Jan. 6, 1953 G. A. STEECE 2,624,129

ROTARY GRAVE DIGGING EXCAVATOR

Filed Nov. 17, 1947 4 Sheets-Sheet 1

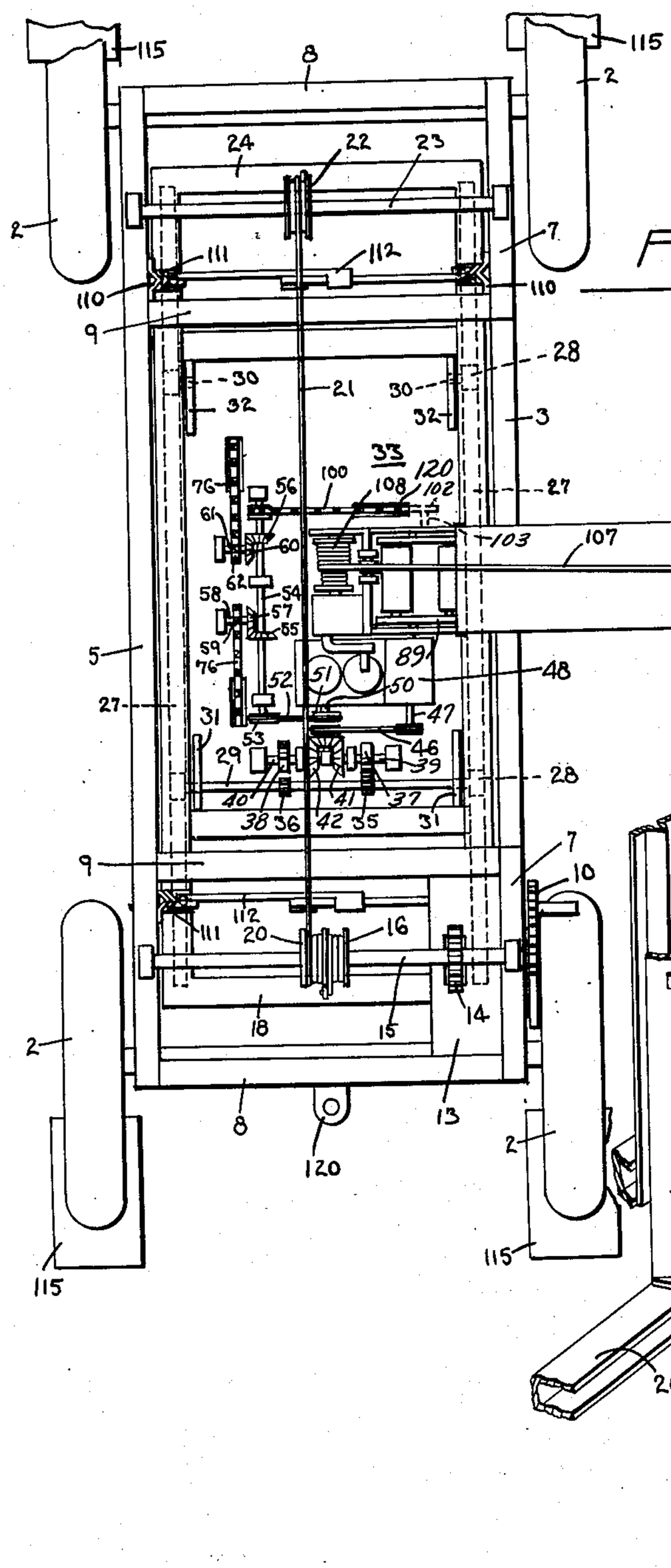

FIG-1

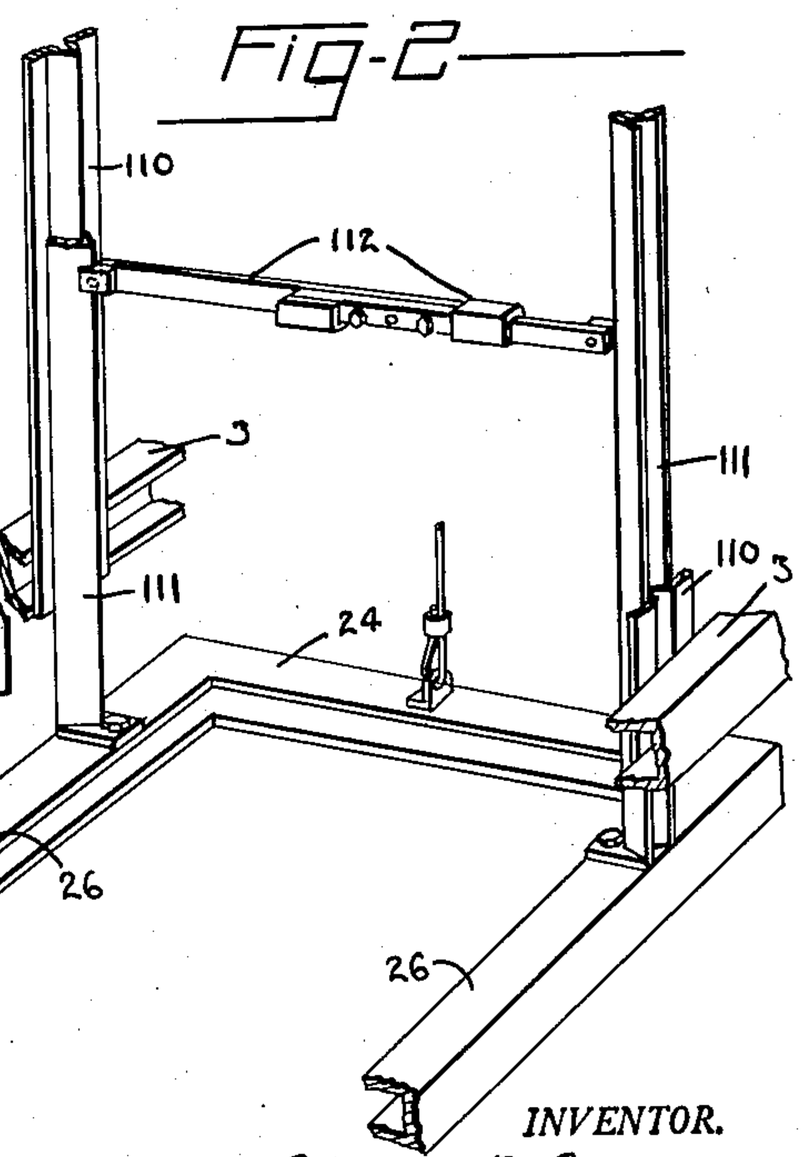

FIG-2

INVENTOR.
GEORGE A. STEECE
BY Bayken, Mohler & Beckley
ATTORNEYS

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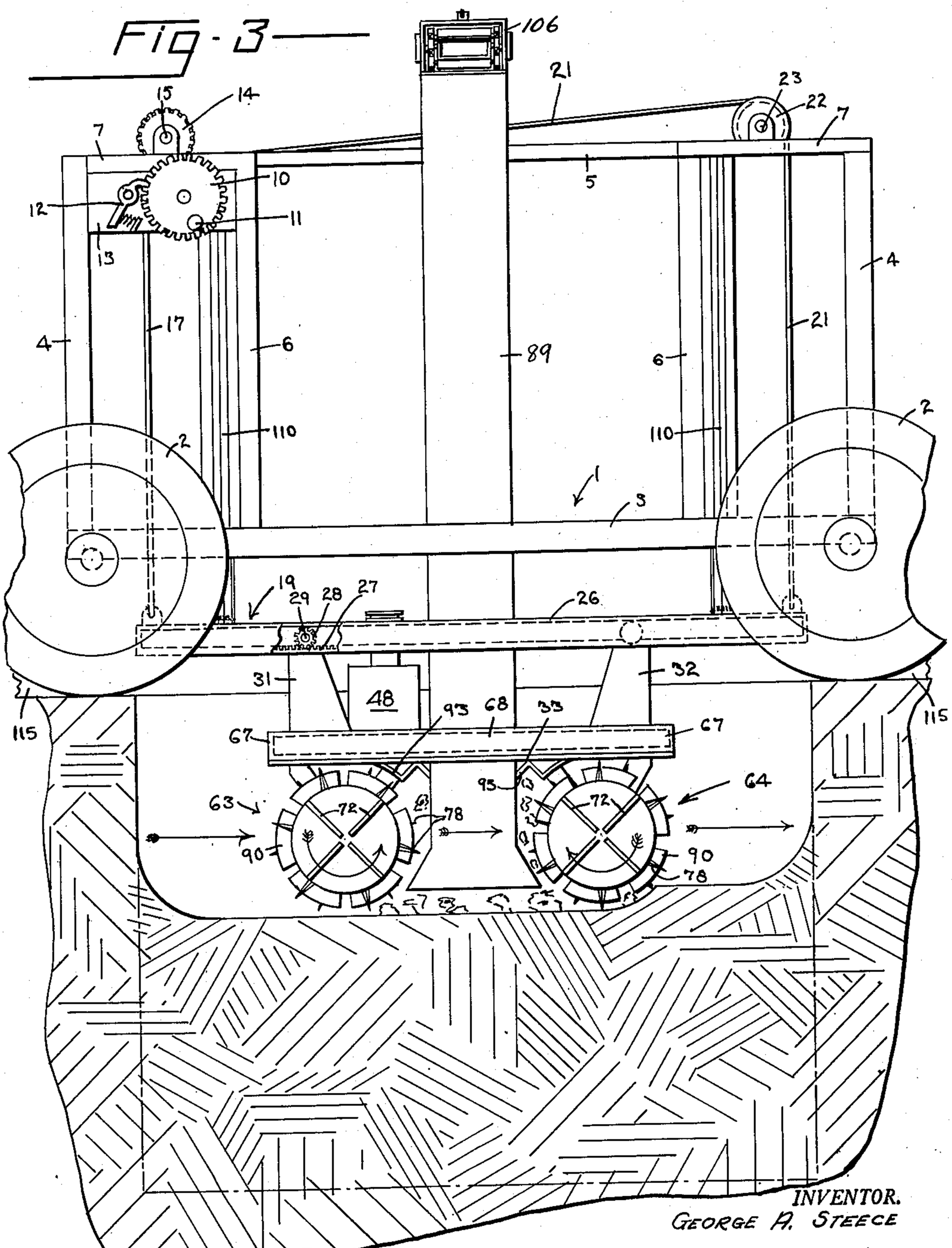
ROTARY GRAVE DIGGING EXCAVATOR

Filed Nov. 17, 1947 4 Sheets-Sheet 2

Fig. 3



INVENTOR.
GEORGE A. STEECE

BY Boykin, Mahler & Beckley

ATTORNEYS

Jan. 6, 1953 G. A. STEECE 2,624,129

ROTARY GRAVE DIGGING EXCAVATOR

Filed Nov. 17, 1947 4 Sheets-Sheet 3

Fig-4—

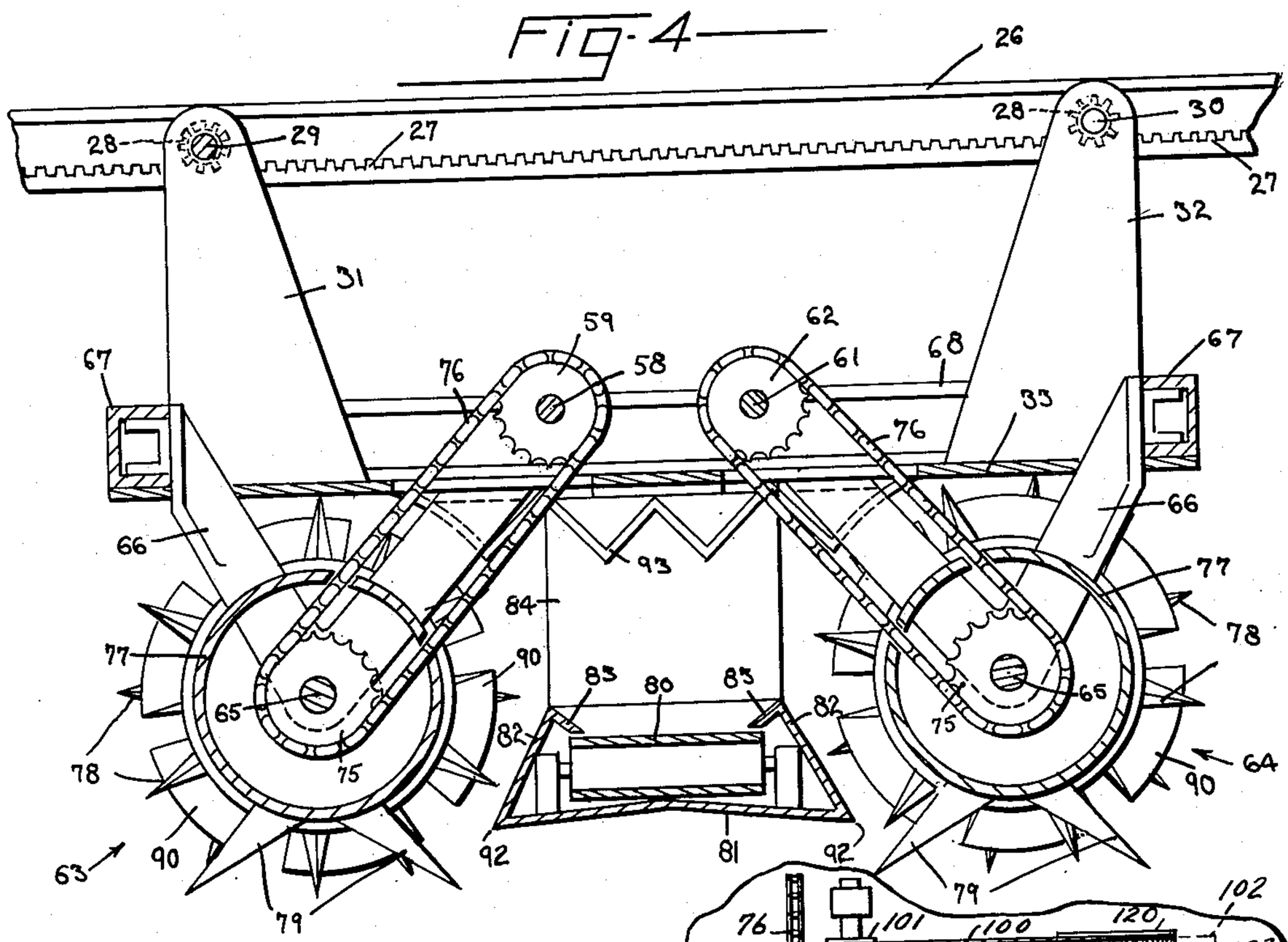
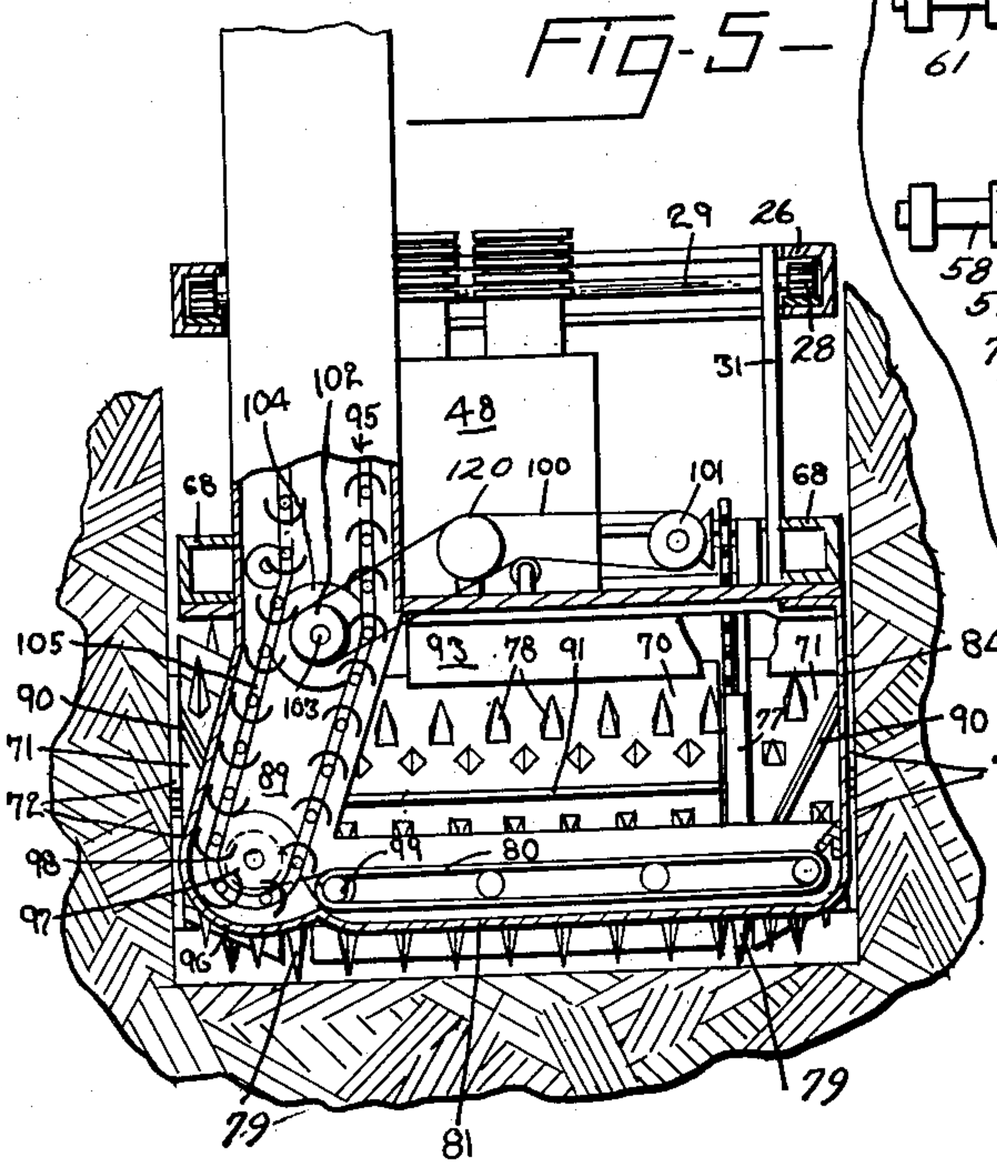


Fig-5—



INVENTOR.
GEORGE A. STEECE

BY
Boyken, Mohler & Barkley
ATTORNEYS

Jan. 6, 1953 G. A. STEECE 2,624,129

ROTARY GRAVE DIGGING EXCAVATOR

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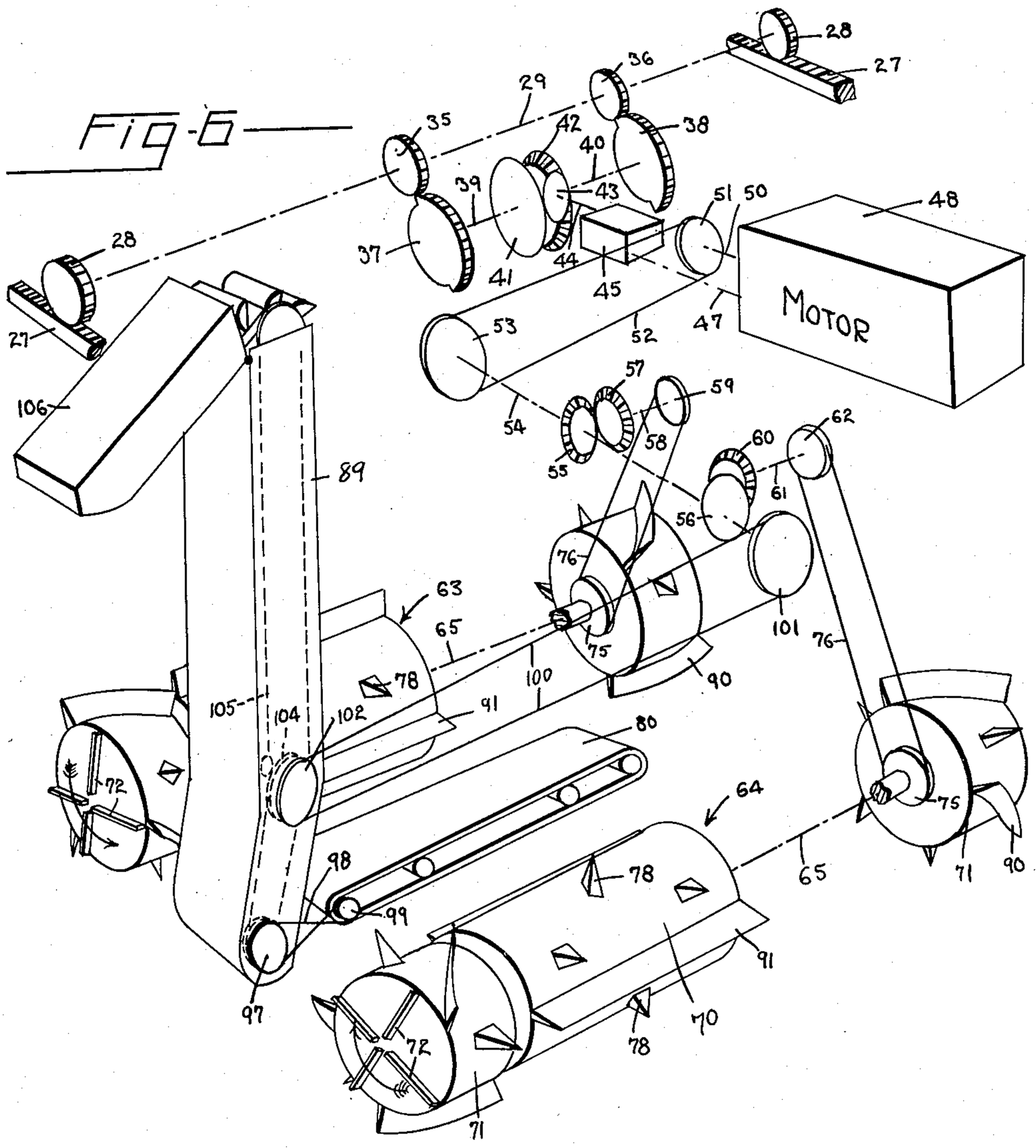
Fig-6



INVENTOR.
GEORGE A. STEECE
BY
Boyken, Mahler & Beckley
ATTORNEYS

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2,624,129

UNITED STATES PATENT OFFICE

2,624,129

ROTARY GRAVE-DIGGING EXCAVATOR

George A. Steece, San Francisco, Calif.

Application November 17, 1947, Serial No. 786,450

12 Claims. (Cl. 37—95)

1

This invention relates to a mechanical gravedigger and has for one of its objects the provision of a machine adapted to more quickly and cleanly dig graves of standard size and depth than heretofore.

Another object of the invention is the provision of a machine for digging graves that includes earth digging rotors supported for horizontal reciprocable movement as a unit for digging a grave but each rotor of which actually moves only about half the length of the grave whereby the time of digging a grave is materially decreased.

The digging of graves involves problems that are quite different from those encountered in digging ditches or in ordinary excavation work where it is relatively unimportant whether the ends of the ditch are square relative to the surface of the ground. While bucket type excavators are satisfactory for ditches they are not practical for use in excavating graves because too much time is required to shift them around for digging a grave and the graves when dug do not present sharp cut square sides. It is another object of the present invention to provide a machine for digging graves that does not require shifting or adjusting of the machine when once set in the desired position over the plot to be excavated. The machine can be operated by one operator having relatively little experience and will dig a grave in a small fraction of the time heretofore required where the graves were dug manually.

Other objects and advantages will be evident from the description and drawings.

In the drawings, Fig. 1 is a plan view of the gravedigger.

Fig. 2 is an enlarged fragmentary, part sectional, perspective view of part of the machine.

Fig. 3 is a side elevational view of the gravedigger showing the rotors in the ground and the earth in section.

Fig. 4 is an enlarged fragmentary sectional view taken transversely through the rotors and conveyor.

Fig. 5 is a reduced size part sectional and part elevational semi-diagrammatic view taken through part of the elevator and conveyor housing that is between the rotors.

Fig. 6 is a diagrammatic view showing the arrangement of the operating parts including gears, rotors, elevator and conveyor.

Fig. 7 is a top plan view of the machinery platform.

In detail, the gravedigger illustrated in the

2

drawings comprises a vehicle frame 1 supported on ground wheels 2 for movement of said frame over the ground. This frame may comprise parallel horizontal side frame members 3 carried on axles on which the wheels 2 are supported. End frame members may extend between and connect the corresponding ends of the frame members 3 and four vertical posts 4 extend upwardly from the said ends of members 3. An upper frame member 5 extends between the upper ends of posts 4 at one side of the machine and is parallel with the member 3 therebelow. At the other side of the machine and spaced from posts 4 are a pair of vertical posts 6 that extend upwardly from the frame member 3 at said other side of the machine and to which said posts 6 are secured at their lower ends. Short horizontal side frame members 7 may connect each of said posts 6 at its upper end with the corner post 4 nearest thereto. End frame members 8 connect between the upper ends of the posts 4 at the ends of the machine, and cross member 9 parallel with end member 8 may connect between the upper end of the post 6 and frame member 5.

From the foregoing it will be seen that the space between posts 6 at one side of the machine (Figs. 1, 3) is open above the lower side frame member 3 at said one side. This is to permit unobstructed movement of part of an elevator, as will later be described, part of said elevator being adapted at certain levels to extend through said open side.

At one end of the vehicle frame and between the upper ends of the posts 4, 6 at said one end, and carried by said posts, is a conventional winch operating mechanism that includes a plurality of intersecting gears, one gear 10 of which (Figs. 1, 3) is provided with a handle 11 for manually rotating said gear. A spring urged pawl 12 releasably engages the teeth of gear 10 to restrict rotation thereof in one direction except when the pawl is released.

Gear 10 is operably connected by gears in a gear box 13 with a gear 14 (Fig. 1) that is secured on a shaft 15 that in turn is journalled at its ends in bearings on frame members 5, 7.

The shaft 15 has a drum 16 secured thereto, and a cable or chain 17 depends from said drum and connects at its lower end with a horzontally extending end frame member 18 of a rectangular frame 19 that is spaced within the confines of the lower portion of the vehicle frame.

A drum 20 is also secured on shaft 15, and a cable or chain 21 is secured at one end to said

drum 20. This chain 21 extends over a pulley 22 on a shaft 23 that is journalled in bearings carried on frame members 5, 7 that are at the opposite end of the machine from shaft 15. The end of the cable or chain 21 extends downwardly from pulley 22 and is secured to the end frame member 24 of frame 19 that is opposite end member 18 with which cable 17 is connected.

The cables 17, 21 preferably connect with the end frame members 18, 24 centrally between the ends of the latter or at such points where the frame 19 is substantially balanced horizontally when suspended from said cables 17, 21. Obviously the points where they connect may vary according to the distribution of weight on frame 19, although any number of cables may be used from any desired points if desired and found necessary.

Upon rotating the gear 10 in the direction permitted by pawl 12, the frame 19 will be elevated. Drums 16, 20 are of the same diameter, hence the ends of frame 19 will be elevated at the same rate of speed. Upon releasing pawl 12, frame 19 will readily fall under the influence of gravity, and the operator may control the descent by controlling the speed of gear 10.

The frame 19 is adapted to move vertically within the vehicle frame from the top of the latter to a substantial distance below the surface of the ground and below the vehicle frame.

Side frame members 26 of frame 19 connect the corresponding ends of end frame members 18, 24 and carry racks 27 extending longitudinally of members 26 with the teeth of the racks directed upwardly. Two pairs of pinions 28 are supported on said racks, the pinions of one pair being secured on the ends of a horizontal shaft 29, and the pinions of the other pair being in axial alignment and rotatable on stub shafts 30.

The ends of shaft 29 are journalled in bearings carried at the upper ends of brackets 31 (Figs. 1, 3) while stub shafts 30 are secured to the upper ends of similar brackets 32.

The brackets 31 are secured to and project upwardly from one end of a platform 33 while the brackets 32 are at the opposite end of said platform. Thus the platform 33 is suspended from shafts 29, 30 and the latter are supported, through pinions 28, on racks 27. Horizontal reciprocation of the platform 33 on racks 27 will occur upon rotation of shaft 29.

Shaft 29 has a pair of gears 35, 36 (Figs. 1, 6) secured thereto. The teeth of gear 35 are adapted to mesh with the teeth of a segmental gear 37 while the teeth of gear 36 are adapted to mesh with the teeth of a segmental gear 38.

Gears 37, 38 are respectively secured on aligned shafts 39, 40 that are journalled in bearings carried by platform 33. The adjacent ends of shafts 39, 40 have bevel gears 41, 42, the teeth of which are in mesh with the teeth on a bevel gear 43 that, in turn, is secured on a shaft journalled in a bearing on platform 33. This gear 43 is secured on a power driven shaft 44 (Fig. 6) that is connected in any suitable manner, as by chain or belt 46 (Fig. 1) with a driving shaft 47 on motor 48, said motor being on platform 33. On the diagrammatic view (Fig. 6) the shaft 47 on gear box 45 is indicated as extending directly from the motor 48 for simplicity in the showing. Upon rotation of gear 43 the teeth on gear 37 will rotate shaft 29 sufficiently to move the platform from one end of the racks to the other end. As soon as the platform reaches said end, the

teeth of gear 37 will move out of engagement with the teeth on gear 35 and into the untoothed portion and the teeth on oppositely rotating gear 38 will engage the teeth of gear 36 to drive the platform to the opposite end of the racks. As long as shaft 44 is rotated the platform 33 will reciprocate horizontally between the ends of the racks. The number of teeth on the segmental gears 37, 38 and their relative arrangement are such as to cause the desired degree of reciprocable movement of the platform.

Motor 48 has a power take off shaft 50 that carries a pulley 51. Pulley 51 is connected by belt 52 with pulley 53 on shaft 54. The pulleys 51, 53 may be multi-V-belt pulleys or sprockets and chains may be used instead if desired, the principal thing being a suitable means for transmission of power.

The shaft 54 is rotatably supported on platform 33 in suitable bearings and carries bevel gears 55, 56 that are rigidly secured thereto.

The bevel gear 55 is in mesh with the teeth of a bevel gear 57 that is on shaft 58. Shaft 58 is journalled in bearings supported on platform 33 and has a sprocket 59 secured thereto (Fig. 6).

Bevel gear 56 is in mesh with a bevel gear 60 that is secured on shaft 61. Shaft 61, like shaft 58, is journalled in bearings supported on platform 33, and a sprocket 62 is secured on said shaft 61.

Below platform 33 is a pair of horizontal, elongated earth digging rotors 63, 64 that extend transversely of said platform or at right angles to the direction of reciprocatory travel of platform 33.

These rotors are secured on shafts 65 that are respectively journalled in bearings carried in the lower ends of hangers 66 (Fig. 4) that are secured to the end and frame members 67, 68 of frame 33 and which hangers are adjacent the ends of said frame.

Rotors 63, 64 each have cylindrical sections 70, 71 (Figs. 5, 6) secured on shafts 65. The section 70 is between each set of hangers 66 and extends to said hangers, while two sections 71 are respectively at opposite ends of each shaft 65 and outwardly of the hangers 66. Thus the hangers 66 extend between each end section 71 and the central section 70 of each rotor.

Each end section 71 carries cutting blades or cutters 72 (Fig. 3) projecting axially outwardly of the opposite outer ends of said sections 71, and these cutters also project outwardly of the oppositely outwardly facing sides of side frame members 68 and also project radially outwardly of the shafts 65 a sufficient distance to extend slightly beyond the end members 67 of platform 33.

Each shaft 65 has a sprocket 75 secured thereto between one of the corresponding end sections 71 and central section 70, and a sprocket chain 76 connects one sprocket 75 with sprocket 59 while the other chain connects the other sprocket 75 with the sprocket 62 (Fig. 4). These sprocket chains extend through openings in a cylindrical guard 77 secured on each of the hangers 66 that are adjacent sprockets 75.

The cylindrical sections 70, 71 that are secured on shafts 65 carry radially outwardly projecting earth digging spikes or elements 78 thereon and which spikes may be arranged in rows extending longitudinally of the rotors and in staggered relation so as to perform a substantially uniform cutting of the earth from end to end of the rotors.

While practically no self sustaining ridge of

earth will remain in the gaps between the sections 70, 71 under normal conditions, I provide downwardly and oppositely outwardly extending stationary cutters 79 on the lower sides of guards 77 that are sufficient to cut off any such ridges.

The rotors 63, 64 are connected with motor 48 for revolving in opposite directions with the lower sides of the rotors moving toward each other whereby the earth that is dug by the rotors will tend to be thrown into the space between said rotors by centrifugal force.

Between said rotors is a horizontally extending endless conveyor 80 that extends longitudinally of said rotors, and which conveyor is supported over a platform 81 that is elongated to extend longitudinally of said conveyor and that is preferably transversely inclined from its longitudinally extending edges to a central point below said conveyor (Fig. 4). Bearings on said platform support the conveyor, and sides 82 extend convergently upwardly past the side edges of said conveyer while downwardly and inwardly inclined side members 83 extend over the upper rim of the conveyer and keep material on the latter from falling onto the platform.

The platform 81 is secured at one end to a depending hanger 84 that is secured to platform 33 or to the frame of said platform 33, while the other end of the platform 81 may be secured to the lower end of an elevator housing 89 that in turn extends upwardly through an opening in platform 33 and that is secured to one of the frame members 68 of platform 33 (Fig. 5).

The end sections 71 of rotors 63, 64 have blades 90 secured thereto and projecting from the peripheral sides of said sections to a distance spaced inwardly from the outer ends of the digging spikes or elements 78. These blades 90 generally extend in a spiral direction relative to the axis of each rotor shaft 65 and are inclined (Fig. 6) so as to throw the dirt from the ends of the rotors generally inwardly onto the conveyer 80 and toward the center of the conveyer. Thus the earth that is dug by the sections 71 that are at opposite sides of the elevator housing will for the most part clear said housing and be deposited on the conveyer.

The central sections 70 of the rotors have straight blades 91 that assure throwing of the dug earth upwardly and over the sides 82 of platform 81 and onto the conveyer.

The conveyer platform is as low as possible between the rotors and the junctures between the sides 82 thereof and the platform 81 form cutting edges 92 that tend to cut into any heaps of loose earth or loosened earth that may not be thrown over sides 82.

Shields 93 above the rotors (Fig. 3) tend to prevent any of the thrown earth from going around the rotors after it is once between them. The blades 90, 91 also function as cutting blades, although the main digging is done by the spikes 78. The degree to which the blades 90, 91 and spikes 78 perform the cutting action depends greatly upon the character of the soil. In more or less sandy soil or light loam the blades may do much of the digging, while in harder and heavier soil, the spikes do most of the digging or loosening.

At one end of conveyer 80 is the upwardly extending elevator housing 89 that encloses a bucket elevator 95. The buckets revolve in a slight sump 96 at their lower ends and move in a direction away from the end of the conveyer so as not to tend to pile dirt on the conveyer. The lower shaft of the elevator has a pulley 97 that

connects by belt 98 with the end pulley 99 of conveyer 80. Elevator 95 is driven by a chain 100 that connects a sprocket 101 on motor driven shaft 54 with a sprocket 102 on shaft 103. Shaft 103 carries a sprocket 104 in mesh with the chains 105 of the bucket elevator (Fig. 5). Suitable idlers such as is indicated at 120 (Figs. 1, 5, 7) may be employed to direct the upper and lower runs of chain 100 as desired.

The upper end of the elevator may be laterally extended as at 106 in the conventional manner for conveying the earth carried by said elevator to a point outwardly of one side of the vehicle frame for discharge at said point.

Any suitable means, such as a cable 107 (Fig. 1) extending to a drum 108 may be employed for raising or for lowering the outer end of extension 106. No claim is made to this structure in itself.

In order to insure against the tilting of the frame 19 during raising and lowering thereof, vertical, elongated V-guide strips 110 (Fig. 2) are rigidly secured to the vehicle frame adjacent the four corners of the frame 19, and complementarily formed V-slides 111 are secured to frame 19 adjacent its four corners. The slides 111 engage guide strips 110 and thus hold frame 19 level at all times. If desired, the slides 111 can be quickly removed from frame 19 by unbolting their lower ends therefrom and by collapsing the collapsible horizontal brace elements 112 that extend between the parts of slides 111 at each end of frame 19.

In operation, the vehicle frame is rolled to a position over the rectangular grave plot where the grave is to be dug. The frame 19 is in elevated position and the downwardly projected area below said frame will practically define the outline of grave or opening to be dug in the earth.

After the vehicle 3 is in the desired position the wheels 2 are blocked by any suitable means such as blocks 115 (Fig. 1) and the motor 48 is started. This motor may be electrical or gasoline according to the facilities available. The carriage comprising the platform 33 will immediately commence its reciprocatory movement, and the rotors will revolve oppositely as already described. The operator then lowers the frame 19 by releasing gear 10, and the rotors will commence to dig the grave.

It is to be noted that the end limits of the reciprocatory movement of the rotors is such that the earth will be loosened to a point beyond the end members 18, 24 of frame 19, while the end cutters on the rotors will dig beyond the sides of frame 19.

As the earth is dug the operator may lower the rotors by release of gear 10 and the grave will be dug to progressively lower depths. The sides and ends of the excavation will be smooth and square.

It is also to be noted that each of the rotors will only move about half the length of the grave, thus the reciprocatory movement of the platform 33 is not great. The excavation is quite rapidly formed by reason of the short stroke of the rotors.

After the grave is dug, the motor may be stopped, if desired, and the frame 19 and platform 33 elevated from the grave and the machine may be moved to the next plot.

While the motor may be connected to the shaft 15 by any well known conventional means for rotating shaft 15, this is usually not found neces-

sary inasmuch as the operator can readily manipulate gear 10 to the same end. Also the motor may be connected with the vehicle wheels if desired, so as to drive the vehicle, but this would merely add to the expense of the machine, which can readily be pulled by a man to any normally positioned lot, or a drawbar can be connected with the eye 120 (Fig. 1) for pulling the vehicle.

I claim:

1. A grave digger comprising a pair of earth digging rotors in side by side relationship adapted for digging into the ground upon rotation of said rotors and upon lowering said rotors into the ground, means for rotating said rotors, means supporting said rotors for reciprocation horizontally transversely of their axes during said rotation, means for so reciprocating said rotors, means supporting said rotors for bodily downward movement during said rotation, and conveyor means for moving the earth dug by said rotors away from the latter.

2. A gravedigger comprising a pair of earth digging rotors in side by side relationship adapted for digging into the ground upon rotation of said rotors and upon lowering said rotors into the ground, means for rotating said rotors in opposite directions for moving the earth dug thereby to between said rotors, means supporting said rotors for reciprocation horizontally transversely of their axes during said rotation, means for so reciprocating said rotors, means supporting said rotors for bodily downward movement by gravity as a unit during said rotation, means for controlling the rate of speed of said downward movement, and conveyor means between said rotors for receiving the earth dug by the latter and for moving said earth away from said rotors to a point above the ground.

3. A gravedigger comprising a pair of earth digging rotors in side by side relationship adapted for digging into the ground upon rotation of said rotors and upon lowering said rotors into the ground, means for rotating said rotors, means supporting said rotors for reciprocation horizontally transversely of their axes during said rotation, means for so reciprocating said rotors, means supporting said rotors for bodily downward movement by gravity during said rotation, holding means for releasably holding said rotors from said downward movement during reciprocatory movement of said rotors, means for releasing said holding means for permitting said downward movement under the influence of gravity, and conveyor means connected with said rotors for downward and reciprocatory movement therewith and for moving the earth dug by said rotors away from the latter.

4. In a gravedigger having a carriage supported for horizontal reciprocable movement and for downward movement into the ground, a pair of horizontally elongated earth digging rotors carried by said carriage for movement therewith and in spaced side by side relation extending transversely of the direction of movement of said carriage, means for rotating said rotors oppositely so their lower sides move generally toward each other for throwing earth dug thereby by centrifugal force to between said rotors, conveyer means between said rotors for receiving the earth so thrown and for carrying said earth away from said rotors.

5. In a gravedigger having a carriage supported for horizontal reciprocable movement and for downward movement into the ground, a pair of horizontally elongated earth digging rotors

carried by said carriage for movement therewith and in spaced side by side relation extending transversely of the direction of movement of said carriage, means for rotating said rotors oppositely so their lower sides move generally toward each other for throwing earth dug thereby by centrifugal force to between said rotors, a conveyor between said rotors extending longitudinally thereof for receiving the earth so thrown by the latter and for moving said earth in one direction to one end of said rotors, an elevator at said one end for receiving the earth moved thereto and for elevating it for discharge at a point above the ground.

6. In a gravedigger having a carriage supported for horizontal reciprocable movement and for downward movement into the ground, a pair of horizontally elongated earth digging rotors carried by said carriage for movement therewith and in spaced side by side relation extending transversely of the direction of movement of said carriage, means for rotating said rotors oppositely so their lower sides move generally toward each other for throwing earth dug thereby by centrifugal force to between said rotors, conveyer means between said rotors for receiving the earth so thrown and for carrying said earth away from said rotors, means intermediate the opposite ends of said conveyors and spaced from said ends supporting said rotors for rotation thereof, cutters on the ends of said rotors for cutting earth at said ends during downward and horizontal reciprocatory movement of said rotors.

7. In a gravedigger having a carriage supported for horizontal reciprocable movement and also for downward movement into the ground, means for so supporting said carriage, a pair of horizontally elongated earth digging rotors carried by said carriage for movement therewith and in spaced side by side relationship extending transversely of the direction of movement of said carriage, means on said carriage connected with said rotors for simultaneously rotating them on their axes in opposite directions so their lower sides will move generally toward each other for delivering earth dug thereby to the space between said rotors, cutters on the ends of said rotors and bearings spaced from said ends supporting said rotors on said carriage, the said rotors having radially projecting earth digging members for digging said earth.

8. In a gravedigger having a carriage supported for horizontal reciprocable movement and also for downward movement into the ground, means for so supporting said carriage, a pair of horizontally elongated earth digging rotors carried by said carriage for movement therewith and in spaced side by side relationship extending transversely of the direction of movement of said carriage, means on said carriage connected with said rotors for simultaneously rotating them on their axes in opposite directions so their lower sides will move generally toward each other for delivering earth dug thereby to the space between said rotors, cutters on the ends of said rotors and bearings spaced from said ends supporting said rotors on said carriage, the said rotors having radially projecting earth digging members for digging said earth, said means for so supporting said carriage including a wheel mounted vehicle adapted to move over the ground.

9. In a gravedigger having a carriage supported for horizontal reciprocable movement and also for downward movement into the ground,

means for so supporting said carriage, a pair of horizontally elongated earth digging rotors carried by said carriage for movement therewith and in spaced side by side relationship extending transversely of the direction of movement of said carriage, means on said carriage connected with said rotors for simultaneously rotating them on their axes in opposite directions so their lower sides will move generally toward each other for delivering earth dug thereby to the space between said rotors, cutters on the ends of said rotors and bearings spaced from said ends supporting said rotors on said carriage, the said rotors having radially projecting earth digging members for digging said earth, a horizontally disposed frame having tracks thereon for supporting said carriage for said reciprocable movement of the latter, and a vehicle frame adapted to be supported on the surface of the ground supporting said horizontally disposed frame for downward movement thereof.

10. In a gravedigger that includes a wheel mounted vehicle frame adapted for movement over the ground, a horizontally disposed frame within the confines of said vehicle frame, means supporting said horizontal frame on said vehicle frame for downward movement of said horizontal frame into the ground and to a position below said vehicle frame, a carriage, a pair of horizontally elongated earth digging rotors mounted on said carriage in spaced side by side relationship, means on said horizontal frame supporting said carriage and rotors for bodily reciprocable movement as a unit in a direction transversely of the said rotors between positions at two opposite sides of said frame with one of said pair projecting laterally beyond said frame at said opposite sides respectively, means for simultaneously rotating said rotors so their lower sides will move toward each other for delivering earth dug thereby to the space between said rotors, power means for so reciprocating said rotors as a unit and means on said carriage supporting an elevator thereon for movement therewith, conveyer means on said carriage for conducting earth dug by said rotors to said elevator.

11. In a gravedigger that includes a wheel mounted vehicle frame adapted for movement over the ground, a horizontally disposed frame within the confines of said vehicle frame, means supporting said horizontal frame on said vehicle frame for downward movement of said horizontal frame into the ground and to a position below said vehicle frame, a carriage, a pair of horizontally elongated earth digging rotors

mounted on said carriage in spaced side by side relationship, means on said horizontal frame supporting said carriage and rotors for bodily reciprocable movement as a unit in a direction transversely of said rotors between positions at two opposite sides of said frame with one of said pair projecting laterally beyond said frame at said opposite sides respectively, means for simultaneously rotating said rotors so their lower sides will move toward each other for delivering earth dug thereby to the space between said rotors, power means for so reciprocating said rotors as a unit and means on said carriage supporting an elevator thereon for movement therewith, conveyer means on said carriage for conducting earth dug by said rotors to said elevator, rigid guides on said vehicle frame engaging said horizontal frame for holding the latter against lateral movement during said movement of said horizontal frame into the ground.

12. In a gravedigger that includes a wheel mounted vehicle frame adapted for movement over the ground, a horizontally disposed frame within the confines of said vehicle frame, means supporting said horizontal frame on said vehicle frame for downward movement of said horizontal frame into the ground and to a position below said vehicle frame, a carriage, a pair of horizontally elongated earth digging rotors mounted on said carriage in spaced side by side relationship, means on said horizontal frame supporting said carriage and rotors for bodily reciprocable movement as a unit in a direction transversely of said rotors between positions at two opposite sides of said frame with one of said pair projecting laterally beyond said frame at said opposite sides respectively, means for simultaneously rotating said rotors so their lower sides will move toward each other for delivering earth dug thereby to the space between said rotors, power means for so reciprocating said rotors as a unit and means on said carriage supporting an elevator thereon for movement therewith, conveyer means on said carriage for conducting earth dug by said rotors to said elevator, the means supporting said carriage and rotors for reciprocable movement including pinions carried by said carriage, and horizontal parallel racks on said horizontal frame supporting said pinions thereon with the teeth of said pinions in mesh with the teeth of said racks.

GEORGE A. STEECE.

No references cited.