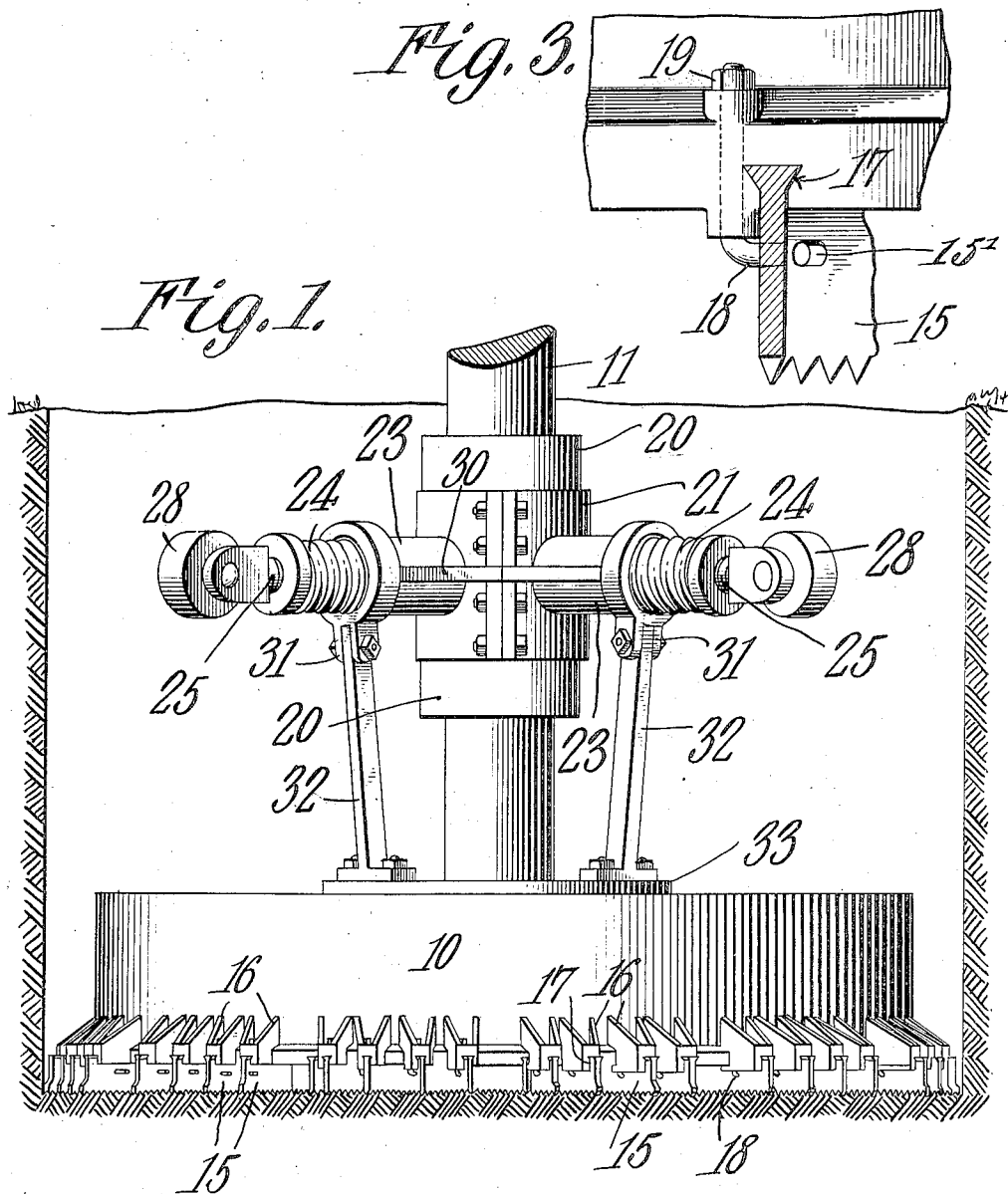


No. 879,822.

PATENTED FEB. 18, 1908.

J. P. KARNS.
SINK SHAFT DRILL.
APPLICATION FILED MAR. 15, 1907.

2 SHEETS—SHEET 1.



WITNESSES:

E. J. Stewart
John D. Carter

John P. Karns,
INVENTOR

By *C. A. Snow & Co.*
ATTORNEYS

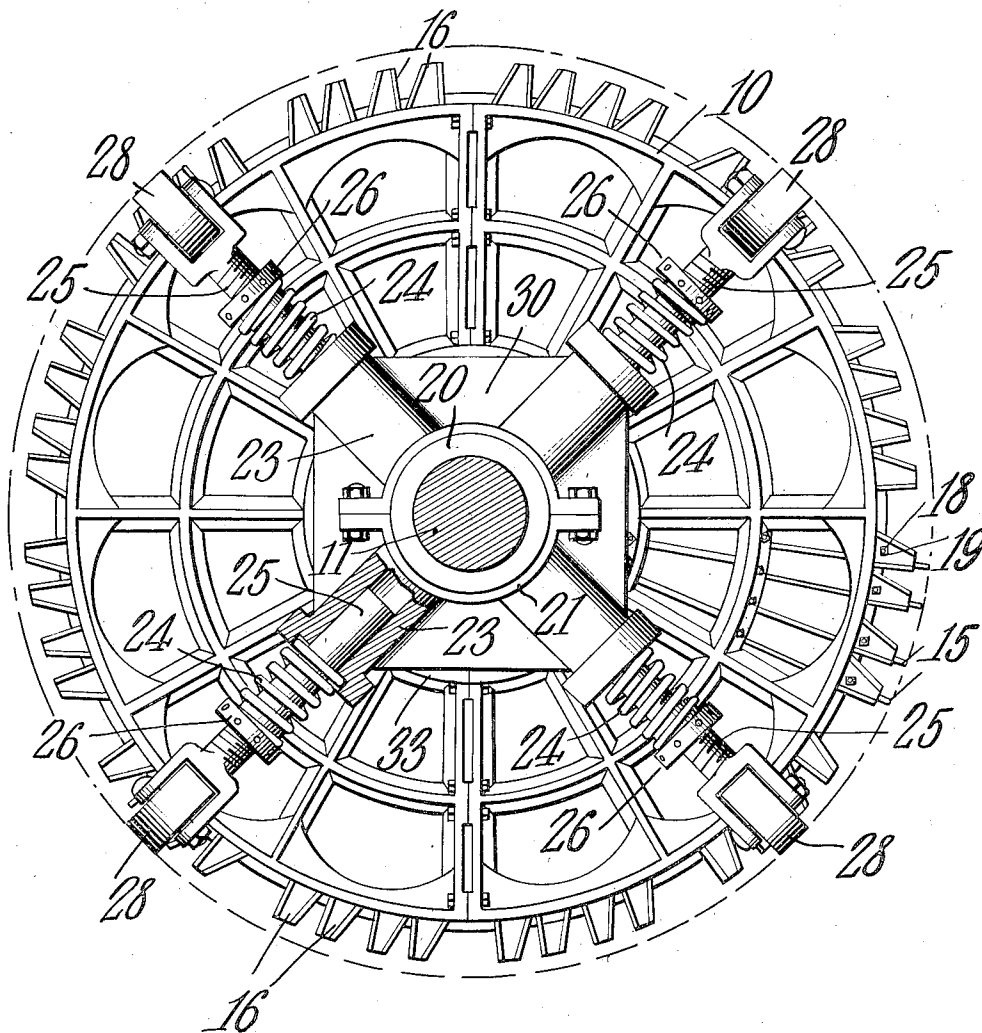
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2 SHEETS—SHEET 2.

Fig. 2



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UNITED STATES PATENT OFFICE.

JOHN PRUE KARNS, OF BOULDER, COLORADO, ASSIGNOR TO THE J. P. KARNS TUNNELING MACHINE CO., OF BOULDER, COLORADO.

SINK-SHAFT DRILL.

No. 879,822.

Specification of Letters Patent.

Patented Feb. 18, 1908.

Application filed March 15, 1907. Serial No. 362,533.

To all whom it may concern:

Be it known that I, JOHN PRUE KARNS, a citizen of the United States, residing at Boulder, in the county of Boulder and State of Colorado, have invented a new and useful Sink-Shaft Drill, of which the following is a specification.

This invention relates to drilling devices, and has for its principal object to provide a mechanism of novel construction for the sinking of vertical shafts or wells of large diameter through rock or other material.

A further object of the invention is to provide a shaft sinking mechanism in which the drill head is free for rotative movement in order that the drill bits may strike against fresh portions of the surface at successive movements, and in which the drill guiding devices may serve as means for guiding and holding a sand pump or the like.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, herein-after fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is an elevation of a shaft sinking device constructed in accordance with the invention. Fig. 2 is a plan view of the same, partly in section. Fig. 3 is a detail view illustrating the manner of holding the drill bits in place.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The drill head 10 is carried by a vertically disposed shaft 11, the shaft being of any desired length and being provided at its upper end with any suitable means for attachment to an operating device, it being intended that the drilling operation shall be accomplished by gravity, the drill head being of such weight that when raised and then allowed to drop, it will cut into the surface and reduce the rock or other material to fragments which can be readily removed when mixed with water or the like.

On the lower face of the drill head are cutting bits 15, these being arranged so as to

cover a very large area of the lower surface of the head, and a number of the bits being arranged in a continuous annular series projecting from the periphery of the drill head proper, these projecting bits being supported by radially disposed lugs 16 that are provided with dove tailed recesses 17 for the reception of the correspondingly shaped portions of the shanks of the bits. It will be seen that each bit may be readily slid into place with its dove tailed head fitting the dove tailed groove, and when the parts are thus locked together, it will be impossible for the bit to drop from the horizontally disposed working face of the drill head.

The body of each drill head is provided with a horizontal slot 15' for the reception of the horizontally turned lower end of an auxiliary securing bolt 18 that passes upward through an opening in the drill head proper, and is held in place by a locking nut 19, or similar securing device, the object of this construction being to prevent longitudinal displacement of the bit.

Secured to the shaft 11 are two spaced collars 20, and between them is secured a collar 21 that preferably is formed of a pair of sections in order to permit convenient assembling of the parts. Extending from the collar 21 are radial arms 23 in the outer ends of which are formed small recesses for the reception of the inner ends of coiled compression springs 24. These springs are mounted on radially projecting pins 25, the inner ends of which may slide in recesses in the arms and the outer portions of the said pins are threaded for the reception of nuts 26 which form bearings for the outer ends of the springs, the nuts being adjustable in order to vary the stress of said springs. If the nuts 26 are turned so that they approach the shaft 11, the springs 24 will be placed under greater stress than if the nuts are turned in the opposite direction, and in this manner the outward thrust exerted by the springs on the stems 25 will be altered, as desired. The outer end of each arm or stem 25 is bifurcated and carries an anti-friction roller 28 that bears against the vertical wall of the shaft, the number of such rollers depending on the diameter of the drill head, four being shown in the present instance. The several outwardly extending arms 23 are connected by a strengthening rib 30, and the arms are further provided with lugs 31 from which

depend hanger bars 32 that are bolted or otherwise secured to a ring 33 mounted on the drill head.

It will be noted that the arms and stems
5 are disconnected from each other at points beyond the rod 30, so that there are clear open spaces formed between the adjacent arms and the wall of the shaft to permit the insertion of the barrel of a sand pump or
10 similar mechanism for the purpose of removing the water and debris which passes through the open drill head.

In operation, the drill is raised and then allowed to fall by gravity against the surface,
15 and the turning of the drill may be accomplished by slight twisting of the cable or other operating device by which the drill is carried. The cable is twisted as the drill is pulled up, and the anti-friction rollers 28
20 will travel on slightly helical lines, on the wall of the shaft, the rollers moving freely during this operation to permit the slight rotative movement of the drill head. The fragments of rock or other material which
25 are detached by the action of the drill are intermingled with the body of water, and readily pass upward through the open drill head and may be removed by a suction pump or other suitable appliance.

The drill is of such construction as to permit the ready use of a sand pump without removing the drill and without stopping the drilling operation. The sand pump barrel
30 may be of the usual type, pointed at both ends, and in descending will be guided between two adjacent arms 23 and supported during the vertical movement of the drill head.

I claim:—

40 1. In a percussive drilling machine for sinking shafts of large diameter, an open drill head carrying cutter bits on its lower face, a shaft extending upward from the center of the drill head, a plurality of radially
45 disposed arms projecting from the shaft at a point above the drill head, the outer ends of said arms being disconnected from each other to form clear spaces for the admission of the barrel of a sand pump or the like, and anti-
50 friction members supported by said arms and arranged to engage with the wall of the shaft being drilled.

2. In percussive drilling mechanism for sinking shafts of large diameter, an open
55 drill head having cutting bits on its lower face, a shaft connected to the head, a plu-

60 rality of arms radiating from the shaft at a point above the head, the outer ends of said arms being disconnected from each other to form clear spaces for the admission of the barrel of a sand pump or the like, spring pressed pins supported by said arms, and a plurality of anti-friction rollers at the ends of said pins.

3. In percussive drilling machines for sink-
85 ing shafts of large diameter, an open drill head having cutting bits on its lower face, a carrying shaft extending upward from the head, a plurality of guiding arms radiating from the shaft, anti-friction members supported by the arms, the outer ends of said
90 arms being disconnected and spaced from each other for the reception and support of a sand pump bucket.

4. In a percussive drilling machine for sink-
75 ing shafts of large diameter, an open drill head having a plurality of cutting bits on its lower face, a shaft extending upward from the center of the head, a collar rigidly secured to said head and provided with a plu-
80 rality of radially extending recessed arms, the outer ends of which are disconnected to form free open spaces for the admission of a sand pump or the like, pins having their in-
85 ner ends guided within said recesses, the outer portions of said pins being threaded, nuts mounted on the threaded portions of the pins, compressing springs disposed between the nuts and the outer ends of the arms, and
90 anti-friction rollers disposed at the extreme outer ends of said pins.

5. In percussive drilling mechanism for sinking shafts of large diameter, a drill head having dove tailed slots and provided with
95 openings extending through the head, and cutting bits, each having a dove tailed head arranged to fit within the slot, each of the bits having an opening, and an auxiliary se-
100 curing bolt for each bit, the bolt having a laterally bent arm arranged to engage in the opening in the bit shank, and an upwardly extending arm passing through the opening in the drill head, and a securing nut on said bolt.

In testimony that I claim the foregoing as
105 my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN PRUE KARNs.

Witnesses:

SHIRLEY DAVIS,
JNO. E. PARKER.