outer peripheries of the discs and are held by means of rivets 34. The cutting edges of these cutters are preferably arranged at right angles to the discs in one set or gang and arranged parallel to the discs in the next set or gang thus alternating around the drill tube. By means of this arrangement the cutters of one set will tend to cut on radial lines and the cutters of the next set will tend to cut on circumferential lines and thus chip out or break away the projections left by the preceding cutters so that the particularly rapid drilling or cutting is performed. The set of cutters shown in Figure 7 illustrates a minimum number, one disc being positioned between the brackets 21 and 22 and the others on adjacent sides of the same, the arrangement being such that an annular kerf 35 will be excavated, the inner wall being of less diameter than the tube 12 and the outer wall of greater diameter than the tube 11 so that these parts will pass freely down therethrough. With this arrangement a hole of given outside diameter may be excavated, as for instance for a well of five feet in diameter. If a larger well is desired additional cutter discs may be provided on the outside of the tubes as readily shown in Figure 3, so that the increase in diameter may be conveniently made by a comparatively slight modification of the drill sets. Any number of these sets of drills may be arranged around the lower periphery of the drill tube, four sets being shown in Figure 6.

The brackets or bearings 21 and 22 may be secured to the tube 10 in any desired manner as by riveting or welding, and the upper or shank portions are preferably braced or supported by segmental plates or inserts 21*a* and 22*a* which extend around the periphery of the tube between the respective bearing members as shown particularly in Figure 6.

The cutter carrying means or combined tubing 10 may be driven by a driving pipe or section 36 such as shown in Figure 2, and which is similar in operation to the driving means shown in my previous patents. This section which is also formed of inner and outer spaced tubes conforming to the tubes 11 and 12, is connected with the top ends of the tubes 11 and 12 by means of a bayonet joint arrangement the same as previously described, so that one tube may be disconnected as the work progresses and another section inserted. The driving section 36 has a cap or head 37 which fits closely over the upper ends of the tubes and which has a central inlet opening 38 and holes or passageways 39 leading therefrom to the space between the tubes so that water or other fluid entering at the opening may be driven down between the tubes. The inlet opening 38 is connected with a feed pipe 40 which is supplied with water or other fluid through a swivel head in the usual manner. The driving section 36 may be turned by means of a worm gear 41 which engages with splines or keys 42 on the section and which may be driven by a worm 43 actuated from any suitable source of power (not shown). The arrangement is such that the section 36 may move longitudinally through the gear while maintaining driving connection therewith.

When a well is to be drilled the lower or cutter section may be connected directly with the driving section 36 and as the cutting section is rotated the cutters will excavate an annular kerf, the cutting operation being expedited by water or other fluid which is forced down between the tubes 11 and 12 around the cutters, thus tending to soften and loosen the material. Some of the water will pass up on the inside of the tube 12 to maintain a head therein and to tend to lubricate the inner surface or prevent sticking against the walls of the core 44. The main portion of the water will pass up from around the cutters on the outside of the tube 11 as shown in Figure 1, thus tending to carry away the muck or excavated material which will be forced out at the top of the well. It will however be noted that the annular kerf, and in fact the entire well, is preferably kept full of water during some or all of the excavating in order to maintain the pressure against the outer walls. The cutters are such that they will tend to cut through boulders or the like so that they are not apt to seriously interfere with the cutting operation. After the annular kerf has been excavated down to the desired depth, which will usually be to bed rock, the drill is removed and any suitable casing or tube inserted in its place and the core is then taken out by means of clam shell buckets or other suitable means. Usually it may be desirable to insert a suitable casing or tube (not shown) in the well after the drill has been removed and preparatory to excavating the core. Such casing should fit within the outer wall of the kerf 35 and will serve in the usual manner for preventing caving of the wall and also to protect workmen or apparatus engaged in taking out the core to complete the well. By means of this system the large bulk of material comprising the center core may be readily removed as the core will be more or less weakened by the excavating of the kerf around the same. It will also be noted that this method is particularly applicable for large sized wells and the casing used should be of sufficient diameter to permit workmen to pass down into the same to work on the removal of the core. I have shown and described a preferred form of apparatus and my preferred method of excavating wells or the like, but it is apparent that changes may be made for different excavating conditions or different earth and therefore I do not wish to be limited to the particular arrangement or method herein shown and described except as specified in the following claim, in which I claim:

In an apparatus for drilling wells of large diameter for foundations, the combination with a large cylindrical drill formed of a plurality of detachable tubular sections, bayonet joints for securing the sections together, each section being

provided with a corresponding tubular section spaced inwardly therefrom and secured to the corresponding outer section, the inner sections being adapted to form butt joints when the outer sections are fastened together, means for turning the cylindrical drill and parts attached thereto, a plurality of pairs of brackets projecting downwardly from the lower edge of the outer tubular section, horizontal shafts carried by each pair of brackets and positioned radially with respect to the drill, a plurality of discs carried by each of said shafts, cutters detachably secured to the outer peripheries of the discs and positioned close together, the arrangement being such that the cutters will cut a circular kerf of sufficient width to permit the drill string to pass therethrough while leaving a center core substantially the full depth of the well which may be removed by clam shell buckets or the like, substantially as described.

WILLIAM J. NEWMAN.