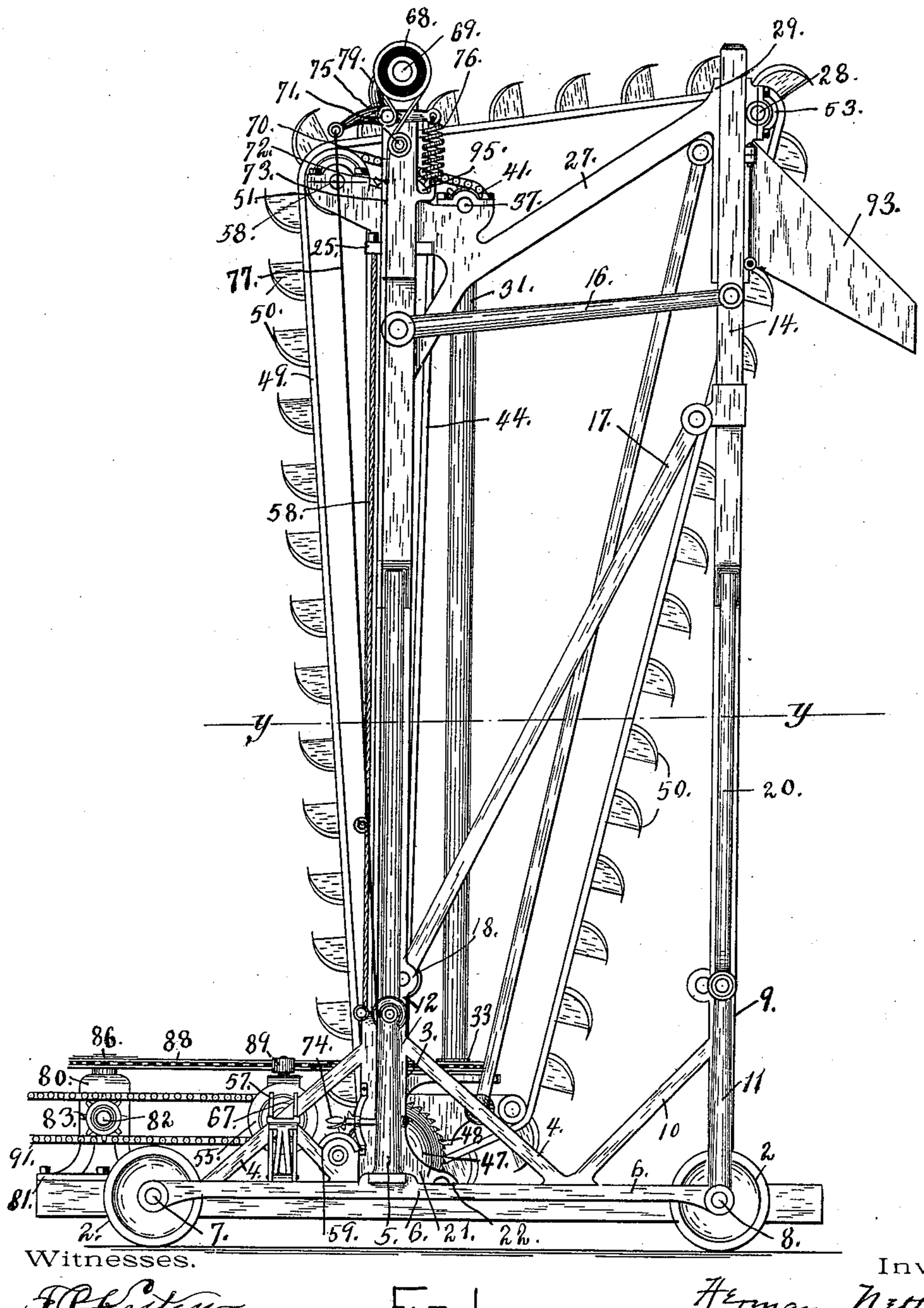
(No Model.) 4 Sheets—Sheet 1.

H. NETTELBECK.

TRENCH EXCAVATING APPARATUS.

No. 594,141. Patented Nov. 23, 1897.



Witnesses.

F. P. Lenton.

W. F. Schiffler

Fig. 1.

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Hermann Nettelbeck.

by W. T. Miller

Attorney.

(No Model.) 4 Sheets—Sheet 2.

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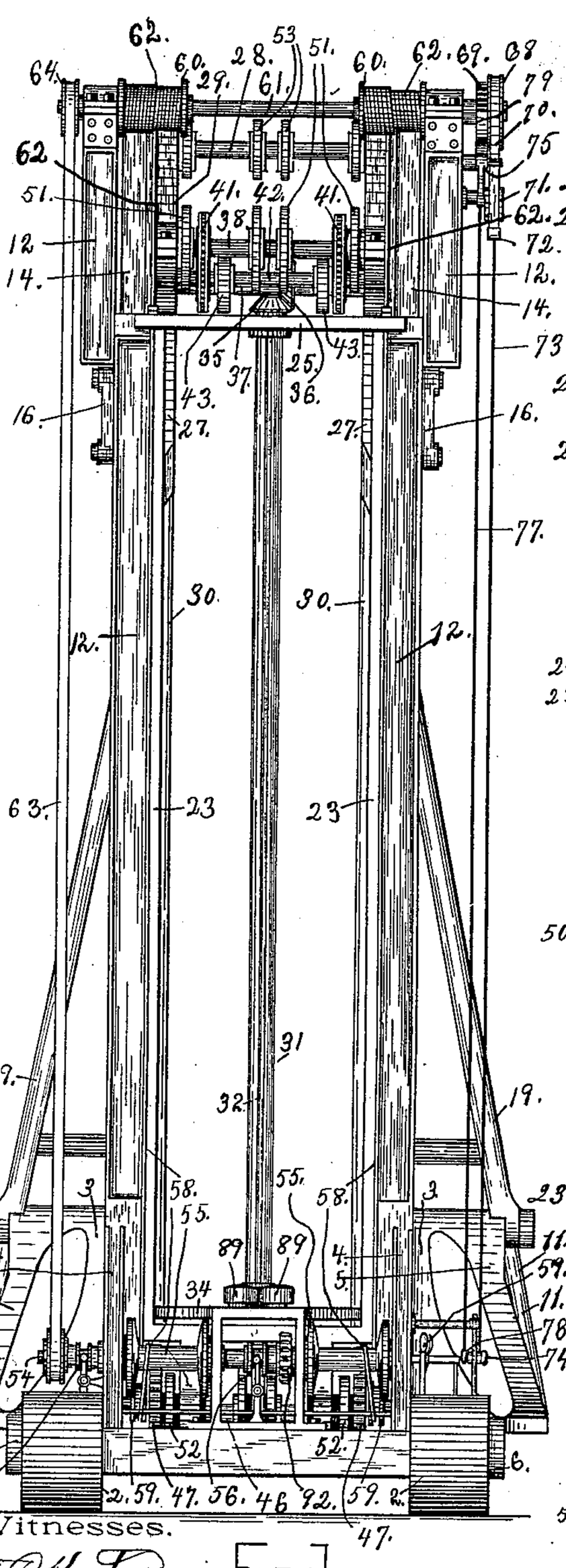

Witnesses.
F. P. Kerstad.
W. F. Schiffler

Fig. 2.

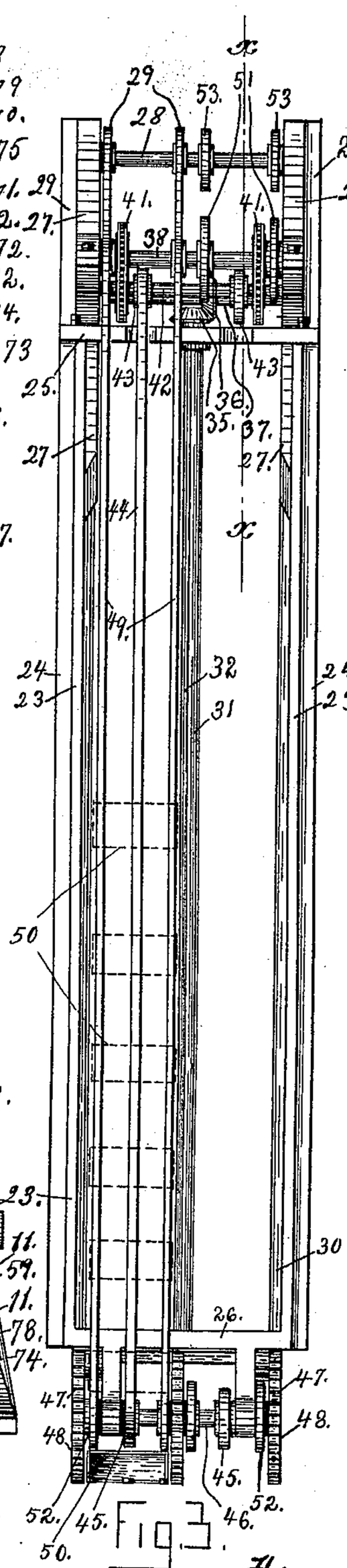

Fig. 3.

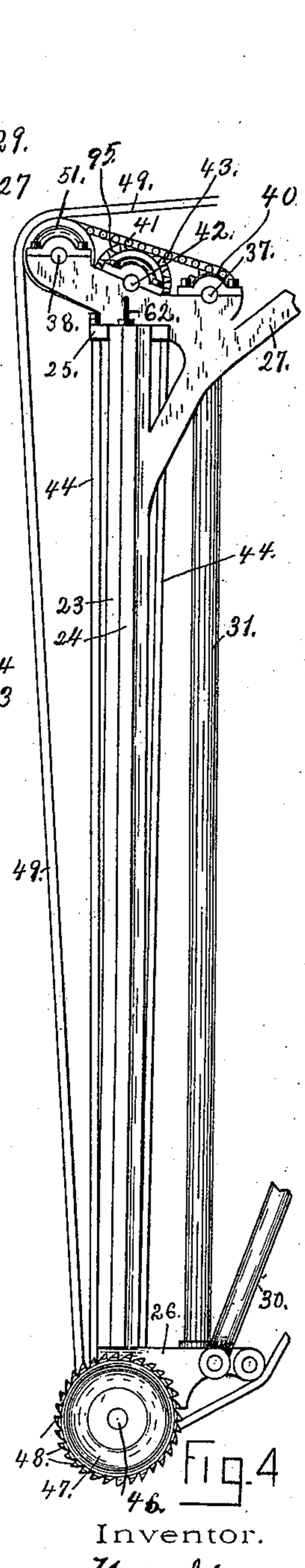

Fig. 4.

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(No Model.) 4 Sheets—Sheet 3.

H. NETTELBECK.

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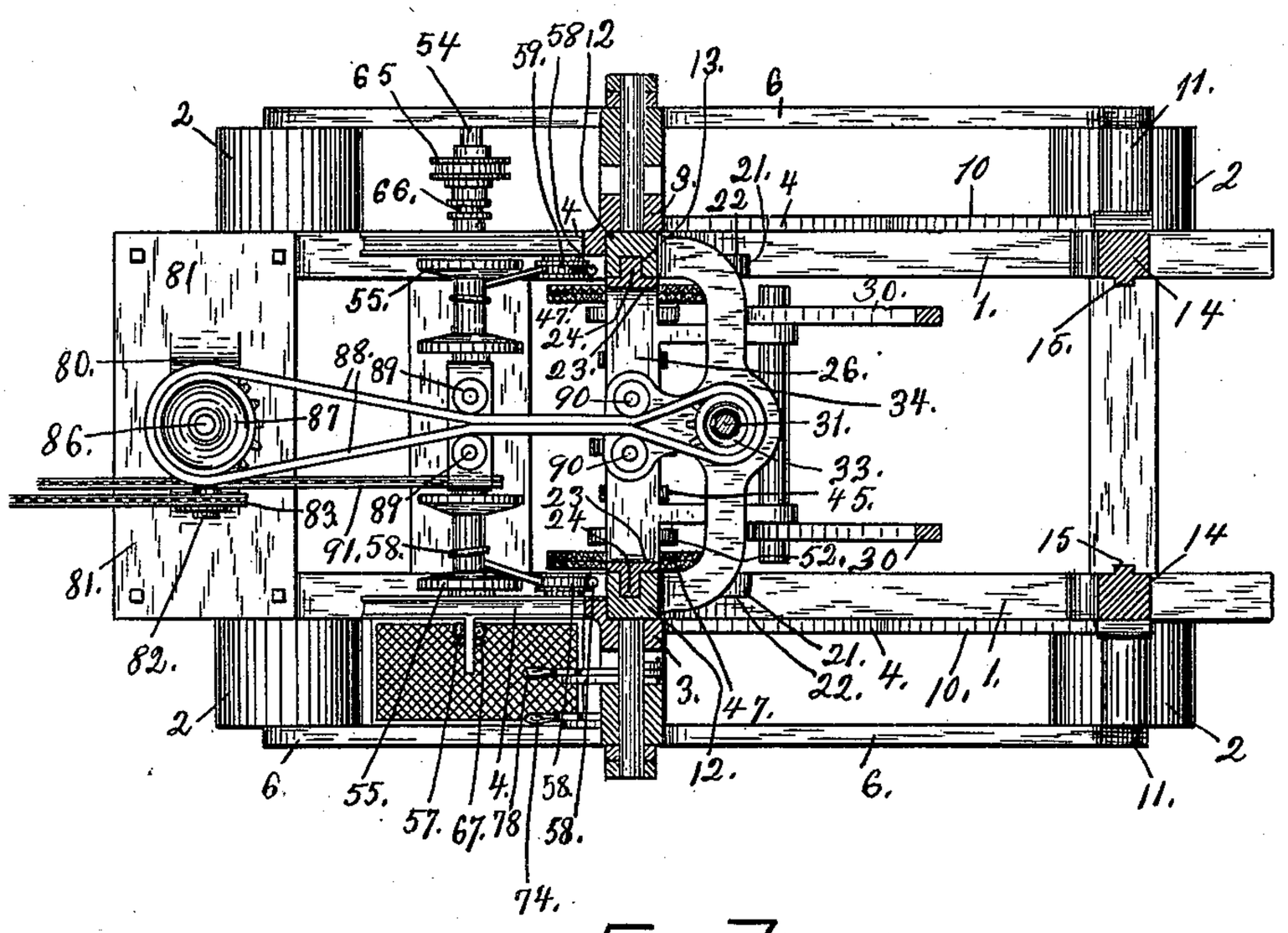

Fig. 7.

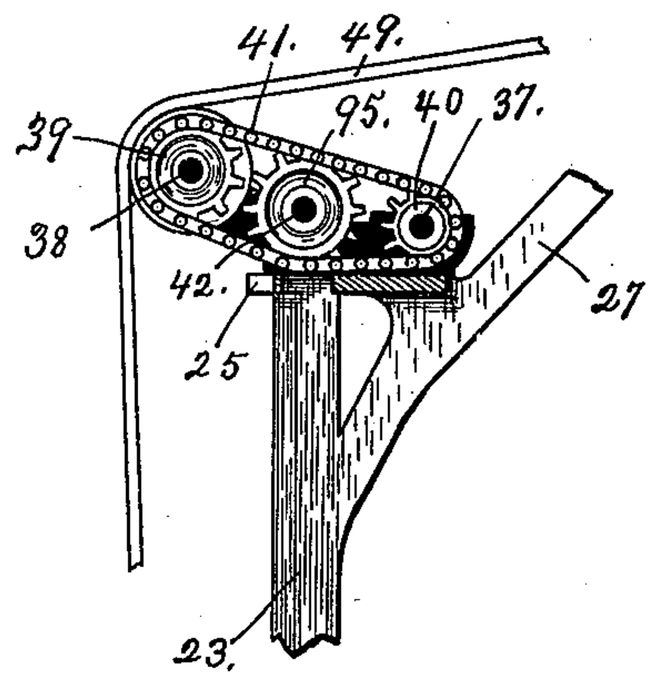

Fig. 5.

WITNESSES.

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ATTORNEY

(No Model.)

4 Sheets—Sheet 4.

H. NETTELBECK.

TRENCH EXCAVATING APPARATUS.

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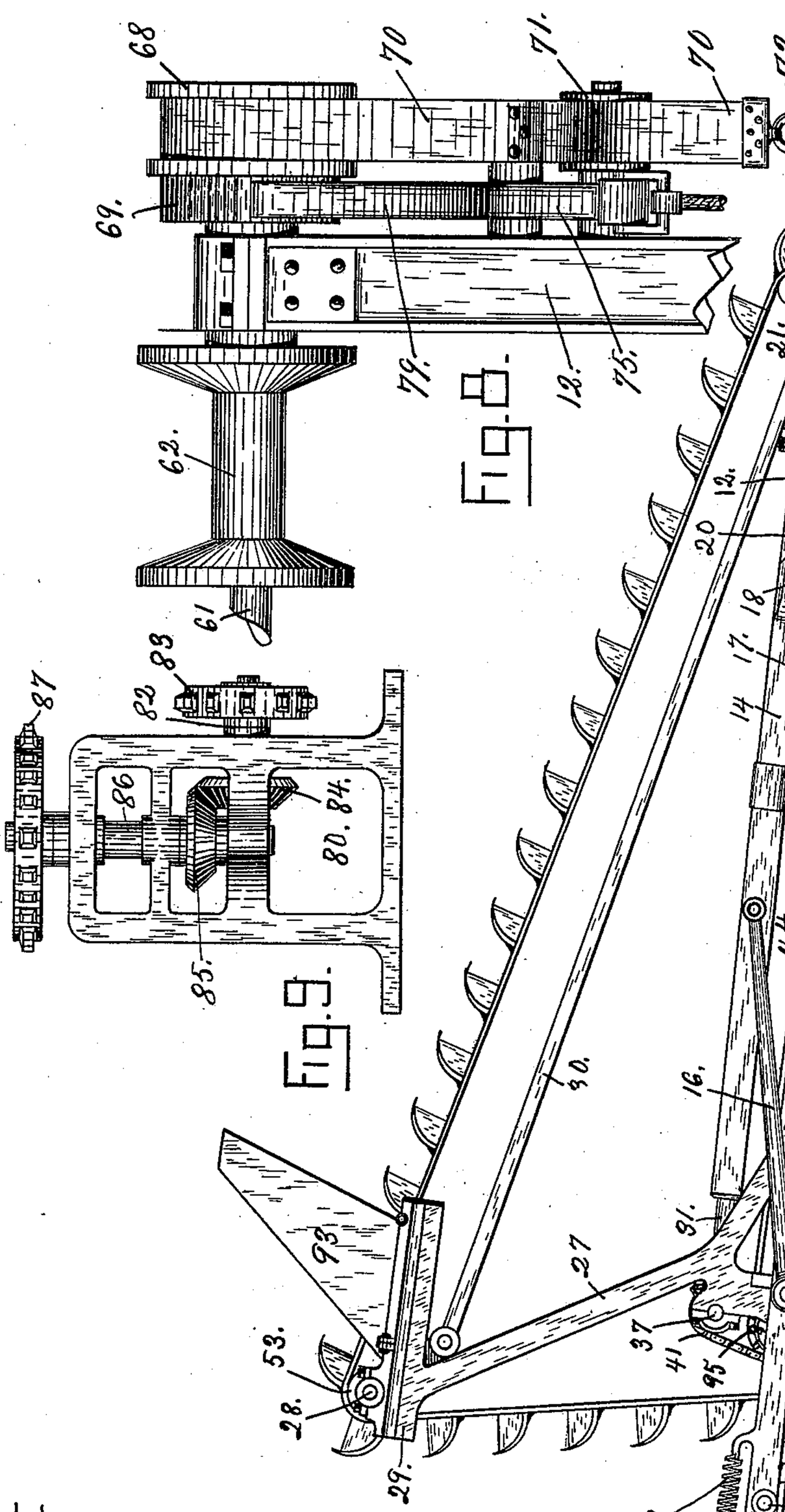

FIG. 8.

FIG. 9.

FIG. 6.

WITNESSES.

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ATTORNEY

UNITED STATES PATENT OFFICE.

HERMANN NETTELBECK, OF BUFFALO, NEW YORK, ASSIGNOR OF ONE-HALF TO GUSTAV A. GRIMM, OF SAME PLACE.

TRENCH-EXCAVATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 594,141, dated November 23, 1897.

Application filed November 28, 1896. Serial No. 613,798. (No model.)

To all whom it may concern:

Be it known that I, HERMANN NETTELBECK, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented certain new and useful Improvements in Trench-Excavating Apparatus; 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, reference being had to the accompanying drawings, and to figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in apparatus specially designed for excavating trenches for sewers and other subways.

Prior to my invention a number of mechanical devices have been employed for excavating trenches, principally of a stationary character, which have to be erected, taken down, and shifted along as the excavation progresses.

The object of my invention is to provide a portable apparatus which can be moved as the work progresses by a suitable motor, either mounted upon or attached to the apparatus and from which the power required for actuating the operative parts of the apparatus can be furnished.

To that end my invention consists of a framework mounted upon wheels which travel on each side of the line of the trench, a motor mounted upon or attached to the portable framework for moving same and actuating the operative parts, a vertically-adjustable frame movable in ways pivoted to the main framework, a grooved power-shaft journaled at its upper and lower ends in the vertically-adjustable frame, a sprocket-wheel operated by the motor with which the grooved power-shaft is movably engaged, endless carriers mounted in the vertically-adjustable frame, each provided with a series of scoops for separating and removing the earth and operated by the grooved power-shaft through intervening mechanism upon the vertically-adjustable frame, a series of disks pivoted in the lower end of the vertically-adjustable frame and having plow-points arranged upon their peripheries to cut the earth vertically on each side of the series of scoops and clutches and attached mechanism for raising or lowering the vertically-adjustable frame carrying the operative parts, the pivoted ways and vertically-adjustable frame carrying the operative parts, which is movable in the pivoted ways, being collapsible to a horizontal position when the apparatus is not in operation and is being transported from one point to another.

I will now minutely describe the manner in which I have carried out my invention and then claim what I believe to be novel.

In the drawings, Figure 1 is a side elevation of my improved excavating apparatus. Fig. 2 is a front elevation of the same. Fig. 3 is a front elevation, and Fig. 4 is a side elevation, of the vertically-adjustable frame carrying the operative parts shown detached. Fig. 5 is a vertical section taken in the line $x\,x$ of Fig. 3. Fig. 6 is a side elevation of my improved apparatus shown collapsed. Fig. 7 is a horizontal section taken through line $y\,y$ of Fig. 1. Fig. 8 is an enlarged detached detail view of the mechanism for regulating the descent of the operative parts, and Fig. 9 is a detail view of the connection of the motor with the operative parts.

Referring to the drawings, 1 is the truck, mounted upon the wheels 2, which are designed to move along each side of the line of the trench as the excavating progresses.

3 3 are the forward posts, mounted on each side of the truck. They are provided with the longitudinal braces 4 4 and the transverse braces 5, secured at their lower ends to the truck, the outer ends of the braces 5 resting upon cross-pieces 6 6, which extend from the outer ends of the front and rear axles 7 and 8.

Rear posts 9 9 are secured to the truck on each side and are provided with longitudinal braces 10 and transverse braces 11, the outer ends of which are secured to the cross-pieces 6 6.

The collapsible frame carrying the operative parts consists of the two forward guides or ways 12 12, having interior channels 13 13, extending substantially their entire length. These ways 12 12 are pivoted near their lower ends to the posts 3 3.

14 14 are two rear guides or ways having interior ribs 15 and pivoted at their lower ends to the rear posts 9 9. The upper ends of the ways 12 and 14 are secured together by the tie-rods 16 16, pivoted at each end to the ways. This construction permits the carrying-frame just described to be collapsed horizontally, as shown in Fig. 6, when it is desired to move the apparatus from one point to another, as otherwise its height, when in upright position, would interfere with trolley or other electric wires while in transit.

The carrying-frame is rigidly held in locked upright position by the diagonal braces 17 17, the upper ends of which are pivoted to the ways 14 14, their lower ends being adapted for removable engagement in the sockets 18 18 in the ways 12 12. The carrying-frame is additionally braced by the diagonal rods 19 19 and 20 20. At the lower ends of the ways 12 12 are apertured extensions 21, which permit the ways to be locked in the sockets 22 when the frame is in upright operative position.

The vertically-adjustable frame, which is movable in the framework just described, consists of the vertical side pieces 23 23, provided with outer longitudinal ribs 24 24, which fit loosely within the channels 13 13 in the ways 12 12.

25 and 26 are the upper and lower cross-pieces, which hold the vertical side pieces together. The upper ends of the vertical side pieces are provided with the extensions 27 27, in the outer ends of which is journaled the shaft 28.

29 29 are slotted guides adapted to travel loosely between the the ribbed ways 14 14.

30 30 are diagonal braces connecting the cross-pieces 26 26 with the outer ends of the extensions 27 27.

Having described the main framework and the adjustable frame which is raised and lowered in the said framework, I will now describe the operative parts of the apparatus and the manner in which they excavate the earth to form the trench.

31 is an elongated shaft journaled at its upper and lower ends in the vertically-adjustable frame. This shaft is provided with one or more longitudinal channels 32, by means of which a sprocket-wheel 33 is loosely feathered upon the same. This sprocket-wheel 33 rests upon an apertured bracket 34, secured to the main framework at its lower end and through which the channeled power-shaft loosely passes as the vertically-adjustable frame carrying this shaft is raised or lowered in the main framework. This sprocket-wheel 33 is intended to be practically stationary with respect to the vertically-adjustable frame, except that it revolves under the action of the motor. The channeled shaft 31 has at its upper end the bevel-gear 36, rigid upon the shaft 37 in the vertically-moving frame.

38 is another shaft in front of the shaft 37. Upon this shaft are mounted two sprocket-wheels 39 39, corresponding in position to the two sprocket-wheels 40 40 upon the shaft 37. Sprocket-chains 41 41, passing around these sprocket-wheels 39 39 and 40 40, communicate the power imparted to the shaft 37 to the outer shaft 38. An intermediate shaft 42 carries two sprocket-wheels 43, around which the sprocket-chains 44 pass. Two sprocket-wheels 45 45 upon the shaft 42 engage with the sprocket-chains 41 41 and communicate power thereby to the shaft 42. The lower portions of these sprocket-chains 44 pass around the sprocket-wheels 45, rigid upon the shaft 46, journaled in the lower end of the movable frame. Upon this shaft 46 are rigidly mounted the disks 47, which are provided around their peripheries with a series of plow-points 48. Two sets of endless carriers 49 49, upon which are mounted the horizontally-cutting scoops 50, pass around the rigid sprocket-wheels 51 on the shaft 38, from which they receive their power, the loosely-mounted sprocket-wheels 52 upon the lower shaft 46, and the loosely-mounted sprocket-wheels 53 upon the shaft 28. As will be seen, the two lines of horizontally-cutting scoops 50 operate between the three disks 47 with their plow-points 48.

54 is a shaft journaled in the main framework just above the truck, upon which are loosely mounted the two drums 55 55.

56 is a clutch which engages or disengages the drums 55 with or from the shaft 54 by means of the lever 57. Around these drums are wound and unwound the cables 58, which pass under the pulleys 59 and up to the cross-piece 25 on the movable frame, where they are secured on each side thereof.

60 60 are two drums rigidly mounted on the shaft 61, around which are wound and unwound the cables 62 62, the lower ends of which are secured to the ends of the cross-piece 25 upon the movable frame.

Power is applied to shaft 61 by means of the belt 63, which passes around the rigid pulley 64 on the shaft 61 and the loosely-mounted pulley 65 on the shaft 54. This pulley 65 is thrown in and out of engagement with the shaft 54 by the clutch 66, operated by the lever 67.

Upon the projecting end of shaft 61 is rigidly mounted the friction-disk 68, to the inner side of which is rigidly secured the ratchet-wheel 69. A friction-band 70 has one end rigidly secured to the main framework. It is then passed over and around the friction-disk 68 and down against the loose pulley 71, its lower looped end 72 being secured to a cord 73, the lower end of which is attached to the lever 74, which operates to tighten or loosen the friction-band 70 upon its disk.

75 is a lever pivoted to the main framework just under the friction-disk 68. Its inner end is secured to the main framework by the spiral spring 76, and its outer end has attached thereto the cord 77, the lower end of which is secured to the lever 78. Near the pivot-point

of the lever is the dog 79, integral with the lever and adapted for engagement with the ratchet-wheel 69.

80 is a frame secured upon a platform 81 upon the front of the truck. Journaled in this frame is the horizontal shaft 82, carrying upon its outer end the sprocket-wheel 83, to which power is communicated from the motor, (not shown,) which may be mounted upon the truck, or it may be a traction-engine, coupled to the apparatus. Upon the inner end of this shaft 82 is the bevel-gear 84, (see Fig. 9,) which intermeshes with the bevel-gear 85, rigidly mounted upon the vertical shaft 86, carrying rigidly at its upper end the sprocket-wheel 87. A sprocket-chain 88 or band passes around this wheel 87 and the sprocket-wheel 33, feathered upon the vertical channeled shaft, thereby communicating power from the motor to this shaft, by means of which the scoops and cutting-disks are kept in motion. The chain or band 88 passes between the two sets of friction-rollers 89 89 and 90 90. The shaft 54, carrying the drums 55 55, the pulley 65, and the clutches 56 and 66, is operated by the sprocket-chain 91, connected with the sprocket-wheel 92, rigid upon the shaft 54 and the motor.

My improved excavating apparatus is operated as follows: Its operative position is shown in Figs. 1 and 2. To lower the vertical movable frame until the cutting-disks and scoops are in contact with the ground, the clutch 56 is thrown into engagement with the drums 55, which causes them to revolve and wind thereon the cords 58, attached to the movable frame. At the same time the dog 79 is thrown out of engagement with the ratchet-wheel 69 the friction-band 70 is forced down upon its friction-disk 68 to prevent a too-rapid descent of the frame, and the clutch 66 is thrown out of engagement with the pulley 65, which permits the shaft 61 with its drums 60 to revolve in the opposite direction and allow the cords 62 to unwind as the frame descends. In this manner the scoops 50 and cutting-disks 47, with their plow-points 48, can be gradually lowered as the excavation progresses. The disks 47 cut into the earth in vertical lines on each side of the two lines of scoops 50, which horizontally cut away and scoop up the earth and carry it to the top of the apparatus, where it is thrown upon the inclined chute 93, from whence it can be diverted to one side of the trench. When the next succeeding section of earth is to be excavated, it will be necessary to lift the movable frame to the surface, which can be quickly accomplished by removing the pressure of the friction-band 70 upon its disk 68, throwing the dog 79 into engagement with its ratchet-wheel 69, throwing off the clutch 56 from engagement with the shaft 54, and throwing the clutch 66 into engagement with the pulley 65, which imparts a winding motion to the shaft 61 and its drums 60 60. The cords 62 are again wound upon their drums, which causes the movable frame to be raised the required height, at which point the dog 79 springs into engagement with its ratchet-wheel 69 and holds the frame from accidental descent. As the cords 62 wind around their drums the cords 58 are unwound from their drums 55. When the apparatus, which is of considerable height in its erect operative position, is to be moved, it will be necessary to collapse the same to avoid contact with the electric wires strung across and along the streets. This is quickly accomplished by unshipping the belt 63 and sprocket chain or band 88 and disengaging the lower ends of the pivoted braces 17 from their sockets 18. The main framework, with its vertically-movable frame, can then be lowered to its horizontal position, as clearly shown in Fig. 6.

With my improved apparatus a trench can be quickly and effectively excavated to any depth desired, and the apparatus, being portable, can be easily moved along in the direction of the excavation, thus entirely obviating the present expense and inconvenience of setting up, taking down, and shifting the apparatus now in use. The number of cutting-disks and lines of scoops can be increased for wider trenches by simply duplicating the parts herein shown.

I claim—

1. A portable apparatus for excavating trenches consisting of a truck carrying an upright main framework having vertical guides or ways, a frame vertically adjustable in the guides or ways of the main framework, a series of vertically-cutting disks and a series of endless bands carrying horizontally-cutting scoops both mounted and operating in the vertically-adjustable frame, a vertical shaft journaled in the vertically-adjustable frame and carrying a stationary feathered sprocket-wheel for actuating the vertical shaft and its attached operative parts in the vertically-adjustable frame, a shaft mounted on the truck carrying loose lower winding-drums with clutch mechanism and cords attached to lower drums and vertically-adjustable frame for lowering same, and a shaft mounted in the main framework and carrying rigid upper winding-drums and cords attached to upper drums and vertically-adjustable frame for raising same.

2. A portable apparatus for excavating trenches consisting of a truck carrying an upright main framework having vertical guides or ways, a frame vertically adjustable in the guides or ways of the main framework, a series of vertically-cutting disks and a series of endless bands carrying horizontally-cutting scoops both mounted and operating in the vertically-adjustable frame, a vertical shaft journaled in the vertically-adjustable frame and carrying a stationary feathered sprocket-wheel for actuating the vertical shaft and its attached operative parts in the vertically-adjustable frame, a shaft mounted on the truck

carrying loose lower winding-drums with clutch mechanism and cords attached to lower drums and vertically-adjustable frame for lowering same, a shaft mounted in the main framework and carrying rigid upper winding-drums and cords attached to upper drums and vertically-adjustable frame for raising same, a loose pulley with clutch mechanism on the truck-shaft and a rigid pulley on the main-framework shaft, with belt connecting lower loose pulley for operating upper winding-drums, a ratchet-wheel and dog on the main-framework shaft for holding the vertically-adjustable frame at any point, and a friction-disk and band connected with the main-framework shaft for regulating the descent of the vertically-adjustable frame.

3. A portable apparatus for excavating trenches consisting of a truck carrying a collapsible main framework having vertical guides or ways, a frame vertically adjustable in the guides or ways of the main framework, a series of vertical cutting-disks and a series of endless bands carrying horizontally-cutting scoops both mounted and operating in the vertically-adjustable frame, and means for raising and lowering the vertically-adjustable frame.

4. A portable apparatus for excavating trenches consisting of a truck, a collapsible main framework having vertical guides or ways, a frame vertically adjustable in the guides or ways of the main framework, a series of vertical cutting-disks and a series of endless bands carrying horizontally-cutting scoops both mounted and operating in the vertically-adjustable frame, a vertical shaft journaled in the vertically-adjustable frame and carrying a stationary feathered sprocket-wheel for actuating the channeled shaft and its attached operative parts, in the vertically-adjustable frame, and means for raising and lowering the vertically-adjustable frame.

5. A portable apparatus for excavating trenches consisting of a truck carrying a collapsible main framework having vertical guides or ways, a frame vertically adjustable in the guides or ways of the main framework, a series of vertically-cutting disks and a series of endless bands carrying horizontally-cutting scoops, both mounted and operating in the vertically-adjustable frame, a vertical shaft journaled in the vertically-adjustable frame and carrying a stationary feathered sprocket-wheel for actuating the vertical shaft and its attached operative parts in the vertically-adjustable frame, a shaft mounted on the truck carrying loose lower winding-drums with clutch mechanism and cords attached to lower drums and vertically-adjustable frame for lowering same, a shaft mounted in the main framework and carrying rigid upper winding-drums, and cords attached to upper drums and vertically-adjustable frame for raising same.

6. A portable apparatus for excavating trenches consisting of a truck carrying a collapsible main framework having vertical guides or ways, a frame vertically adjustable in the guides or ways of the main framework, a series of vertically-cutting disks and a series of endless bands carrying horizontally-cutting scoops, both mounted and operating in the vertically-adjustable frame, a vertical shaft journaled in the vertically-adjustable frame and carrying a stationary feathered sprocket-wheel for actuating the vertical shaft and its attached operative parts, in the vertically-adjustable frame, a shaft mounted on the truck carrying loose lower winding-drums with clutch mechanism and cords attached to lower drums and vertically-adjustable frame for lowering same, a shaft mounted on the main framework and carrying rigid upper winding-drums and cords attached to upper drums and vertically-adjustable frame for raising same, a loose pulley with clutch mechanism on the truck-shaft and a rigid pulley on the main-framework shaft with belt connecting lower loose pulley for operating upper winding-drums, a ratchet-wheel and dog on the main-framework shaft for holding the vertically-adjustable frame at any point and a friction-disk and band connected with the main-framework shaft for regulating the descent of the vertically-adjustable frame.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HERMANN NETTELBECK.

Witnesses:
W. T. MILLER,
W. F. SCHIFLA.