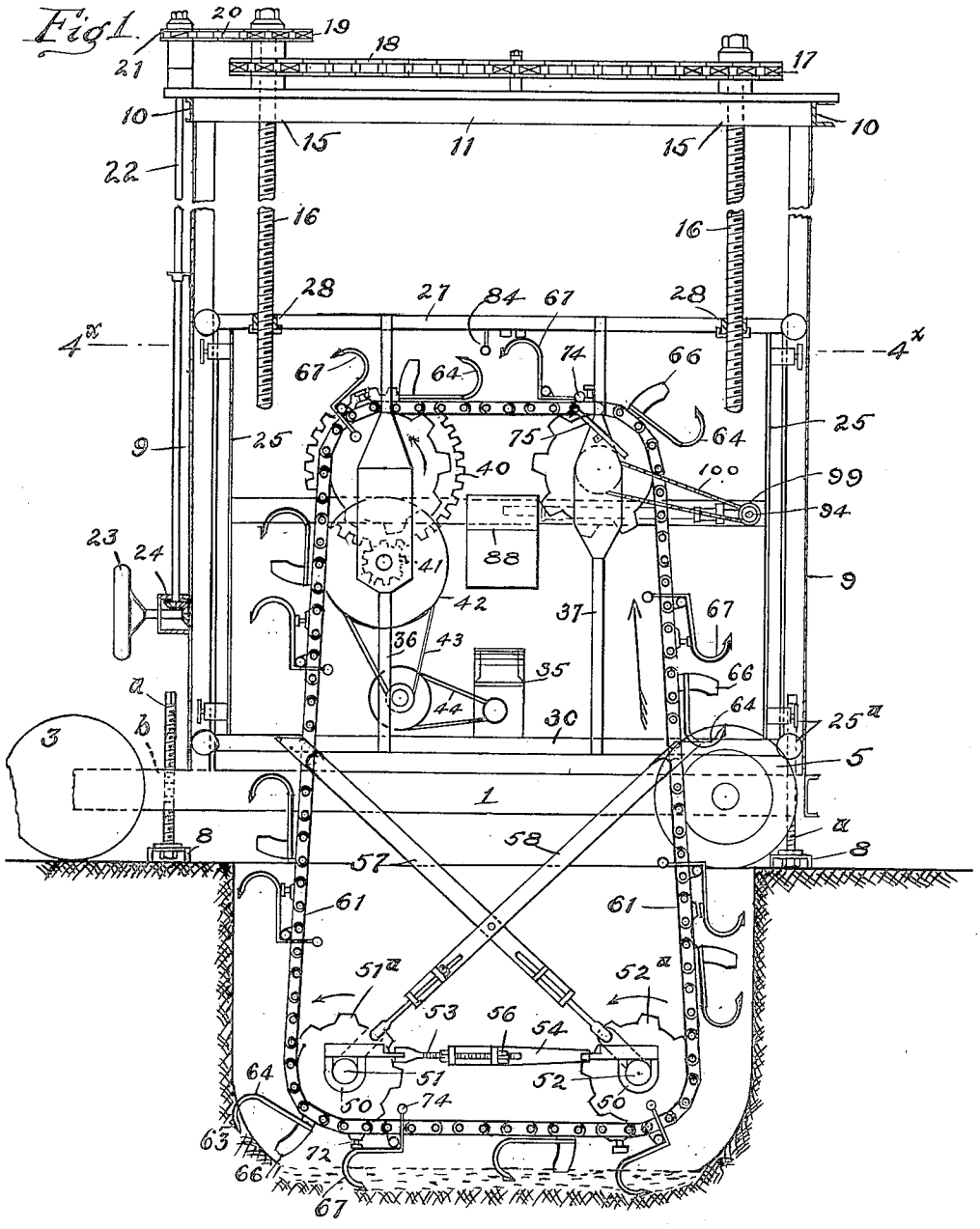
March 21, 1950 W. A. OWEN 2,501,083

EXCAVATOR

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Fig 1.



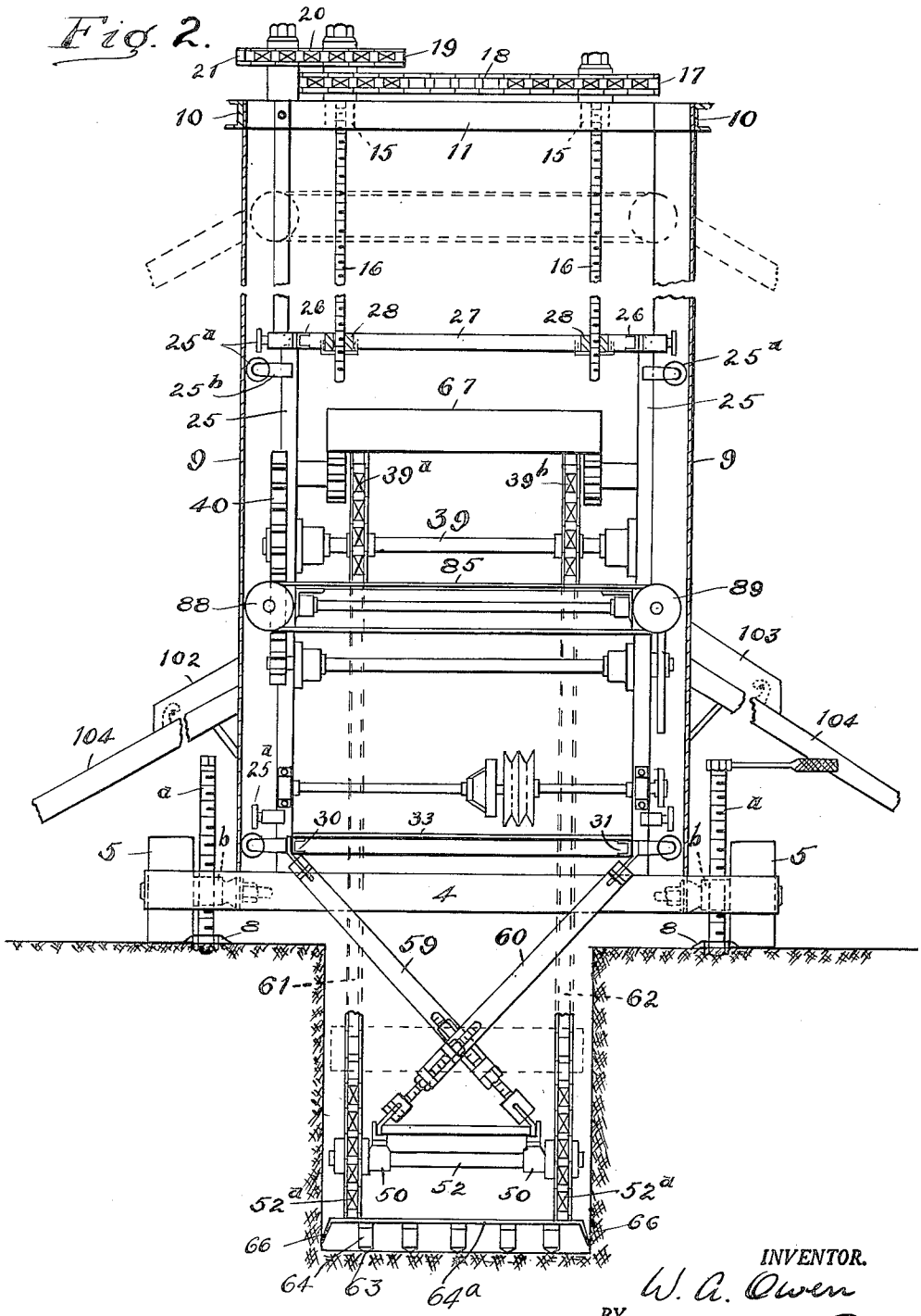
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EXCAVATOR

Filed April 12, 1946 7 Sheets-Sheet 2

Fig. 2.



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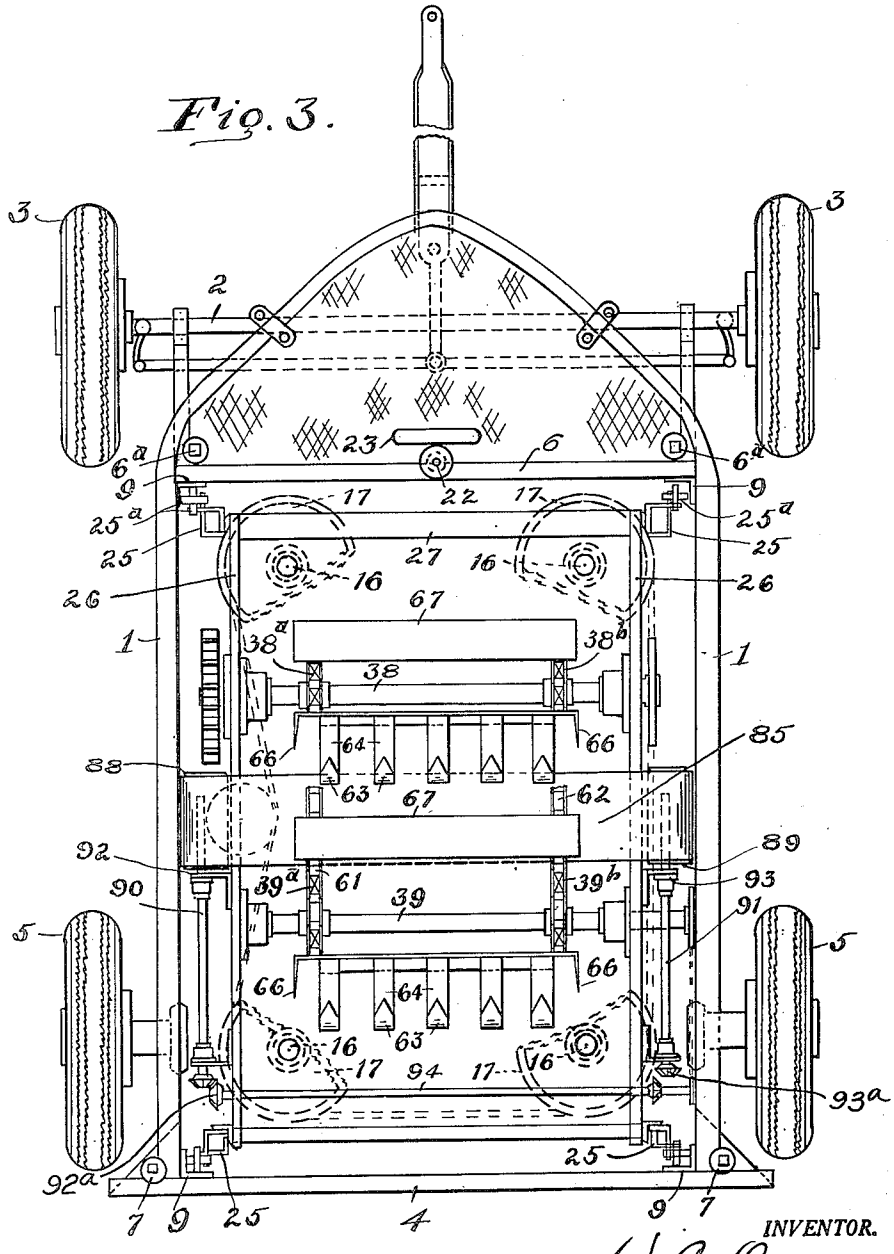
Attys.

March 21, 1950 W. A. OWEN 2,501,083

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Fig. 3.



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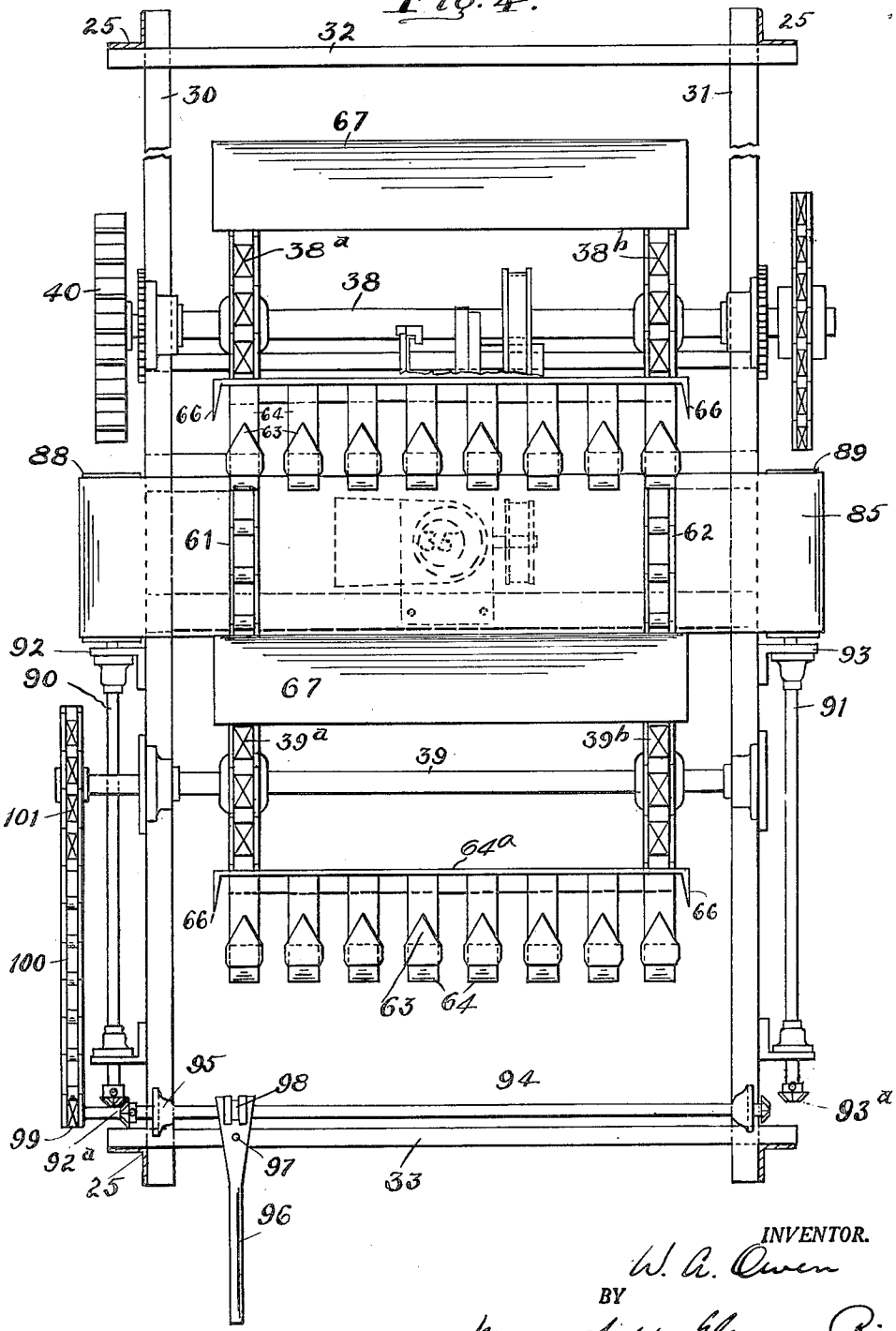
Attys.

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EXCAVATOR

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Fig. 4.



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March 21, 1950 W. A. OWEN 2,501,083

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Fig. 5.

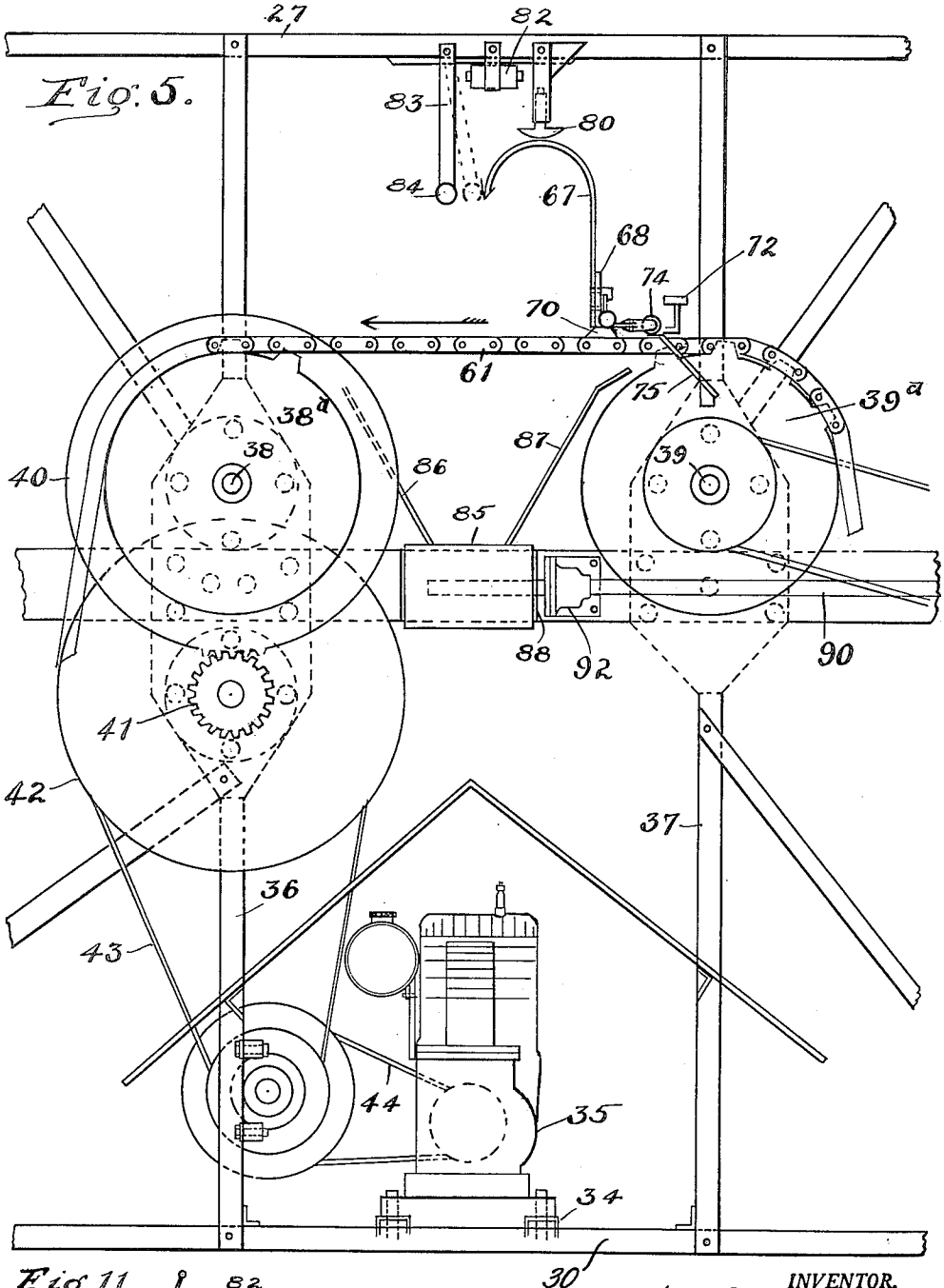
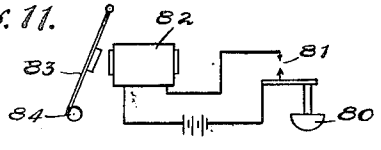


Fig. 11.



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March 21, 1950 W. A. OWEN 2,501,083

EXCAVATOR

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Fig. 7.

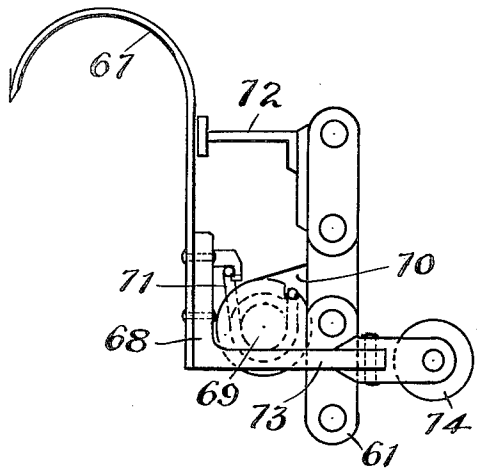


Fig. 6.

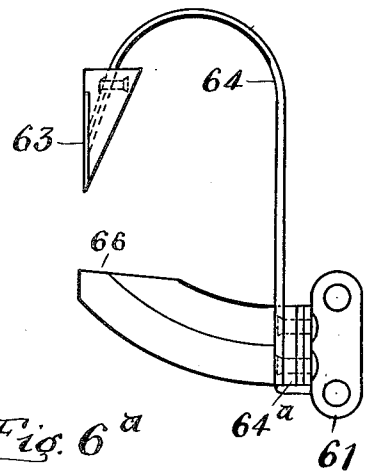


Fig. 6a

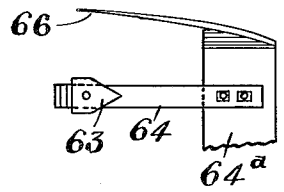
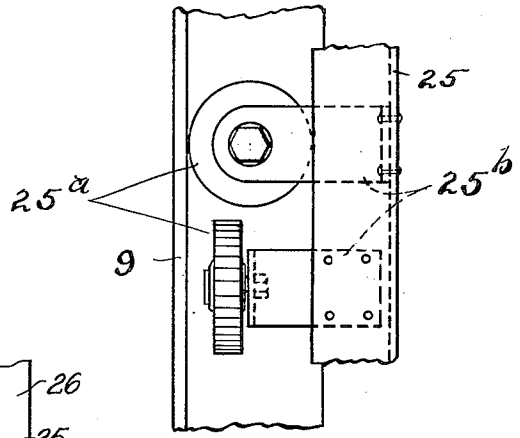


Fig. 9.



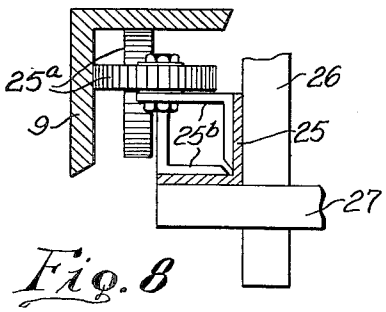


Fig. 8

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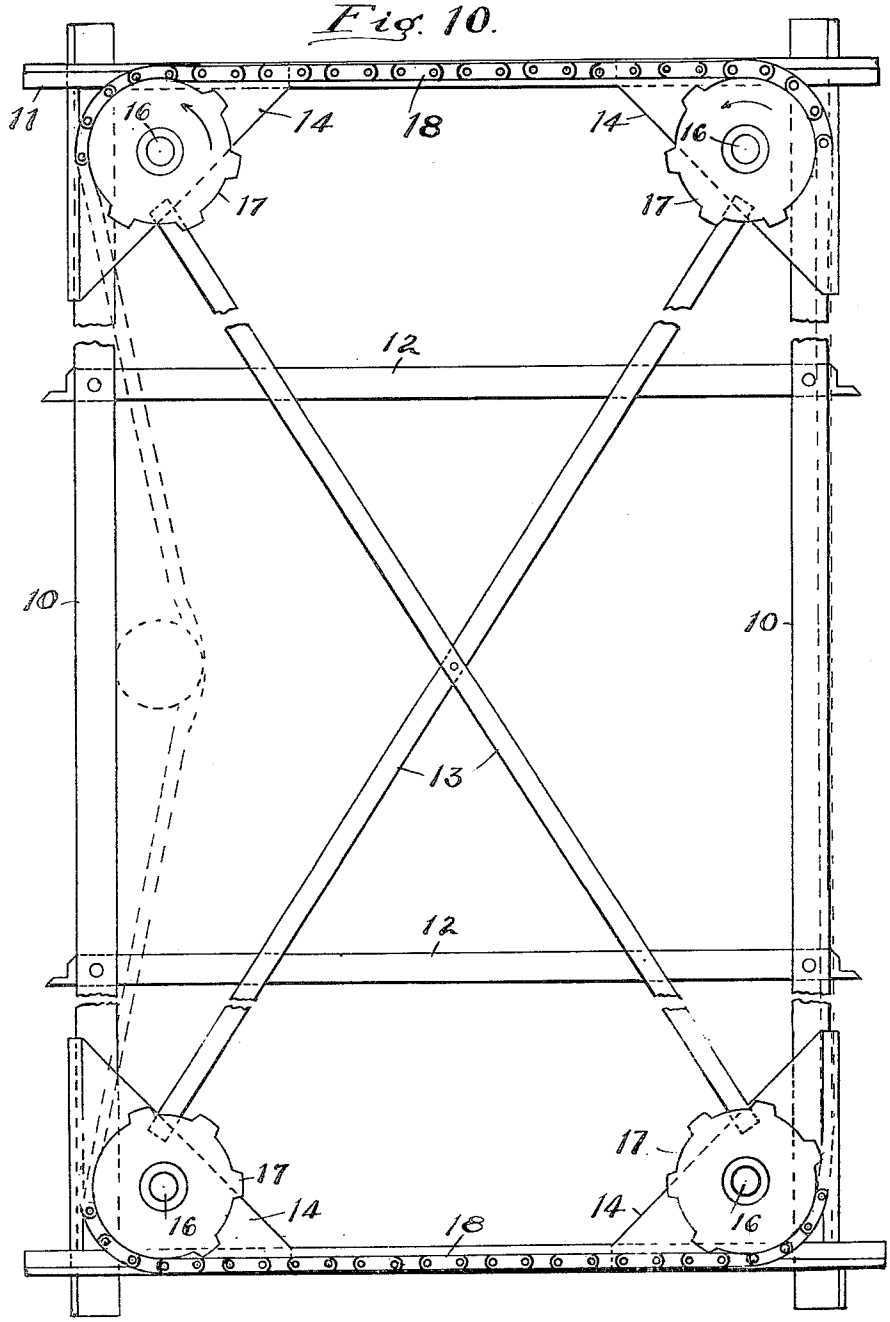
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EXCAVATOR

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Fig. 10.



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Patented Mar. 21, 1950 2,501,083

UNITED STATES PATENT OFFICE

2,501,083

EXCAVATOR

William A. Owen, Johnson City, Tenn.

Application April 12, 1946, Serial No. 661,809

6 Claims. (Cl. 37—192)

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My present invention has for its object to provide an excavating machine especially adapted for digging cemetery graves which embodies suitable mechanism for digging rectangular pits having perpendicular side walls.

Another object of my invention is to provide a transportable apparatus capable of being anchored over the site of the work comprising a main frame constituting a stationary superstructure and a vertically movable frame carrying the digging devices which may be lowered as earth is removed until the maximum depth of the excavation is reached.

A still further object of my invention is the provision of a succession of digging tools mounted on an endless conveyor carried on a vertically adjustable frame which are so arranged that the over all dimensions of the excavation are defined and accurately maintained from top to bottom thereof.

My invention also comprehends a frame supported for vertical movement to effect a cut of desired depth carrying soil removing implements operating in such a manner that as the loosened earth is removed it is elevated and deposited upon a movable conveyor also carried on said frame by means of which it is transported in a transverse direction and deposited at one side of the excavation.

To these and other ends my invention embodies other improvements all as will be fully described in the following specification, the novel features of the invention being set forth in the appended claims.

In the drawings:

Figure 1 is a side elevation of a machine embodying my invention, showing the excavator mechanism with certain parts of the framework in section, the inner frame being in a partially extended position.

Figure 2 is a rear end elevation thereof, parts of the outer frame being shown in section.

Figure 3 is a top plan view, parts of the top of the outer and inner frame being omitted to show the underlying mechanism.

Figure 4 is an enlarged fragmentary horizontal sectional view showing the inner frame taken on the line 4^x—4^x of Fig. 1.

Figure 5 is an enlarged fragmentary view of the upper end of the vertically movable frame showing the conveyor driving motor and connections and illustrating the operation of an excavating tool in discharging its load onto the transversely movable conveyor.

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Figure 6 is a detail view showing, in side elevation, of one of the digging tools.

Figure 6^a is a top plan view of one of the side trimmers shown in Fig. 6.

Figure 7 is a similar view showing one of the earth carriers or scoops which are associated with the tools shown in Fig. 6.

Figure 8 is an enlarged horizontal sectional view through one of the corners of the outer and inner frames showing the manner of guiding one of them upon the other.

Figure 9 is a detail side view of the parts shown in Fig. 8.

Figure 10 is a top plan view showing the structural features of the main frame.

Figure 11 is a diagrammatic circuit of the knocker for dislodging accumulations of earth adhering to the scoops.

Similar reference characters in the several figures indicate similar parts.

In carrying out my invention I mount a main frame which extends upwardly from a vehicle chassis which may be anchored over the site of the excavation and enclose therein an inner frame which is movable vertically the distance required for the digging of a grave of standard depth, said inner frame carrying excavating tools positioned on an endless conveyor which is motor driven and is moved downwardly manually according to the speed with which the work progresses.

The chassis 1 comprises the side rails united at their forward ends where they are connected to the axle 2 carrying the forward wheels 3. At their rear ends the rails are connected to a cross piece 4 and slightly ahead of it are brackets extending laterally of the side pieces which carry a pair of rear wheels 5.

At the forward end of the frame in rear of the axle 2 is a cross piece 6 on the forward side of which and within the frame pieces 1 are the forward anchoring devices 6^a, similar devices 7 being provided at the rear of the chassis and located on the outer sides of the frame pieces and within the extended ends of the rear cross piece 4. These anchoring devices comprise vertically extending rods *a*, as shown in Fig. 1, which are threaded in bosses *b* on the frame and carry foot pieces 8, the upper ends of the rods being squared to receive a wrench.

Extending upwardly from the chassis is an outer rectangular frame having the parallel corner posts 9 at the four corners of the chassis each composed of angle iron and disposed with their inner angles facing inwardly. These posts

are connected at their upper ends by the top side rails 10, end rails 11, intermediate cross bars 12 and diagonal tie rods 13. The top of the frame is further braced by triangular corner braces 14 which carry in their lower sides bosses 15 which constitute the stationary bearings for four vertically extending threaded shafts 16. From these shafts the inner frame is suspended and their length is therefore such as to permit this frame to be moved downwardly for the maximum depth of the intended excavation.

The feed screws 16 for controlling the vertical movement of the excavating mechanism are connected for simultaneous movement and to this end I provide each of them, above the top of the main frame, with a sprocket 17 and around the several sprockets an endless chain 18 is trained. One of the pair of forward shafts 16 is provided with a second sprocket 19 which is connected by a chain 20 to a sprocket 21 on the upper end of a shaft 22 which extends downwardly in a central position on the main frame for manipulation by means of a hand wheel 23 to which it is connected through bevel gears 24, as shown in Fig. 1.

The excavating mechanism comprises an inner frame also composed of four corner posts 25 which are guided on the outer frame posts 9 by pairs of anti-friction rollers 25^a journaled at right angles to each other on brackets 25^b and bearing on the inner angular faces of the posts 9. The posts 25 are also angular in cross section and are connected at their upper ends by side and end cross bars 26 and 27, two of which carry nuts 28 receiving the regulating screws 16 by which the elevation and operating position of this frame is regulated. Likewise the corner posts 25 are united at their lower ends by side pieces 30—31 and end pieces 32—33. Cross pieces 34 on the bottom of the frame form supports for a motor 35 as a source of power for the conveyor. The inner frame is virtually a cage like structure for carrying the movable excavating conveyor. It is further provided on each side with vertical members 36 and 37 carrying bearings for two transversely extending shafts 38—39 disposed at opposite sides of the center of the frame, which are provided with spaced alined sprockets 38^a—38^b and 39^a—39^b, respectively. The shaft 38 has one end extended exteriorly of the frame where it is equipped with a large gear 40 meshing with a pinion 41 on a drive wheel 42 driven from motor 35 by belting connections 43—44 (see Fig. 5).

The lower end of the inner frame has an extension carrying the lower end of the conveyor which when the frame is retracted supports the conveyor above the ground surface and when the frame moves downwardly carries it to the maximum depth of the grave to be dug. This extension comprises a supplementary frame composed of side pieces carrying bearings 50 for two shafts 51—52 parallel to shafts 38 and 39, but spaced somewhat further apart each carrying sprockets 51^a—52^a complementary to and in alinement with the four sprockets on shafts 38 and 39. The spacing of the shafts 51—52, is important as this determines the length of the grave and to this end as well as to utilize this factor as the means of maintaining the conveyor chains tight I adjustably connect the side bearings 50 using a member, somewhat in the nature of a turnbuckle, comprising two relatively adjustable parts 53 and 54 one of which is a screw passing through ears 55 on the other

part and regulated by nuts 56. The shafts 51—52, thus connected are further supported in relatively fixed position, but also are adjustably held, in relation to the shafts 38—39 by pairs of struts each of which extend diagonally in two directions from the bottom of the inner frame to said shaft bearings 50.

Principally for reasons of stability the machine as a whole is made of such width that the inner frame is somewhat longer and wider than that of the standard grave. Another reason for this construction is also to provide the necessary lateral and longitudinal stability in the extension frame when this is fully extended for the purpose of ensuring accuracy in vertically trimming the ends and side walls of the grave. These objects are accomplished by extending downwardly from the bottom side pieces 30—31 of the inner frame pairs of struts 57—58 and 59—60. These are connected at their upper ends at points within extensions of the vertical ends of the excavation as shown in Fig. 1 but are located outside or beyond extensions of the vertical planes of the side walls, as shown in Fig. 2. In extending these struts downwardly I cause one of each pair to cross the other and cross each pair with the other pair thus obtaining maximum stability against the possibility of the extension shifting under strains imparted to it either lengthwise or sidewise of the grave.

The actual digging of the excavation is accomplished by a plurality of sets of tools carried on the endless conveyor at equidistant points composed of two parallel chains 61—62 trained over the eight sprockets mounted on the upper pair of shafts 38—39 and the lower pair of shafts 51—52, and buckets or scoops arranged to trail behind the cutters and carry away the earth as it is loosened. The digging tools are a series of spring harrow teeth comprising plow points 63 carried on the extremities of spring arms 64 mounted in spaced relation on drag bars 64^a extending across the conveyor chains 61—62. The ends of the drag bars extend beyond the conveyor chains and carry trimmers 66 which have knife edges curving rearwardly, the points and major portions of their outer sides being set to determine the width of the grave to be excavated. At points intermediate the foregoing cutting tools I locate scoops 67 formed of sheet metal having the same configuration as the harrow arms. These are attached to bases 68 pivoted on pintles 69 held in brackets 70 fixed to corresponding links of the chains 61—62. The scoops are normally held in parallel relation to said chains by coil springs 71 and as the brackets 70 cause them to be offset somewhat from the chains, I secure to the latter on succeeding links stops 72. Each base 68 is provided with an extension 73 projecting beyond the inner sides of the chains and carrying a roller 74 for engaging a cam projection 75 to cause the scoop to be tripped to dump its load as the scoop arrives at the top of its flight.

The direction of movement of the conveyor chains is indicated by arrows in Figs. 1 and 5 from which it will be seen that the scoops follow the diggers and gather the earth as it is loosened ahead of them while they are moving horizontally. Thereafter the scoops carry the collected load upwardly in their curved bottoms until they reach the point where the chains 61—62 pass into a horizontal position as they leave the sprockets 39^a—39^b. At this point I locate the cam 75 which is an inclined stationary surface lying in the path of the crank arms 73. As the rollers 74 carried on

these arms successively engage the cam surface the scoops are rocked into a vertical position for the purpose of discharging their loads.

Inasmuch as there may on occasion be a tendency for earth to adhere to the scoops I provide an automatic device for jarring them while in their inverted position. During the travel of the scoops and while they are still held in the upside down position they pass beneath an electric switch control member in the form of a plunger 80 and move it sufficiently to close a pair of contacts 81 in the circuit of a powerful electromagnet 82. Upon energization this magnet attracts an armature 83 the lower end of which forms a hammer 84 and is so placed as to strike the free end or lip of the scoop. The blow thus imparted to the scoop which is of spring material causes it to reverberate to free itself of substances that may be clinging to its surfaces.

It will be observed that the point at which the scoops are overturned lies approximately midway between the shafts 38 and 39. In this space I provide a transversely extending conveyor belt 85 onto which earth discharged from the scoops is directed by the upwardly diverging guide plates 86 and 87. The belt 85 is supported and driven alternately by a pair of rollers or broad faced pulleys 88 and 89 located in parallelism at opposite sides of the inner frame or cage. Shafts 90 and 91, journaled in brackets 92—93 on the sides of the inner frame, extend toward the rear side thereof and are adapted to be connected by pairs of bevel gears 92^a and 93^a to a cross shaft 94. The latter is journaled in bearings 95 and is movable longitudinally therein by a lever arm 96 pivoted at 97 having a bifurcated end engaging in a grooved collar 98 whereby either set of pinions 92^a or 93^a may be engaged to alternately rotate the shafts 90 and 91 according to whether it is desired to cause the conveyor 85 to discharge at the right or the left hand side of the machine. Shaft 94 carries at one end a sprocket 99 which is driven by a chain 100 trained over a sprocket 101 on shaft 39.

Inasmuch as it is intended to discharge the earth removed from a grave at one side or the other thereof according to the terrain or other proximate surroundings short chute sections 102—103 are mounted on the sides of the inner frame below the belt pulleys 88 and 89. These may also be extended sufficiently to discharge into a truck or other suitable container or into a temporary extension 104 if the earth is to be piled adjacent the excavation.

I claim as my invention:

1. In a machine for digging excavations of fixed length, breadth and depth, the combination with a supporting framework, and an inner vertically movable frame therein of greater area than the excavation, of a bottom extension centrally suspended from the inner frame sufficient to reach the bottom of the excavation when said frame is in its lowermost position on the supporting framework, said extension being composed of longitudinally adjustable struts disposed crosswise, a pair of spaced parallel shafts carried by the struts and provided with sprockets, a second pair of shafts carried on said inner frame and having sprockets, conveyor chains trained around said sprockets, digging tools mounted on said chains, an earth removing scoop also mounted on the chains in rear of the tools and means for driving the conveyor.

2. In a machine for digging excavations of fixed length, breadth and depth, the combination with a supporting framework, and an inner vertically movable frame therein of greater area than the excavation, of a bottom extension centrally suspended from the inner frame sufficient to reach the bottom of the excavation when said frame is in its lowermost position on the supporting framework, pairs of parallel shafts carrying sprockets mounted in alinement on the inner frame and on said extension, conveyor chains trained around said sprockets, a cross bar connected to said chains, sidewall truing tools carried on the ends of the bar, digging tools mounted intermediately on the bar, an earth removing scoop trailing said tools and pivoted on the chains, means for tripping the scoop at a given point in movement of the conveyor to deposit its contents and means for driving the conveyor.

3. In a machine for digging excavations of fixed length, breadth and depth, the combination with a supporting framework, and an inner vertically movable frame therein of greater area than the excavation, of a bottom extension centrally suspended from the inner frame sufficient to reach the bottom of the excavation when said frame is in its lowermost position on the supporting framework, pairs of parallel shafts carrying sprockets mounted in alinement on the inner frame and on said extension, conveyor chains trained around said sprockets, a cross bar connected to said chains, sidewall truing tools carried on the ends of the bar, digging tools mounted intermediately on the bar, an earth removing scoop pivoted on the chains in trailing position to the tools and having a tripping finger, a cam surface for engaging said finger disposed to deposit the contents of the scoop as it approaches the top of its movement on the conveyor and means for driving the latter.

4. In a machine for digging excavations of fixed length, breadth and depth, the combination with a supporting framework, and an inner vertically movable frame therein of greater area than the excavation, of a bottom extension centrally suspended from the inner frame sufficient to reach the bottom of the excavation when said frame is in its lowermost position on the supporting framework, pairs of parallel shafts carrying sprockets mounted in alinement on the inner frame and on said extension, conveyor chains trained around said sprockets, a cross bar connected to said chains, sidewall truing tools carried on the ends of the bar, digging tools mounted intermediately on the bar, an earth removing scoop pivoted on the chains in trailing position to the tools and having a tripping finger, a cam surface for engaging said finger disposed to deposit the contents of the scoop as it approaches the top of its movement on the conveyor, a belt conveyor extending transversely on the inner frame in position to receive the contents of the scoop and means for driving both conveyors continuously.

5. In a grave digging machine, the combination with a conveyor composed of endless chains, lower and upper sets of sprockets supporting the chains, disposed to provide a lower reach which determines the movement of digging tools to cut an excavation the full length and width of a grave and upward and downward reaches inclined toward each other to cause said tools to pass downwardly and upwardly without cutting engagement with the end walls of the grave as the depth of the latter increases downwardly, a vertically adjustable frame carrying said sprockets, cross bars on the chains, truing tools on the ends of the bars for cutting and maintaining

the side walls of the grave perpendicular, spring arms mounted intermediately on the bars carrying plow points for loosening earth at the ends of the grave and across its bottom as the conveyor descends, scoops on the conveyor trailing the tools and extending across the width of the grave for removing the loosened earth and means for driving the conveyor.

6. In a machine for digging excavations, the combination with an outer frame, a vertically adjustable inner frame therein and pairs of parallel shafts on the latter carrying sprockets, of conveyor chains trained around the sprockets, sets of digging tools carried in spaced relation on the conveyor, earth removing scoop located intermediate the sets of tools and pivoted on the conveyor, means for tripping the scoops at a given point in the movement of the conveyor to deposit their contents, an electrically operated hammer arranged to strike the scoops when in their inverted position, comprising a circuit having a normally open switch arranged to be closed to energize an electro-magnet and operate said hammer after the contents of each scoop has been deposited, and means for driving the conveyor.

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