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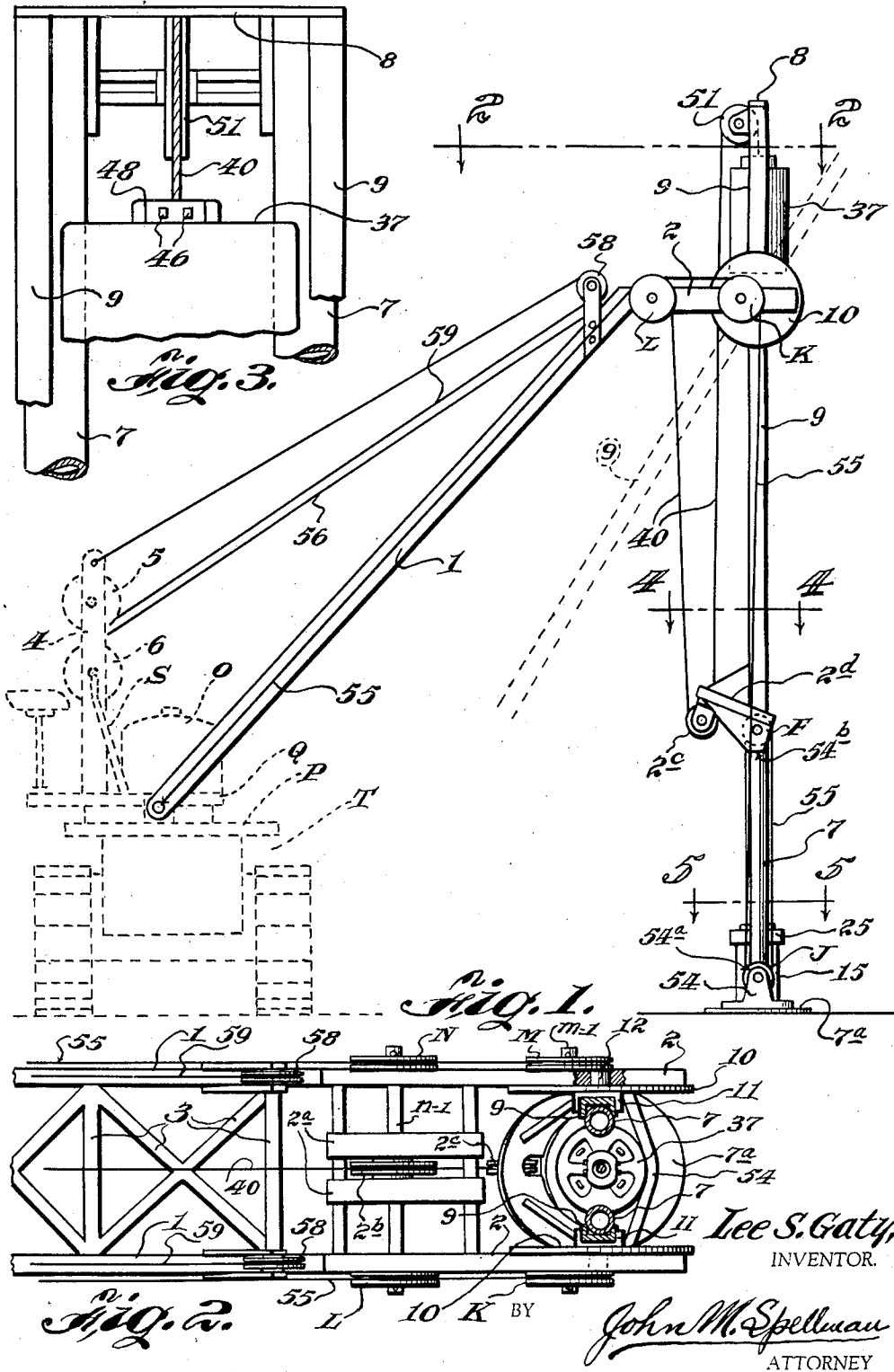
L. S. GATY

2,122,686

HOLE DRIVING MACHINE

Filed May 14, 1937

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HOLE DRIVING MACHINE

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4 Sheets-Sheet 2

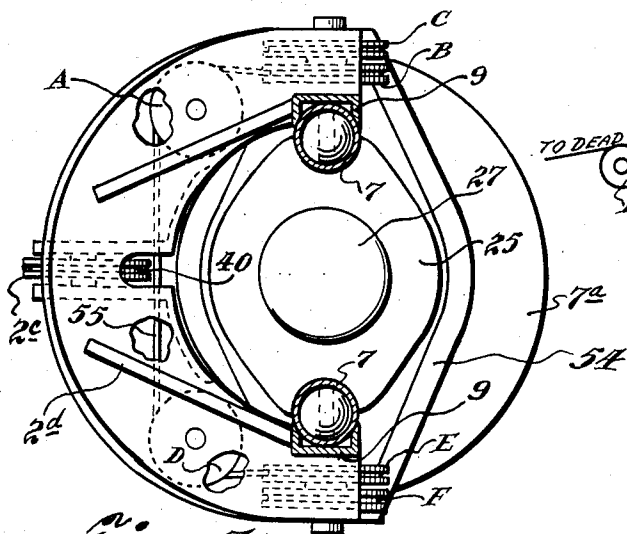


Fig. 4.

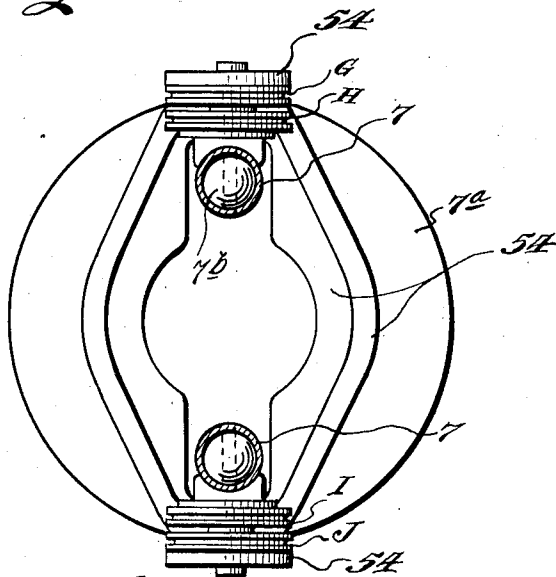


Fig. 5.

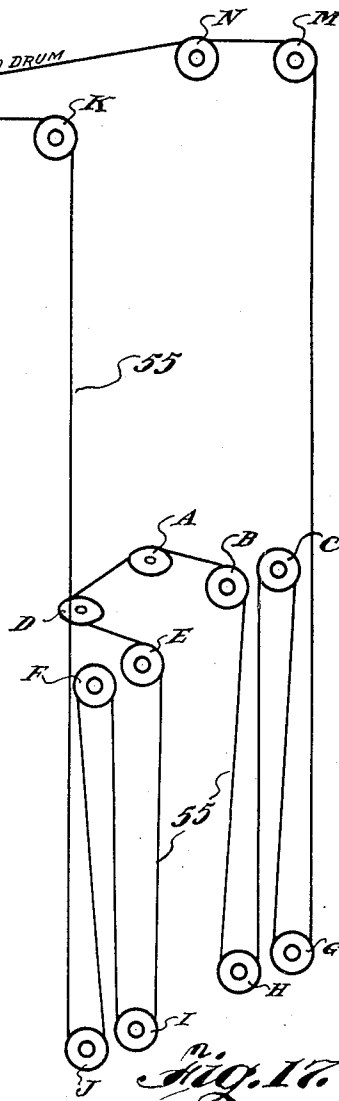


Fig. 17.

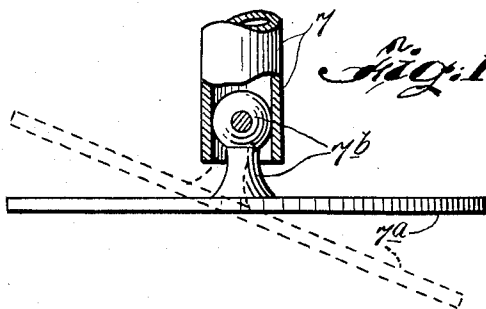


Fig. 18.

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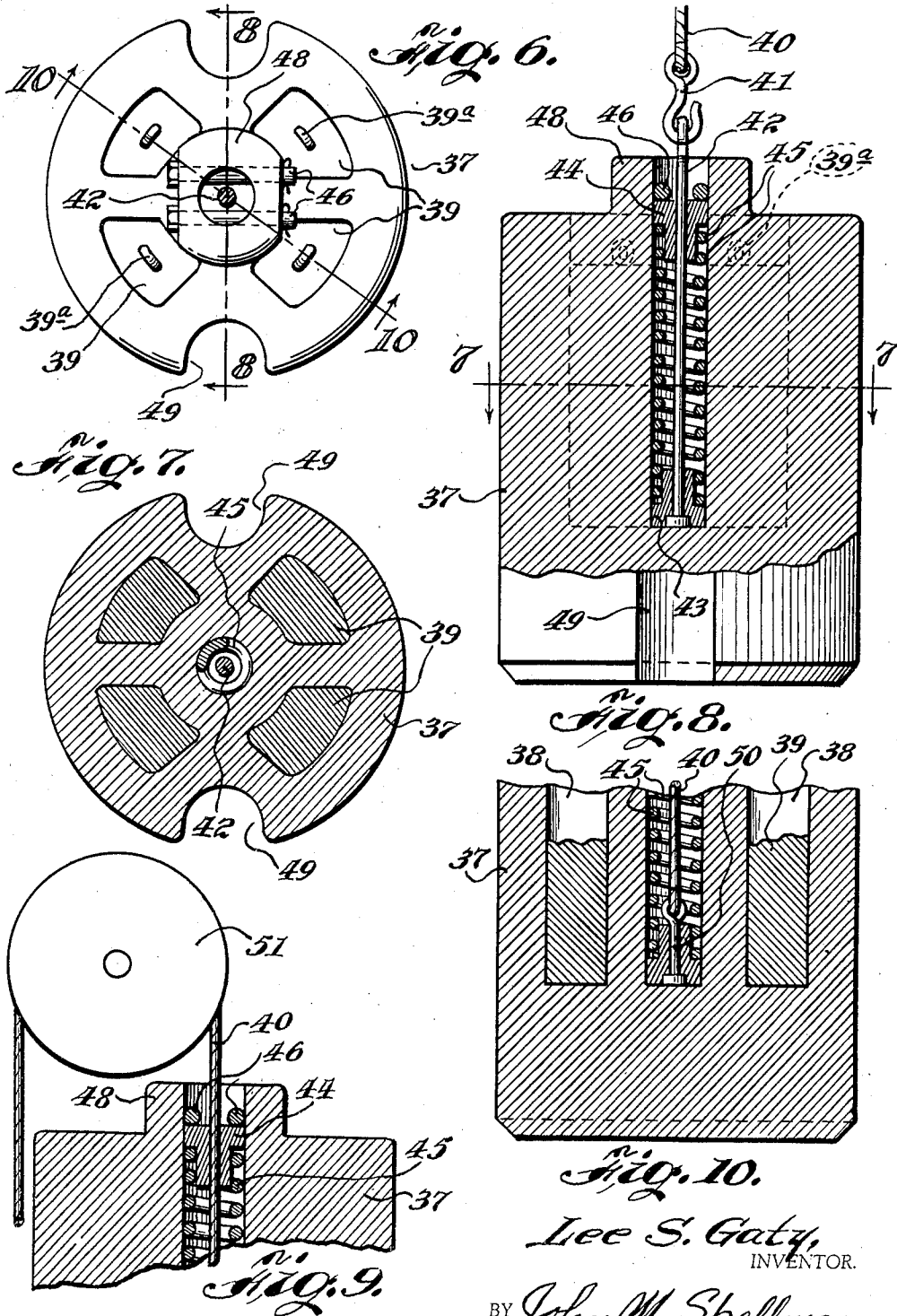
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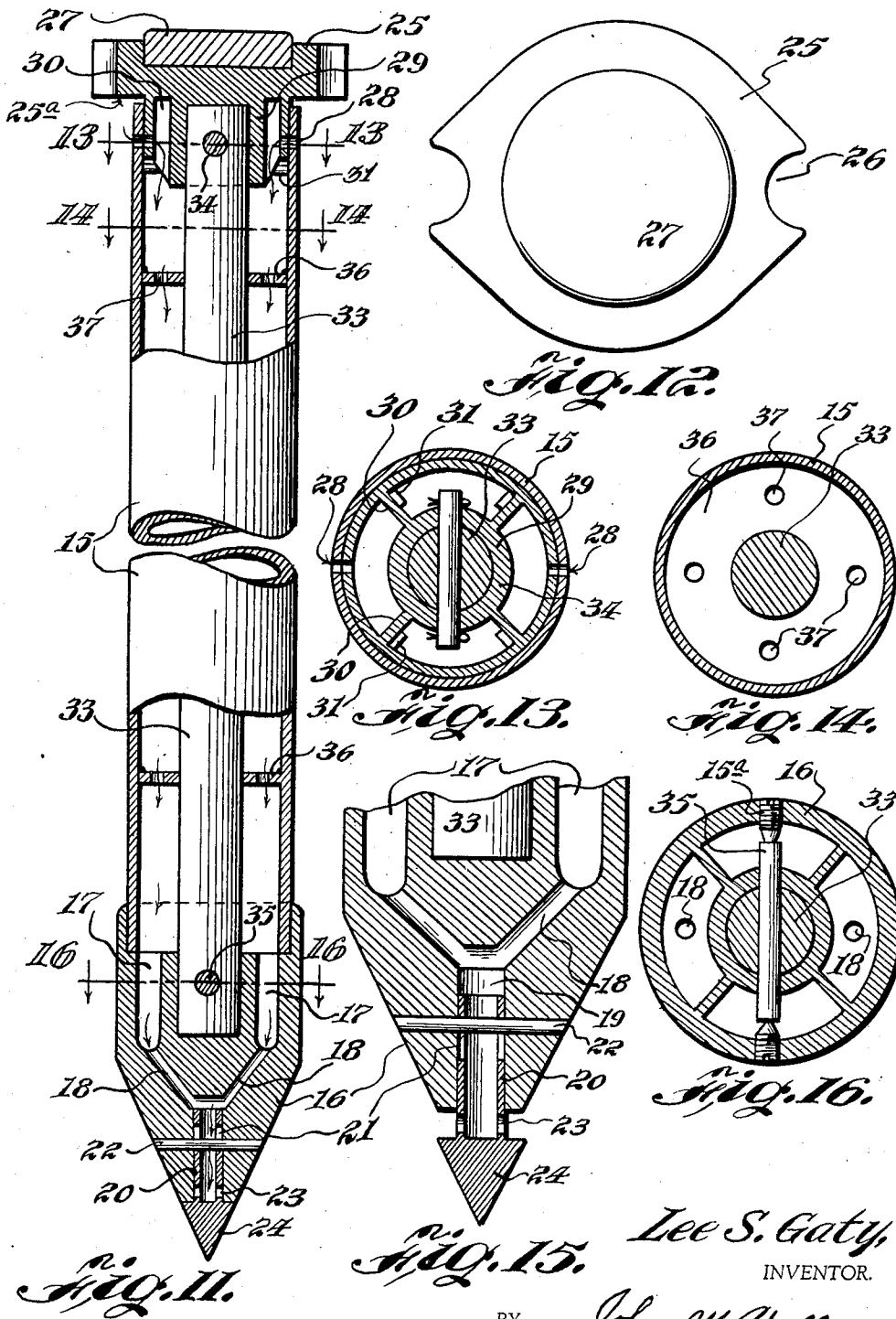
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HOLE DRIVING MACHINE

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4 Sheets-Sheet 4



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HOLE DRIVING MACHINE

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7 Claims. (Cl. 255—1)

This invention relates to machines for making holes in the earth for the purpose of setting posts, poles and piling, such as for highway guard rails, fences, telegraph, telephone and electric service line poles, and foundation piling.

The primary object of the invention is to provide a machine which will form the necessary holes for setting posts, piling and poles by driving the hole instead of boring or digging the same, the hole formed by this machine being made by driving or forcing a plunger element into the ground under impact of a hammer.

Another important object of the invention is the novel provision in the machine for withdrawing the plunger element from the hole and for preventing the walls of the latter from collapsing, after the removal of the plunger element.

A further object of the invention is the means for conveniently and quickly "spotting" or reaching the place where the holes for the poles, posts and piling are to be located.

The invention also includes a novel hammer or driver for forcing the plunger into the earth, the hammer provided with shock-absorbing means to lessen wear and friction on the cable, the drums and similar machine parts. The hammer also includes a novel arrangement of parts whereby the weight of the hammer may be increased or decreased.

The above principal and other objects of the invention will be clearly understood from a perusal of the following detailed description, taken in connection with the accompanying drawings, and in the drawings:

Figure 1 represents a side elevational view of a tractor or a self-propelled power hoisting and swinging machine on which the parts embodying the invention are mounted, and showing the hammer in uppermost position and the plunger in a hole-forming position,

Figure 2 is a cross-sectional view of Figure 1, the view being enlarged and taken along the line 2—2 thereof,

Figure 3 is a sectional detail view of the hammer, the latter being partly broken away, and showing the guide leads therefor,

Figure 4 is an enlarged cross-sectional view of Figure 1, the view being along the line 4—4 thereof,

Figure 5 is a view similar to Figure 4, the view being on the line 5—5 of Figure 1, but on a lower plane,

Figure 6 is an enlarged top view of the hammer by itself,

Figure 7 is a cross-sectional view of the ham-

mer, the view being had on the line 7—7 of Figure 8,

Figure 8 is a transverse vertical sectional view in part of the hammer, the view being on the line 8—8 of Figure 6, and showing the cable connecting means,

Figures 9 and 10 are partial sectional detail views respectively of the hammer, and illustrating a modification of the cable connecting means, Figure 10 being taken on the line 10—10 of Figure 6,

Figure 11 is a longitudinal sectional detail view in part of the plunger in broken formation,

Figure 12 is a plan view of the hammer contact member and guide means for the plunger,

Figures 13 and 14 are cross-sectional detail views of Figure 11, the views being on the lines 13—13 and 14—14 respectively of said figure,

Figure 15 is an enlarged detail sectional view of the lower end of the plunger in open or ascending position,

Figure 16 is a cross-sectional detail view of the plunger, the view being on the line 16—16 of Figure 11,

Figure 17 is a diagrammatic view illustrating the stringing of the cable used in lifting the plunger from the hole.

Figure 18 is a detail fragmentary view of the means for fastening the bottom plate to the guides.

A detailed reference being now had to the drawings and wherein like characters will designate like parts, in Figure 1 the machine is shown mounted on a tractor of any type such as is indicated generally at T, or a truck, crane or shovel. A stationary platform P and a revoluble platform Q, which are not part of this invention, provide a supporting means for an engine O which supplies power for operation.

Swingably secured to the platform Q is a boom of two spaced parallel members 1, preferably of channel or angle iron, and forming a horizontal continuation by the members 2. Braces 3 maintain the members 1 in rigid spaced relation. Uprights 4 provide a support for two drums 5 and 6 upon which are wound the cables for operating the hammer and for raising the plunger after the hole is made, as well as for elevating the boom to various heights, such as for lifting poles, and more fully explained hereinafter.

The machine is provided with two vertical tubular guide lead rods 7 for guiding the hammer and the plunger in their up and down movements as the hole is being formed. These guide lead rods are joined at their upper ends by a cross

piece 8 which forms a continuation with the members 9, embracing the tubular guide lead rods 7 and being welded thereto and providing a support therefor. A disk 10 is provided for each of the horizontal members 2 the disk being welded to the boom members, and each disk has disposed diametrically across one face thereof a guide member 11 and a pin 12, connected at one end to these guide members and traversing the disks, pivots the guide members to the horizontal boom members 2. This arrangement permits the guide lead rods 7 to slide vertically and angularly in the guide members 11, since the guide members are pivoted centrally of the disks and secured to the boom members 2. The broken lines in Figure 1 show an angular position of the guide lead rods.

The rods 7 are secured to a bottom plate 7a to stabilize the rods and relieve boom strain, this plate being removably and pivotally fastened to the rods 7, necessary when the rods 7 are making an angular hole, the arrangement being shown in Figure 18, the ends of the leads seated over the members 7b.

In Figures 11 to 16, inclusive, are shown the plunger for forcing or driving the hole for a post or the like, and this plunger comprises a barrel 15, one end thereof having connected thereto a conical element 16 which has formed therein the air ducts or channels 17, 18 and 19. The larger channel 19 has disposed therein a tube 20 with a slot 21 and a pin 22, traversing the conical element 16 permits longitudinal movement of the tube to an open position, see Figure 15, when the barrel is moved upwardly, permitting air to escape through a port 23. The tube 20 completes the formation of the conical element by means of a pointed member 24, carried on the tube.

The upper end of the barrel 15 is closed by means of a cap 25 with the slots 26 for conformably engaging with and sliding along the guide rods 7 as the barrel is raised and lowered in forming a hole. Centrally of the cap is a wooden block 27 which provides a means of lessening the jar or impact of the hammer when the plunger is being driven into the earth. The cap is also provided with air intake ports 28 which register with similar ducts in the barrel 15 as will be clear from Figure 13. A centrally projecting portion 29 formed integrally with the cap has spaced thereon the lugs 30 which contact with similar lugs 31 carried on the inner wall of the barrel as will be clear from Figure 11. These lugs prevent the cap from rotating. The cap and the conical element 16 are connected by means of a rod 33 through the medium of the pins 34 and 35, and spaced along the rod 33 are disks 36 to strengthen the barrel and which are provided with the openings 37 for passage of air to the lower end of the barrel, as indicated by the arrows in Figure 11. Screw plugs 35a enable the pin 35 to be removed and replaced when necessary.

For the purpose of driving the plunger into the ground in forming a hole there is provided a hammer such as is indicated generally at 37 which is of cast metal and formed therein are spaces 38. In these spaces are placed weights 39 of lead which being heavier than steel provides a means for making the hammer adjustable in weight. Each of these weights is provided with an eye 39a for easy placement and removal. The spaces are cast on a taper permitting the weights to be removed when a lighter hammer is desired.

In Figure 8 is shown one mode of connecting the cable 40 to the hammer and in this form the cable which operates the hammer is connected to a hook 41 and the hook in turn is passed through the eye of a bolt 42. Members 43 and 44 at each end of the bolt 42 form a seat for a heavy coil compression spring 45, while two spaced pins 46 hold the members 43 and 44 in place, just within the neck 48. In this form of construction the removal of the pins 46 will enable the bolt 42 to be withdrawn when necessary. The hammer is adapted to be guided by means of the grooves 49 which slide along the guide rods 7, previously referred to, and as will be clear from Figure 3.

In Figures 9 and 10 are illustrated a modification of the means for joining the cable to the hammer, and in this modified form the cable 40 is connected to a shorter bolt 50 and two members 43 and 44, as in the former case, including the spring 45, are employed, also the two pins or bolts 46. In this modification no hook is used and the fastenings are all inside the hammer, and in the absence of the hook 41 the hammer is allowed to be hoisted approximately one foot higher. In both modes of the hammer and cable connection, the jar and shock are taken off the cables and the boom. It will also be apparent that the two pins 46 will provide the lifting point in both arrangements, and there will be less wear and tear on the friction clutches, drums, increasing the life of the cables and the power unit generally.

Referring to Figures 1 and 2, on the horizontal members 2 of the boom are supports 2a for mounting a pulley 2b for the hoist cable 40 for the hammer. This cable is directed from pulley 2b to a pulley 2c, mounted on a support 2d, secured to the ends of the rails 9. The cable 40 winds on the drum 6.

Referring now to the means for lifting the plunger from the hole after the latter has been made, it will be noted that the cap projects or overhangs the barrel 15 at the point 25a. In Figures 4, 5 and 6 is shown a collar element 54 which is adapted to bear underneath the cap at the point 25a in lifting the plunger. For this purpose the collar element has mounted thereon, (see Figures 4 and 5,) the sheaves G, H, I and J, and on the support 2d are mounted the sheaves A, B, C, D, E, and F. In Figure 17 is shown diagrammatically the threading of the pulling cable for the plunger withdrawal, the cable being indicated at 55. The "dead" end of this cable is indicated at 56 connected to one of the boom member 1 and passes over the successive pulleys as pointed out, passing from one side of the frame to the opposite side through the pulleys A and D, and thence to the drum 6. Pulleys M and K are mounted by the pins such as m-1 on the boom members 2, while the pulleys L and N are mounted on a shaft n-1.

For lifting the boom to various positions there are mounted thereon and over which pass a cable 59, one cable length being used for each pulley, and the "dead" ends of the cables are connected to the uprights 4 as shown.

In the operation of the machine, the boom is swung to the desired position where a hole is to be driven with the plate 7a supported on the ground. The collar element 54 being moved upward will hold the plunger in a hole forming position with the point 24 on top of the ground. The hammer 37 is then operated to drive the plunger downward to the desired depth. In Fig-

ure 1 the plunger (or plunger barrel and its component parts) is shown driven into the ground, having almost completed its full downward movement. During the driving operation the collar element 54 is being supported on the plate 7a, and after the plunger has reached its lowermost earth penetrating position, the collar element is brought into action by operating one of the levers S. The drum 6 will then be allowed to rotate to exert a pull on the cable 55 and through its various leads through the sheaves and pulleys previously referred to the collar element 54 will contact with the marginal underside of the cap or head 25 and the plunger will be withdrawn. It will be apparent that, as the cable is reeved through the sheaves and pulleys, when the plunger is being withdrawn it is operating on an eight part line, that is the four strings of the cable on each side of the guide leads 7 will be pulling the plunger up. However, when the bottom of the plunger reaches the top of the ground, without changing the power, the cable automatically becomes a two part line, that is while the cable is still reeved through the sheaves and pulleys, the top of the collar element 54, as at 54a, will move against the pulley support at 54b. Thus while the cable is still being pulled through the sheaves and pulleys, the lifting power will only be a two-part lift, which elevates the bottom plate 7a, the collar element 54, and of course the barrel 15 of the plunger by contact with the cap or head 25.

This arrangement of lifting the leads 7 and other parts entirely off the ground is the most important feature of the invention, and obviates the necessity of moving the machine when a new hole location is to be made. It will be apparent that by this construction and operation, in connection with the pivotal and sliding means manifested by the guide members 11 and the disks 10, that the guide leads 7, after being thus raised off the ground, can then be moved to the next position where a new hole is to be made, and can be lifted over any obstruction and placed at any angle, and it is not necessary to move the power unit on which the parts are mounted. It will be seen, also, that a hole may be driven at any practical angle as the bottom plate 7a is pivoted to assume a flat position in line with the angular position at which the guide rods 7 may be placed. Similarly, the arrangement is convenient in conveying the machine to change of operating locations from one location to another, as in passing under bridges and the like.

During the time the plunger is being driven into the ground the tube 20 with its pointed end 24 and which constitute a valve is pressed up tightly in the position shown in Figure 11. Consequently dirt or extraneous material cannot get into the plunger barrel. When the hole is driven and the plunger is being withdrawn the pointed end 24 will remain stationary until the barrel has moved upwardly sufficient to bring the tube port 23 to an open position as shown in Figure 15. The air is then permitted to flow through the downward extension of the cap and downwardly as indicated by the arrows and exhaust through the port 23 into the hole. This prevents the creation of a vacuum which would otherwise cause the walls of the hole to collapse due to pressure. In addition to this form of making a hole the earth immediately adjacent the hole walls is compressed and packed due to earth displacement, making the hole walls firm and capable of standing so, long after the plunger is withdrawn.

The means for allowing air to enter the plunger barrel and thus pass into the hole when the plunger is to be withdrawn makes it much easier to elevate the plunger than would otherwise be possible.

Attention is also directed to the fact that the boom extension manifested by the horizontal members 2 and the disks 10 are so arranged that the space between these boom members and the leads 7 is open and permits the setting of a telephone pole or the like without obstruction.

While there is shown and described a practical working embodiment of the machine, it is to be understood that modifications, changes and alterations may be made therein in keeping with the principle thereof without departing from the intent and spirit of the invention, and within the scope and meaning of the claims appended hereto.

What is claimed as new is:

1. A machine for making holes for posts, poles and the like and adapted to be mounted on a power unit, and comprising a boom with horizontal members, spaced guide leads and supports swingably associated with the horizontal members of the boom, a hammer and a driven element adapted to travel on said guide leads, said hammer having spaced hollow divisions and removable weights for adjusting the weight of the hammer, said hammer including shock-absorbing means for connecting the hammer to an operating cable, and means for withdrawing said driven element from the hole formed.

2. A machine such as is claimed in claim 1 and wherein said horizontal boom members include disks rigidly mounted on said members, guide members pivotally mounted on said disks, whereby said guide leads are adapted to slide in said guide members in raising and lowering said guide leads off the ground and moving them to an angular hole forming position without moving said power unit.

3. A machine of the class described comprising a boom with horizontal extensions and adapted to be mounted on a power unit, said horizontal boom members including disks rigidly mounted on said horizontal members, guide members carried on said disks, the end portions of the horizontal members being spaced from each other and providing an open space for passage of a pole or the like.

4. A machine for making holes for posts, poles and the like and adapted to be mounted on a power unit, said machine comprising a boom of spaced members, with horizontal extensions, means pivotally mounted on said extensions and carrying guide lead member and supports therefor whereby the guide lead members and supports may be slid vertically and swung laterally in moving the members and supports to hole making positions without changing the location of the power unit, and including a hole forming member, with means for operably connecting said hole forming member to and with said guide members and supports.

5. A machine such as claimed in claim 4 and including a driven element consisting of a hollow cylindrical body with a pointed end, said body having air inlet and air exhaust ports, a valve co-operating with said pointed end for automatic air release when the body is elevated and withdrawn from the hole and preventing the hole from collapsing, said machine also having means for withdrawing said driven element.

6. A machine of the class described, compris-

ing a boom adapted to be mounted on a power unit, said boom having extensions disposed on a horizontal plane and carrying a vertically reciprocable and angularly swingable means, whereby said means may be moved to various hole forming positions without changing the location of the power unit, sheaves mounted on one end of said reciprocable and swingable means, said machine including a driven element, means for elevating said driven element from a hole formed, said means consisting of a yoke or collar adapted to engage the driven element, a pair of sheaves mounted on each side of the yoke or collar whereby a connection by cable may be established between, to and with said sheaves on the reciprocable and swingable means and the sheaves on said yoke or collar to lift said yoke or collar and the driven element with the entire reciprocable and swingable means from the ground.

7. A machine of the class described and as claimed in claim 6, and wherein said vertically reciprocable and angularly swingable means carries sheaves arranged in spaced pairs and mounted on said reciprocable and swingable means at the lower end thereof, a driven element with a yoke or collar element having a similar spaced paired sheave arrangement, a projection on said reciprocable and swingable means, said collar or yoke element having parts extending adjacent said sheaves and adapted to abut said projection on the reciprocable and swingable means when the driven element has been withdrawn from the hole, and thereby lifting said reciprocable and swingable means from the ground and enabling the hole forming parts to be moved to another adjacent or near-by hole making position without changing the location of the power unit.

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