Oct. 16, 1923. 1,470,838

L. HOLMES

ADJUSTABLE POWER EARTH AUGER

Filed May 12, 1919 5 Sheets-Sheet 1

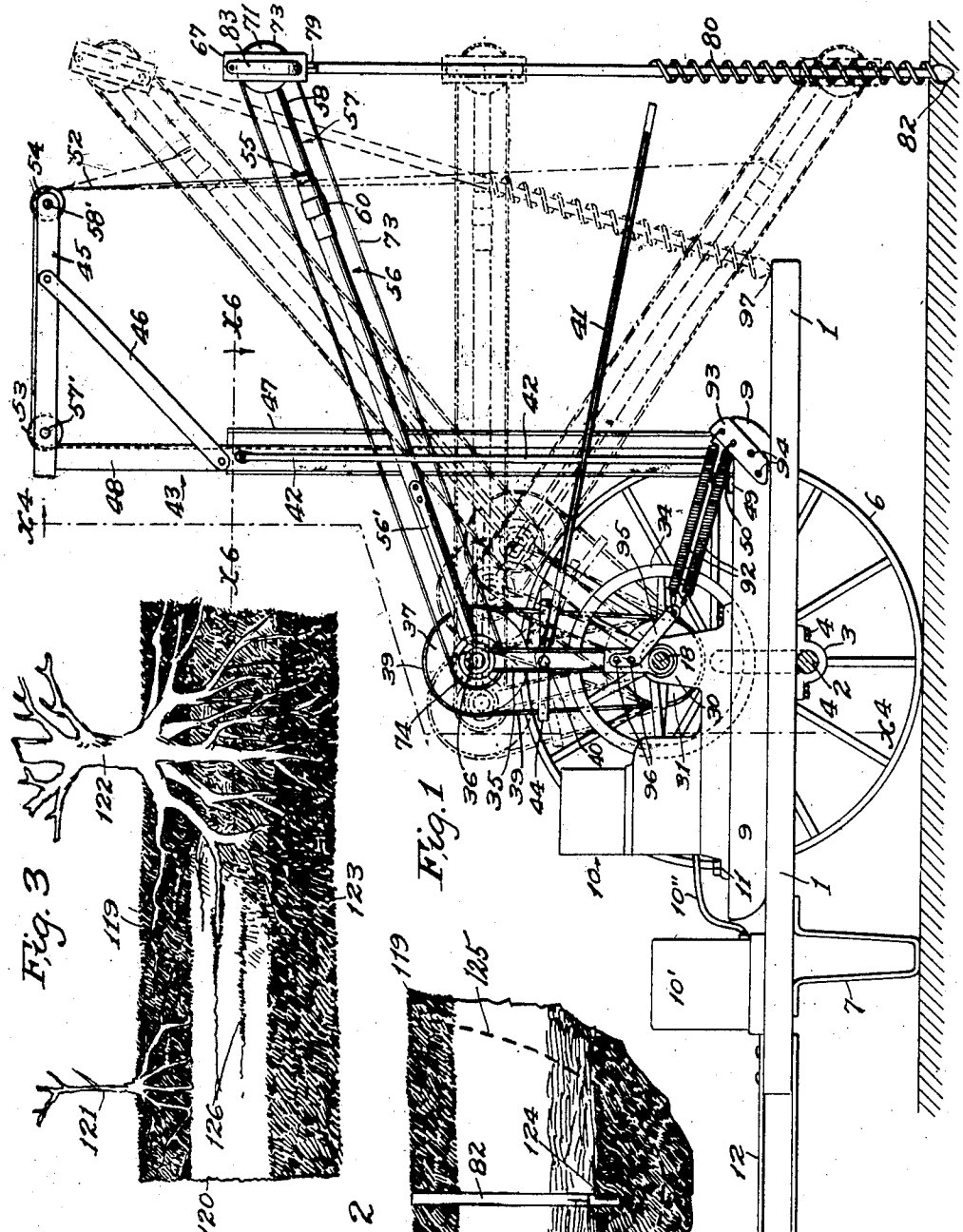

Fig. 1

Fig. 3

Fig. 2

Witness
C. C. Holly.

Inventor
Lawrence Holmes
by
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his Atty.

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ADJUSTABLE POWER EARTH AUGER

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Fig. 4

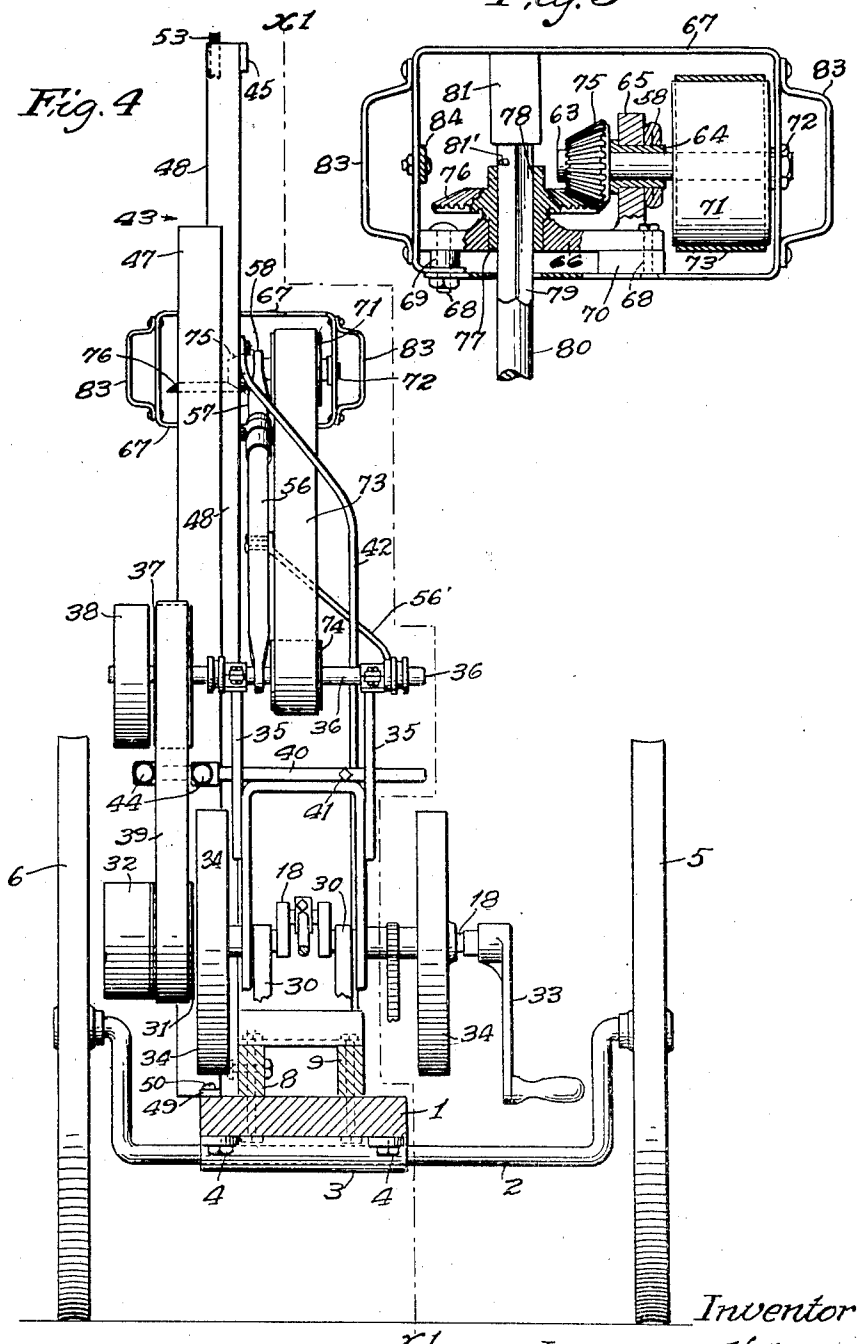

Fig. 5

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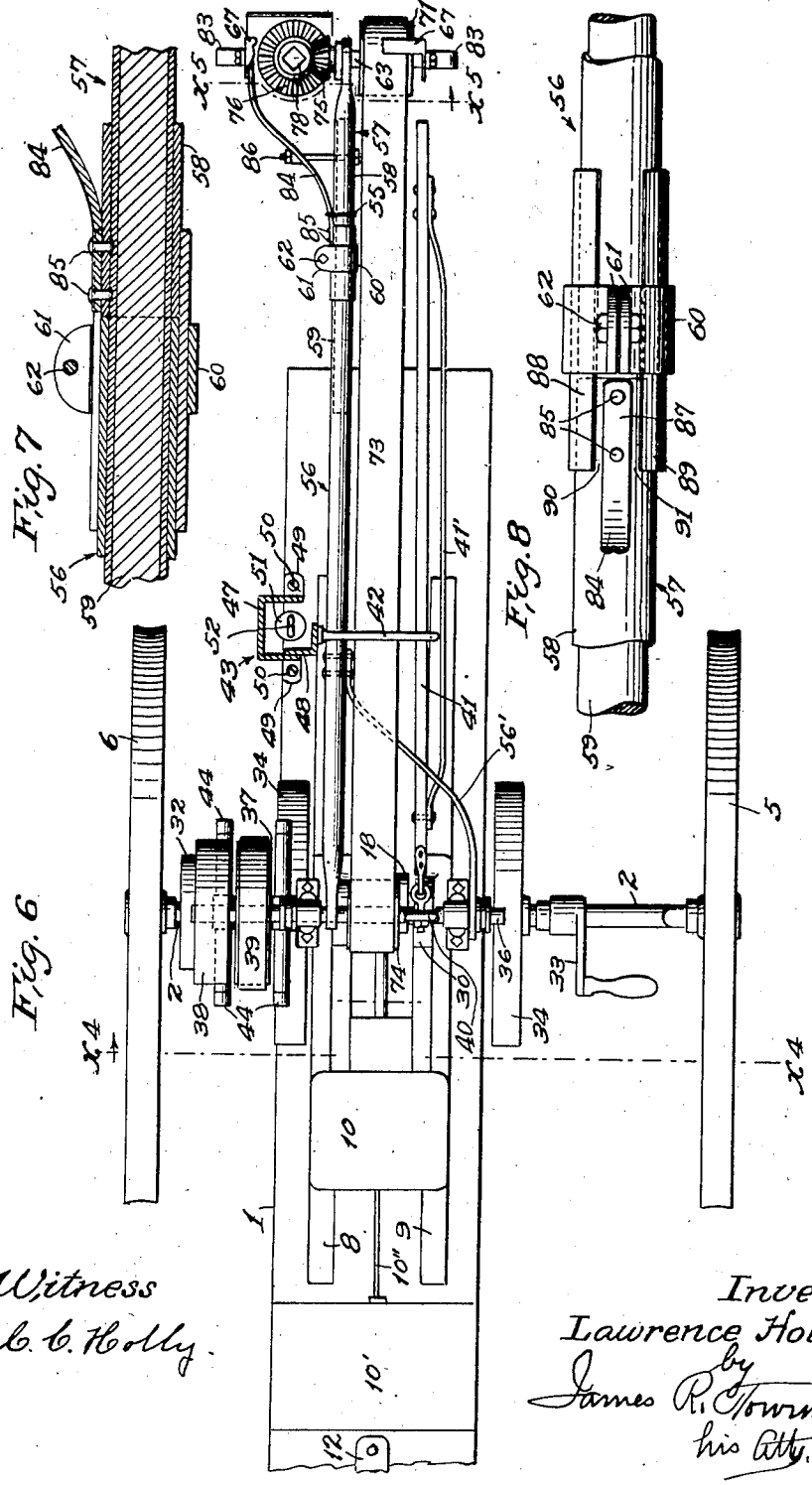

Fig. 6

Fig. 7

Fig. 8

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ADJUSTABLE POWER EARTH AUGER

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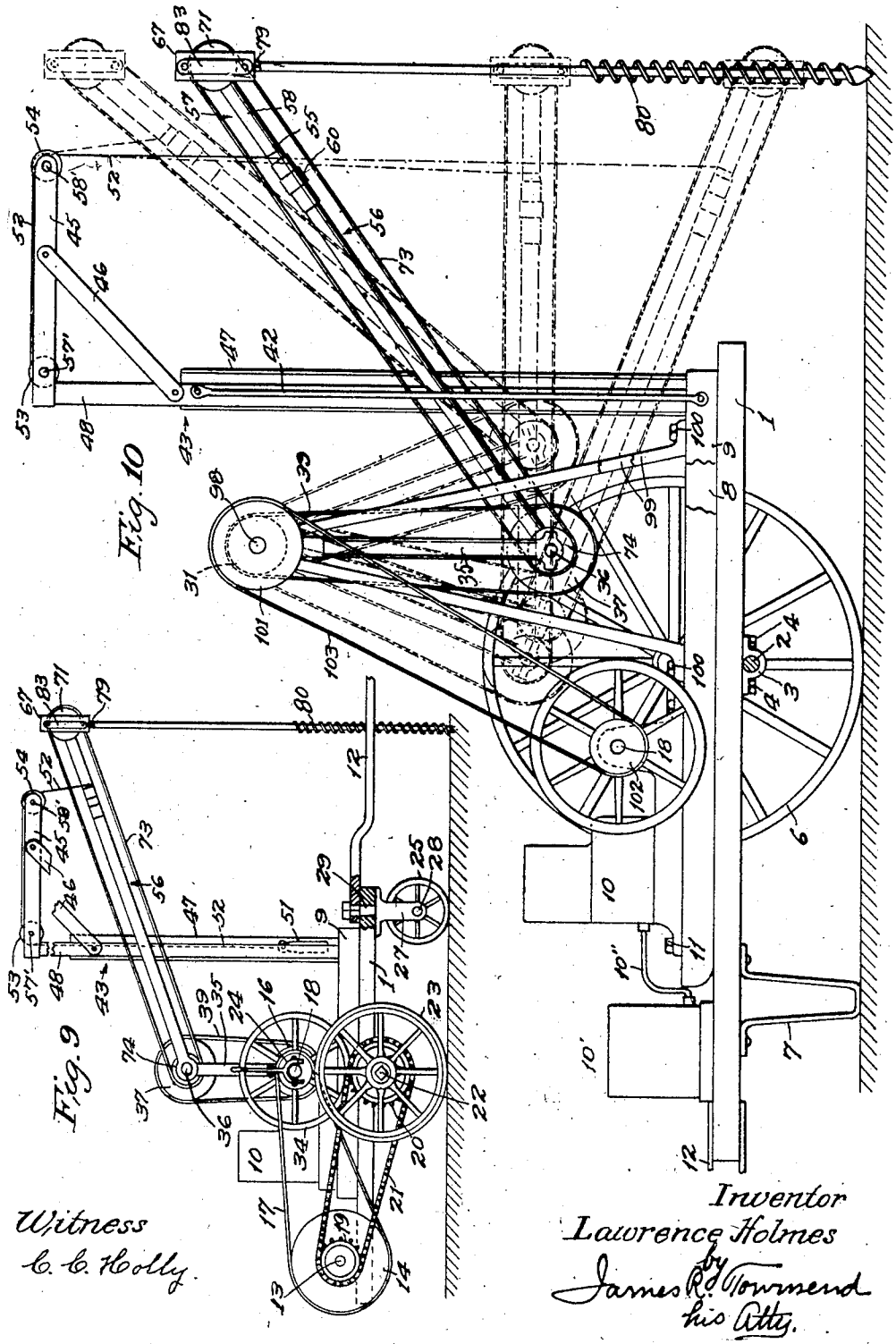

Fig. 10

Fig. 9

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ADJUSTABLE POWER EARTH AUGER

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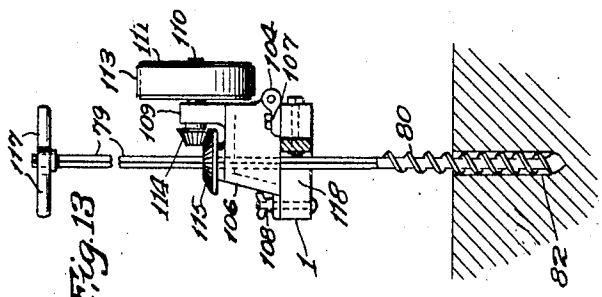

Fig. 13

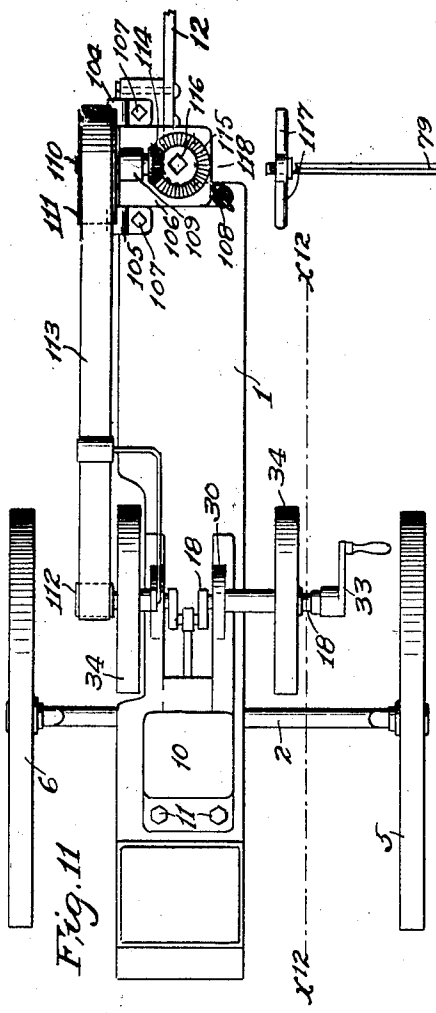

Fig. 11

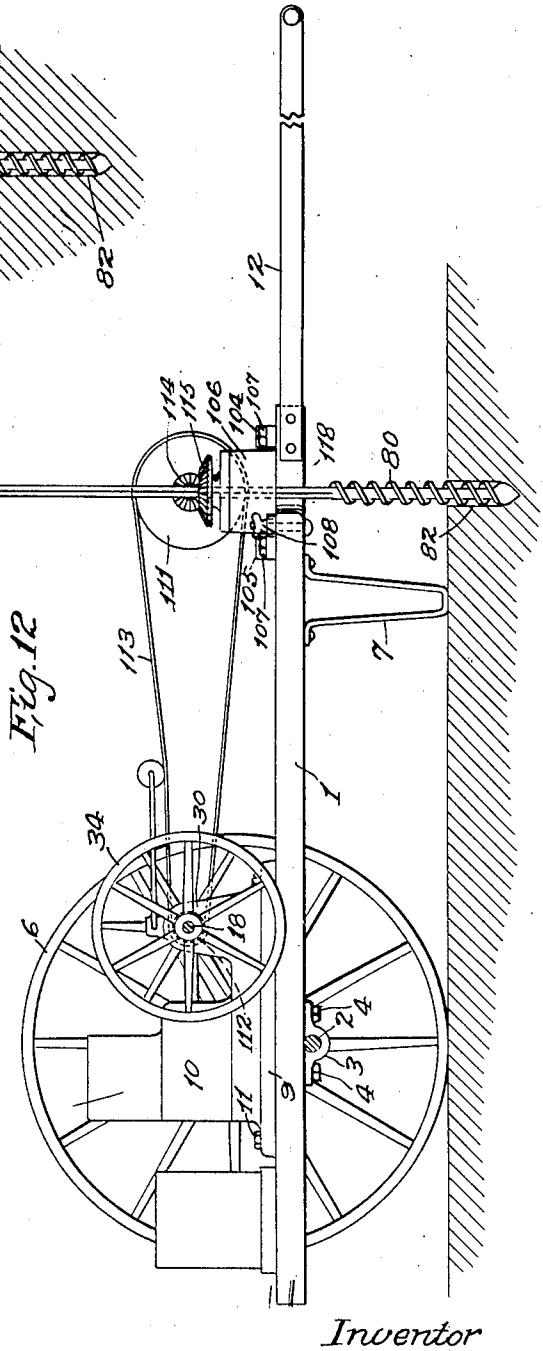

Fig. 12

Witness
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Patented Oct. 16, 1923. 1,470,838

UNITED STATES PATENT OFFICE.

LAWRENCE HOLMES, OF LOS ANGELES, CALIFORNIA.

ADJUSTABLE POWER EARTH AUGER.

Application filed May 12, 1919. Serial No. 296,636.

To all whom it may concern:

Be it known that I, LAWRENCE HOLMES, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Adjustable Power Earth Auger, of which the following is a specification.

This invention is intended for use in boring holes into the earth for the purpose of applying explosive charges below the surface of the earth in agricultural, horticultural and geological work.

The process of fitting the earth for plant growth by blasting, is coming more and more into vogue, and is subject to great inconvenience and is greatly retarded by reason of the difficulty in locating the explosive charge at the proper place below the surface of the ground.

It is found that by blasting a pocket in the earth at the place where a tree is to be planted, said tree will take root and thrive more lustily than when such blasting is not employed, and also that it is possible by such blasting process to produce thriving orchards on ground which otherwise would be impractical for such purposes. This is particularly true in ground having hard-pan near the surface or in shaly or rocky ground.

An object of this invention is to provide a boring machine by means of which the operator may conveniently, rapidly and with great ease, bore holes in the ground perpendicularly, or otherwise at numerous exact locations, as occasion may require or make expedient, and to do this with minimum interference by the irregularities of the surface, where the borings are to be made.

Another object is to provide a power machine of this character, which is easily transportable over rough and hilly ground, and by means of which the boring operation may be rapidly proceeded with and performed at different places, and at different angles without requiring any time for leveling up the machine or for adjusting its parts to the different angles of the earth surface.

The size of the hole required to be bored is usually about 1½ inches, more or less, and it has been found very expensive and laborious to produce the holes as required in the art. Said holes should be bored to the depth of from 2 to 6 feet, and heretofore the cost of boring such holes has been the greatest expense in connection with this form of industry.

I have avoided this great expense and labor by my invention, which comprises a portable frame having a central axis and two pivotal wheels thereon, a motor on said frame, a rotary bit or auger adapted to bore a hole of the required diameter into the earth, means to rotate the auger, means under the control of the operator to adjust the auger and said auger-rotating means to a desired angularity with the frame, and means for transmitting power from the motor to the auger-rotating means in its various angular adjustments.

The invention may be carried out in various ways, and an object is to provide a cheap, simple and adjustable power auger that is easily manufactured, and is easy to transport and to operate.

Other objects, advantages and features of my invention may appear from the accompanying drawings, the subjoined detailed description and the appended claims.

The drawings illustrate the invention.

Figure 1 is a sectional elevation of the apparatus on line x^1, Fig. 4, showing the principal part of the device in side elevation; and also showing by dotted lines altered positions of various parts.

Fig. 2 is a section through a hard-pan subsoil, showing a hole drilled by the apparatus, and also indicating by a dotted line the area of the pulverizing effect of a powder explosion in the bottom of the hole.

Fig. 3 is an illustration of the results accomplished by breaking up the hard-pan subsoil; and also the results of not doing so.

Fig. 4 is a sectional elevation on line x^4, Figs. 1 and 6, showing a rear view of the apparatus.

Fig. 5 is a sectional elevation on line x^5, Fig. 6, with the parts enlarged and with parts broken away.

Fig. 6 is a plan view of the apparatus with the upper part of the counterbalance support shown in section.

Fig. 7 is a section through a portion of the auger-supporting arm with parts enlarged and parts broken away.

Fig. 8 is another view of the portion of the auger-supporting arm, shown in Fig. 7, with the ends reversed and with the clamp for the arm in side elevation.

Fig. 9 is a side elevation of the apparatus provided with a propelling attachment by which means the apparatus travels from place to place under its own power. For the sake of clearness parts are omitted and parts broken away.

Fig. 10 is a modification of the apparatus illustrated in Figs. 1 to 9, inclusive; the view here shown being a sectional elevation similar to Fig. 1, with parts omitted and parts broken away, and altered positions of the parts being shown by dotted lines.

Fig. 11 is another modification of the apparatus which is shown in plan, with parts broken away.

Fig. 12 is a side elevation of the apparatus shown in Fig. 11.

Fig. 13 is a sectional elevation of the apparatus, with many parts omitted for the sake of clearness.

In detail, my invention comprises a bed plate 1, secured to a bent axle 2 by an elongated clip 3, which is secured around the axle 2 and to the bed plate by bolts 4, and the ends of the axle 2 are supported by wheels 5 and 6.

To and under the bed plate 1 and near its rear end is secured a leg 7, and by means of this leg and the wheel support the bed plate 1 is maintained in a level position, except when the leg is elevated from the ground for the purpose of transporting the device from place to place.

On the bed plate 1 are beams 8 and 9, on which an engine 10 is mounted, the engine and the beams being secured to the bed plate 1 by the bolts 11.

The heaviest portion of the engine is positioned between the wheels 5 and 6 and the foot 7, and the other mechanism is distributed so that a slight overbalance of weight is between the foot piece 7 and the wheel support. This slight unbalancing of the weight is for the purpose of maintaining the equilibrium of the apparatus when at rest; and also for the purpose of easily lifting the foot piece 7 from the ground when the apparatus is to be transported from place to place.

Secured to the bed plate 1 is the handle 12 which serves as means for raising the foot piece 7 from the ground and also for pulling or pushing the apparatus from place to place.

A means is provided, however, whereby the apparatus can travel from place to place under its own power instead of being moved by hand as above indicated. For this purpose there is mounted upon, and at one end of the bed plate 1, a stub shaft 13, to which is secured a pulley 14, which is connected with a pulley 16 by a belt 17, the pulley 16 being mounted on the engine shaft 18, see Fig. 9. There is also secured on the stub shaft 13 a sprocket wheel 19, which is connected with a sprocket wheel 20 by a sprocket chain 21.

When the apparatus is driven by the power means just described, a straight shaft 22 is substituted for the bent axle 2 and secured to the bed plate 1 by any suitable means, and wheels 23, of less diameter than the wheels 5 and 6, are substituted for the latter. Also, a clutch mechanism 24 is interposed between the pulley 16 and the engine shaft 18, and a toggle wheel 25 mounted in a yoke 27 on a pin 28 is substituted for the foot piece 7.

On the upper end of the yoke 27 is an extension 29, which passes through the bed plate 1 and has secured on the upper end thereof the inner end of the handle 12, which serves as means for turning the toggle wheel so as to guide the apparatus when it is moved from place to place.

The engine 10 may be of any construction suitable for such purpose as herein indicated, and, if it is of the internal combustion type, can be supplied with fuel from the tank 10′ by the pipe 10″.

The crank shaft 18 of the engine 10 is mounted in upward extensions 30 on the beams 8 and 9, and has on one end thereof mounted, fixed and loose pulleys 31 and 32, respectively. On its other end the shaft 18 is supplied with a removable crank lever 33, by which the engine is cranked for starting; and on this shaft are also mounted flywheels 34.

On the extensions of the housings 30 that form the bearings for the shaft 18 are pivotally mounted the lower ends of arms 35, and in the upper ends of the arms 35 is mounted a jack shaft 36, parallel with the straight portion of the crank shaft 18.

On one end of the jack shaft 36, fixed and loose pulleys 37 and 38, respectively, are so mounted that, when a belt 39 connects the pulleys 31 and 37, the jack shaft 36 will be rotated during the operation of the engine, and, when this belt is over the pulleys 32 and 38, the jack shaft will be idle.

A means is provided for shifting the belt 39 from the fixed to the loose pulleys. As is best shown in Figs. 1, 4 and 6, a rod 40 passes through the arms 35 and has secured thereto one end of a shifting lever 41. The lever 41 is fulcrumed around the brace rod 42, which has one end thereof secured to the beam 9, and its other end secured to an upright hollow post 43, the purpose of which is explained hereinafter.

Secured to one end of the rod 40 are fingers 44 which are arranged oppositely to each other relative to the edges of the belt 39, so that, when the rod 40 is moved by the hand lever 41, one of the fingers 44 will contact with the respective edge of the belt, and thus move the belt either to the fixed or to the loose pulleys. As is best shown

in Fig. 6, the lever 41 is fulcrumed on the brace 42 by means of the rod 41′, which has its ends secured to the lever 41 and is bent outward around the brace rod 42, so that, when the lever 41 is moved in either direction, it contacts with the rod 42 and thereby forms a fulcrum point.

To the upper end of the post 43 is secured one end of an extension 45, near the other end of which is secured one end of a brace 46, the other end of said brace 46 being secured to the hollow post 43.

The hollow post 43 is preferably formed of a channel iron 47 and an angle iron 48, which irons overlap each other, as seen in Fig. 6, and are secured together by any well known means. Upon the channel iron 47 are outwardly extending lugs 49, secured to the bed plate 1 by screws 50.

Within the hollow post 43 is mounted a counterbalance 51, attached to one end of a cable 52, which passes over sleeve pulleys 53 and 54, respectively, and is at its other end secured to a ring 55 on an arm 56.

The sleeve pulleys 53 and 54 are mounted on pins 57′ and 58′, respectively, at opposite ends of the extension 45, the purpose of the counterbalance 51 and its connection with the arm 56 being explained hereinafter. On the arm 56 is riveted one end of a side brace 56′, the other end of which is mounted on the outer end of the shaft 36.

The arm 56 which is preferably formed of a pipe, has one end pivotally connected with the shaft 36, and to its other end is secured an extension 57, formed of a pipe 58, which has therein a brass-jacketed wooden rod 59 for the purpose of reinforcing the outer end of the arm 56 as seen in Figs. 7 and 8, the pipe 56 and the reinforcing rod 59 telescope, and a band 60 provided with flanges 61 which are secured together by a bolt 62, serves to clamp the pipe to the reinforcing rod.

On the outer end of the extension 57 is mounted a shaft 63 having its bearing in a bushing 64 secured in the flattened end of the pipe 58 in a bracket 65.

The bracket 65 and another bracket 66 are secured to a rectangular band 67 by the bolts 68, the bracket 66 being spaced away from one side of the band 67 by a washer 69 and a block 70, as shown in Fig. 5, and the shaft 63 having thereon and near one end thereof mounted a pulley 71 and the end of the shaft being journaled in a bearing 72 secured in the band 67. In order to drive the shaft 63, the pulley 71 is connected by a belt 73 with a pulley 74, secured to the jack shaft 36.

Secured to the other end of the shaft 63 is a bevel pinion 75, which meshes with a gear 76, having on its underside a hub extension 77, journaled in the bracket 66, being in its center provided with a square opening 78 for receiving therein the square shank 79 of a drill bit 80.

The square end of the shank 79 abuts a stop 81, and in the square end is inserted a cotter pin 81′ in order to prevent the bit 80 from dropping through the opening 78 when the bit 80 is being withdrawn from the ground after the drilling of a hole 82, shown in cross section in Fig. 2, with the bit or auger 80 removed, and with a powder charge 124 in the bottom thereof.

Attached on each end of the rectangular frame 67 are handles 83, which the operator holds in order to shift the bit 80 to proper drilling position, and on which he applies his weight when the device is in operation and the bit is driven into the ground for drilling a hole. The handles 83 also serve the purpose of assisting the counterbalance 51 in lifting the bit from the ground after the hole 82 has been drilled, while the counterbalance and its cable and sleeve pulley connection with the arm 56 are for the purpose of holding the arm 56 and, consequently, the bit 80 in elevated position when the bit is not in use.

A brace 84 has one end thereof secured to the frame 67 and its other end bent inwardly and secured to the pipe 58 by rivets 85; and a bolt 86 passes through the extension 57 and the brace 84 so as to form a substantial, rigid connection between these parts.

Also, as seen in Fig. 8, the end 87 of the brace 84 forms a stop for the flanges 88 and 89 of the band 60, there being spaces 90 and 91, respectively, between the end 87 and the flanges 88 and 89 in order to allow a considerable rotational, oscillation or play of the extension 57 and its associated parts on the produced axis of the arm and extension for the purpose of giving the auger or bit 80 side movements, relative to a vertical plane drawn centrally and longitudinally through the machine, so as to permit the bit 80 to be driven obliquely into the ground.

It is further evident that the bit 80 has a swinging movement toward and away from the end of the machine on account of the pivotal connection of the rectangular frame 67 and its associated parts with the shaft 63. In other words, the rectangular frame 67 will turn on the shaft 63, and the pinion 76 will change its position on the gear 75 so as to allow the bit 80 to be swung toward or away from the machine.

Also, as seen in the drawings, the rod 56 and all of its associated parts can be moved toward or away from a vertical line central through the engine shaft. In other words, since the rod 56 has one end thereof pivotally connected with the shaft 36, and since, as previously stated, the shaft 36 is mounted in the upper ends of the arms 35, and the arms 35 have their other ends pivotally

mounted, it is clear that the upper ends of said arms can be moved in the arc of a circle.

Normally, the arms 35 are automatically returned to and held in a perpendicular position, as shown in full lines in Fig. 1, by means of springs 92, which have their outer ends secured to a plate 93, attached by screws 94 to the beam 9, and their inner ends secured to a plate 95 secured by screws 96 to one of the arms 35.

By means of the arc movement of the upper ends of the arms 35 and the pivotal mounting of the auger or bit 80 on the outer end of the arm 56, the auger or bit can be moved downward in a perpendicular line, as indicated in Fig. 1 by the dotted line positions of the various parts.

As is further indicated by dotted lines in the same figure, the bit 80 can be moved from a perpendicular position so as to enable the operator to place the point of the bit upon the bed plate 1, as at 97, when the drilling apparatus is idle and when it is to be moved to another place.

In the modification shown in Fig. 10, the pivotal ends of the arms 35, instead of being mounted on the extensions around the engine shaft, are mounted on a shaft 98, supported by bearing stands 99, which are secured to the beams 8 and 9 by bolts 100.

The fixed pulleys 31 and 37, and the loose pulleys 32 and 38 are mounted on the respective shafts 98 and 36; and the shaft 98 has thereon a pulley 101 connected with a pulley 102 on the engine shaft 18 by a belt 103 in order to drive the shafts 98 and 36, which in their turn drive the bit 80 by means connected therewith, as hereinbefore described.

From the foregoing, it can readily be seen that in this modification the ends of the arms 35 move in the arc of a circle, inverted to the arc described by the movement of the arms 35 previously referred to, but that the movements and operations of all the other parts are substantially the same in the modified as in the preferred construction.

In the modified construction the spring support for the arms 35 is dispensed with, as the arms automatically return to a perpendicular position by gravity after having been moved out of such position for the purpose of holding the bit 80 perpendicularly during the drilling operation.

In the modified forms shown in Figs. 11 to 13, inclusive, the apparatus is simplified to a very great extent, and many parts are eliminated.

In these figures, lugs 104 and 105, are shown as having pivotally mounted therein a gear boxing 106 and as being secured to the bed plate 1 by screws 107. The boxing is also shown as secured to the bed plate 1 by a thumb bolt 108. Mounted in a bearing 109 is a shaft 110, on one end of which is a pulley 111, connected with a pulley 112 on the engine shaft 18 by a belt 113.

On the other end of the shaft 110 is a bevel gear 114, which meshes with a pinion 115, having therein a square opening 116, through which extends the square end 79 of the bit 80.

On the upper end of the bit 80 is pivotally mounted a handle 117, which the operator holds, and on which he bears his weight when the apparatus is in operation and the bit 80 is driven into the ground. The square end 79 of the bit 80 is of considerable length and, by pressure of the operator's weight, is forced downward through the pinion 115, as the hole is drilled.

A cut-away portion in the bed plate 1 forms a recess 118, through which the bit 80 passes, the recess being open on one side so that, when the thumb bolt 108 is loosened, the boxing 106 can be turned over on its bearings in the lugs 104 and 105, and thereby enable the operator to place the bit 80 in a horizontal instead of a vertical position when the apparatus is to be transported from place to place.

In practice the apparatus is transported either manually or under its own power to the place of operation, such place usually being orchard land in which, as a rule arranged in rows, the points for drilling the holes for the purpose of blasting have been determined and indicated, after which the apparatus is positioned to follow the rows from point to point.

With the apparatus positioned over one of these determined points, the operator grasps the handles 83 and moves the point of the bit 80 to a line perpendicular to the determined point. Then, assuming that the engine is in operation, he moves the lever 41 so as to shift the belt 39 from the loose to the fixed pulleys, thereby rotating the bit 80, which thus begins drilling a hole in the ground at the point indicated. By adding his weight to the handles 83, the operator causes the bit 80 to drill very rapidly through the hard-pan subsoil, and to form a hole 82 suitable for orchard-blasting purposes.

When a predetermined depth is reached, the operator, by means of the handles 83 and aided by counter-balance 51, easily lifts the bit from the hole. The belt 39 is thereafter shifted to the loose pulleys, and the apparatus is moved to a new drilling point, where the operation is repeated.

By the foregoing easy and simple operation a hole is drilled in a few moments through a hard-pan subsoil, the drilling of which by a hand auger, according to the old method, would require hours of arduous labor to accomplish.

However, the business of blasting for tree-

planting has become an absolute necessity. Consequently, there is a great need of a machine adapted to perform the work for which the laboring man is physically unsuited.

In the drawings, Figs. 2 and 3, which illustrate the purpose of this machine, show the top soil 119 as quite shallow and underlaid with a solid hard-pan 120, through which the roots of trees or vegetation are unable to penetrate.

As seen in Fig. 3, the roots of the tree 121, having contacted with the hard-pan 120 and being unable to penetrate it, have turned back into the top soil, the impoverished condition of which, together with its lack of moisture, causes the body of the tree to be dwarfed and spindling. The tree 122, on the contrary, illustrates one, which is planted in a place where the hard-pan has been pulverized by blasting so as to allow the roots to penetrate to the rich, moist subsoil 123, which is almost invariably found below a stratum of hard-pan, thus, owing to the tree's vigorous root growth, the growth of the tree above the ground is correspondingly vigorous.

In Fig. 2, the area of the pulverizing effect of a charge of blasting powder 124 is indicated by the curved dotted line 125. The effect of blasting, however, is not limited to this area, as the shock rends long fissures 126 in the rock and hard-pan, as seen in Fig. 3, and thus opens passageways for the tree roots and also forms pockets for the accumulation of water.

In order to adjust the tension of the belt 73, the operator loosens the bolt 62 through the flanges 61 of the band 60, and is thereafter, by means of the handles 83, able to move the extension 57 to a position in the arm 56 adapted to produce the desired tension, after the attainment of which he again tightens the bolt 62.

This invention admits of modifications and changes and a right is reserved to all such modifications and changes as do not depart from the scope and spirit of the invention.

I claim—

1. In an adjustable power auger, a portable frame, an engine on said frame; a hole-forming apparatus operatively connected with said engine and said frame; an auger having its shank end pivotally connected with said apparatus; a counterbalance flexibly connected with said shank end for normally opposing the downward movement of said auger; and manual means pivotally connected with said shank end for moving the auger downwardly.

2. In a hole-forming apparatus, a portable frame, an arm pivotally mounted on said frame, an auger pivotally mounted at its shank end on said arm, means for swinging said arm so as to move said auger into drilling position, a motor on said frame, and a driving connection between said motor and said auger, a hollow post on said frame for adjustably supporting said arm, a counterbalance in said hollow post, and a cable connection between said counterbalance and said arm.

3. In a hole-forming apparatus a portable frame, an arm pivotally mounted on said frame, an extension on said arm, an auger having its shank end pivotally mounted on said extension, a telescoping connection between said arm and said extension, a motor on said frame and a driving connection between said motor and said auger.

4. In a hole-forming apparatus, a frame, a motor on said frame, an arm pivotally mounted on said frame, an extension on said arm, a telescoping connection between said arm and said extension, means for moving said extension in said telescoping connection, an auger pivotally mounted on said extension, and a driving connection between said motor and said auger.

5. In a hole-forming apparatus, a frame, a motor on said frame, an arm pivotally mounted on said frame, an extension on said arm, an auger having its shank end pivotally mounted on said extension, a driving connection between said motor and said auger, and means whereby said auger can be moved to an angular position relative to a line perpendicular to a longitudinal vertical plane through said frame.

6. A power auger comprising a frame; a power boring apparatus on the frame; a boring bit pivotally mounted at one side of the center of gravity of the frame; two supporting wheels journalled to the frame near the center of gravity of the frame and of the apparatus so that said apparatus may be pivotally turned and adjusted on the ground with ease so as to readily bring the boring bit of the apparatus to the point on the ground where the boring is to be made.

7. In a hole forming apparatus, a frame, a motor on said frame, an arm pivotally mounted on said frame, an extension on said arm, a rotationally oscillating connection between said arm and said extension whereby said extension may be oscillated on the produced axis of said arm and extension, an auger pivotally mounted on said extension, and a driving connection between said motor and said auger.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 2d day of May, 1919.

LAWRENCE HOLMES.

Witness:
WM. M. GENTLE.