A. G. & E. G. SEBERG.

DRILLING MACHINE.

APPLICATION FILED OCT. 19, 1909.

976,703.

Patented Nov. 22, 1910.

3 SHEETS—SHEET 1.

FIG. 1

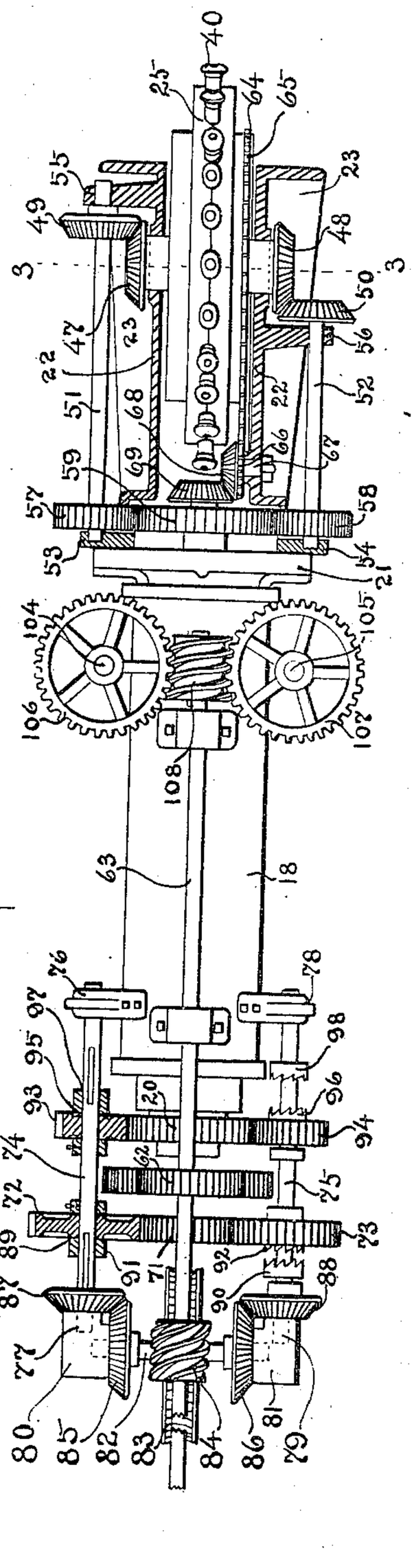
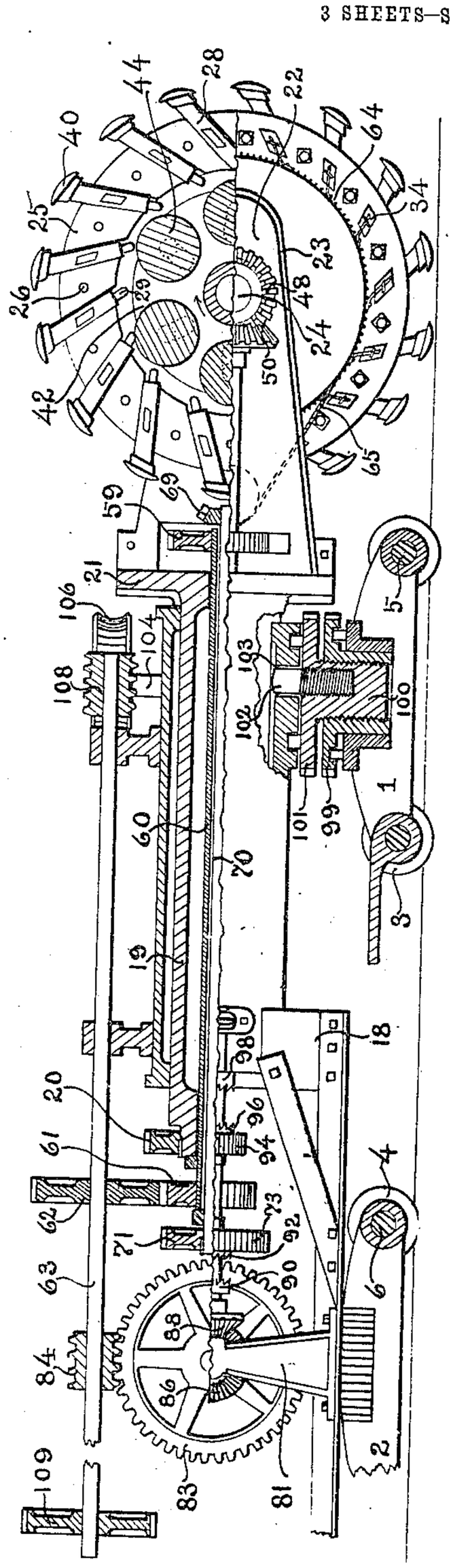


FIG. 2



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3 SHEETS—SHEET 2.

Fig. 6

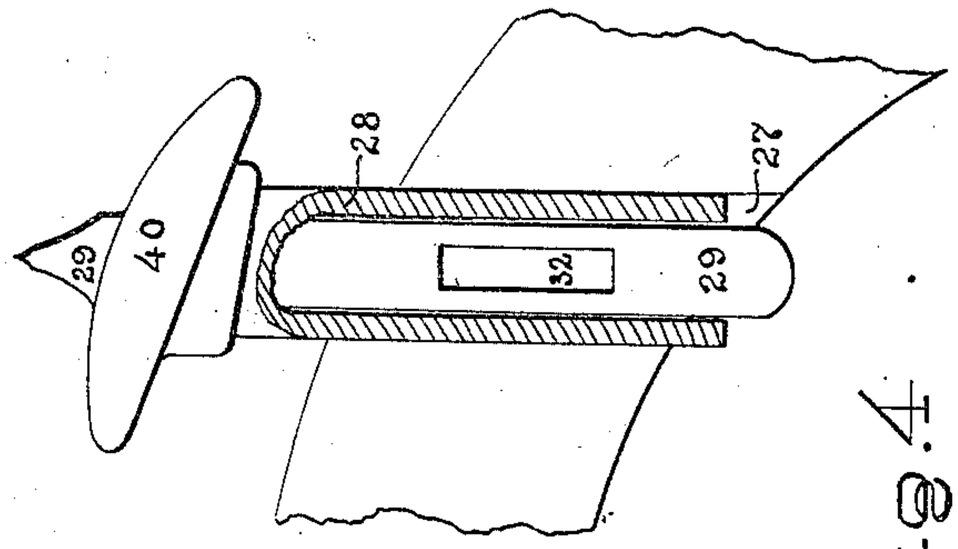


Fig. 5

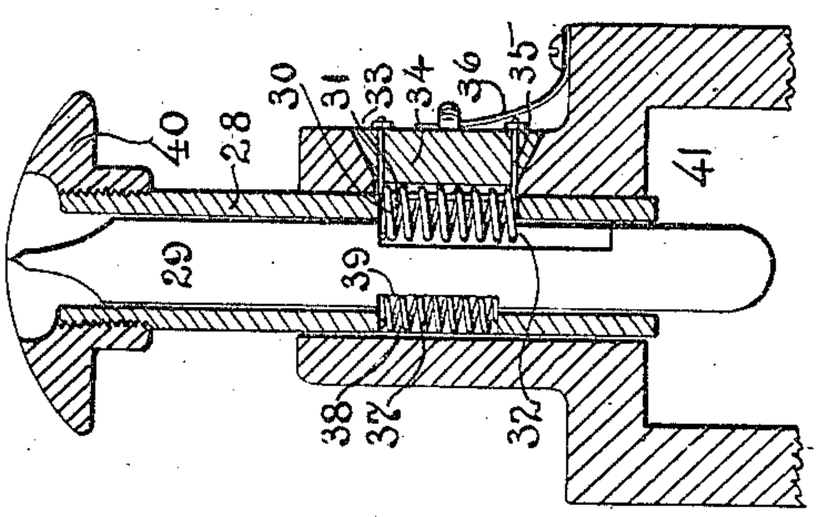


Fig. 4.

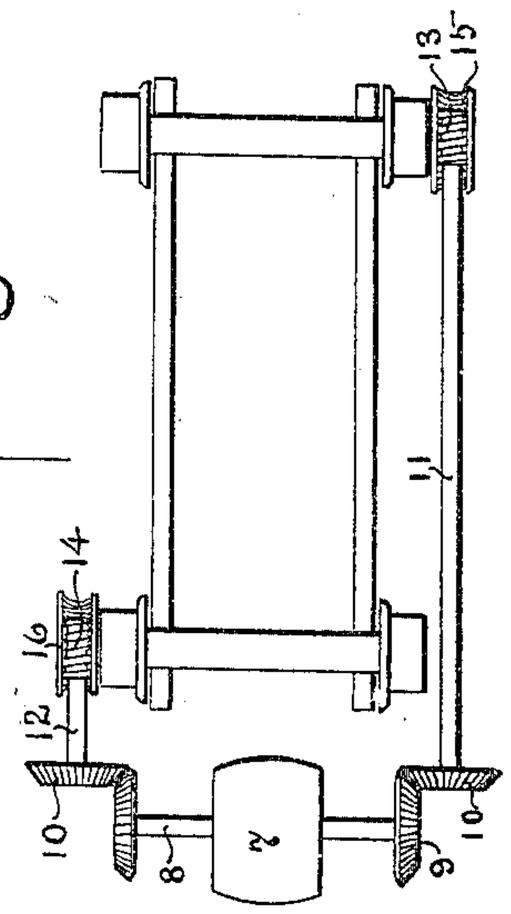
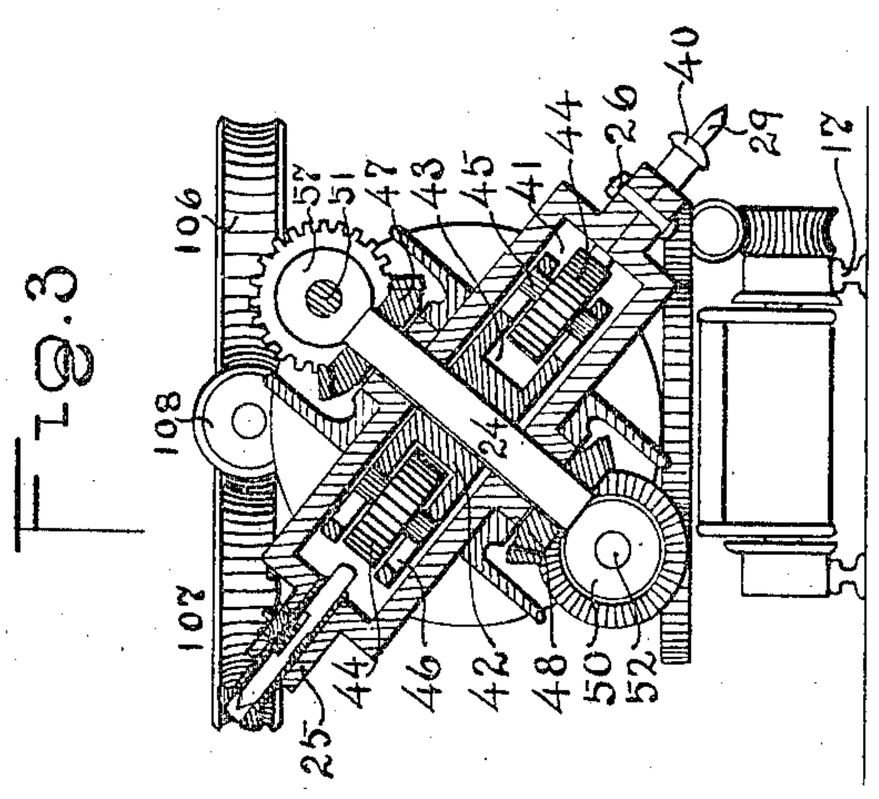


Fig. 3



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3 SHEETS—SHEET 3.

Fig. 7.

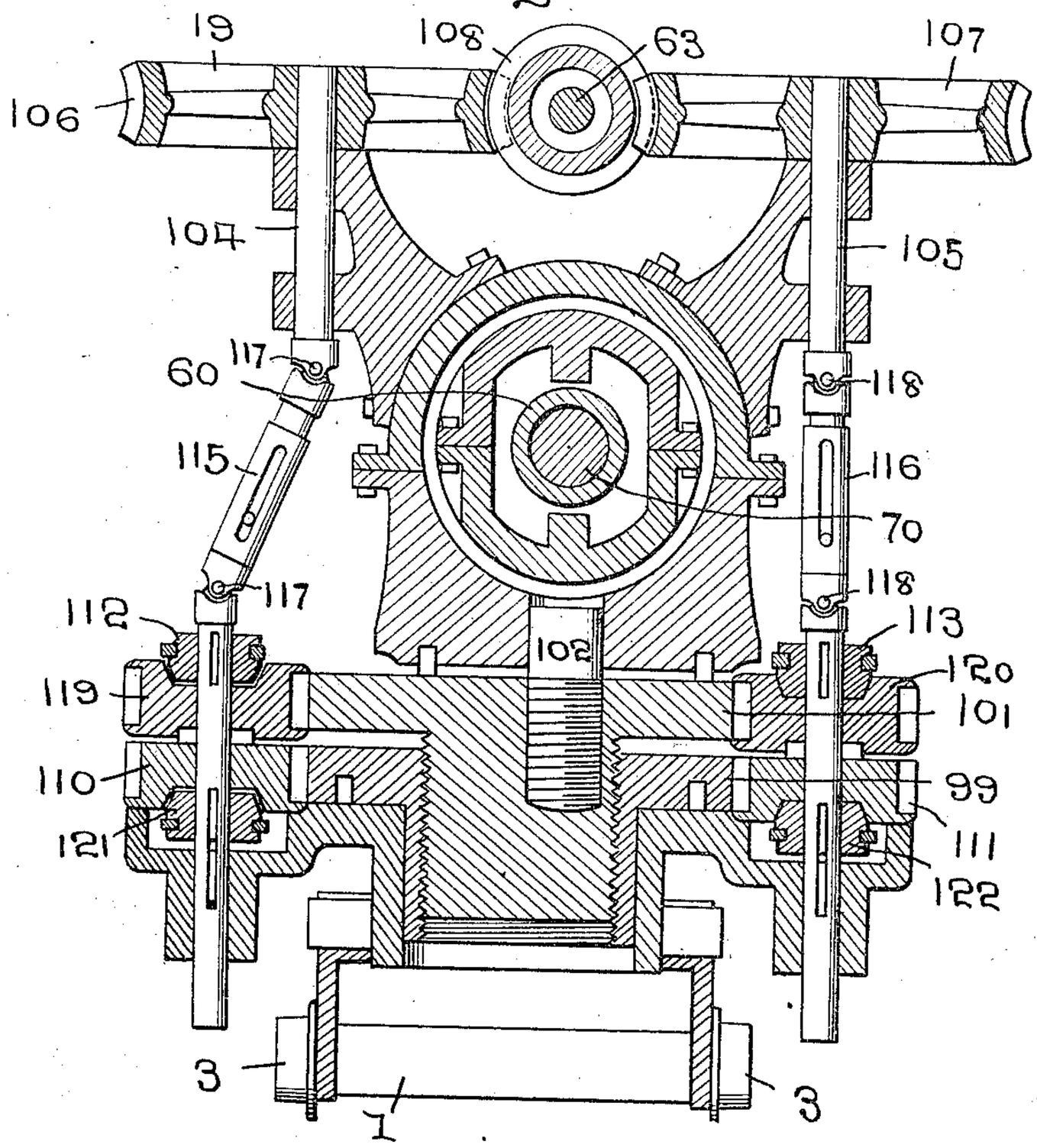
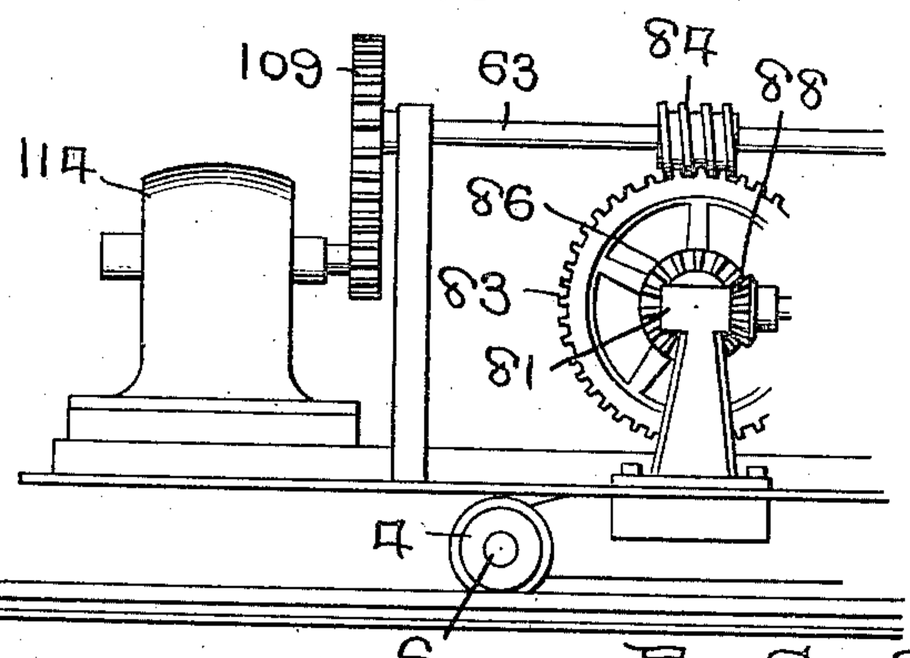


Fig. 8.



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UNITED STATES PATENT OFFICE.

ARON G. SEBERG AND EDWIN G. SEBERG, OF RACINE, WISCONSIN.

DRILLING-MACHINE.

976,703. Specification of Letters Patent. Patented Nov. 22, 1910.

Application filed October 19, 1909. Serial No. 523,451.

To all whom it may concern:

Be it known that we, ARON G. SEBERG and EDWIN G. SEBERG, citizens of the United States, residing at Racine, in the county of Racine and State of Wisconsin, have invented certain new and useful Improvements in Drilling-Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to new and useful improvements in drilling machines and more particularly to that class adapted to be used for constructing tunnels, drilling ores and various other purposes and our object is to provide suitable drilling mechanism and mounting the same upon trucks.

A further object is to provide suitable drills and housings therefor.

A further object is to provide means for yieldingly mounting the drills and housings therefor.

A further object is to provide means for forcing the drills out of the housing by delivering a blow thereto.

A further object is to provide rotating means for carrying the drills and housings.

A further object is to provide suitable gears for rotating and operating the drill carrying mechanism.

A further object is to provide means for raising and lowering one end of the drilling mechanism.

A further object is to provide means for swinging one end of the drilling mechanism laterally.

A further object is to provide means for propelling the trucks upon which the drilling mechanism is mounted and a further object is to provide means for operating and controlling the movement of the drilling mechanism.

Other objects and advantages will be hereinafter referred to and more particularly pointed out in the claims.

In the accompanying drawings forming part of this application, Figure 1 is a top plan view of the drilling mechanism complete. Fig. 2 is a side elevation thereof, showing parts of the device in section. Fig. 3 is a sectional view as seen on line 3—3, Fig. 1. Fig. 4 is a diagrammatic view of the supporting trucks for the drill, showing the manner of applying power thereto. Fig. 5 is an enlarged detail sectional view showing the manner of mounting the drills, and, Fig. 6 is an elevation partly in section of one of the drill housings and parts of the wheel to which it is attached. Fig. 7 is a vertical section of the machine taken on line 7—7, Fig. 2. Fig. 8 is a fragmentary side elevation of the machine showing a conventional form of motor applied thereto.

Referring to the drawings in which similar reference numerals designate corresponding parts throughout the several views, 1 and 2 indicate the forward and rear truck, respectively, which trucks are mounted upon wheels 3 and 4, which are mounted upon suitable supporting axles 5 and 6, respectively.

The axles are driven from a motor or similar device 7, through which extends a shaft 8, the ends of the shaft having bevel gears 9 thereon, which mesh with similar gears 10 carried by shafts 11 and 12, said shafts having worms 13 and 14, respectively and the worms in turn mesh with gears 15 and 16, respectively on the ends of the axles 5 and 6.

By this construction it will be readily seen that when power is applied to the shaft 8, the axles 5 and 6 will be rotated and the drilling mechanism caused to travel over the track-way 17 and it will further be seen that the worms and gears coöperating therewith will act as brakes and hold the trucks against movement on the track-way.

Mounted upon the trucks 1 and 2 is a frame 18, a portion of said frame being cylindrical and forming a bearing for a tubular sleeve 19, one end of the sleeve having a gear 20 fixed thereto, while the opposite end is provided with a cross head 21.

Extending forwardly from the cross head 21 are ears 22, said ears having flanges 23 to securely brace the same and extending transversely through said ears is a shaft 24 and on said shaft is mounted a drill carrying wheel 25, said wheel being formed in two sections and secured together by means of bolts 26 or other suitable devices.

The meeting faces of the two sections of the wheel are provided with semi-circular channels 27, in which are adapted to fit shields 28, said shields being adapted to form housings for the drills 29.

The shields are adapted to move longitudinally through the channels and are yieldingly held therein by means of a spring

30, which spring is adapted to extend through a slot 31 in the wall of the shield and enter a groove 32 in the body of the drill, said groove 32 being greater in length than the normal length of the spring, whereby the drill may be moved out of the shield without affecting the tension of the spring.

The spring 30 is introduced into the slot and groove through an opening 33 in one section of the wheel 25 and is held therein by providing a plug 34, which is adapted to fit said opening, the plug having a clevis 35 attached thereto which passes through the spring 30 from end to end thereof, thus permitting the spring to be depressed, while at the same time it is securely held seated in its respective slot and groove.

The plugs 34 are held seated in the openings 33 by attaching one end of a spring 36 thereto, the opposite end of said spring being attached to the drill wheel 25 and so arranged as to direct pressure against said plug at all times.

The drills 29 are yieldingly held within the shields 28 by means of springs 37, said springs being entered through slots 38 formed in the wall of the shield and entered into grooves 39 formed in the drills 29, said slot and groove being of a length equal to the normal length of the spring, while the depth of the groove 39 is such as to extend the spring substantially one-half its diameter in the shield and the other half in the groove.

The shields 28 project a distance beyond the periphery of the wheel 25 and have attached to their outer ends heads 40, the faces of which are oval, whereby they will engage and pass over uneven surfaces, the outer ends of the drills resting substantially flush with the oval face of the heads, while the inner ends thereof project beyond the shields and enter a cavity 41 in the interior of the wheel 25 and around the axial center thereof.

Located within the cavity 41 is a disk 42, the peripheral edge of said disk having a recess 43 therein, in which are positioned hammers 44, the trunnions 45 of said hammers being extended through elongated slots 46 formed in the disk 42, said slots extending through the walls formed by the recess 43.

The hammers 44 are circular in cross sections and are adapted to strike the inner ends of the drills 29 and force the same outwardly through the ends of the shields 28 and in view of the momentum resulting from rapidly rotating the disk 42, the trunnions will move to the outer ends of the slots 46 and move the hammers in position to engage the inner ends of the drills, the object in providing the slots being to permit the hammers to yield and prevent breakage of the parts, which would result if the hammers were stationary, owing to the great force with which the hammers are brought into engagement with the drills.

When the heads 40 are out of engagement with the wall of the tunnel or the object being drilled, the drills will remain out of the path of the hammers so that the drills will not be operated, but as soon as the heads pass into engagement with the wall, the shield and drill is moved inwardly and the inner end of the drill brought into the path of the hammers so that the drill will be forced out of the shield and into the object in engagement with the head 40 and in view of the springs 30 and 37, the drills will be immediately returned into the shields after the blow has been delivered.

The disk 42 is rotated very rapidly, which will result in causing the drills to be continuously driven into the object at the outer ends of the shields, said disk being rotated by attaching to the outer ends of the shaft 24, bevel gears 47 and 48, with which mesh similar gears 49 and 50 carried by shafts 51 and 52, respectively, said shafts extending from the shaft 24 to the cross head, bearings 53 and 54 being provided on said cross head to receive the ends of the shafts while the opposite ends of said shafts are extended through bearings 55 and 56, respectively, on the ears 22.

The shafts 51 and 52 are rotated by placing thereon cogs 57 and 58, respectively, which mesh with a cog 59 on the end of a tubular driving shaft 60, said driving shaft extending horizontally through the sleeve 19.

The opposite end of the shaft 60 from that occupied by the gear 59 has a gear 61, which meshes with a gear 62 on a worm shaft 63 and it will be readily seen that when said worm shaft is rotated, the tubular shaft 60 will be likewise driven, which will result in rotating the disk 42 through the shafts 51 and 52 and gears attached thereto.

The wheel 25 is rotated independently of the disk 42 and preferably at a different speed, a sprocket 64 being attached to one section of the driving wheel 25 around which extends a sprocket chain 65, said chain also extending around a sprocket 66 carried by a stub shaft 67, said shaft being mounted upon one of the ears 22.

Fixed with the sprocket 66 is a bevel gear 68, which meshes with a similar gear 69 on the end of a shaft 70, said shaft extending through the tubular shaft 60 and beyond each end thereof. The opposite end of the shaft 70 from that engaged by the gear 69 is engaged by a gear 71, which meshes with reversing gears 72 and 73 mounted upon shafts 74 and 75, respectively, said shafts being mounted in suitable brackets 76, 77 and 78 and 79, respectively, said shafts being extended in a horizontal position.

Extending horizontally between posts 80 and 81 is a gear shaft 82, on which is mounted a worm gear 83, with which engages a worm 84 carried by the shaft 63, and said worm and gear are employed for operating the shafts 74 and 75 by mounting the bevel gears 85 and 86 on the shaft 82, which mesh with similar gears 87 and 88 on the shafts 74 and 75, respectively.

Although both of the shafts 74 and 75 are rotated simultaneously, but one at a time is to be geared to the gear 71 and to readily accomplish this result, the hubs of the gears 72 and 73 are provided with clutch faces 89 and 90, respectively, with which are adapted to engage clutches 91 and 92 mounted on the shafts 74 and 75, said clutches being slidably mounted on said shafts and feathered thereto.

By this construction it will be readily seen that when one of the clutches is engaged with its respective reverse gear, it is necessary for the opposite clutch to be disengaged therefrom and vice versa when it is desired to rotate the wheel 25 in the opposite direction. The sleeve 19 is also adapted to be rotated, whereby the parts carried by the cross head 21 will be bodily rotated with the sleeve and to accomplish this result, gears 93 and 94 are attached, respectively, to the shafts 74 and 75 and are provided with clutch faces 95 and 96, with which are adapted to engage clutches 97 and 98 on said shafts, said clutches being feathered to said shafts and caused to rotate therewith, said clutches being operated in conjunction with the clutches for he reverse gears and as the reverse gears 93 and 94 are in mesh with the gear 20, the sleeve 19 will be readily operated thereby.

In addition to rotating the drill wheel and forcing the drills into engagement with the walls of the tunnel, the drill carrying end of the frame 18 may be raised or lowered to enlarge the dimensions of the tunnel by rotatably mounting an interiorly threaded nut 99, which is rotatably mounted on the truck and in the threaded opening of said nut is introduced an exteriorly and interiorly threaded stem 100 of a gear 101 and as the drill carrying end of the frame 18 rests upon said gear 101, it will be readily seen that when said gear is rotated in opposite directions, said end of the frame will be raised or lowered. The same end of the frame 18 may be likewise swung laterally by entering a stud 102 into the stem of the gear 101, the upper end of which stud projects through an opening 103, in the frame 18 and by placing said stud eccentrically of the axis of the gear 101, the rotation of said gear will move the forward end of the frame laterally, whereby an oblong or substantially square opening may be produced.

A pair of shafts 104 and 105 is mounted in bearings at the forward end of the frame, said shafts having securely mounted on their upper ends, the worm gears 106 and 107, respectively, which mesh with the worm 108 on the drive shaft 63. Said shafts are formed in sections and the sections connected by means of sleeves or slip couplings 115 and 116, respectively, the connection between the slip couplings and the shafts being by means of universal links 117 and 118, respectively. The lower sections of said shafts are provided respectively with the gears 110 and 111 which mesh with the teeth of the nut 99 and said shafts are also provided with additional gears 119 and 120, respectively, said latter gears meshing with the gear 101. The gears 110, 111, 119 and 120 are all loosely mounted on the shafts 104 and 105 and as said shafts are rotating continuously, it will be seen that the same have normally no effect on the gear 101 and the nut 99. To cause said gears to have effect on said nut and gear, however, or in other words, to cause the same to be rotated either together or separately, I have provided the cone clutches 112 and 113 to cooperate with the gears 119 and 120, respectively, and the clutches 121 and 122 for the gears 110 and 111, respectively, said clutches being securely held to the lower sections of said shafts and adapted to be moved vertically on said shafts into and out of effective engagement with said gears.

It is often desirable in the operation of a machine such as this to enlarge the tunnel which is being made or change the course of the machine and such operation is performed by throwing into and out of effective position, said clutches which, in turn, cause the gears on the shafts to coöperate with the gear 101 and the nut 99, as the case may be. By throwing into effective position, the clutches 113 and 122 and the throwing out of the clutches 112 and 121, as indicated in Fig. 7 or vice versa, the head of the machine will be swung laterally by the rotation of the gear 101 and the nut 99, upon which said head is eccentrically mounted, without raising or lowering the same. By throwing the clutch 113 in and moving all others out of effective position, the head of the machine will be raised and at the same time swung laterally and by throwing the clutch 112 in and moving all others out, the head of the machine will be lowered and at the same time swung laterally. With the clutch 121 thrown in with the others moving out, the machine will be raised without the lateral movement and vice versa when the clutch 121 is thrown into effective position and all others moved out, the machine will be lowered without lateral movement. With the clutches 113 and 121 thrown in and the others moved out, the machine will be raised at double

speed with the normal lateral movement of the same and vice versa when the clutches 112 and 122 are moved in and the others out, the machine will be lowered at double speed with normal lateral movement. Hence, it will be seen that the machine may be raised or lowered without lateral movement, may be raised or lowered with lateral movement or may be given lateral movement without either raising or lowering the same, which provides for all difficulties which may be encountered in tunneling.

I have made no provision for the levers which may operate the various clutches, as described, but as this forms no extremely essential part of the invention, the usual or any preferred form may be used and it will be seen that in view of the lateral movement which is given the head of the machine, it is absolutely necessary to provide the shafts 104 and 105 with flexible intermediate connections which has, in this instance, been done by the provision of the slip couplings and universal joints.

The power for operating the several parts with the exception of the supporting trucks is applied to the shaft 63 in any suitable manner as by placing a gear wheel 109 thereon and having the same rotated through some conventional form of motor 114.

By mounting the drills in the manner shown and providing the hammers for operating the same, it will be readily seen that the drills will be driven into the soil, rocks, etc., in the path of the drills when the heads of the shields are in engagement with the soil, etc. and said drills will be operated with great rapidity. It will likewise be seen that by rotating the drill carrying parts, a circular tunnel may be formed and further by shifting the front portion of the frame carrying said parts laterally, a square or oblong opening may be formed.

What we claim is:

1. In a drill machine, the combination with a wheel; of shields yieldingly mounted in said wheel, drills slidably mounted in said shields, means to force said drills beyond the outer ends of said shields and means to rotate said wheel.

2. In a drilling machine, the combination with a rotating sleeve; of a wheel for said sleeve adapted to rotate therewith, a supporting axle around which said wheel revolves, means to rotate said wheel, a plurality of drills carried by said wheel and rotating means adapted to force said drills outwardly and enter the same into an object.

3. In a drilling device, the combination with a frame, supporting trucks therefor and a sleeve rotatably mounted on said frame; of a cross head at one end of said sleeve, ears on said cross head, a shaft carried by said ears, a wheel rotatably mounted on said shaft, shields carried by said wheel, drills carried by the shields, springs adapted to hold said shields in engagement with the wheel, additional springs adapted to hold the drills against leaving the shields and means to deliver a blow to the inner ends of said drills and force the same outwardly.

4. In a drilling device, the combination with a two-part wheel having channels therein, shields slidably mounted in said channels, springs adapted to yieldingly hold said shields in engagement with the wheel, drills slidably mounted in said shields, springs adapted to yieldingly hold said drills within the shields and means to move said drills longitudinally and project the ends thereof beyond the ends of the shields.

5. In a drilling device, the combination with a two-part wheel and means to rotate said wheel; of a plurality of shields yieldingly mounted on said wheel, drills yieldingly mounted in said shields, rotatably mounted hammers within said wheel and means to rotate the hammer supporting mechanism.

6. In a drilling machine, the combination with a wheel, yieldingly supported drill mechanisms mounted therein and means to rotate said wheel; of means within said wheel for operating said drill mechanisms.

7. In a drilling machine, the combination with a wheel, drill mechanisms yieldingly supported therein and means to rotate said wheel; of means within said wheel for operating said drill mechanisms, and additional means to independently rotate said drill operating means.

8. In a drilling machine, the combination with a frame, a sleeve rotatably mounted therein, a cross head at one end of said sleeve, ears in said cross head, a shaft on said ears, a wheel mounted on said shaft and carrying yieldingly supported drill mechanisms therein and means within said wheel for operating said drill mechanisms; of means to rotate said wheel, and additional means to rotate said sleeve.

9. In a drilling machine, the combination with a two-part wheel having channels therein; of shields mounted in said channels, spring means for retaining the shields in said wheel and allowing a yielding movement thereof, drills slidably mounted in said shields, additional spring means for retaining said drills within said shields, and means to force said drills beyond the ends of said shields, for the purpose described.

10. In a drilling machine, the combination with a two-part wheel having channels therein; of shields mounted in said channels, spring means for retaining the shields in said wheel to allow a yielding movement thereof, drills slidably mounted

in said shields, additional spring means for retaining the drills within said shields, and a plurality of hammers rotatably mounted within said wheel and adapted to engage the inner ends of said drills and force the outer ends thereof beyond the outer ends of said shields.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ARON G. SEBERG.
EDWIN G. SEBERG.

Witnesses:
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