Dec. 29, 1970 M. I. FEWELL 3,550,294

GRAVE DIGGER

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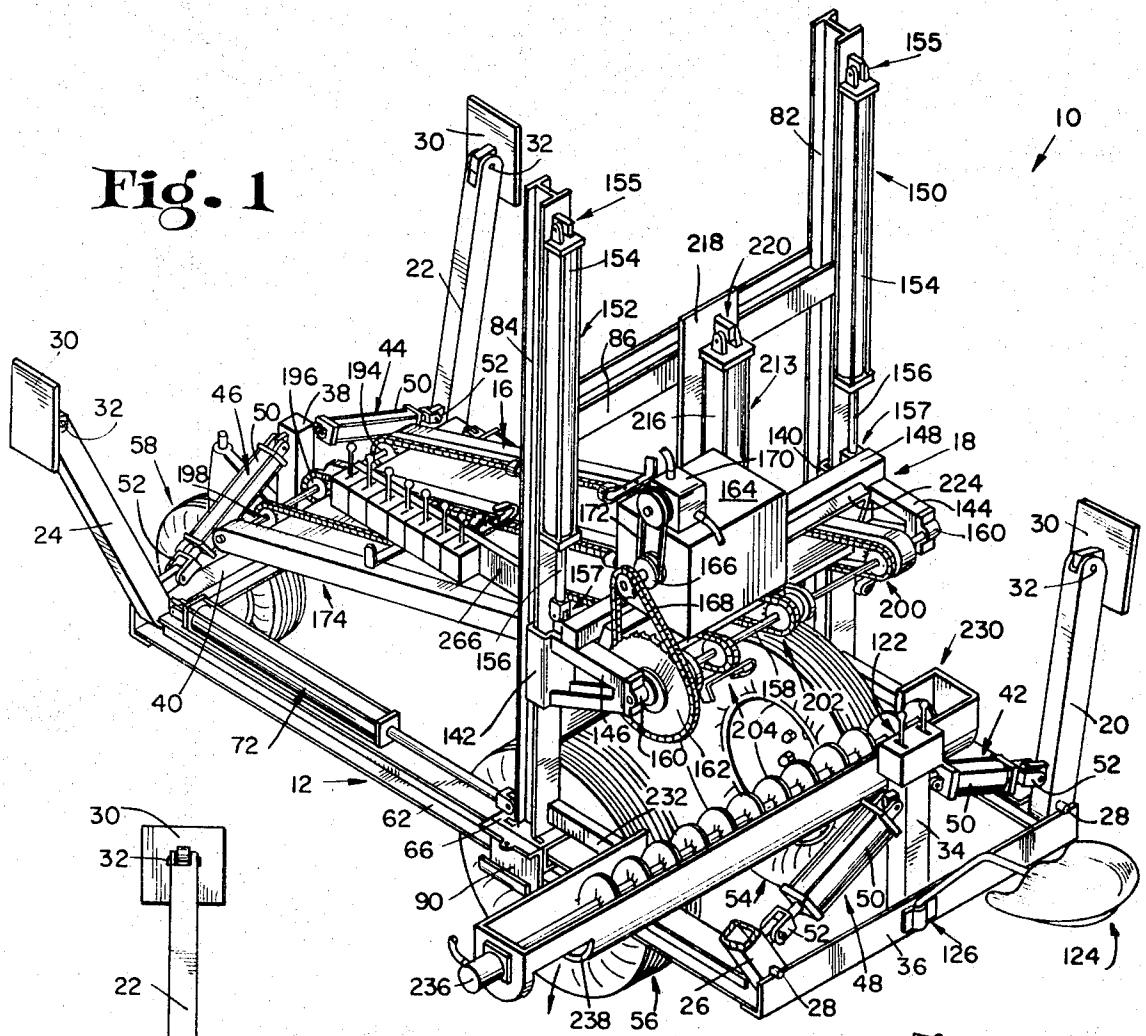
Fig. 1



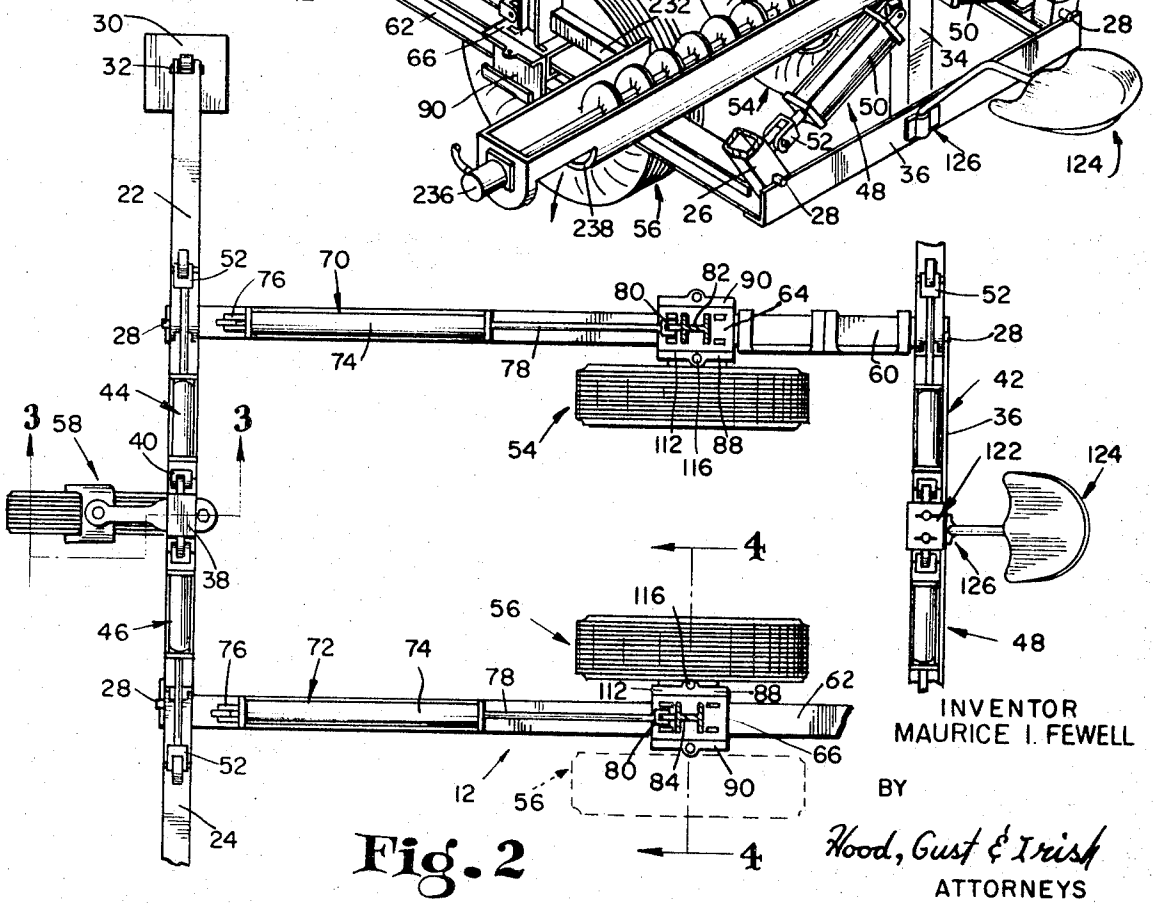


Fig. 2

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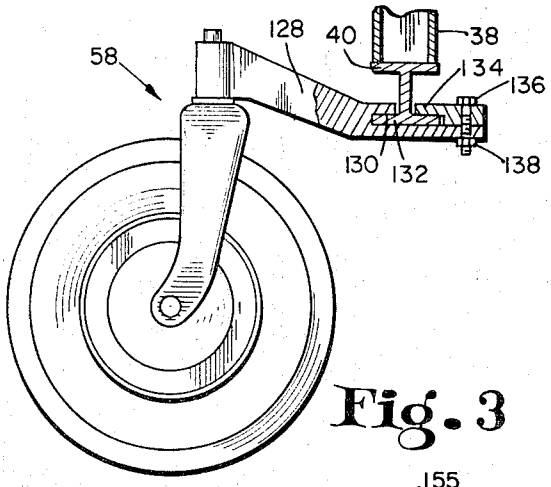

Fig. 3

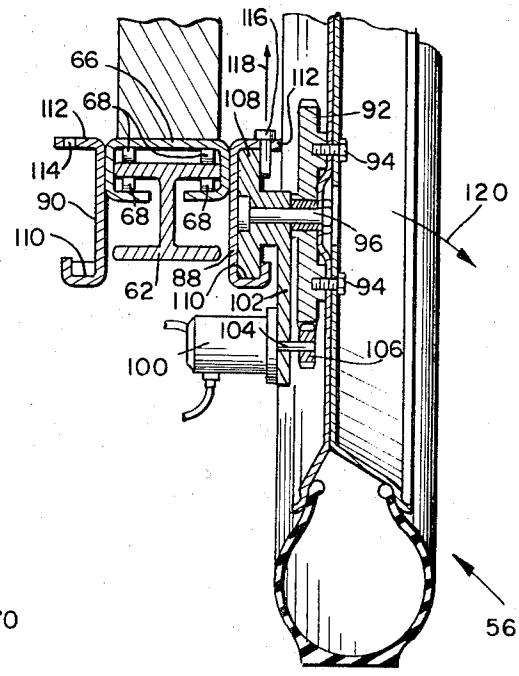

Fig. 4

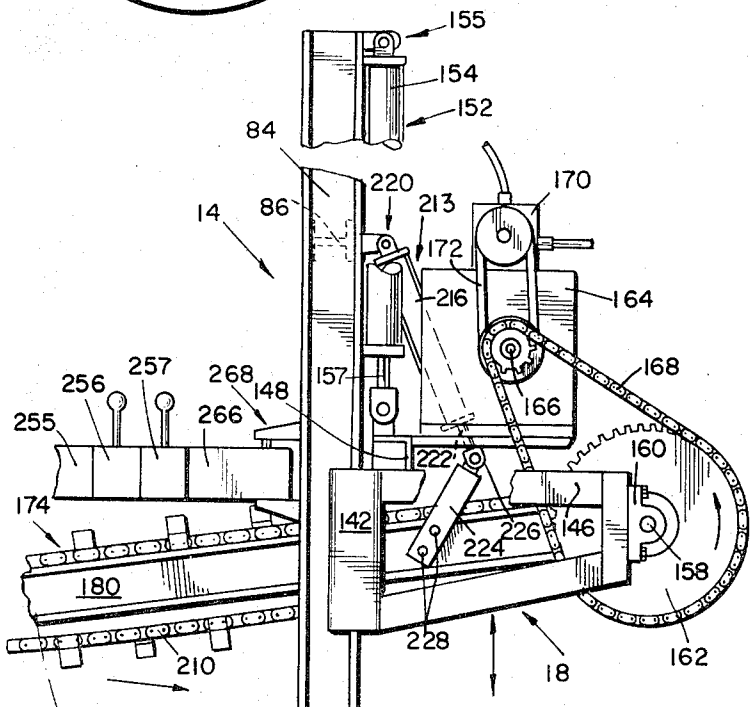

Fig. 5

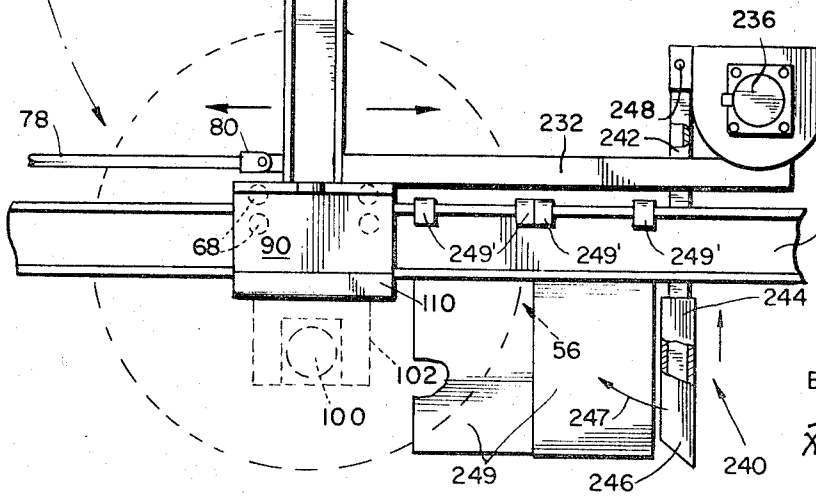

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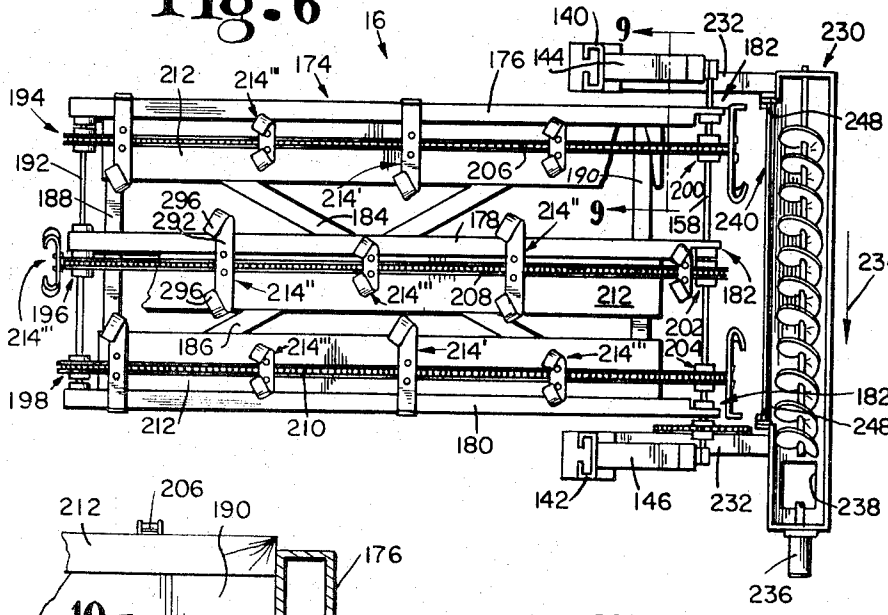
Fig. 6



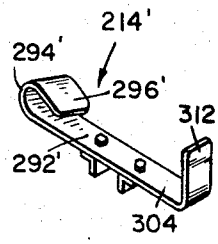


Fig. 7

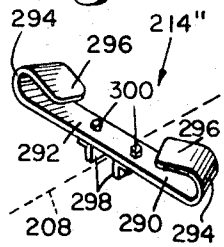


Fig. 8

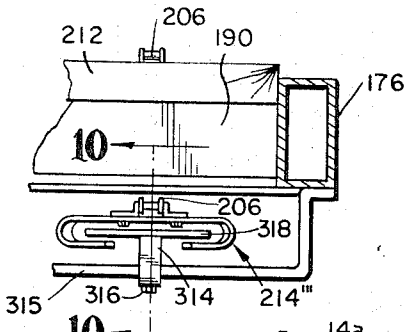


Fig. 9

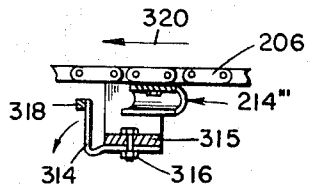


Fig. 10

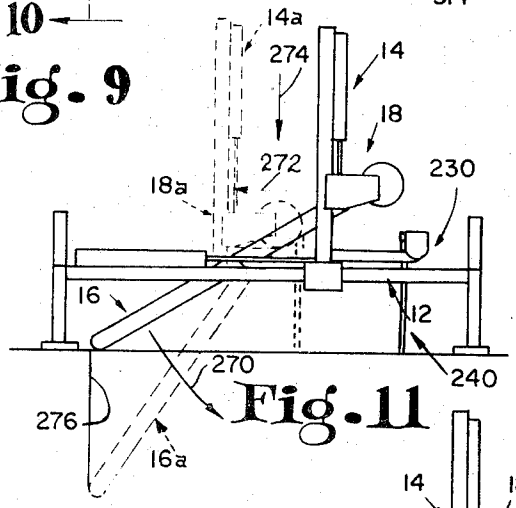


Fig. 11

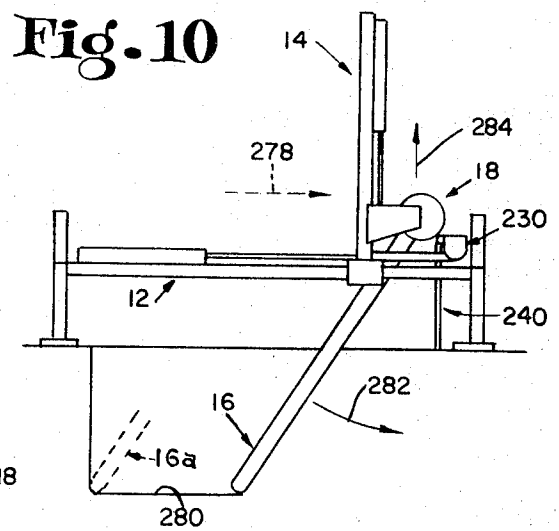


Fig. 12

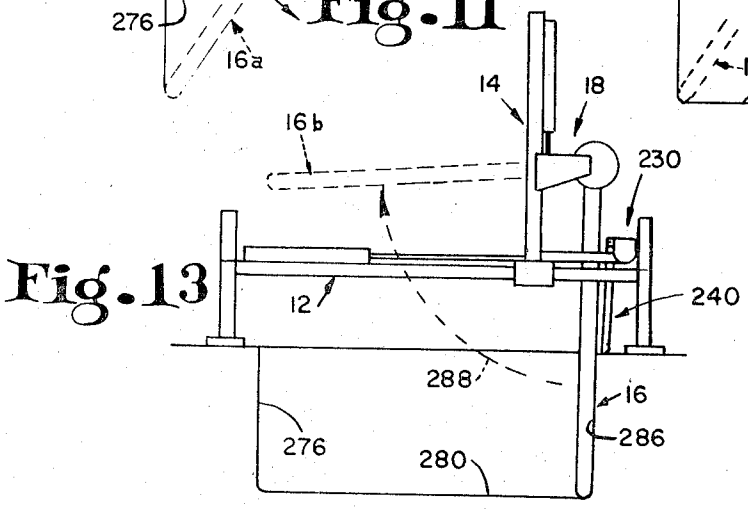


Fig. 13

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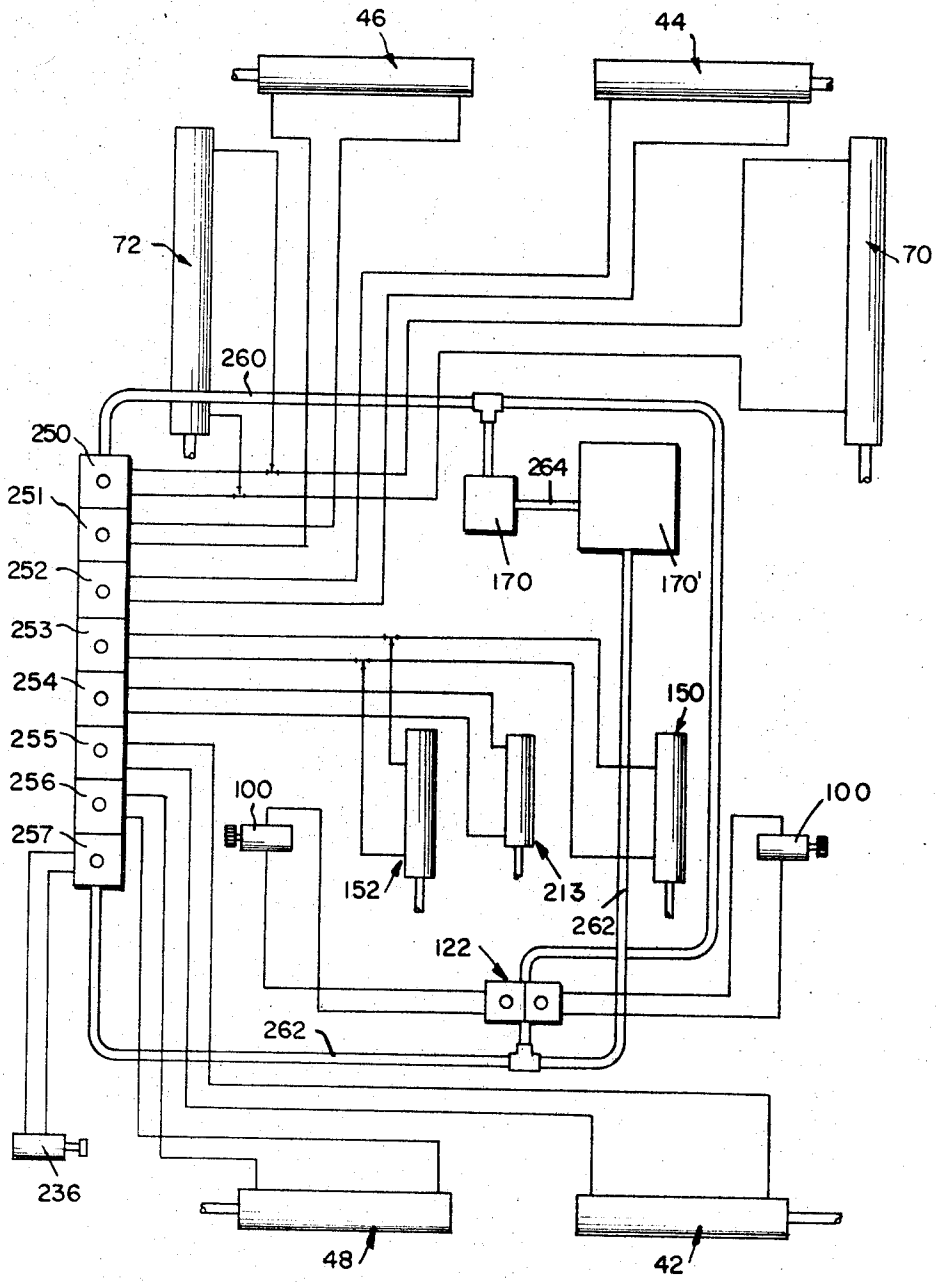

Fig. 14

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United States Patent Office 3,550,294 Patented Dec. 29, 1970

3,550,294

GRAVE DIGGER

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Filed Feb. 28, 1968, Ser. No. 708,902
Int. Cl. E02f 3/14, 9/28
U.S. Cl. 37—191 10 Claims

ABSTRACT OF THE DISCLOSURE

An excavating apparatus comprising a boom-type digger supported for pivotal movement about one of its ends, for generally vertical reciprocation and for generally horizontal reciprocation in a direction generally perpendicular to its pivot axis. The boom-type digger delivers earth to an auger which conveys the earth away from the apparatus. The apparatus is movably supported by independently driven wheels. The digger includes endless chains which carry teeth formed from metal strips to have main body portions, curved portions at each end of each main body and an extension portion connected to each curved portion. Each curved portion of a tooth is formed about an axis which defines an acute angle with the run of the chain to which the tooth is connected so that the extension portions of the tooth extend forwardly of its body portion in the direction of movement of the tooth.

It is a primary object of my invention to provide an excavating apparatus which is particularly suitable for digging graves and which is characterized by its compactness and maneuverability.

My apparatus comprises a boom-type digger having teeth carried by endless chains and is compact because its boom is supported for pivotal movement about a horizontal axis at one of its ends, the one end of the digger being supported for both vertical and horizontal reciprocation. The digger can be pivoted from a generally horizontally extending position to a generally vertically extending position.

Since a grave digging apparatus must be extremely manueuverable, I have provided a pair of independently driven wheels for supporting the digger, the wheels being mounted on brackets which are mounted for reciprocation on the main supporting frame of the digger. At a grave site, the wheels can be easily removed and the main frame supported on leveling arms which are preferably hydraulically actuated.

Another object of my invention is to provide such an apparatus which is arranged so that the earth removed from the grave can be collected without spillage about its perimeter. In connection with this object, I have provided an auger arranged to convey the earth away from the apparatus.

Still another object of my invention is to provide such an excavating apparatus comprising teeth which will cut into any type of soil and which can be easily cleaned during the digging operation. My preferred tooth structure will be described in greater detail hereinafter.

Other objects and features of the present invention will become apparent as this description progresses.

In the drawings:

FIG. 1 is a perspective view, partially cut away, of a preferred embodiment of my excavating apparatus;

FIG. 2 is a sectional plan view, also partially cut away, showing the main supporting frame of the apparatus;

FIG. 3 is an enlarged, fragmentary, sectional view taken from FIG. 2 generally along the line **3—3**;

FIG. 4 is an enlarged, fragmentary, sectional view taken from FIG. 2 generally along the line **4—4**;

FIG. 5 is an enlarged, fragmentary, elevation view of

the apparatus showing particularly the manner in which the digger is supported for pivotal movement about a horizontal axis;

FIG. 6 is a plan view of the digger;

FIG. 7 is a perspective view of one type of tooth used on the digger;

FIG. 8 is a perspective view of another type of tooth used on the digger;

FIG. 9 is a fragmentary, sectional view, slightly enlarged, taken from FIG. 6 generally along the line **9—9** and showing a means for cleaning the teeth of the digger;

FIG. 10 is a fragmentary, sectional view taken from FIG. 9 generally along the line **10—10**;

FIG. 11 is a somewhat diagrammatic view of the apparatus showing the manner in which the excavation of a grave is started;

FIG. 12 is another such diagrammatic view showing a further step in the excavation of the grave;

FIG. 13 is still another diagrammatic view showing the final step in the excavation of the grave; and

FIG. 14 is a schematic view of a hydraulic control system for controlling the operation of my excavating apparatus.

Referring now to the drawings, and particularly to FIG. 1, it will be seen that my apparatus **10** comprises a main horizontal support frame **12**, a vertical frame **14**, a digger **16** pivotally supported at one end on a support **18**, the support **18** being mounted for vertical reciprocation on the vertical frame **14**. The vertical frame **14** is mounted for reciprocation in a direction perpendicular to the pivot axis of the digger **16** on the frame **12**. A leveling arm **20, 22, 24, 26** is disposed at each of the four corners of the frame **12**, each leveling arm being pivotally connected to the frame **12** by means of a pin **28**. A shoe **30** is pivotally connected to the distal end of each arm by means of a pivot pin **32** which is generally parallel to the pivot pin **28** at the other end of the arm.

A rigid, vertical column **34** is disposed at the rear end **36** of the frame **12** and another rigid, vertical column **38** is disposed at the forward end **40** of the frame **12**. A fluid motor **42, 44, 46, 48** is operatively connected to each arm **20, 22, 24, 26** and arranged to pivot the arm downwardly so that its shoe **30** will engage the ground to support and level the frame **12**. The fluid motor **42** is connected between the column **34** and the arm **20**, the fluid motor **44** is connected between the column **38** and the arm **22**, the fluid motor **46** is connected between the column **38** and the arm **24** and the fluid motor **48** is connected between the column **34** and the arm **26**. In the illustrative embodiment, each fluid motor **42, 44, 46, 48** comprises a hydraulic cylinder **50** pivotally connected to its associated column **34, 38** and a piston rod pivotally connected to its associated arm **20, 22, 24, 26** as indicated at **52**.

In position over a grave site, the frame **12** can be supported entirely by the leveling arms **20, 22, 24, 26**. In order to transport the apparatus **10** to a grave site, I have provided a pair of independently driven drive wheels **54** and **56** and a caster **58**, each drive wheel **54, 56** being disposed at a side of the frame **12** (FIG. 2) and the caster **58** being disposed in the center of the forward end **40** of the frame **12**. The manner in which the wheels **54** and **56** and the caster **58** are mounted to support the frame **12** will be discussed further along in this description.

The frame **12** comprises a pair of parallel, spaced apart tracks **60** and **62** (clearly seen in FIG. 2) which, in the illustrative embodiment, are steel I beams having a cross section such as that shown in FIG. 4. Thus, as seen in FIG. 2, the frame **12** is a rectangular frame, the longest sides of which are defined by the tracks **60, 62**. A bracket **64, 66** is arranged for longitudinal reciprocation

on each of the tracks **60, 62**. In the illustrative embodiment, each bracket **64, 66** is mounted for reciprocation on the upper flange of the beam **60, 62** (FIG. 4) and antifriction means **68** are arranged to support the bracket on the track. A fluid motor **70, 72** (clearly seen in FIG. 2) is operatively connected to each bracket **64, 66** and arranged to reciprocate the bracket on its track **60, 62**. In the illustrative embodiment, each fluid motor **70, 72** comprises a hydraulic cylinder **74** connected to its track **60, 62** as indicated at **76** and a piston rod **78** connected to its bracket **64, 66** as indicated at **80**.

The vertical support frame **14** comprises a pair of parallel, spaced apart tracks **82** and **84** which, in the illustrative embodiment, are also steel beams having the cross section shown in FIG. 2. The track **82** is welded or otherwise securely fastened to the bracket **64** and the track **84** is welded or otherwise securely fastened to the bracket **66**. Thus, the tracks **82, 84** reciprocate with the brackets **64, 66**. A cross beam **86** is welded or otherwise securely fastened between the tracks **82, 84** as clearly seen in FIG. 1 to hold the tracks in their parallel, spaced apart relationship.

An inner and outer wheel support bracket **88, 90** is welded or otherwise securely fastened to each bracket **64, 66** so that the wheels **54, 56** can be selectively mounted either between the tracks **60, 62** or outside of the tracks **60, 62**. Specifically, in the illustrative embodiment as best seen in FIG. 4, each wheel, **54, 56** carries a spur gear **92** which is mounted concentric with the axis of the wheel by means such as the illustrated screws **94** and the spur gear **92** and wheel are journal mounted on a hub **96** which extends outwardly from a member **98**. A hydraulic motor **100** is mounted on an extension portion **102** of the member **98** so that its output shaft **104** extends generally parallel to the hub **96**. A pinion **106** mounted on the output shaft **104** for rotation therewith is engaged with the spur gear **92** so that, when the motor **100** is energized, the wheel **54, 56** is driven relative to its support member **98**.

Each member **98** is provided with an enlarged portion **108** which can be releasably fastened either to an inner support bracket **88** or to an outer support bracket **90**. Specifically, each bracket **88, 90** is provided with a socket portion **110** for receiving the lower end of the portion **108** and an outwardly extending upper portion **112** having a hole **114** formed therein for receiving a pin **116** which engages the upper portion of the member **108** to hold the member in the bracket **88, 90**. It will be apparent that, when the pin **116** is pulled in the direction of the arrow **118**, the entire wheel assembly can be pivoted in the direction of the arrow **120** and thereby disconnected from the bracket **88**.

From the above description, it will be clear that the wheels **54, 56** can be mounted either on the inside or on the outside of the frame **12** and that the brackets **88, 90** on which the wheels are mounted can be reciprocated along the track **60, 62** of the frame **12**. This versatile mounting capability provides for great maneuverability of the apparatus **10**. For instance, the wheels **54** can be placed on the inside of the frame **12** so that the apparatus **10** can be moved between closely spaced tombstones, shrubs and the like. Further, the capability of moving the brackets **88, 90** longitudinally along the tracks **60, 62** greatly enhances the cornering or turning capability of the apparatus **10**. That is, in order to make a very sharp turn, the wheels **54, 56** can be moved closer to the caster **58**. Of course, the wheels **54, 56** must be removed from their positions inside the frame **12** before excavation of a grave can be started.

The hydraulic motor **100** for each wheel **54, 56** is reversible and the control valves for the motors, indicated generally by the reference numeral **122**, are disposed at the top of the column **34** at the rear **36** of the frame **12**. I have provided a seat **124** which is releasably connceted to the rear end **36** of the frame **12** as indicated at **126**. A person sitting in the seat **124** can operate the valves **122** to steer the apparatus **10**. I have found that, because each wheel **54, 56** is independently driven and because the positions of the wheels relative to the frame **12** can be adjusted, the maneuverability of my apparatus **10** is greatly increased.

Further to enhance the maneuverability of my apparatus **10**, I have provided means for removably fastening the caster **58** to the front end **40** of the frame **12** so that the caster can be mounted selectively on the outside or the inside of the frame. In the illustrative embodiment, the caster **58** is mounted on a member **128** which is arranged to be releasably clamped to the lower flange of the beam defining the front end **40** of the frame **12**. Specifically, referring to FIG. 3, it will be seen that the member **128** is provided with a deep groove **130** for receiving one side of a flange **132** and that a toe clamp **134** is mounted on the member **128** and arranged to engage the other side of the flange **132**, thereby releasably to fasten the member **128** to the flange **132**. The toe clamp **134** secured to the member **128** by means of the bolt **136** and nut **138**. Of course, the caster **58** must be moved from its position inside the frame **12** before excavation of the grave can begin.

The support **18** is mounted for vertical recprocation on the tracks **82, 84** of the vertical frame **14**. In the illustrative embodiment, the support **18** comprises a slider **140, 142** mounted on each track **82, 84** for reciprocation therealong and a framework **144, 146** welded or otherwise securely fastened to each slider **140, 142** as shown in FIGS. 1 and 5. The frameworks **144, 146**, are tied together by a cross bar **148** welded or otherwise securely fastened thereto. fluid motors **150, 152** are provided for reciprocating the support **18** on the tracks **82, 84**. In the illustrative embodiment, each fluid motor **150, 152** comprises a hydraulic cylinder **154** connected to its track **82, 84** as indicated at **155** and a piston rod **156** connected to its slider **140, 142** as indicated at **157**.

An axle **158** is journal mounted between the distal ends of the frameworks **144, 146** as shown in FIG. 1 and 5, the axis of the axle **158** coinciding with the aforementioned pivot axis of the digger **16**. Specifically, in the illustrative embodiment, a bearing block **160** is mounted on the distal end of each framework **144, 146** and the ends of the axle **158** are supported in these bearing blocks. A sprocket **162** is mounted on the axle **158** and keyed to the axle for rotation therewith. A driving means **164** is mounted on the support **18** and is drivingly connected to the sproket **162**. The driving means **164** may be a gasoline engine or some other suitable means for driving a shaft. In FIGS. 1 and 5, I have shown the driving means **164** comprising an output shaft **166** which is drivingly connected to the sprocket **162** by means of a chain **168**. Also, I have shown a conventional hydraulic pump **170** drivingly connected to the shaft **166** by means of a V-belt **172**. The pump **170**, which will be discussed in greater detail in conjunction with FIG. 14, is connected to the various hydraulic cylinders comprising my apparatus **10**.

The illustrative digger **16** comprises a boom assembly **174** comprising three boom arms **176, 178, 180** (FIG. 6) the proximal ends of which are pivotally mounted on the axle **158** as indicated by the reference numeral **182**. The boom arms **176, 178** and **180** are secured together by cross members **184** and **186** and end members **188** and **190**. Preferably, the boom arms **176, 178** and **180**, cross members **184** and **186** and the end members **188** and **190** are all fabricated from steel and welded together to provide a rigid boom assembly **174** which is as wide as a normal grave.

A shaft **192** is mounted at the distal end of the boom assembly **174**, the shaft **192** being parallel with the axle **158**. Mounted for rotation on the shaft **192** are three spaced apart sprockets **194, 196, 198**. Mounted on the axle **158** for rotation therewith are three spaced apart sprockets **200, 202, 204**. A chain **206, 208, 210** is trained about each pair of sprockets **194** and **200**, **196** and **202**, **198** and **204** as shown clearly in FIG. 6. Bearing members **212** are

mounted on the boom assembly **174** to provide bearing surfaces for the chains **206, 208, 210.** These bearing numbers **212** may be wooden boards secured by screws or other similar means to the boom assembly **174.** A plurality of teeth **214', 214'', 214'''** is mounted on each chain **206, 208, 210.** My preferred structure for these teeth will be discussed further along in this description.

I have provided a fluid motor **213** for pivoting the boom assembly **174** about the axle **158.** In the illustrative embodiment, this fluid motor **213** comprises a hydraulic cylinder **216** pivotally mounted on a member **218** as indicated at the reference numeral **220,** the member **218** being welded or otherwise securely fastened to the cross bar **86,** and a piston rod **222** (FIG. 5) pivotally connected to a brace **224** as indicated at **226.** The brace **224,** which spans the boom assembly **174,** is rigidly attached to the boom assembly by means such as the illustrated screws **228** (FIG. 5).

As shown clearly in FIGS. 1, 5 and 6, I have provided an auger, indicated generally by the reference numeral **230,** supported by brace members **232** extending rearwardly respectively from the tracks **82** and **84** of the frame **14.** The axis of the auger **230,** in the illustrative embodiment, is generally parallel to the axle **158.** Further, the auger **230,** which is driven by a fluid motor **236,** is arranged to convey earth in the direction of the arrow **234** (FIG. 6) away from the apparatus **10.** It will be clear, however, that, in some embodiments, it may be advisable to arrange the auger **230** so that earth can be conveyed in either direction therealong merely by reversing the fluid motor **236.**

I have shown an opening **238** in the trough of the auger **230,** which opening is arranged to deposit earth into another conveyor (not shown) or some other means for conveying earth away from the grave site. Further, in some instances, it will be desirable to deposit the earth into a hopper which is left at the grave site.

Referring to FIG. 5, it will be seen that I have provided a telescoping fender or shield means **240** pivotally connected to the auger **230** as indicated at **248.** The shield means **240,** which extends alongside the auger **230** between the brace members **232,** is effective to deflect the earth removed by the digger **16** upwardly into the auger.

The shield means **240** comprises a first panel member **242** connected to the auger **230** for pivotal movement about the axis indicated at **248** and a second panel member **244** telescopically disposed on the member **242.** The lower edge portion **246** of the member **244** will engage the ground and will prevent the flow of earth under and to the right of (FIG. 5) the auger **230.** The shield means **240** is pivotally movable in the direction of the arrow **247** from its illustrated vertical position to a position in which it is held when the apparatus **10** is moved between grave sites.

I will provide side shields **249** (FIG. **5**) with hook portions **249'** for preventing movement of earth laterally under the tracks **60** and **62.** The operator of the apparatus **10** can install and remove these shields **249** as needed to cause the earth to move toward the shield means **240.**

The shield means **240** and the side shields **249** provide walls which contain the earth drawn up from a grave by the digger **16.** That is, the shield means **240** and side shields **249** cause the earth brought out of the grave by the digger **16** to pile up between the digger and the auger **230** to form an earth ramp which directs or guides the loose earth upwardly into the auger. The digger **16** drags the earth out of the grave and upwardly into the space bounded by the shield means **240** and shields **249.** Since one end of the digger **16** is higher than the auger **230** and since the digger is progressively pivotally moved toward the shield means **240** as will be seen in FIGS. 11, 12 and 13, the earth is moved by the digger into the auger. The concept of using an earth ramp to direct loose earth upwardly into a lateral conveyor is disclosed in U.S. Pat. 2,708,798 issued May 24, 1955.

Referring now to FIG. 14, a hydraulic control system for my apparatus **10** will be discussed. The control system comprises a plurality of valves **250, 251, 252, 253, 254, 255, 256, 257** and the valves **122** discussed previously connected to the hydraulic pump **170.** Specifically, the output side of the pump **170** is connected to the input side of each of the valves **250–257** and **122** by lines **260** and the return side of each of these valves is connected to a storage tank **170'** by a line **262.** The storage tank **170'** is connected to the input side of the pump **170** by a line **264.**

The valve **250** is arranged to control the fluid motors **70, 72;** the valve **251** is arranged to control the fluid motor **46;** the valve **252** is arranged to control the fluid motor **44;** the valve **253** is arranged to control the fluid motors **150, 152;** the valve **254** is arranged to control the fluid motor **213;** the valve **255** is arranged to control the fluid motor **42;** the valve **256** is arranged to control the fluid motor **48;** the valve **257** is arranged to control the fluid motor **236;** and the valves **122** are arranged to control the fluid motors **100.**

In the illustrative embodiment, the valves **250–257** are all carried on a member **266** which is swingably mounted on the track **84** as indicated by the reference numeral **268** in FIG. 5. Thus, an operator of my apparatus **10** can position the valves **250–257** about the axis of the connection **268** conveniently to locate the valves for use during the operation of the apparatus **10.**

Referring now to FIGS. 11, 12 and 13, the manner in which my apparatus **10** can be used to dig a grave will be discussed.

First, the frame **12** is positioned over a grave site and levelled as discussed previously. Then, the vertical frame **14,** digger **16** and support **18** are moved to their illustrated, solid-line positions of FIG. 11. From these positions, the digger **16** is moved to its illustrated broken-line position **16*a*** to define the first end wall **276** of the grave. It will be apparent that, in order to achieve the position **16*a*** while maintaining the wall **276** vertical, the frame **14,** digger **16** and support **18** all must be moved simultaneously. Specifically, the digger **16** must be tilted in the direction of the arrow **270** toward its position **16*a*** while the frame **14** is being moved in the direction of the arrow **272** to its broken-line position **14*a*** and the support **18** is being lowered in the direction of the arrow **274** to its broken-line position **18*a*.**

The digger **16** is then moved from its position **16*a*** in the direction of the arrow **278,** i.e., the frame **14** is reciprocated on the frame **12** from its position **14*a*** to its solid-line position illustrated in FIG. 12, to define the bottom **280** of the grave. From its solid-line position in FIG. 12, the digger **16** is tilted in the direction of the arrow **282** while the support **18** is lifted vertically in the direction of the arrow **284** until the solid-line position of the digger **16** shown in FIG. 13 is achieved. The illustrated solid-line position of the digger **16** in FIG. 13 defines the opposite end wall **286** of the grave. Since the digger **16** is as wide as a normal grave, its movements as illustrated in FIGS. 11, 12 and 13 will completely excavate a grave. From its solid-line position in FIG. 13, the digger **16** is tilted in the direction of the arrow **288** to its position **16*b*** above the grave.

All of the movements illustrated in FIGS. 11, 12 and 13 are accomplished by manipulation of the valves **250, 253** and **254.** That is, the valve **250** is operated to reciprocate the frame **14** on the frame **12,** the valve **253** is operated to reciprocate the support **18** on the frame **14** and the valve **254** is operated to tilt the digger **16** on the support **18.**

Referring now to FIGS. 7 and 8, the preferred structure for the teeth **214', 214'', 214'''** will be discussed. The tooth **214'** (FIG. **7**) is proportioned and designed to cut a flat side wall for a grave and the tooth **214''** (FIG. 8), which is my basic tooth structure, is proportioned and

designed to operate effectively in all types of soil in all types of weather conditions.

The tooth 214'' is fabricated by forming a steel strap **290** to have a main body portion **292**, a curved portion **294** at each end of the main body portion **292** and an extension portion **296** extending from each curved portion **294** parallel to the main body portion **292**. Brackets **298** are connected to the mid-point of the main body portion **292** by fastening means indicated at **300**. The brackets **298** are utilized to connect the tooth 214'' to one of the chains **206**, **208**, **210**, a run of the chain **208** being indicated by a dashed-line in FIG. 8. Preferably, the main body portion **292** will extend perpendicularly to the run of the chain and parallel to the axle **158**. Each of the curved portions **294** is formed about an axis which defines an acute angle with the chain **208** at a point to the rear of the tooth 214'', i.e., to a point on the chain which follows the tooth as it moves about its path. Thus, the extension portions **296** extend forwardly of the main body. portion **292** to provide leading edges for the tooth 214''.

The curved portion **294** and extension portion **296** at each end of the main body portion **292** provides a pocket or space for receiving the earth and for dragging the earth upwardly from the excavation.

The illustrated teeth 214''' (FIG. 6) are similar to the teeth 214'' except that the main body portions and extension portions of the teeth 214''' are shorter than the main body portions **292** and extension portions **296**, respectively, of the teeth 214''. As seen in FIG. 6, a tooth 214''' is located on the chain **208** just behind each tooth 214'' and a tooth 214''' is located behind each tooth 214' on the chains **206** and **210**.

Each tooth 214' comprises a metal strap **304** formed to have a main body portion **292'**, a curved portion **294'** and an extension portion **296'** at one end of the main body portion **292'** and another extension portion **312** at the opposite end of the main body portion **292'**. The curved portion **294'** and extension portion **296'** (FIG. 7) correspond respectively to the curved portions **294** and extension portions **296** of the tooth 214''. The extension portion **312** which is bent at a right angle to the main body portion **306** is effective to cut a flat side wall for a grave.

Referring now to FIGS. 9 and 10, an illustrative means for cleaning the teeth **214** will be discussed. In FIGS. 9 and 10, it will be seen that I have illustrated a member **314** secured to a member **315** extending under the boom assembly **174** by means of a screw **316**, the member **314** having a portion extending upwardly toward the chain **206**. A steel spring **318** is welded or otherwise securely fastened to the upper end of the member **314** so that it will extend generally parallel to the main body portions of the teeth **214** carried on the chain **206**. The ends of the spring **318** extend into the pockets or spaces formed by the curved portions **294** of the teeth **214** to remove earth from such pockets or spaces. Specifically, when the illustrated tooth 214''' moves in the direction of the arrow **320** (FIG. 10), each end of the member **318** will wipe away the earth being carried by the tooth 214'''. Such a cleaning means will be associated with each chain **206**, **208**, **210**.

The illustrated member **315** may be positioned to extend transversely across the boom **174** at a convenient point between the boom member **190** (FIGS. 6 and 9) and the pivot axis of the boom.

What is claimed is:

1. An excavating apparatus comprising a boom-type digger, first means for supporting said digger for pivotal movement about a generally horizontal axis at one of its ends, second means for supporting said first support means for generally vertical reciprocation, third means for supporting said second support means for generally horizontal reciprocation in a direction generally perpendicular to said horizontal axis, whereby the pivot axis of said digger can be reciprocated both vertically and horizontally, means for conveying earth away from said apparatus and depending shield means cooperating with said digger to direct and guide earth excavated by said digger upwardly into said conveying means, said shield means comprising a first panel member pivotally connected to said conveying means and a second panel member disposed for telescopic movement relative to said first member, the lower edge portion of said second panel member being arranged to engage the ground.

2. An apparatus as in claim **1** wherein said conveying means is an auger extending generally parallel to said pivot axis, said auger being carried by said second support means for movement therewith, and wherein said shield means is supported for pivotal movement about an axis parallel to said first-mentioned axis.

3. An excavating apparatus comprising a boom-type digger, first means for supporting said digger for pivotal movement about a generally horizontal axis at one of its ends, second means for supporting said first support means for generally vertical reciprocation, third means for supporting said second support means for generally horizontal reciprocation in a direction generally perpendicular to said horizontal axis, whereby the pivot axis of said digger can be reciprocated both vertically and horizontally, means for stationarily supporting said third means above an excavation site, said third support means comprising frame means including a pair of parallel tracks, and further comprising a pair of drive wheels, means for independently driving each wheel, and means for mounting said wheels on said frame means whereby said frame means can be transported to an excavation site and positioned at the site, said mounting means comprising bracket means mounted for reciprocation on each of said tracks, and means for removably mounting said wheels respectively on said bracket means.

4. An apparatus as in claim **3** wherein said second support means is carried by said bracket means.

5. An excavating apparatus comprising a boom-type digger, first means for supporting said digger for pivotal movement about a generally horizontal axis at one of its ends, second means for supporting said first support means for generally vertical reciprocation, third means for supporting said second support means for generally horizontal reciprocation in a direction generally perpendicular to said horizontal axis, whereby the pivot axis of said digger can be reciprocated both vertically and horizontally, means for stationarily supporting said third means above an excavation site, said third support means comprising frame means including a pair of parallel tracks, and further comprising a pair of drive wheels, means for independently driving each wheel, and means for mounting said wheels on said frame means whereby said frame means can be transported to an excavation site and positioned at the site, said mounting means comprising first bracket means mounted for reciprocation on each of said tracks, and second bracket means mounted on each of said wheels, each second bracket means being proportioned and designed to be releasably connected to one of said first bracket means.

6. An apparatus as in claim **5** wherein said bracket means are arranged so that each wheel can be selectively mounted on either side of its associated track.

7. An excavator comprising first frame means including a pair of spaced apart, parallel first tracks, means for stationarily supporting said first frame means above an excavation site with said first tracks being disposed above and on opposite sides of such a site, second frame means mounted for reciprocation on said first tracks, said second frame means including a pair of spaced apart, parallel second tracks, said second tracks being generally perpendicular to said first tracks, support means mounted for reciprocation on said second tracks, a boom-type digger, means for mounting one end of said digger on said support means for pivotal movement about an axis generally

perpendicular to said first and second tracks, the other end of said digger being movable through the space between said first tracks to engage the ground, said digger comprising rotor means at each of its ends, at least one endless chain trained about said rotor means, and teeth carried by said chain, driving means carried by said support means, means for drivingly connecting said chain to said driving means, first fluid motor means for reciprocating said second frame means on said first tracks, second fluid motor means for reciprocating said support means on said second tracks, and third fluid motor means for pivoting said digger about its axis, a fluid pump connected to said fluid motor means, means for drivingly connecting said fluid pump to said driving means, a plurality of leveling arms pivotally mounted on said first frame means and arranged to engage the ground to support said frame means, fourth fluid motor means for adjustably positioning each of said arms, said fourth fluid motor means being connected to said pump, a pair of wheels, bracket means mounted for reciprocation on each of said first tracks, means for removably fastening said wheels to said bracket means, and fifth fluid motor means for independently driving each of said wheels, said fifth fluid motor means being connected to said pump.

8. An excavator as in claim **7** wherein said bracket means are connected to said second frame means for reciprocation therewith.

9. An excavator as in claim **8** further comprising auger means for conveying earth away from said excavator, and sixth fluid motor means for driving said auger means, said sixth fluid motor means being connected to said pump.

10. An excavator as in claim **9** wherein each of certain of said teeth comprises an elongated member formed to have a main body portion extending generally perpendicular to said chain and parallel to said first-mentioned axis, said chain being connected to said main body portion at a point intermediate its ends, a curved portion at each end of said main body portion and a generally flat extension portion connected to each of said curved portions and extending generally parallel to said main body portion and inwardly toward said chain, said curved portions curving outwardly from said digger, each of said curved portions being formed about an axis which forms an acute angle with said chain at a point on said chain following said tooth whereby said extension portions project forwardly of said main body portion in the direction of movement of said chain.

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