June 19, 1928.

1,674,189

H. S. BROWN

PORTABLE BORING MACHINE

Filed March 1, 1924

4 Sheets-Sheet 1

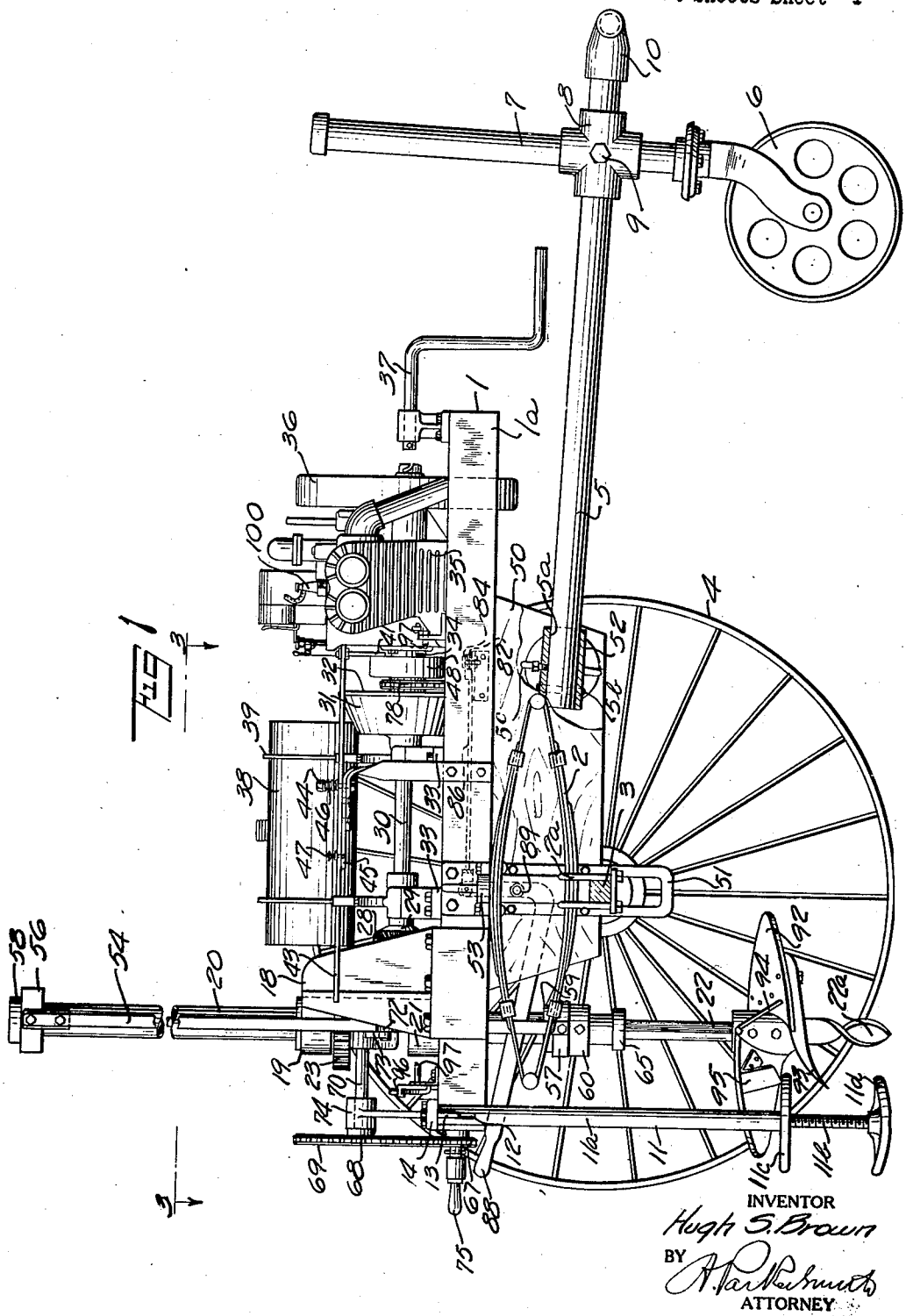


FIG 1

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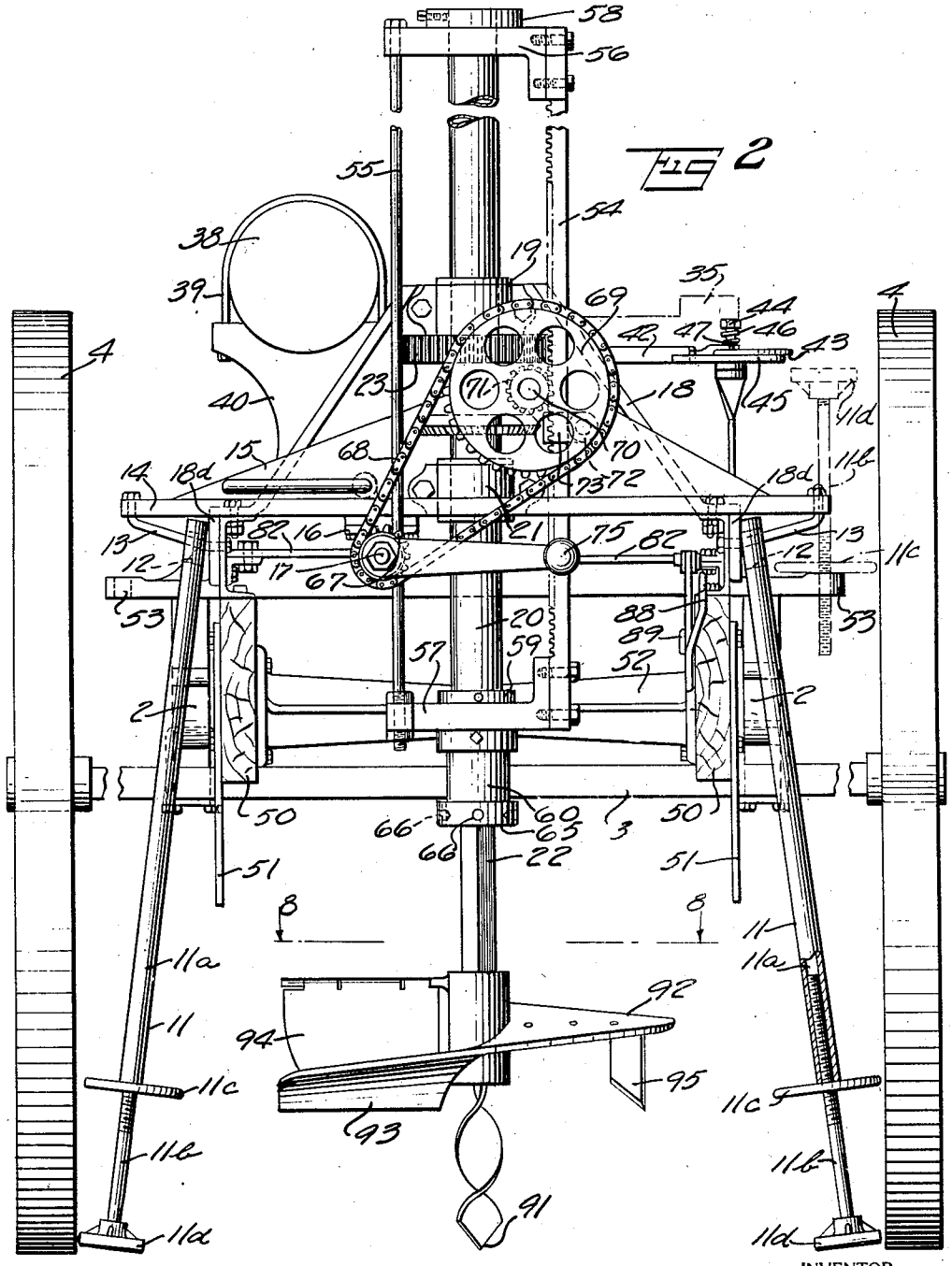
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FIG 2




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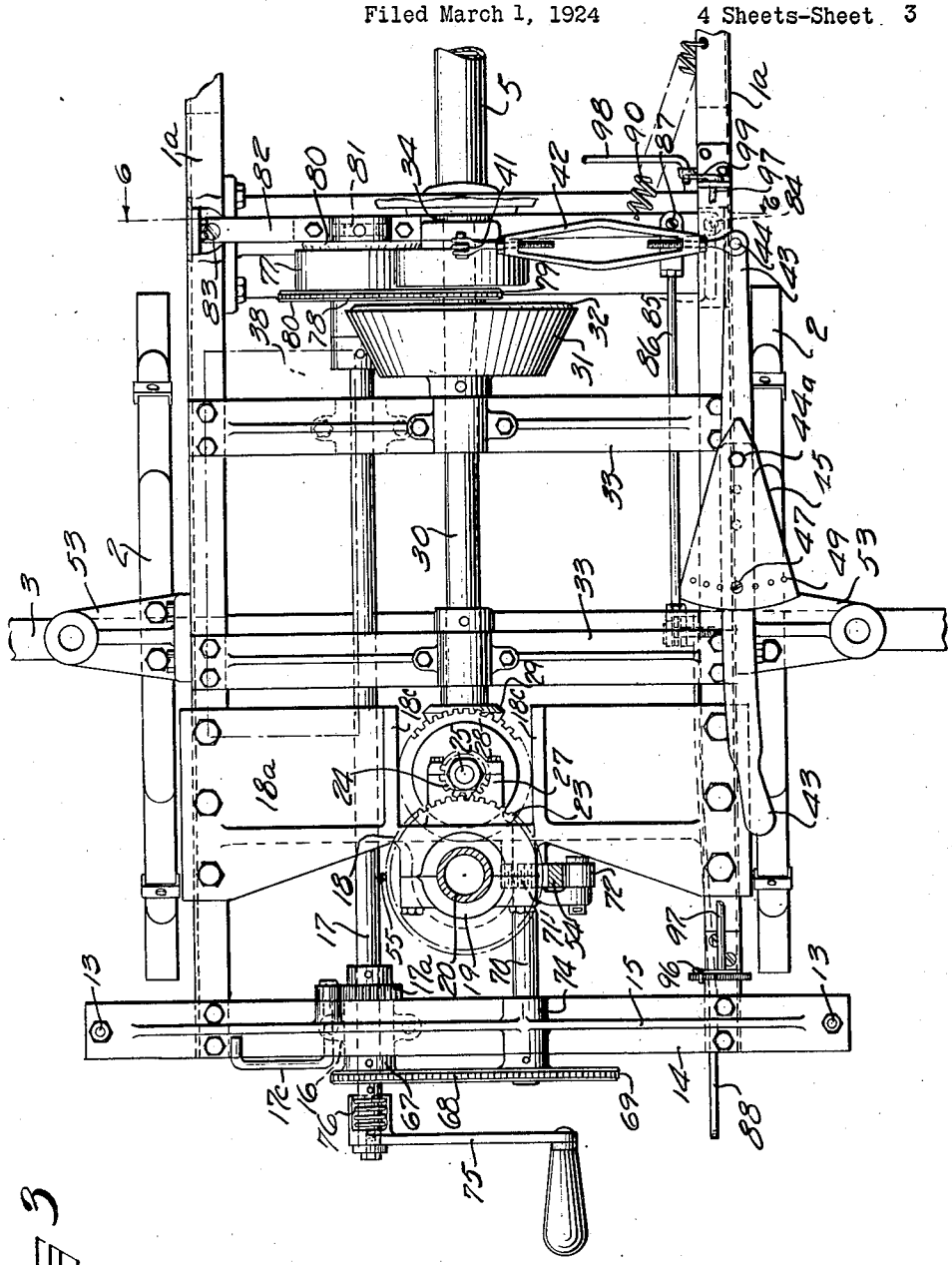


Fig. 3.

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FIG 4

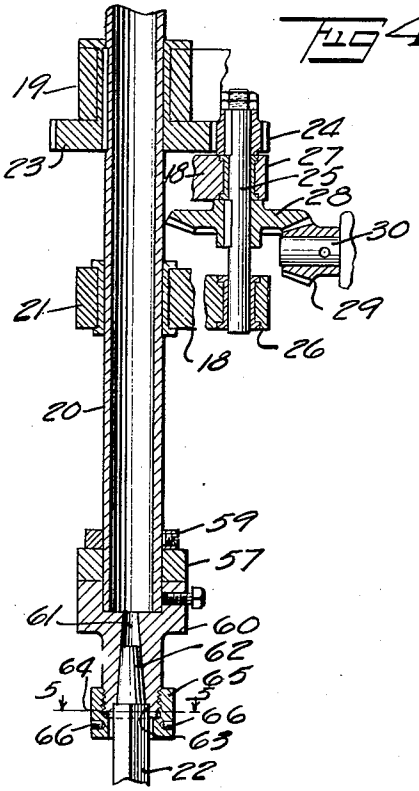



FIG 8

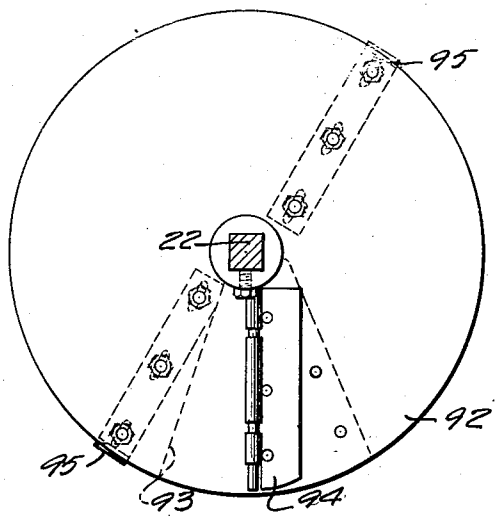



FIG 7

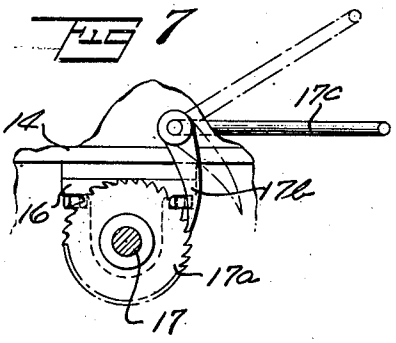



FIG 5

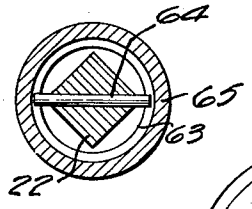
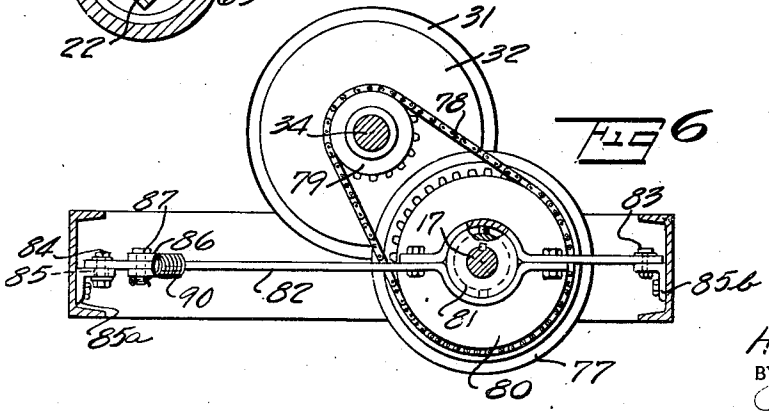



FIG 6




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# UNITED STATES PATENT OFFICE.

HUGH S. BROWN, OF ROSELLE PARK, NEW JERSEY, ASSIGNOR TO THE HUBRON COMPANY, INC., A CORPORATION OF NEW JERSEY.

## PORTABLE BORING MACHINE.

Application filed March 1, 1924. Serial No. 696,215.

My invention relates to earth boring machines in general and more particularly consists in improved apparatus for digging post holes for telegraph and telephone posts, fence posts, &c. It comprises certain improvements on the machine shown in my pending application Serial No. 328,251, filed October 3, 1919, allowed February 5, 1924, which will be herein more particularly pointed out, and is designed to render said machine more efficient and convenient in operation. The best form of apparatus embodying my invention at present known to me is illustrated in the accompanying four sheets of drawings in which

Fig. 1 is a side elevation of the machine with parts broken away and others shown in section and one of the supporting wheels being removed.

Fig. 2 is a front elevation, certain parts being broken away and others shown in partial section.

Fig. 3 is a partial plan view showing the front end of the machine with certain parts broken away and others shown in section, the principal section being taken on lines 3—3 of Fig. 1.

Fig. 4 is a detail of the tool holding element and driving gear therefor, parts being shown in section and others broken away.

Fig. 5 is a horizontal section on line 5—5 of Fig. 4 looking downward.

Fig. 6 is a detail of the clutch mechanism taken in section on line 6—6 of Fig. 3 looking toward the front of the machine.

Fig. 7 is a detail of the pawl for holding the tool holder in elevated position, and

Fig. 8 is a plan of the earth-auger and a cross section of the auger-shaft taken on line 8—8 of Fig. 2.

Throughout the drawings like reference characters indicate like parts. 1, is the main frame or chassis of the machine composed of the two longitudinally extending channel irons and certain cross braces and housings hereinafter to be described. This chassis is supported upon elliptical wagon springs 2, 2, fastened at their upper portions to the lugs 53, which are bolted to the channel irons $1^a$, and fastened at their lower portions by clips $2^a$, to the supporting axle 3, which in turn is supported by wheels 4, 4. 5, is a wagon tongue, the inner end of which is held in the brace 52, extending across the chassis, said brace having the horizontal sleeve $5^a$ cast therein for receiving said tongue 5. Normally this tongue is held in extended position, as shown in Fig. 1, by means of the pin $5^b$, but when said pin is removed the tongue may be slid in under the chassis and held in any adjusted position by set-screw $5^c$, during storage or when the machine is being transported on a railroad car or other means of conveyance. Near the outer end of the tongue 5, is the casting 8, having a vertically arranged sleeve in which the vertical post 7, is adjustable, the latter being held in any desired position by setscrew 9. On the lower end of the post 7, is swiveled the caster wheel 6, and on the extreme outer end of the tongue 5, is mounted any convenient handle 10, by which the machine may be pulled or pushed about by hand.

At the other, or front end, of the chassis are shown a pair of non-compressible supports represented generally at 11, each of which is preferably composed of a hollow tubular member $11^a$, and a threaded member $11^b$, telescoping into said tubular member and carrying a nut $11^c$ provided with a hand wheel serving to limit the extent to which the member $11^b$, may be telescoped into $11^a$. The lower ends of members $11^b$, are provided with any convenient form of shoes $11^d$, providing adequate bearing surfaces on the ground. Preferably these supports 11, are flexibly connected to the chassis by a flexible lost motion connection formed by the slot 12, in the member $11^a$, through which passes the pin member 13, which is fast to the chassis.

14, is a front housing or cross bar on the chassis fastened to the channel irons $1^a$, $1^a$, by means of the pins 13, and any other suitable fastening, provided with the vertical upper rib 15, preferably made in the shape of an inverted V. On the under side of the housing 14, is the journal bearing 16, for the front end of the shaft 17, of the auger-feed

mechanism. 74, is a journal bearing fast in the upper portion of rib 15, for the front end of the counter shaft 70, of the feed mechanism and these two shafts 17 and 70, are geared together by the sprocket chain 68, running over the sprocket pinion 67, on shaft 17, and the sprocket wheel 69 on counter-shaft 70. 75, is a hand crank connected to the shaft 17, by detachable spring controlled coupling 76, similar to that employed for cranking motor cars. Normally this handle is out of engagement, but the coupling is thrown into mesh when the handle is pushed inward.

18, is the main housing for supporting the earth-auger and its driving and feeding mechanism. It consists of two horizontally extending wings $18^b$, bolted at their outer ends to the channel irons $1^a$, $1^a$, and held together by a vertical, upwardly extending rib $18^a$, having the form of an inverted V. $18^d$, $18^d$, are downwardly extending lugs on the outer edges of the wings $18^b$, overlapping the channel irons $1^a$, and $18^c$, $18^c$, are rearwardly extending ribs connecting the inner edges of the wings $18^b$, with the vertical rib $18^a$. On the front of the rib $18^a$, are the upper journal bearing 19, and lower journal bearing 21, for the vertically rotating tool-holder 20. In the recess at the back of rib $18^a$, between ribs $18^c$, is located a counter-shaft 25, carrying at its upper end driving pinion 24, meshing with gear wheel 23, on tool-holder 20. This counter-shaft is journaled in bearings 26, 27, on the back of rib $18^a$, and carries beveled gear 28, meshing with bevel pinion 29, on driving shaft 30. By means of this gearing, speed of rotation is reduced during transmission from the driving shaft 30, to the tool-holder 20.

On the rear of the chassis is mounted an 8-horse power, 2-cylinder horizontal gas engine 35, the shaft 34 of which carries at its forward end the male member 32, of a cone friction clutch, the other member of which, 31, is fast on the rear end of the main driving shaft 30, which shaft is journaled in bearings on cross bars 33, of the chassis. 36, is the fly wheel of this engine, 37, the usual starting crank, and 38, a gas tank held on pillow blocks 40, by straps 39. The clutch above described can be thrown into or out of mesh by means of the clutch lever 41, operating a screw threaded housing 48, for advancing or retarding clutch member 32. 42, is an adjustable turn-buckle link connecting the upper end of clutch lever 41, with the rear end of starting lever 43, which latter extends along the side of the chassis nearly to the front end of the machine and is pivoted at $44^a$, to said chassis. 45, is a sector plate rigid on the chassis having a series of holes 49, arranged in the arc of a circle the center of which is the pivot pin 44. Starting lever 43, is movable slightly in a vertical direction on pin 44, but is normally held down by spring 46, surrounding pivot 44, so that pin 47, extending downwardly from the under side of the lever 43, may be spring-pressed into one of the holes 49. When the starting lever 43, is raised it may be swung on pivot 44, to operate the clutch, but when released it is locked in position by pin 47, entering one of said holes 49.

50, 50, represent wooden blocks fastened to the under side of channel irons $1^a$, and fastened together by the cross brace 52, in which tongue 5 is socketed, as previously described. To these wooden blocks are bolted clips 51, 51, surrounding axle 3, and forming a lost motion connection between the chassis and the said axle so that the resiliency of the wagon springs 2, may have full play, but limiting the same in an upward direction. The lugs 53, to which the springs 2, are fastened, as before described, project outwardly as well shown in Figs. 2 and 3, and are perforated near their outer ends to serve as rest clips for the members $11^b$, of the non-compressible supports 11, when the same are removed during transportation of the machine.

The mechanism for feeding the tool-holder downward and raising it upward to withdraw the auger from the hole when dug consists of the rectangular frame composed of the vertical rack 54, the upper cross head 56 and lower cross head 57, bolted thereto, and the tie rod 55, connecting the other ends of said cross heads. The tool-holder 20, is journaled in these cross heads and prevented from endwise movement therein by the upper collar 58, fast on the tool-holder, the lower collar 59, and the tool-holder tip 60, bolted to the lower end of the tool-holder 20, all as best shown in Fig. 2. This lifting and feeding frame and the tool-holder supported thereby may be raised and lowered by the pinion 71, on counter-shaft 70. The rack 54 is held in positive engagement with pinion 71, by idler roller 72, journaled on a stub shaft and supported by lug 73, carried by the rib $18^a$, of main housing 18, as best shown in Fig. 3.

The tool-holder tip 60, has a coned recess 61, into which fits the tapered end 62, of the auger shank 22. This auger shank is of a polygonal cross section, preferably square as shown in Figs. 5 and 8, and the upper end of this polygonal cross sectioned shank nests in the correspondingly shaped mouth 63, of the recess 61, in the tool-holder tip 60. When the tapered end 62, of the shank is forced home in said recess, the auger shank is held in this position by the screw collar or muff coupling 65, which can be screwed on to the lower end of the tip 60, and engages the projecting ends of the cross pin 64, extending transversely through the auger shank 22. 66, represents radial sockets in

coupling 65, in which a spanner wrench may be inserted for rotating the coupling.

While the tool holder 20, may be raised as well as lowered by the hand crank 75, I prefer to employ power for raising the tool-holder and auger from the post hole when it is completed, as this operation requires a great deal of force. To this end I provide on the rear end of shaft 17, a loosely revoluble clutch member 77 (see Figs. 3 and 6) which is geared by sprocket chain 78, to sprocket pinion 79, on engine shaft 34, and also provide a coned clutch member 80, which is fastened on shaft 17, as shown in Fig. 6, and movable lengthwise thereof by means of the grooved collar 81, engaged by the shifting lever 82, pivoted at 83, to the chassis, and pivoted at its other end to the connecting rod or link 86, by pin 87. 90, is a tension spring connected at one end to lever 82, and fast at the other end to the chassis, serving to normally hold the lever 82, in retracted position with the clutch member 80, out of mesh. To prevent this shifting lever from rattling, I provide a pin 84, in its free end which moves in slot 85, cut in a small piece of angle-iron $85^a$, fastened to the inner face of the channel beam $1^a$. The link 86, is pivoted to the upper end of the bell crank lever 88, which is pivoted to the chassis at 89, and has its forward end projecting at the front of the machine, as shown in Figs. 1 and 3. By this arrangement the sprocket clutch member 77, rotates continuously with the engine shaft 34, and when the clutch member 80, is forced into mesh by pressing down on the front end of the shifting handle 88, the feed shaft 17, is rotated in a counter clockwise direction, looking at Fig. 2, and the rack 54, is forced up, carrying with it the tool-holder 20, and the earth auger chucked therein. To hold the parts in the elevated position I provide the releasing pawl $17^b$, shown in Figs. 2, 3 and 7, which is carried by the little hand crank $17^c$, journaled on the housing 14. This pawl engages the ratchet wheel $17^a$, on shaft 17, and is held against said ratchet wheel by yielding pressure derived from the weight of the lever $17^c$. When the auger is being fed down by hand crank 75, this pawl is released, the little crank $17^c$, resting against the rib 15, of the front housing, as indicated in dotted lines in Fig. 7.

The preferred form of earth auger shown in Figs. 1, 2 and 8 consists of the helical mold-board of one convolution of the helix mounted on the lower end of shank 22, and a screw shaped auger point 91, for boring the centering hole in the ground. The mold-board is equipped with one or more downwardly projecting vertical slicing knives 95, bolted to it near its circumferential edge. Preferably there are two of these knives placed 180 degrees apart, as shown in Fig. 8. Preferably also the lower edge of the mold-board is provided with a removable cutting knife 93, and a hinged flap 94, swings loosely from the rear upper edge of the mold-board helix backwardly from knife 93, and rests on the lower end of the mold-board, as best shown in Fig. 1.

96, is the usual throttle lever for the motor 35, located at the front end of the chassis on shaft 97, the rear end of which is provided with a crank 99, from which extends the connecting rod 98, to the motor throttle, not shown. 100 (Fig. 1) is one of the ignition plugs for the motor.

The foregoing apparatus is operated as follows: When the machine is being transported over wagon roads or across country the telescoping members $11^b$, of the non-compressible supports are hung in clips 53, as indicated in dotted lines in Fig. 2, and the earth-auger is removed from the tool-holder 20. The machine may then be dragged along by a team or motor car connected to the handle 10. When in position for operation, the members $11^b$, are placed back in operative position and the telescoping supports 11, are so adjusted by nuts $11^c$ that a considerable proportion of the weight of the machine will be taken off of the springs 2, so as to give the chassis a firm basis of support. The earth-auger is inserted in the toll-holder 20, the pawl $17^b$, is thrown out of operative position, the clutch lever 43, swung into position to engage the driving clutch 31—32, and the auger is thereby revolved and forced downward into the earth by turning the crank 75, in a clockwise direction, looking at Fig. 2. As soon as the mold-board 92, of the auger is buried in the earth, the auger will feed itself down and continue to burrow into the earth, creating practically no disturbance whatever upon the surface thereof. If the auger strikes a rock or other obstruction which tends to jolt the machine, the chassis and the entire mechanism carried thereby may spring upwardly under the yielding action of the springs 2, and the lost motion connections of the supports 11, and the axle clips 51, without moving the wheels 4, or supports 11, from their initial positions on the ground. As soon as the auger takes hold again if it begins to pull the machine downward, compressing springs 2, these non-compressible supports soon come into play again and withstand any such further pull of the auger. When the hole has been dug sufficiently deep, the pawl $17^b$, is thrown back into operative position, as shown in full lines in Fig. 7, and the bell crank lever 88, is depressed, throwing the clutch member 80, into mesh, and the continued rotation of the engine rotates pinion 71, and lifts rack 54, and with it tool-holder 20, and the earth-

auger chucked therein, together with all the loose dirt in the hole on top of the mold-board 92, thus leaving the hole clean. During this withdrawal operation, the clutch 31, 32, may be thrown out of mesh so as to stop the rotation of the auger, or it may be left in mesh, the rotation of the auger during withdrawal tending to throw off the dirt carried thereby by centrifugal action and prevent the same dropping back into the hole after the auger is entirely removed.

The special chuck or coupling for holding the shank 22, of the earth-auger in the tool holder 20, above described is particularly important because while it ensures rotation of the auger it is not liable to become jammed under the twisting and jolting the auger may endure. No matter how hard usage it encounters, on unscrewing the threaded coupling 65, and striking the tool-holder or auger shank 22, with a hammer the latter comes free from the chuck.

During the boring operation of the auger its downward feeding motion may be accelerated, if necessary, by holding feed crank 75 in mesh and turning it by hand in a clockwise direction. The slicing knives 95, cut out a cylindrical core of earth under which the main cutting knife 93 passes, slightly lifting the loose earth of the core so that mold-board 92 may burrow under it, the hinged flap 94 swinging backward to permit this action. When the auger is lifted out of the hole, however, by hand or by power, flap 94 drops into the position shown in Figs. 1 and 2, traps the entire core of loose earth on top of the mold-board, and all of said earth is thereby lifted out with the auger, leaving the post hole clean and empty, ready for setting the post.

Of course, during the lifting of the auger with its load of loose dirt, the chassis supporting springs 2, 2, are nearly always compressed to an extent such that the telescoping supports 11, 11, are brought into action and the chassis is rigidly supported by them during this operation of removing the dirt from the hole which has been dug.

The advantages of my invention comprise, among other things, the following: The unit feature of the main housing 18 on which all the bearings for the revolving and sliding elements of the tool-holder and its driving and feeding mechanism are bolted in close-coupled relation so that none of them can get out of line or register with the others, and consequently only the minimum of driving power is lost in friction. The rigid base for the machine afforded by caster 6, and non-compressible supports 11, 11, during the boring operation whereby a straight hole may be bored under normal conditions, combined with the yielding character of the driving fulcrum afforded by the partially spring supported weight of the chassis under abnormal conditions (such as those resulting from encountering small rocks, roots, etc.) whereby the auger is permitted to swerve, avoid any obstruction, and resume boring beneath it along the original line of feed. The small amount of power needed because the slicing knives 95 cut a loose core of earth in which main knife 93, and mold-board 92 may operate easily, and the complete removal of such earth core due to the trapping action of flap 94 when the auger is lifted. Keeping the mold-board down to the length of one convolution of the helix also reduces the friction of the boring operation, while the flap 94, renders any greater extent of mold-board unnecessary for the dirt removing operation. As a result of the cooperation of all these factors this machine, equipped with an 8 horse-power motor, will bore and clean out a standard telegraph post hole in three minutes, while six times that amount of power is required for the only other machine known to me to be on the market for this work. This light weight motor, and the compact driving connections reduce the total weight of the machine so that it can be easily and quickly hauled from one position to another, the average time consumed in pulling up stakes from one location, moving to the next telegraph pole location, setting up the machine in the new location and starting the auger, is seven minutes. Consequently such standard telegraph post holes can be dug at the rate of six to the hour with one man to operate the machine and whatever gang or team may be needed to drag it from one location to another according to the nature of the terrain, which may or may not make it necessary to yank the machine up and down railway embankments and the sides of railway cuts.

As all the clutch and control levers, and the feed crank, are located at, or extend to, the front of the machine, one skilled man can control the hole boring and emptying operations without moving out of his tracks, and only cheap labor or draft animals are needed for tractive power in moving the apparatus. The light and compact construction also reduces first cost and that of maintenance and repairs.

Various changes could be made in the form and arrangement of the elements of the driving, feeding and supporting mechanisms described without departing from the underlying principle of the invention above described, so long as the essential principles of construction and operation herein set out are preserved.

Having described my invention, I claim:

1. In a portable boring machine the combination, with a spring supported chassis, an earth auger and driving and feeding mechanism for said auger supported by said

chassis, of incompressible supports connected to said chassis and adapted to bear upon the surface of the ground when the springs are compressed to the extent consistent with normal operation of the auger by reason of any downward pull of said auger in such operation.

2. A combination such as set forth in claim 1 in which said supports are adjustable lengthwise.

3. A combination such as set forth in claim 1 in which said supports have universal joint connections to the chassis.

4. A combination such as set forth in claim 1 in which said supports have lost motion connections to the chassis.

5. In a portable earth boring machine the combination, with a chassis, an earth auger and means for rotating said auger carried by said chassis, a pair of supporting wheels and an axle therefor, and springs resting on said axle and supporting said chassis, of a pair of non-compressible supports having lost motion connections to said chassis located on either side of said earth auger, and lost motion connections between said chassis and said axle.

6. As an element in the supporting apparatus of a portable earth boring machine, a support therefor comprising, in combination, an upper tubular member having a universal joint connection to the machine, a lower, threaded member adapted to slide freely within limits into and out of said tubular member, and a nut on said threaded member adapted to limit said inwardly sliding action in an inward direction.

7. A combination such as set forth in claim 6 in which said threaded member is equipped at its lower end with a shoe adapted to provide it with adequate bearing surface on the ground.

8. In a portable earth boring machine, the combination, with a chassis, an earth auger and driving mechanism therefor, and two supporting wheels, of a draft tongue projecting from said chassis and a casterwheel journalled in a vertical post which is mounted on and adjustable lengthwise of said tongue.

9. A combination such as set forth in claim 8 in which the said tongue is pinned in a horizontal sleeve on said chassis and is movable through said sleeve when the pin is removed, whereby the overall length of the machine may be shortened for purposes of storage or transportation.

10. In an earth boring machine the combination, with a chassis, an earth auger and power driven mechanism for rotating said auger without imparting any feeding motion thereto supported on said chassis, and a hand operated feed mechanism for said auger, of a power driven mechanism adapted to be thrown into gear for lifting said auger.

11. Mechanism such as set forth in claim 10, combined with a releasable pawl for holding the auger in elevated position.

12. A combination such as set forth in claim 10 in which the said auger feed mechanism comprises a hand crank provided with a normally open, spring-controlled clutch connection to the remainder of said feed mechanism.

13. In an earth boring machine the combination of auger rotating and auger lifting mechanisms comprising parallel shafts, a motor shaft in line with the shaft of the auger rotating mechanism, a clutch member fast on the end of said auger rotating shaft, a cooperating clutch member rotating with but movable lengthwise of the motor shaft, a clutch member revoluble on the end of the auger lifting shaft, connecting gearing between the two last mentioned clutch members, a clutch member rotating with the auger lifting shaft but movable lengthwise thereof, and means for throwing either or both of said clutch members which are movable lengthwise of their respective supporting shafts into, or out of mesh with their cooperating clutch members.

14. A combination such as set forth in claim 13 in which the gearing connecting the clutch member movable lengthwise on the motor shaft with the clutch member revoluble on the auger lifting shaft is of chain and sprocket wheel construction, whereby the requisite flexibility for movements of the first mentioned clutch member is secured.

15. In an earth boring machine comprising a chassis, an earth boring auger and a motor mounted on said chassis, driving mechanism interposed between said motor and auger, a clutch for connecting said motor to, or disconnecting it from, said driving mechanism and manually operable means for controlling said clutch extending to the front end of said chassis, the combination with the above recited apparatus of manually operable means for feeding downward, or lifting upward, said auger also located at the front end of said chassis.

16. As an element in a portable earth boring machine, which machine comprises an earth boring auger and driving mechanism therefor, a housing for supporting said auger and a portion of said driving mechanism, which housing comprises a casting having separated horizontal wings adapted to be bolted at their outer ends to the chassis of said machine, a main vertical rib connecting said wings and extending along the front edges thereof, journal bearings for an auger-holding member on the front of said rib, two vertical ribs extending from the rear of said main rib along the inner edges of said horizontal wings to form a vertically arranged box-like structure open at the rear, and journal bearings for a countershaft mounted

on the rear of said main vertical rib within said box-like structure.

17. In an earth boring machine the combination, with a tool holder, a motor, and gearing connecting said motor to said tool holder, and a clutch in said gearing, of a mechanism for controlling said clutch comprising a fixed sector plate, a pivot pin at the sector center, a lever pivoted, and vertically movable on, said pivot pin, a spring normally holding said lever down upon the sector, a series of holes in said sector disposed circumferentially about said pivot pin, and a depending pin on said lever adapted to engage any one of said holes.

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