

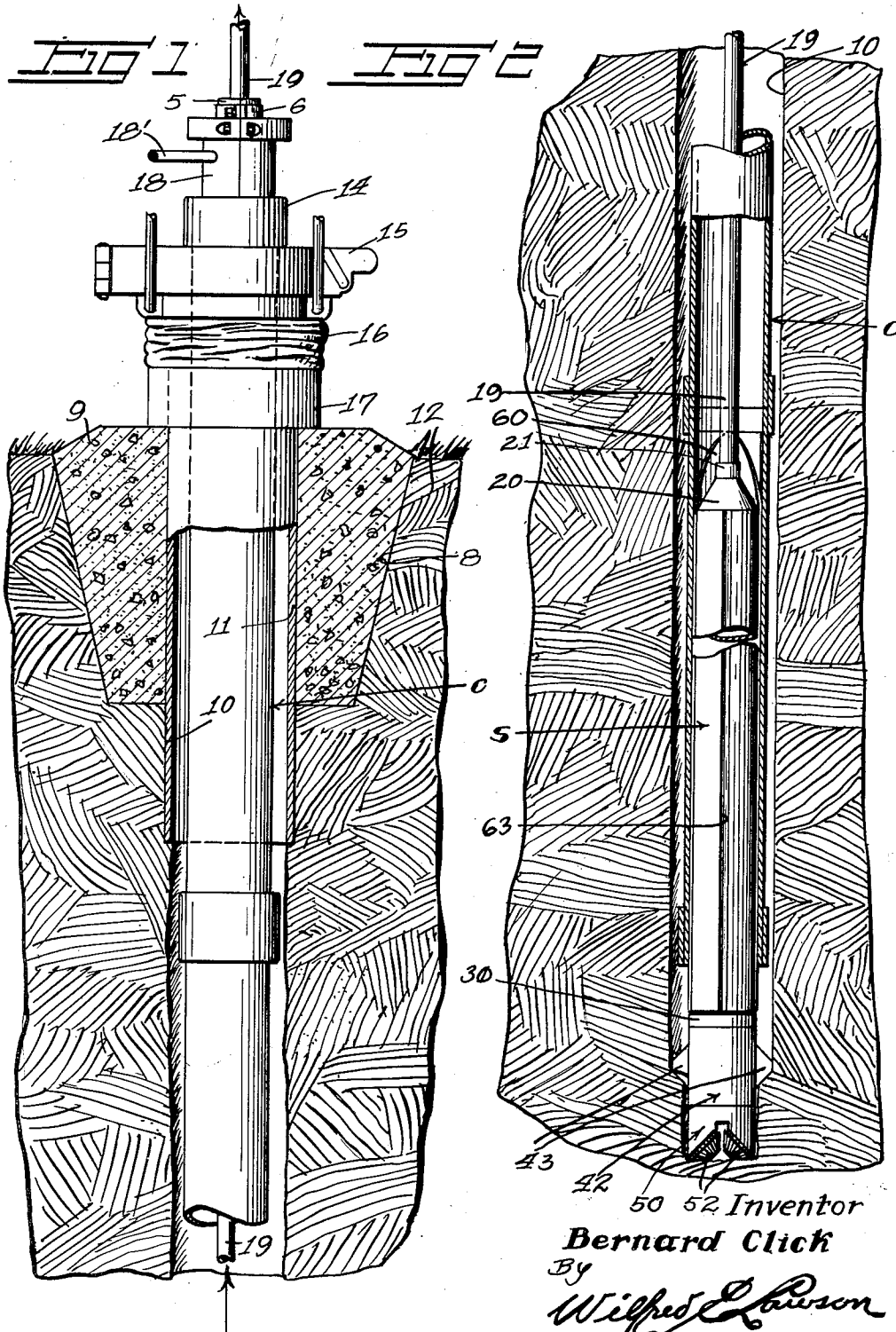
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B. CLICK
SYSTEM OF DRILLING

2,621,023

Filed July 11, 1947

3 Sheets-Sheet 1



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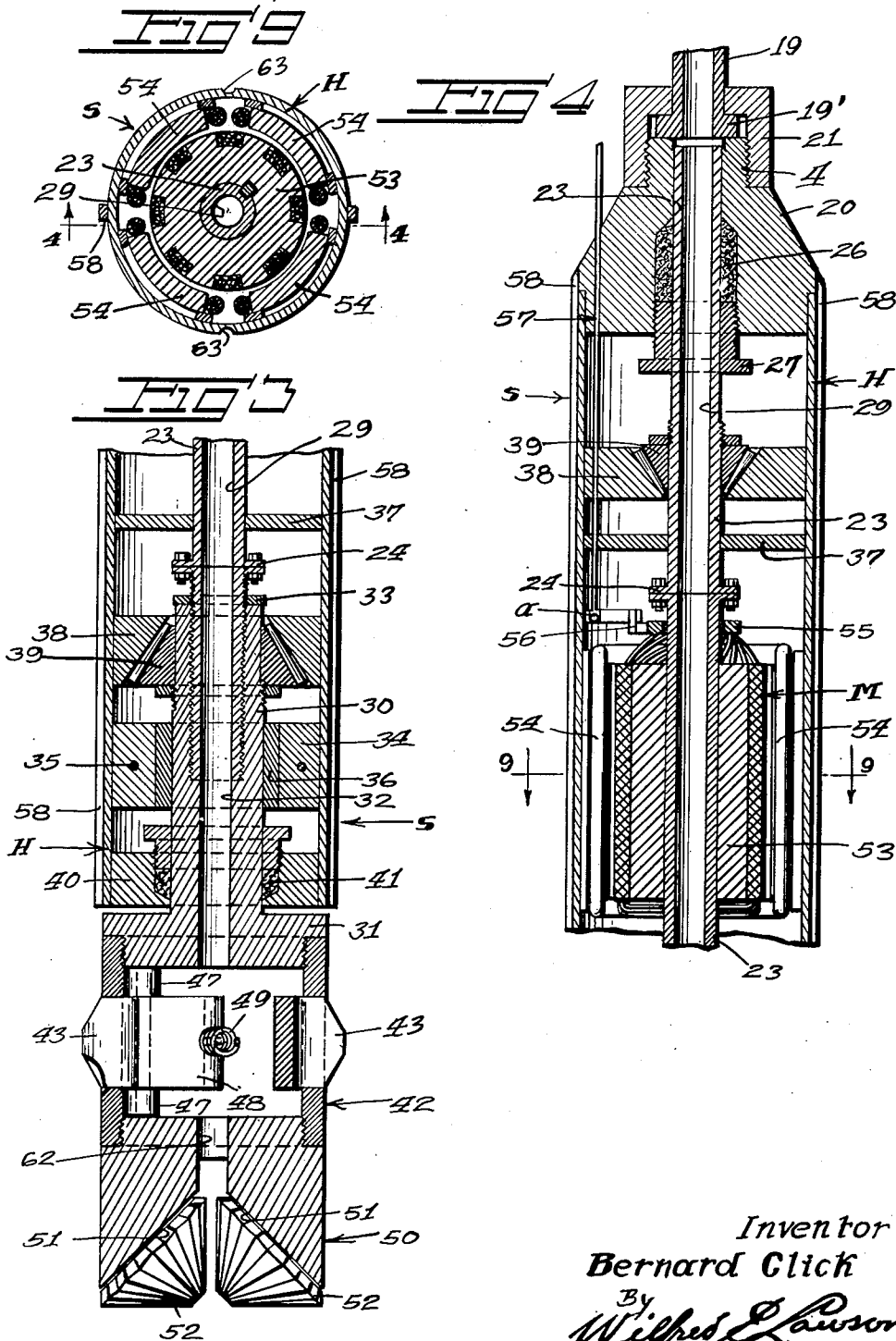
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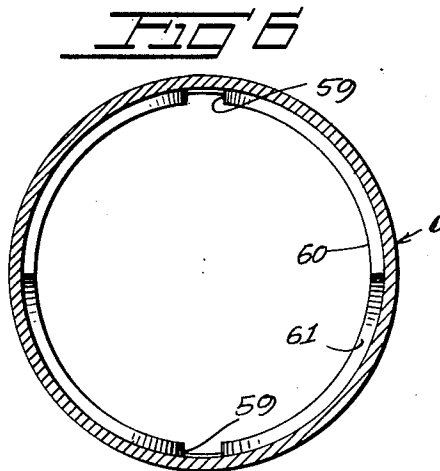
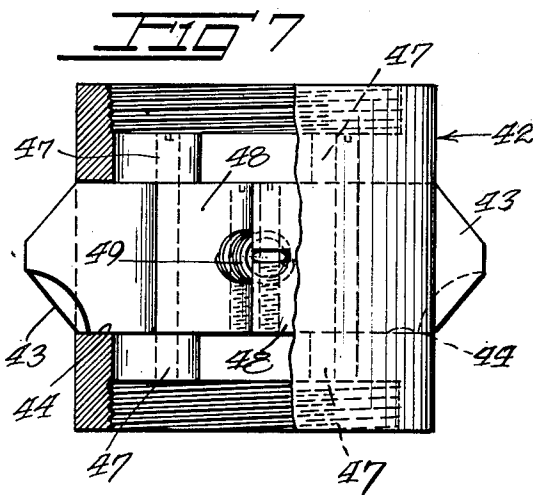
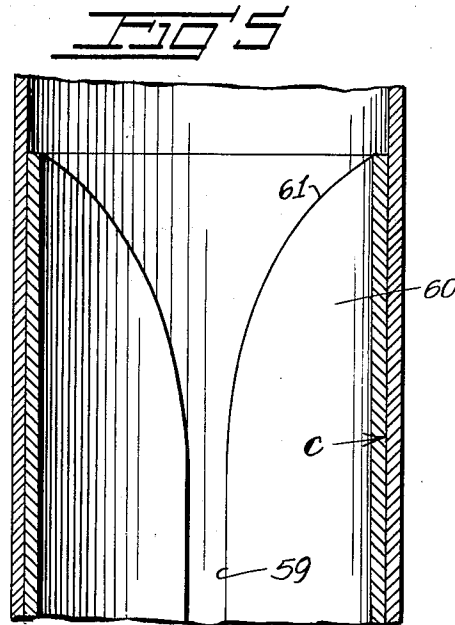
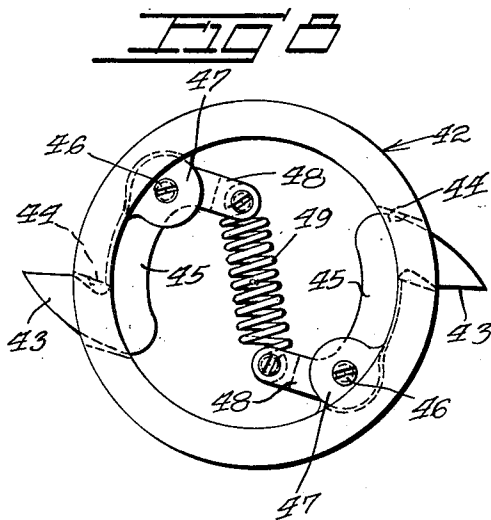
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3 Sheets-Sheet 3



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SYSTEM OF DRILLING

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3 Claims. (Cl. 255—4.8)

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Two systems of oil drilling are used at the present time, of which the older one is the "Cable-Tool System" and the modern one is the "Rotary System." The present invention belongs to the latter class. In both of said systems the source of mechanical power is at the present time located on the surface of the well, far away from the actual operation. This results in very low efficiency.

The principal and fundamental object of my invention is now to increase the operating efficiency by placing the mechanical power at the point of operation. I therefore believe my oil drilling system to be much more practical and efficient for shallow drilling than any other system now in use. The maximum depth to which drilling may be done can only be determined by experiment in each individual case.

It is an aim of the invention to benefit the petroleum industry by increasing greatly the drilling speed. The system herein embodied is believed superior to other systems now in use because drilling can be done with less material, using less labor, and with a saving of time.

Other objects and advantages will be pointed out in the subjoined description with the aid of the attached drawings.

Like numerals denote the same details in the different views.

Figure 1 is a side elevation and partial section of the oil drill apparatus as reaching thru several layers into the oil bearing deposit;

Figure 2 is a similar view of a short portion of the apparatus;

Figures 3 and 4 constitute, when put end to end, the lower and the middle portions of Figure 2 in larger size;

Figure 5 is an axial section of the bottom joint of the drill casing and shows how the liner is tailed off or tapered;

Figure 6 is a top plan view of Figure 5 showing the tapered grooves in which the lugs of the housing enter to be guided;

Figure 7 is half elevation and half axial section of the reamer and spring actuated bits projecting thru suitable side openings;

Figure 8 is a top plan view of Figure 7 and half horizontal section;

Figure 9 is a sectional view taken substantially on the line 9—9 of Figure 4.

Referring first to Figures 1, 2, 3 and 4, of the drawings;

When a well is to be started, a hole 10, is drilled in the formation 12, larger in diameter than that actually needed for my apparatus and of a depth

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to receive a tube 11. After the tube 11 has been properly placed, the same is held in position by the surrounding filler 9 of cement molded in the upper enlarged portion 8 of the hole 10. The inner diameter of the tube 11 permits the passage thereto of a casing C of such length as required. The upper extremity of the casing C is provided with a surrounding collar 14 and engaged with the casing C immediately below the collar 14 is an elevator clamp 15. This clamp 15 may be as desired and interposed between the applied clamp 15 and a collar 17 is a packing 16 of suitable composition and which co-acts with the adjacent portion of the casing C to prevent escape of fluid from between the casing C and the tube 11.

The collar 17 surrounds the upper portion of the tube 11 and it is believed to be obvious that the filler 9 constitutes a footer or bearing for the tube 11.

Screwing from above into the collar 14 is a split cap 18 having an outer head 6 constituting a gland for tightly holding suitable packing 5 against the flush line 19. Delivering thru one of the sections of the cap 18 is a pipe fitting 18' through which suitable flushing fluid is forced to the cap 18 and down thru the casing C.

The flush line 19 is, of course, tubular and also constitutes a suspender or hanger for the speed drill S.

The lower extremity of the line 19 is provided with a surrounding collar 19' to provide means whereby said end portion of the line 19 may be coupled to the top head or member 20 of the housing H comprised in the speed drill structure. This coupling is effected by a cap 21 which engages the flange 19' from above and having threaded engagement with the reduced portion 4 of said head or member 20.

Below and in axial alinement with the line 19 is a tubular drive shaft 23. This shaft 23 preferably is sectional with adjacent lengths suitably coupled, as at 24, to facilitate assembly. The bore 29 of the shaft 23 constitutes a continuation of the bore of the line 19 and said bore 29 is opened at its lower end whereby the desired discharge of the flushing fluid is permitted.

The upper portion of the shaft 23 snugly but rotatably passes thru the head or top 20 and associated with the shaft 23 within the head or member 20 is a conventional packing 26 and gland nut 27.

The lower portion of the shaft 23 is coupled by screw threads, or otherwise, with an elongated sleeve 30 carried by a head 31. The bore 32 of the sleeve 30 is continued thru the head 31 and

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thru which bore 32 the flushing fluid will flow up into the bore 29 of the shaft 23.

In the present embodiment of the invention the sleeve 30 and the shaft 23 are held in fixed connection by a lock nut 33.

The sleeve 30 is snugly and rotatably disposed thru a bearing plate 34 held within the lower portion of the housing H and pinned, as at 35, or otherwise fixedly held in desired position. The opening of the plate 34 is preferably provided with a lining 36 of babbitt or other material as preferred.

The shaft 23 at desired points therealong has associated therewith the bearing elements 37 suitably held within the housing H and of such type as preferred. Also suitably held within the housing H at desired points therealong are the stationary thrust bearing plates 38 with which connect in a well known manner the thrust bearing cones 39 fixed to and surrounding the shaft 23.

The lower portion of the housing H has held therein the bottom head or member 40 thru which the sleeve 30 rotatably passes from below and carried by said head 40 for co-action with the portion of the sleeve 30 within the head 40 is conventional packing 41.

The head, hereinbefore referred to, underlies and is closely adjacent to the bottom end of the housing H and of substantially the same diameter. This head 31 constitutes the top head for the reamer cylinder 42. This cylinder 42, as herein disclosed, is provided with two substantially diametrically acting bits 43, which pass outwardly thru the properly positioned openings 44 formed thru the wall of the cylinder 42. The inner end portions of the bits 43 are provided with laterally directed arms 45 of desired length and herein disclosed as having their outer faces curved on a radius substantially equal to the internal radius of the cylinder 42 so that the arm 45 will have effective contact with the internal face of the cylinder 42 to limit the extent of movement of the bits 43 outwardly beyond the periphery of the cylinder.

The extremities of the arms 45 remote from the bits 43 are pivotally held as at 46 to the inwardly disposed ears 47 carried by the wall of the cylinder 42. The pivoted extremities of the arms 45 are continued by the inwardly disposed short arms 48 on predetermined angles with respect to the arms 45. Interposed between and operatively engaged with the outer or free extremities of the arms 48 is a retractor member 49 of desired tension and here disclosed as a coil spring. This spring 49 yieldingly holds the bits 43 at the limit of their outward movements but readily permits retraction of said bits within the cylinder 42 as may be necessitated during a working operation.

Operatively engaged with the lower portion of the cylinder 42 is a relatively long head 50 having an outer end provided with the inwardly and upwardly converging opposed faces 51 disposed at an angle of approximately 45° with respect to the axial center of the head 50. Mounted in a conventional manner upon the faces 51 are the conventional cutting cones or bits 52.

At a suitable position within the housing H is an electric motor M, the armature 53 of which is fixed to the shaft 23 to turn therewith while the field coils 54 are suitably held by the wall of the housing H. Above the armature 53 and also carried by the shaft 23 is a commutator ring 55 with which co-acts in the usual manner a brush

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56 carried by the wall of the housing H. The conductors for the motor M, are comprised in the cable 57 which extends up and out thru the head 20 to a desired source of electrical energy.

As the motor M and its connections in detail form no part of the present invention, a more specific disclosure is believed unnecessary.

In practice the hole 10 is initially drilled or spudded for a depth to properly receive the sleeve 11 and a desired length of casing C with the collar 14 resting upon the packing 16. The housing H with the parts associated therewith are then lowered down thru the casing C and which casing, when initially applied within the hole, is spaced above the bottom of the hole so that upon the closing of the operating circuit for the motor M, the resultant rotation of the cylinder 42 and the parts carried thereby will effect the desired cutting operation so that the hole may be further drilled to the depth desired.

The wall of the housing H at diametrically opposed points is provided therealong with the outstanding keys 58 which are received within the opposed grooves 59 provided along the inner face of a sleeve 60 snugly and rigidly fitted within the lowermost section of the casing C. To facilitate the entrance of the keys 58 into the grooves 59 the upper portions of the side walls of the grooves 59 are upwardly and outwardly flared as at 61. The coaction between keys 58 and the grooves or keyways 59 assures nonrotation of the housing H when the shaft 23 and parts carried thereby are in rotation.

When the shaft 23 is in rotation the cones or bits 52 will cut and pulverize the formation at the bottom of the hole being reamed by the bits 43. At the same time flushing fluid is forced into the casing C thru the line or pipe 18' and which fluid will travel up thru the central opening 62 in the head 50, thru the cylinder 42 and up and out thru the shaft 23 and line 19.

It is believed to be obvious that as the drilling operation continues, additional sections of the casing C are added as required.

As to the motor M it is to be stated that it is not the purpose of the invention to limit the same to any particular type of motor or character of current although it has been found an advantage to use a motor of the polyphase induction type operated by a "220" or "440" alternating current. It is also to be stated that the speed of the motor M is constant, varying only with the alternating cycle of the current.

The invention as herein embodied is one which allows the use of the motor M which may be small in diameter but of sufficient strength to drive the cutting tool at a speed that will rapidly cut the stone or other formation from the bottom of the well. Since the vertical distance is not restricted, it is proposed that, if necessary to obtain sufficient horsepower, several motor units may be coupled together in order to provide sufficient torque to carry the load. The stator windings must be independent of each other and each connected directly to the main current supply.

It is to be particularly pointed out that the shaft 23 permits the desired circulation of the flushing fluid without interfering with the operation of the motor M and as the circulation of such flushing fluid is substantially axial to the motor, such fluid will tend to absorb a portion of the heat generated by the motor and thus provide a safety factor.

The outside of the housing H is provided there-

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along at, preferably, diametrically opposed points with grooves 63, to allow passage of the flushing fluid downward and to permit or facilitate the entry and withdrawal of the tool into the well thru liquid.

As the entire unit is completely submerged in water while in operation, the sealing of the housing is extremely important. The cool water contacting the housing H, will also serve to absorb heat generated within the unit.

It is to be understood that the invention as herein disclosed may be varied from the details described and shown without departure from the spirit of the subjoined claims.

I claim:

1. Drilling apparatus of the character described comprising a tubular housing for suspension in a well hole, a shaft depending through and journalled centrally of the housing, an electric motor mounted within the housing and having its armature secured on said shaft, a cylinder coupled at one end to the lower end of the shaft immediately below said housing, said cylinder having a pair of diametrically disposed openings in the wall thereof, reamer bits pivotally mounted within the cylinder to swing outwardly through said openings on axes extending lengthwise of the cylinder, said pivot mounting for each bit being offset to one side of the bit opening in a direction circumferentially of the cylinder whereby pressure applied to the cutting edge of the bit in drilling tends to swing the bit back into the cylinder, inwardly angled arms extending from the pivoted ends of said bits, and spring means interconnecting said arms and acting to urge the bits outwardly of said openings in opposition to said applied pressure.

2. Drilling apparatus of the character described comprising a tubular housing for suspension in a well hole, a tubular shaft depending through the housing, bearings within the housing for ro-

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tatably supporting the shaft, a cylinder coupled at one end to the lower end of the shaft immediately below the housing, said cylinder having a pair of diametrically disposed openings in the wall thereof, a reamer bit extending through each opening, laterally disposed arcuate arms extending from the inner ends of said bits and lying along the inside wall of the cylinder in a plane perpendicular to the axis thereof, a pivot at the free end of each of said arms fixedly mounted in the wall of the cylinder, other arms extending angularly inward from the pivoted ends of the first arms, a coiled spring interconnecting the free ends of said other arms and acting to urge said bits outwardly of the openings in a curved path corresponding to the direction of circular movement of the apparatus, an electric motor having its armature fixedly mounted on said shaft above the lowermost of said bearings.

3. The invention as defined in claim 1, with a cylindrical head detachably mounted on the lower end of said cylinder and having a recess in its lower end provided with oppositely sloping walls and a central bore opening into the recess, and a pair of rotary cutters of cone form mounted on said sloping walls.

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