993,706.

E. J. MUNDALE.

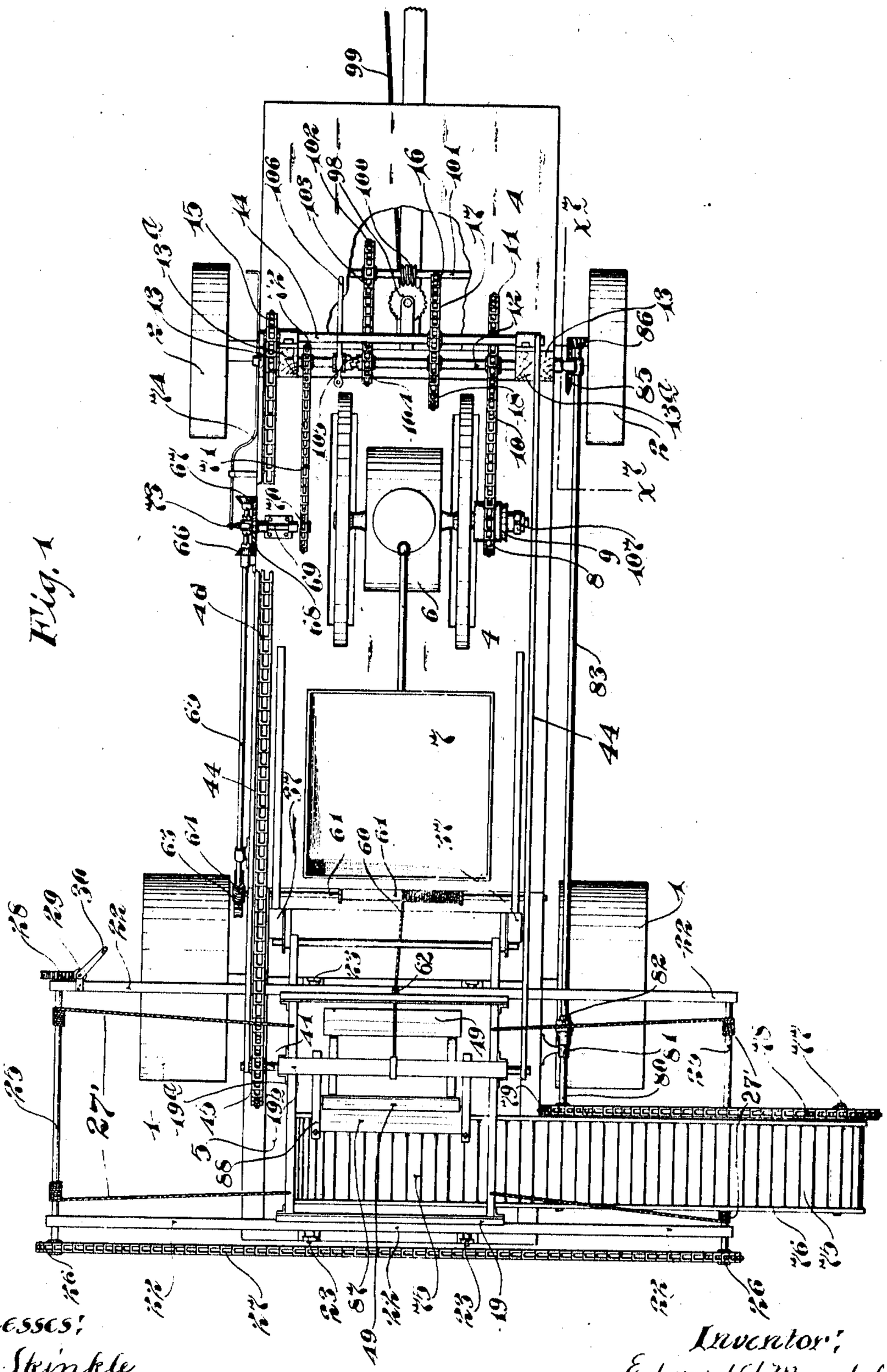
EXCAVATING MACHINE.

APPLICATION FILED JUNE 22, 1910.

Patented May 30, 1911.

4 SHEETS—SHEET 1.

Fig. 1.



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Harry Opsahl.

Inventor:
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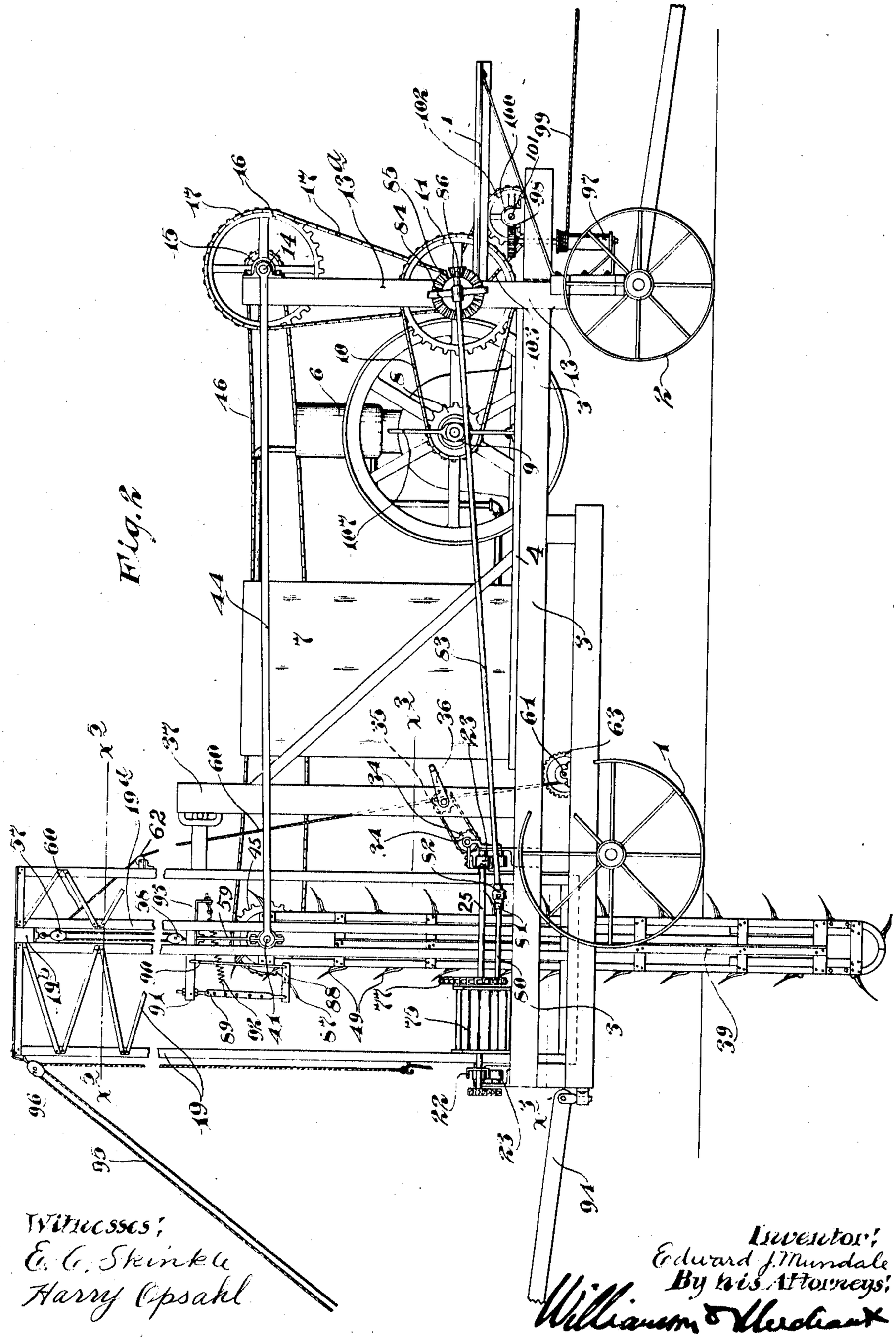
4 SHEETS—SHEET 2.

Fig. 2



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4 SHEETS—SHEET 3.

Fig. 3

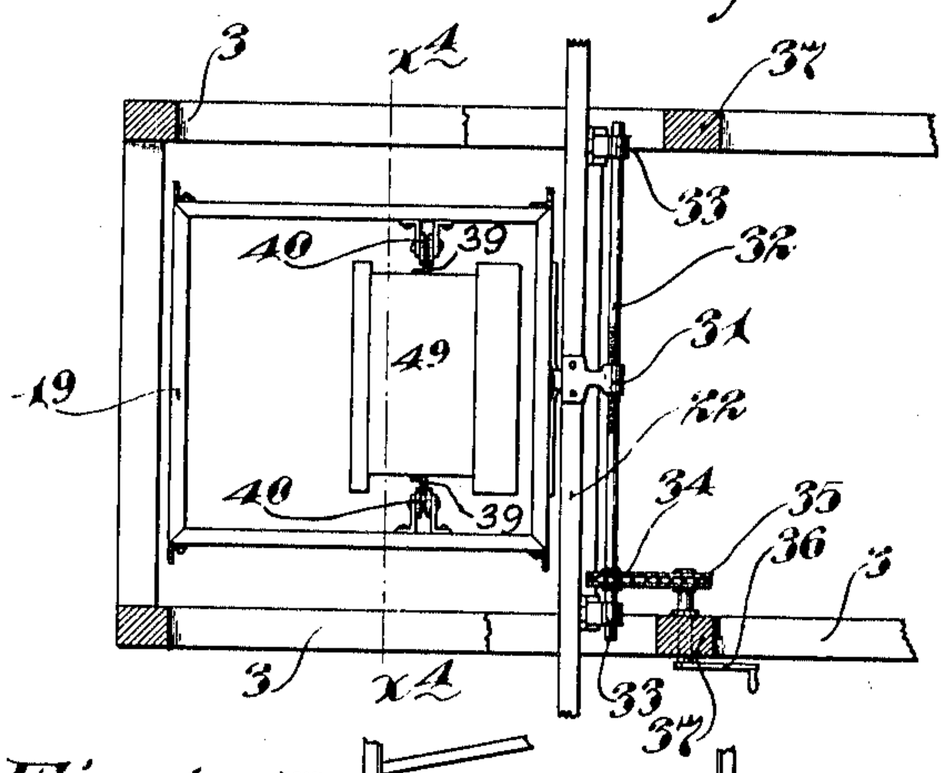


Fig. 4

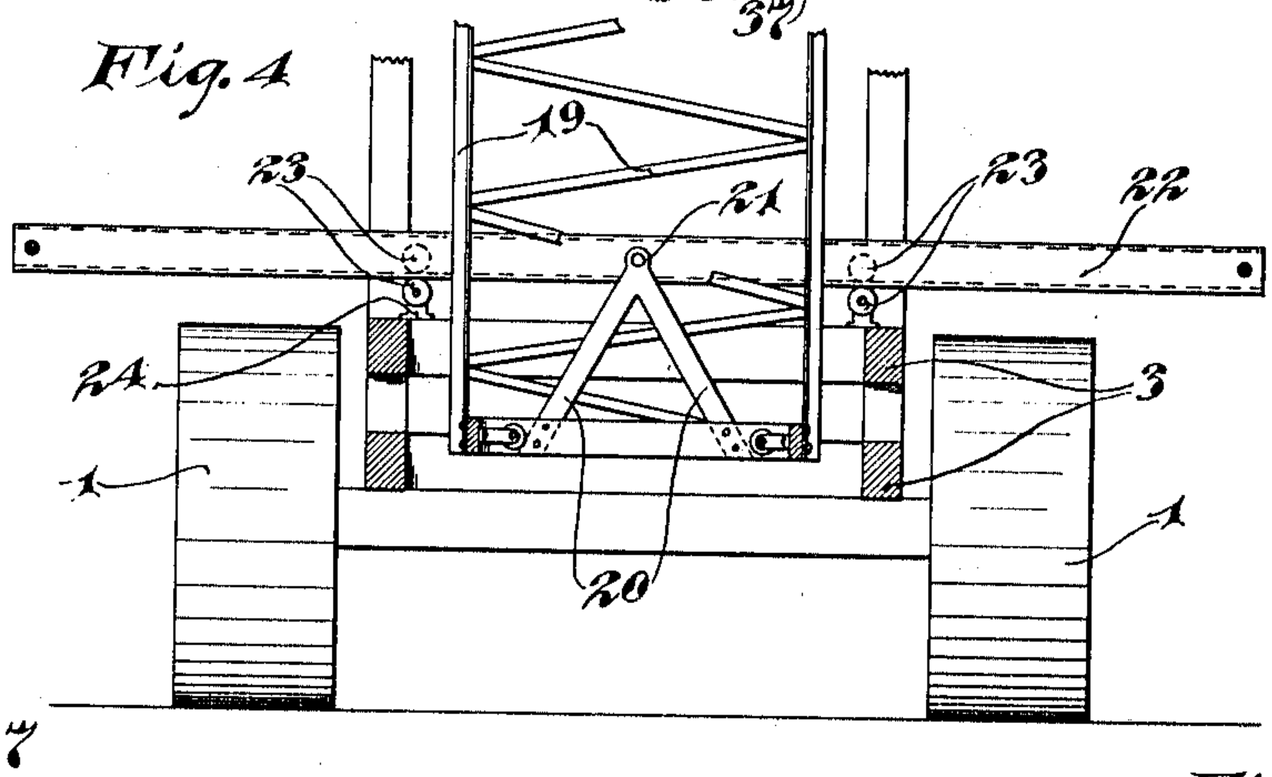


Fig. 7

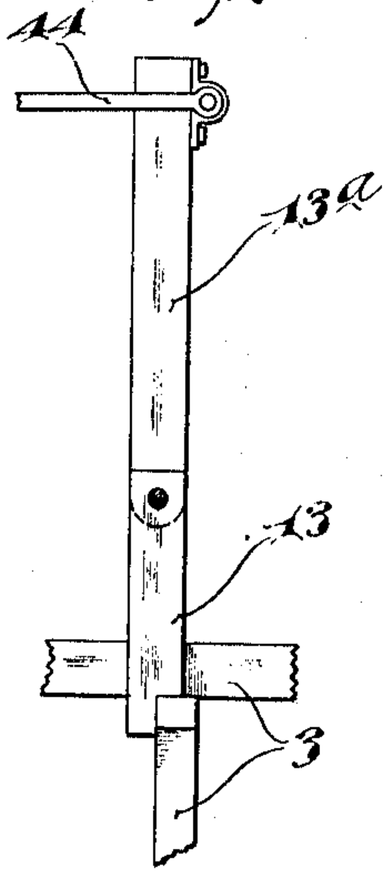


Fig. 5

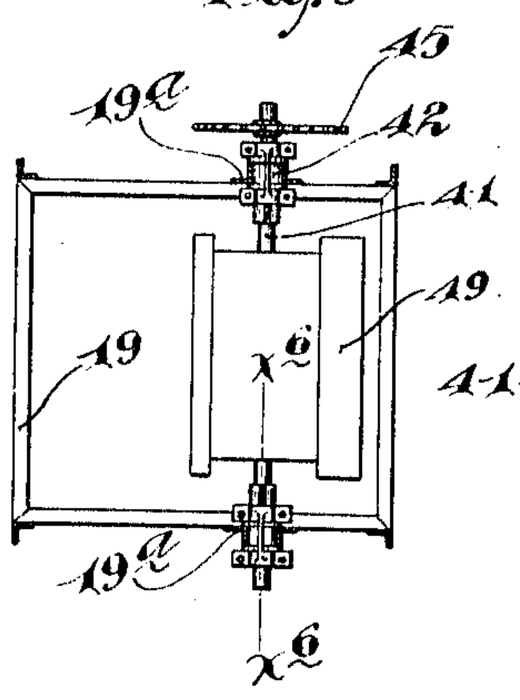
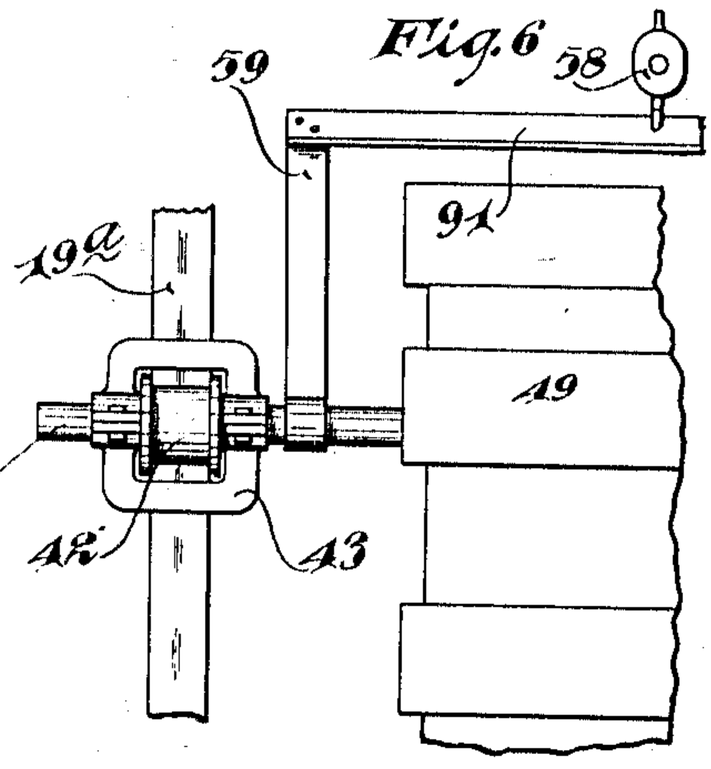


Fig. 6



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4 SHEETS—SHEET 4.

Fig. 9

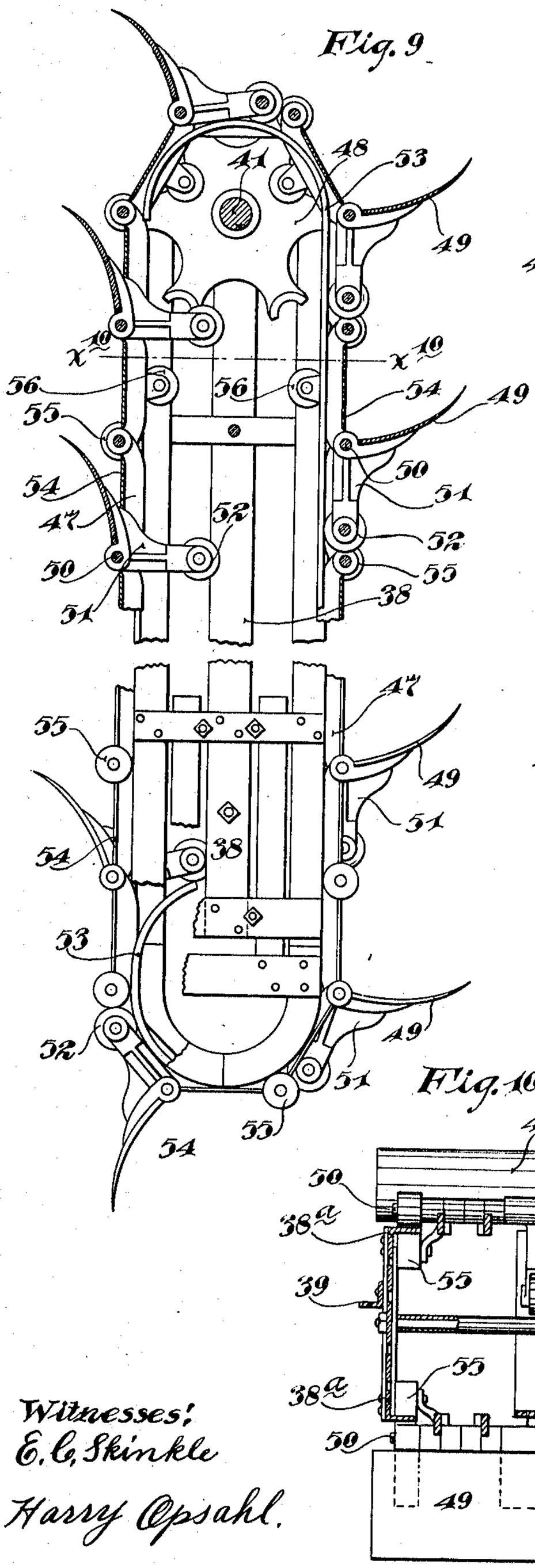

Fig. 8

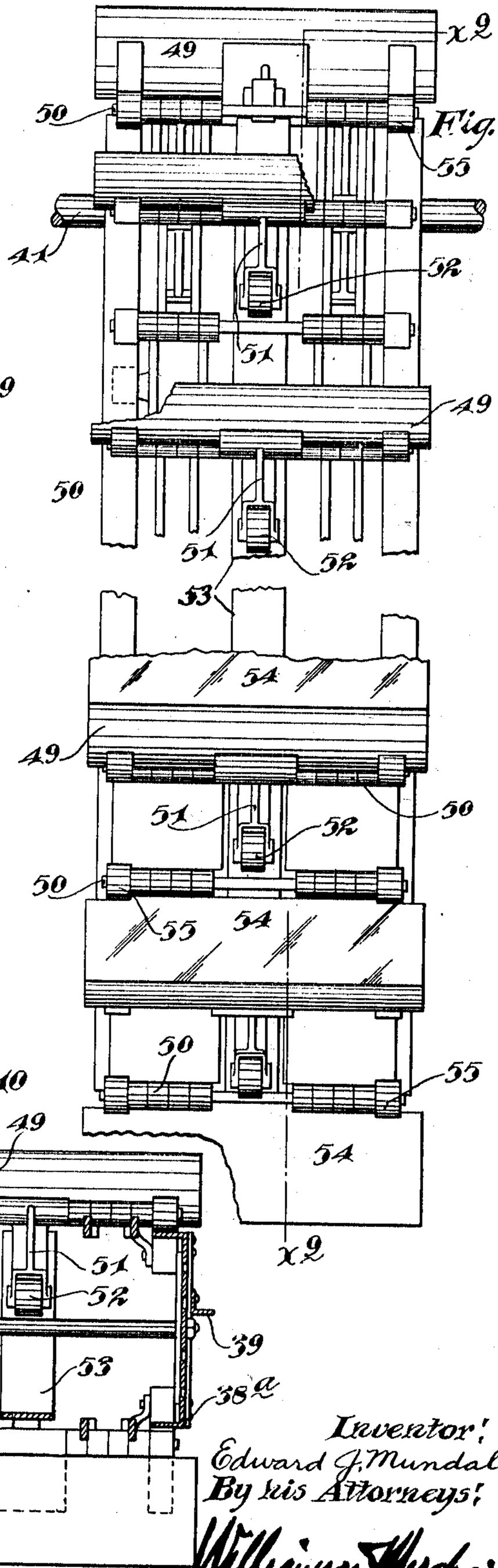

Fig. 10

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UNITED STATES PATENT OFFICE.

EDWARD J. MUNDALE, OF FROST, MINNESOTA.

EXCAVATING-MACHINE.

993,706. Specification of Letters Patent. Patented May 30, 1911.

Application filed June 22, 1910. Serial No. 568,305.

To all whom it may concern:

Be it known that I, EDWARD J. MUNDALE, a citizen of the United States, residing at Frost, in the county of Faribault and State of Minnesota, have invented certain new and useful Improvements in Excavating-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to excavating machines and is especially designed as an improvement on the excavating machine disclosed and claimed in my prior Patent No. 923,290 of date June 1st, 1909.

This improved machine, while capable of a large range of work, is especially adapted for use in digging deep and comparatively narrow trenches or ditches such as required for the laying of drain pipes, sewer pipes, water pipes and the like.

The invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings: Figure 1 is a plan view of the complete machine some parts being broken away; Fig. 2 is a side elevation of the machine some parts being broken away; Fig. 3 is a detail in horizontal section taken approximately on the irregular line x^3 x^3 of Fig. 2; Fig. 4 is a vertical section taken on the line x^4 x^4 of Fig. 3 some parts being broken away; Fig. 5 is a detail in section taken approximately on the line x^5 x^5 of Fig. 2 some parts being removed; Fig. 6 is an enlarged view showing parts in the vicinity of the line x^6 x^6 of Fig. 5 some parts being broken away; Fig. 7 is a detailed view showing parts of the pivoted front pedestal of the frame work some parts being sectioned on the line x^7 x^7 of Fig. 1; Fig. 8 is a detail with parts broken away showing, in elevation, the endless elevator and supporting frame therefor; Fig. 9 is a vertical section taken approximately on the line x^9 x^9 of Fig. 8; and Fig. 10 is a horizontal section taken on the line x^{10} x^{10} of Fig. 9.

Preferably, all of the parts of the machine or excavating apparatus are carried on the wheeled truck, of the parts of which the numeral 1 indicates the rear wheels, the numeral 2 the front wheels, and the numeral 3 a heavy truck frame having, as shown, a platform 4 covering all but the rear portion thereof, and the said rear portion being formed with a large rectangular opening 5 within which the lower portion of a skeleton tower, presently to be described, is located.

By reference to Fig. 2, it will be noted that that portion of the platform 4 which projects outside of the front axle extends in a plane slightly above the main platform.

The power required for driving the excavating apparatus is preferably afforded by an explosive engine indicated as an entirety by the numeral 6, and as shown, secured on the forward portion of the platform 4. Numeral 7 indicates a cooling tank also secured on the platform 4 and having a proper circulating connection to the water jacket of the engine. On the engine crank shaft is a driving sprocket 8 that is adapted to be connected for rotation with the said shaft, at will, by friction clutch 9. A sprocket chain 10 (see Fig. 1) runs over the sprocket 8 and over a larger sprocket 11 secured on a front shaft 12 that is journaled in short laterally spaced front bearing pedestals 13, which latter are provided with upper end extensions 13^a pivotally connected thereto at their lower ends.

Journaled on the upper ends of the pivoted pedestals 13^a and extending transversely of the machine is a counter shaft 14 provided at one end with a small sprocket 15 and having at its intermediate portion a larger sprocket 16. A sprocket chain 17 runs over the sprocket 16 and over a smaller sprocket 18 on the lower countershaft 12. At the rear end of the truck is a skeleton tower 19 of considerable height which is formed rectangularly in horizontal cross section and is positioned with its lower end in the passage 5 of the truck frame. This tower is mounted for pivotal movements in a vertical plain extending transversely of the machine; and to this end the said tower is shown as provided with hanger brackets 20 secured to the lower front and rear bars thereof and pivotally attached at their upper portions, by pivots 21, to the intermediate portions of the pair of transversely ex-

tended approximately horizontal beams 22 that afford a base support for the said tower. These beams 22 are preferably constructed of channel iron or steel and the out-turned lower flanges are arranged to run between guide rollers 23 mounted on bearings 24 secured to the rear portion of the truck frame 3. These beams 22 are therefore capable of limited traveling movement so as to adjust the tower bodily in a direction transversely of the machine. Journaled in the outer ends of the beams 22 are windlass shafts 25 provided at their rear ends with sprockets 26 over which a sprocket chain 27 is arranged to run so as to simultaneously move the two windlass shafts 25 in the same direction and at the same speed. Each of these windlass shafts 25 is connected by a pair of cables 27′ to the top of the pivotally supported tower 19. The cables 27′ are kept taut so as to steady the tower and by adjustments thereof the tower may be always set in a true vertical position even though the rear truck wheels stand on unlevel ground. As is evident, the cables on one of the windlass shafts 25 will always be wound up as the cables on the other windlass shaft are unwound. For simultaneously moving the two windlass shafts, one of the said shafts, as shown, is provided at the front end with a worm gear 28 that meshes with a worm 29 journaled to the adjacent end of the front beam 22 and provided with an operating crank 30.

The transversely movable base beams 22 are preferably further rigidly tied together with transverse braces, not shown; and to impart the limited transverse traveling movements thereto the front beam 22 is shown as provided with a nut block 31 that works with threaded engagement on a screw rod 32 that is journaled in suitable bearings 33 and is held against endwise movements in the said bearings (see Fig. 3). The bearings 33 are rigidly secured to the rear portions of the sides of the truck frame 3 so that the screw rod 32 is held against endwise movements transversely of the machine. Said screw rod, as shown, is provided with a sprocket 34 that is alined with a sprocket 35 carried by the shaft of an operating crank 36 journaled to one member of a pair of pedestals 37 rigidly secured on the truck frame 3 just in front of the tower 19.

Extending vertically within the tower 19 and vertically adjustable therein is an excavating device which is of the general form and arrangement disclosed and claimed in my prior patent above identified. The details of this excavating device are best shown in Figs. 8 and 10. The vertically elongated frame 38 is provided at its sides with vertically extended rails 39, the outward extended flanges, of which, run on grooved rollers 40 journaled on the sides of the tower 19. By this means the excavator frame 38 is supported within the tower with freedom for vertical movements only. In the upper portion of the excavator frame 38 is a transverse shaft 41 the ends of which project through vertically extended guide channels formed between guide rails 19ª in the sides of the tower 19, and are provided with antifriction rollers 42 that engage the said rails 19ª (see Figs. 2 and 6). The rollers 42 are embraced by bearing yokes 43 in which the shaft 41 is journaled. Long connecting rods 44 are connected at their rear ends to the bearing yokes 43 and at their front ends are pivotally connected to the countershaft 14. At one end of the shaft 41 is provided a sprocket 45 over which and the sprocket 15 on the countershaft 14 runs a long sprocket chain 46. The links 44 serve to make the shafts 14 and 41 spaced at the same distance apart in all vertical adjustments of the excavator frame 38 and shaft 41.

The heavy sprocket chain 47 runs over a heavy sprocket 48 of special design best shown in Figs. 8 and 9. The excavating scoops or buckets 49 are pivotally connected at 50 to returned joints of the chains 47. Each scoop or bucket 49 is provided with intermediately secured inwardly projecting arm 51 that carries an antifriction roller 52 at its free end. The rollers 52 throughout the working travel of the scoops run against a guide rail 53 rigidly secured to the excavator frame 38. This guide rail 53 extends vertically from top to bottom of the supplemental frame and has curved extremities so disposed in respect to the sprocket chains 47 and rollers 52 that its action upon the latter will positively force the scoops into an extended or operative position just before they pass their lowermost position and will hold the same in said operative position until after said scoops have passed the upper extreme of their travel. The transversely opposite links of the chains 47 immediately above the coöperating buckets 49 are tied together by thin metal plates 54 that coöperate with the adjacent scoops 49 and hold the excavated dirt.

The two sprocket chains 47 are provided with outer guide rollers 55 and inner guide rollers 56, which throughout the travel of the chains, maintain engagement with the inturn flanges of the endless angle-bars 38ª which constitute parts of the so called excavator frame 38. The endless rails 38ª and coöperating rollers or wheels 55 and 56 on the chains 47 in themselves completely guide the excavating chains but said chains are given the positive movements by the sprocket 48 the arms of which are formed to fit pivot joints of the said chains and thereby to positively drive the chains.

The excavating frame 38 and parts carried thereby are adapted to be given their vertical adjustments by an engine driven windlass

which, as shown, is comprised as follows: The numerals 57 and 58 indicate upper and lower tackle blocks the former of which is suspended from the top beam 19[b] of the tower 19, while the latter is connected, as best shown in Figs. 2 and 6, by a yoke 59, to the shaft 41. A cable 60 connects the tackle blocks 57 and 58 in the customary way, and at its lower end is wound upon a windlass shaft 61 (see Figs. 1 and 2). Also, as shown, the intermediate portion of the cable 60 runs over a guide sheave 62 on the upper front portion of the tower 19. On one end of the windlass shaft 61 is a worm gear 63 that meshes with a worm 64 on the rear end of the shaft 65 journaled in suitable bearings on the truck frame and provided at its front end with a pair of reversely beveled loose pinions 66 and 67. The pinions 66 and 67 are meshed with the beveled gear 68 carried by a short shaft 69 journaled in suitable bearings on the truck platform and provided at its other end with a sprocket 70. The sprocket chain 71 runs over the sprocket 70 and over a sprocket 72 carried by the engine driven countershaft 12.

The beveled pinions 66 and 67 are provided with half clutches that are adapted to be engaged at will with a double ended clutch sleeve 73 that is mounted to slide upon the shaft 65 but held to rotate therewith by a key or other well known means.

The numeral 74 indicates a shipper rod connected to the clutch member 73 for imparting sliding movements thereto to thereby engage the said clutch member with one or the other of the pinions 66 and 67, according to whether the excavator frame 38 is to be raised or lowered by the application of the engine power.

The dirt elevated by the scoops or excavator buckets 49 will be dropped upon an endless conveyer 75 supported by suitable framework 76 rigidly secured to the lower portion of the tower 19. The said conveyer 75 is arranged to run over suitable guide rollers, not shown, one of which has a shaft that carries a sprocket 77 (See Figs. 1 and 2). The inner portion of this conveyer 75 extends through the lower portion of the tower and the delivery end thereof extends to a point far at one side of the machine. A sprocket chain 78 runs over the sprocket 77 and over a sprocket 79 which is carried by the rear end of a short shaft 80 journaled in suitable bearings 81 on a truck frame 3. The front end of the shaft 80 is connected by a knuckle joint 82 on to the rear end of a long driving shaft 83 the front end of which is journaled in a bearing yoke 84 shown as pivotally supported by the right hand end of the engine driven countershaft 12. This same end of the shaft 12 carries a beveled gear 85 that meshes with a pinion 86 on the front end of the said shaft 83. By the connections just described it will be seen how the endless conveyer 75 is driven from the countershaft 12. Also, it has previously been shown how the endless excavator chains or link belts 47 are driven from the countershaft 12; and it will be remembered that the said shaft 12 can be thrown into or out of action at will by manipulation of the friction clutch 9.

Immediately after the elevator excavating scoops or buckets have thrown their dirt onto the conveyer 75, they are permitted to turn pivotally upward and while moving downward in such position they are engaged with and moved over the sharp edge of a scraper blade 87 which blade is yieldingly supported preferably by the following connections: The blade 87 is secured to a laterally spaced pair of short bars 88 that are supported by pairs of parallel links 89 and 90 from top bars 91 shown as fixed to the top of the excavator lifting yoke 59. The coiled spring 92 adjustably attached to one of the links 89 and to a projecting bracket 93 of the yoke 59, yieldingly holds the scraper blade 87 in position for proper initial engagement with the excavator buckets or scoops 49 but permits the said blade to yield and move slightly rearward under each engagement with the said scoops. The said parallel links 89 and 90 support the scraper blade 87 for forward and rearward movement without changing its angularity in respect to the perpendicular.

The dirt excavated, elevated and delivered onto the conveyer 75 will, by the latter, be discharged at a point considerably at one side of the machine and sufficiently far from the excavated ditch or trench. As evident, the depth of the trench may be varied by vertical adjustments of the excavator frame 39 and excavating device carried thereby. The width of the trench may be varied by adjusting the tower 19 and parts carried thereby, transversely of the machine, such movements being made possible, as will be remembered by endwise traveling movements of the base beams 22 transversely of the machine. The manner in which the tower may be set in a vertical position even when the truck frame, on account of unlevel ground is inclined transversely, has also been described.

To facilitate the laying of the water or sewer pipe sections in the excavated trench I preferably apply to the rear of the machine a suitable derrick which utilizes the tower 19 and its column or mast and comprises in addition thereto a boom 94 that is pivotally connected to the rear portion of the truck frame 3, and a block and tackle of the cable 95 of which runs over suitable tackle blocks of the upper member 96 of which is shown as anchored to the top of the tower 19. Also, preferably provided,

is a simple and efficient device whereby the power of the engine may be utilized to slowly draw the machine forward so as to keep the excavator buckets or scoops always properly engaged with the front end of the ditch. This device, as shown, comprises a windlass drum 97 journaled in suitable bearings on the front portion of the truck frame 3 and having an upwardly extended shaft provided with a worm gear 98. Normally, 99 indicates a cable attached to the drum 97 and adapted to have its front end suitably anchored to the ground at a point ahead of the excavation. The worm gear 98 meshes with a worm 100 carried by a transverse countershaft 101 journaled in suitable bearings in the front portion of the truck frame 3. The countershaft 101 is provided with a sprocket 102; and a sprocket chain 103 runs over this sprocket and over a smaller sprocket 104 which is loosely journaled on the countershaft 12 and is adapted to be coupled to the said shaft for rotation therewith, by a sliding half clutch 105 rotatively carried by the said shaft 12 and, as shown, subject to a shipper lever 106. Also, the main clutch 9, already described, is shown as subject to a shipper lever 107.

What I claim is:

1. In an excavating machine, the combination with a portable supporting frame, of a tower pivotally connected to said frame for oscillatory movements transversely thereof. and an endless excavating device mounted on said tower and vertically adjustable in respect thereto.

2. In an excavating machine, the combination with a supporting frame, of a vertically extended excavating frame mounted for vertical adjustments and for lateral oscillatory movements in respect to said supporting frame, an endless scoop equipped excavating device mounted on said excavator frame, an engine on said supporting frame, engine driven connections for driving said endless excavating device in all positions of said excavator frame, and an independently operative engine driven connection for vertically adjusting said excavator frame.

3. In an excavating machine the combination with a supporting frame, of a tower pivotally connected thereto for oscillatory movements transversely thereof, reversely acting connections for holding said tower in an upright position regardless of the unlevelness of the supporting frame, and an excavating device supported by said tower.

4. In an excavating machine the combination with a supporting frame, of transversely extended base beams mounted to travel transversely on said supporting frame, a tower pivotally connected to said base beams for oscillatory movements transversely of the machine, reversely acting cables and a cooperating windlass drum connecting the top of the tower to the opposite end portions of said base beams, an excavator frame supported from the top of said tower and guide for vertical movements thereon, an endless scoop equipped excavating device mounted on said excavator frame, and engine driven connections for driving said excavating device and for vertically adjusting said excavator frame.

5. In an excavating machine the combination with a supporting frame, of a base support adjustable transversely on said supporting frame, a tower pivotally mounted on said base support, an excavator mounted for vertical adjustments on said tower, an engine on said supporting frame with connections for driving said excavator and for vertically adjusting the same, and an independent device operative at will for imparting transverse movements to said base support and pivotal movements to said tower.

6. In an excavating machine the combination with an endless excavating device provided with pivoted scoops, a scraper for engagement with said scoops, to clean the same, and a support for said scraper comprising parallel links, and means for yieldingly holding said scraper in working position.

7. In an excavating machine the combination with a supporting frame, of a vertically extended and a vertically adjustable excavator frame, vertically extended guides for said excavator frame mounted on said supporting frame, pivoted pedestals on said supporting frame, an engine also on said supporting frame, an endless scoop equipped excavating device working on said excavator frame, means for driving said excavator from said engine including sprockets and coöperating chains, certain of said sprockets being located on said pivoted pedestal and on said vertically adjustable excavator support, and connections holding the said noted sprockets spaced equidistant throughout vertical adjustments of said excavator frame.

8. In an excavating machine the combination with a supporting frame and a tower supported thereby, of an excavating device supported from said tower, an engine with connections for driving said device, and a derrick comprising a beam pivotally supported at the base of said tower, and a block and tackle anchored to the upper portion of said tower whereby the said tower is utilized as the derrick mast.

9. In an excavating machine the combination with a truck, of a tower supported on the truck frame with freedom for oscillatory movements transversely thereof, means for holding said tower in an upright position when the said truck is on unlevel ground, an endless scoop equipped excavating frame mounted for vertical adjustments within said

tower, a windlass shaft or drum with a cable connection supporting the said excavator frame from the top of said tower, an engine on the truck frame, engine driven connections for driving said excavator in all adjustments thereof, and means for driving said windlass drum from said engine including a reversible clutch mechanism, whereby the said excavator frame may be raised and lowered at will.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD J. MUNDALE.

Witnesses:

NORDAHL CHILSON,

E. H. GULLORD.