

No. 713,750.

Patented Nov. 18, 1902.

W. COLE.  
EXCAVATING MACHINE.  
(Application filed Apr. 16, 1902.)

(No Model.)

3 Sheets—Sheet 1.

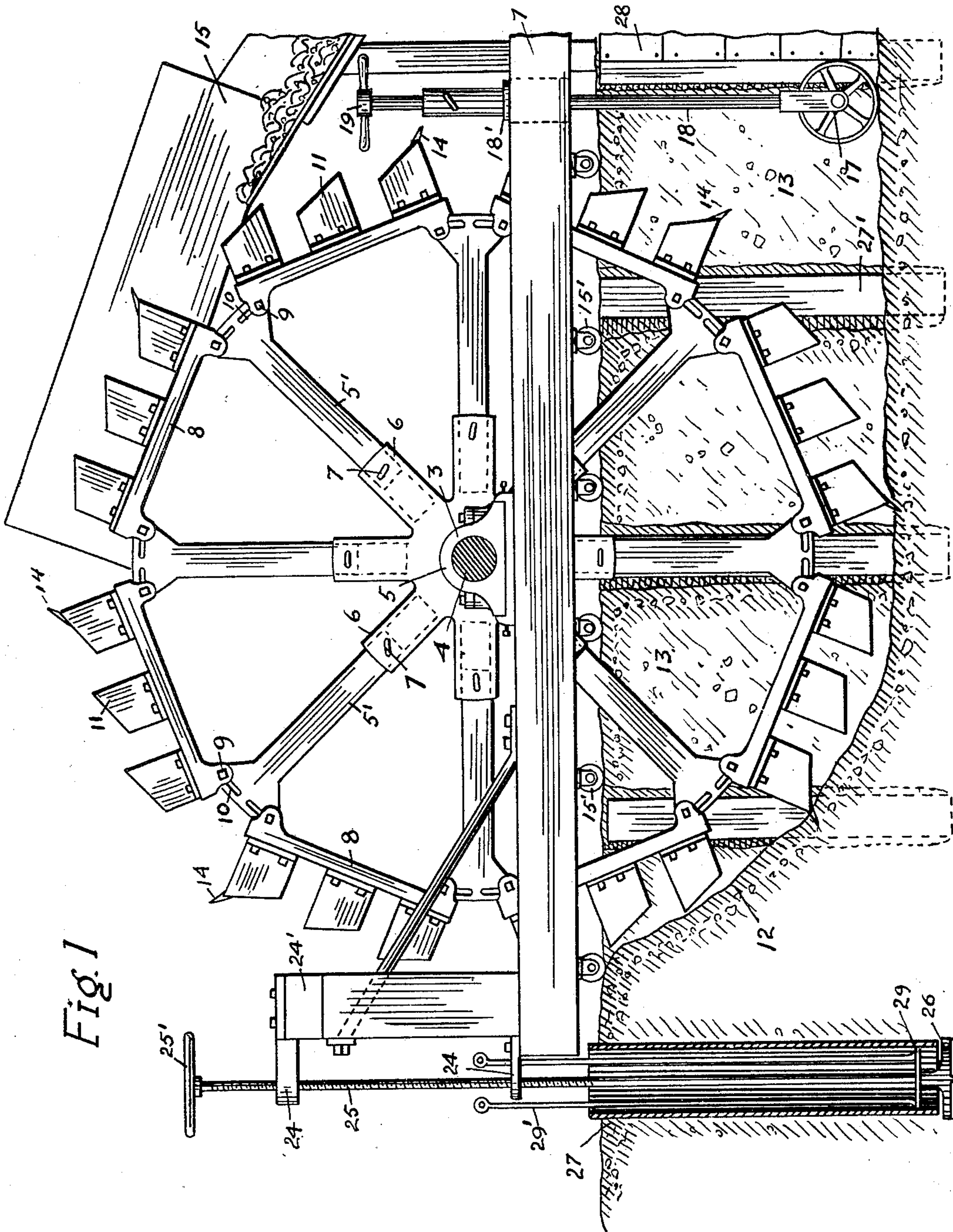


Fig. 1

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INVENTOR:

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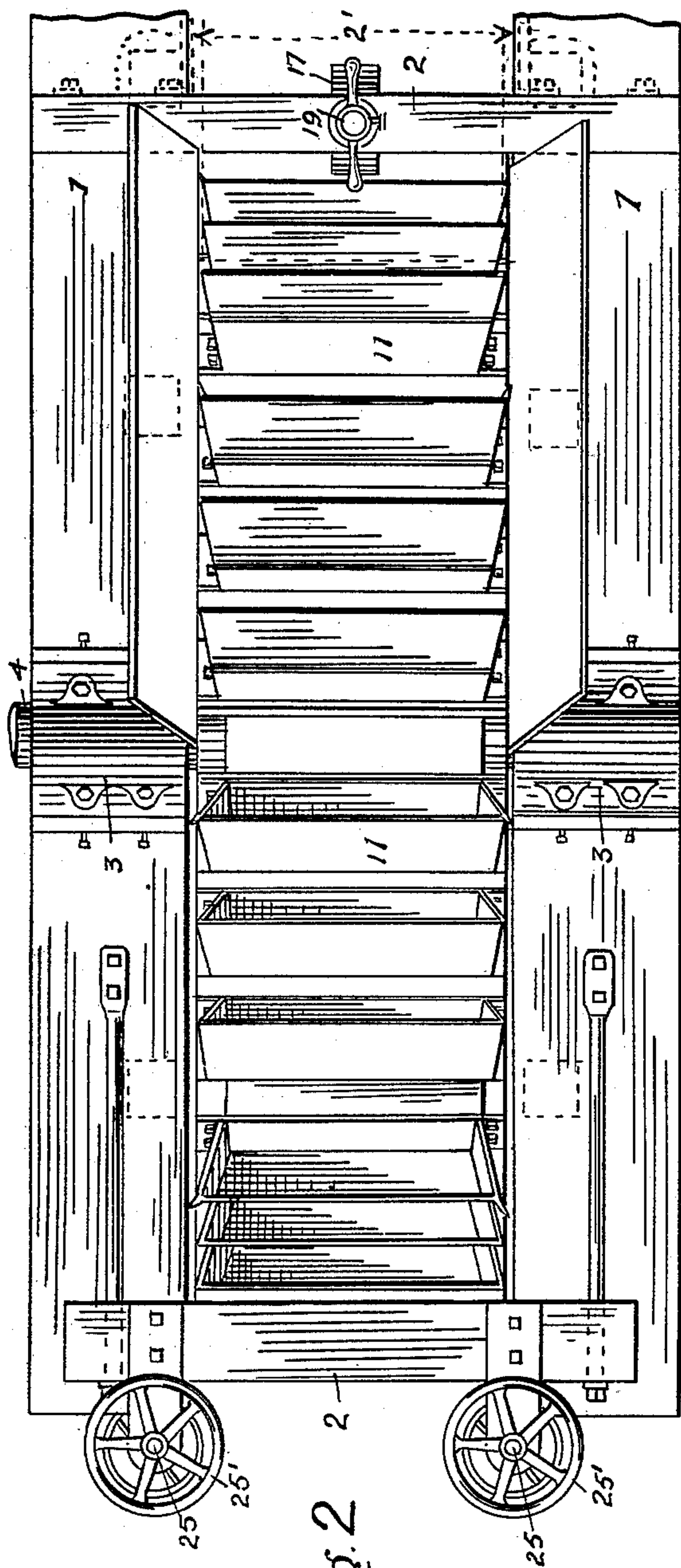


Fig. 2

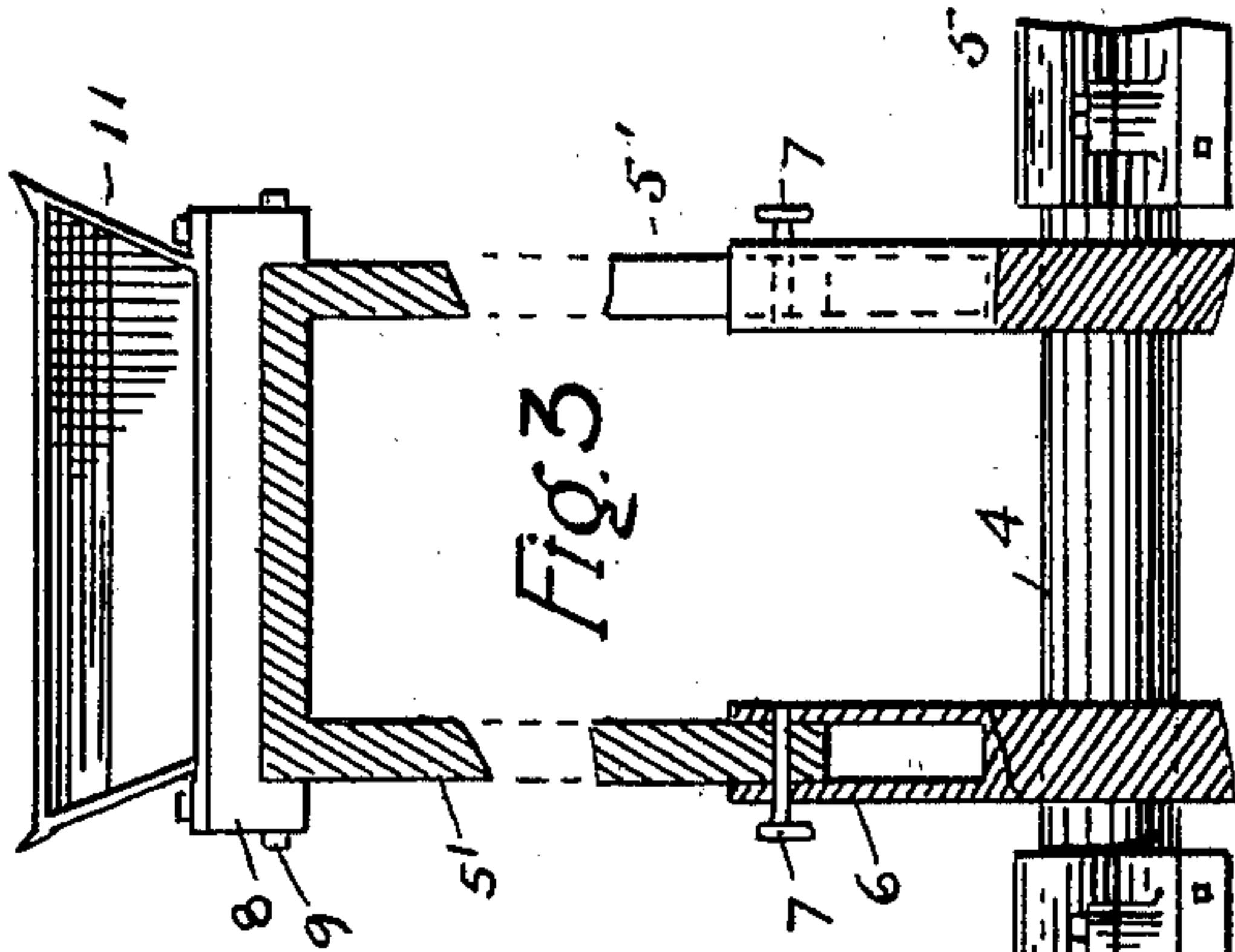


Fig. 3

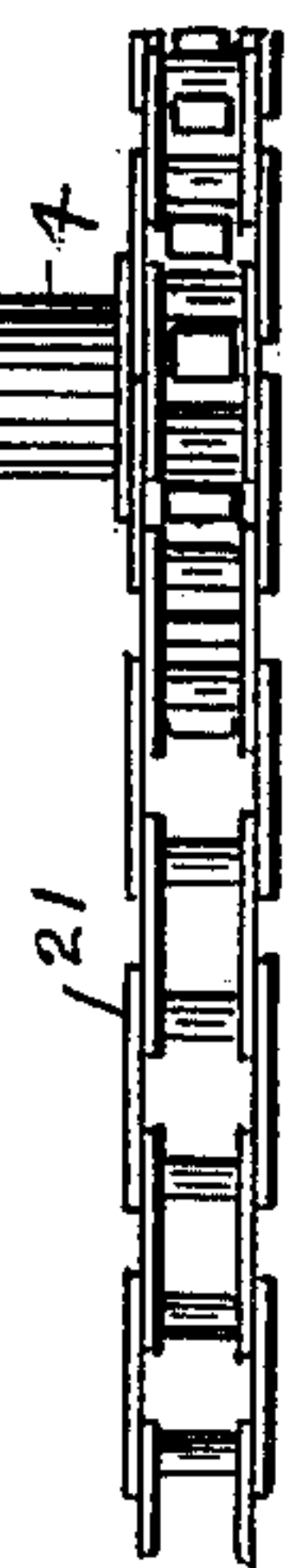


Fig. 4

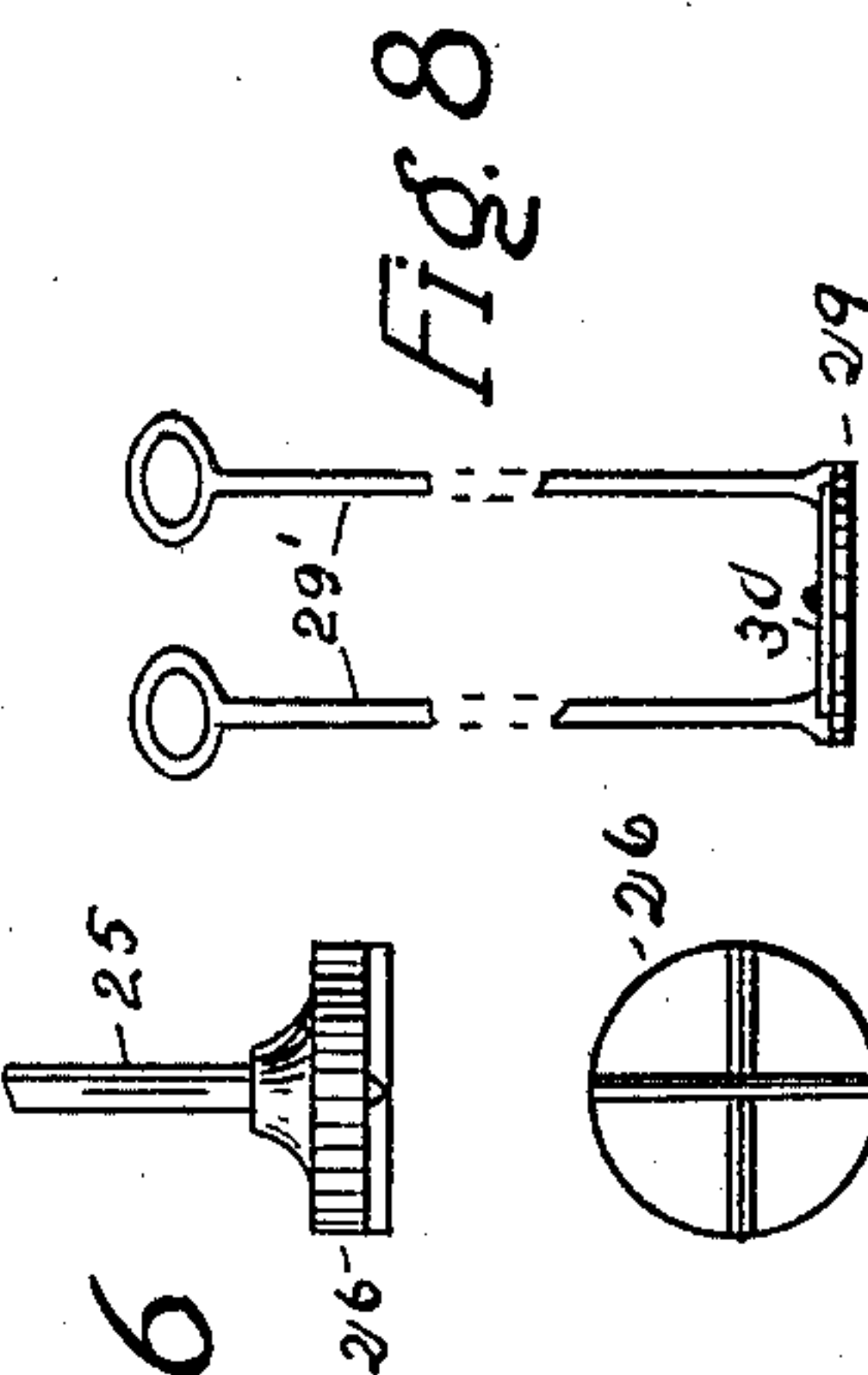


Fig. 6

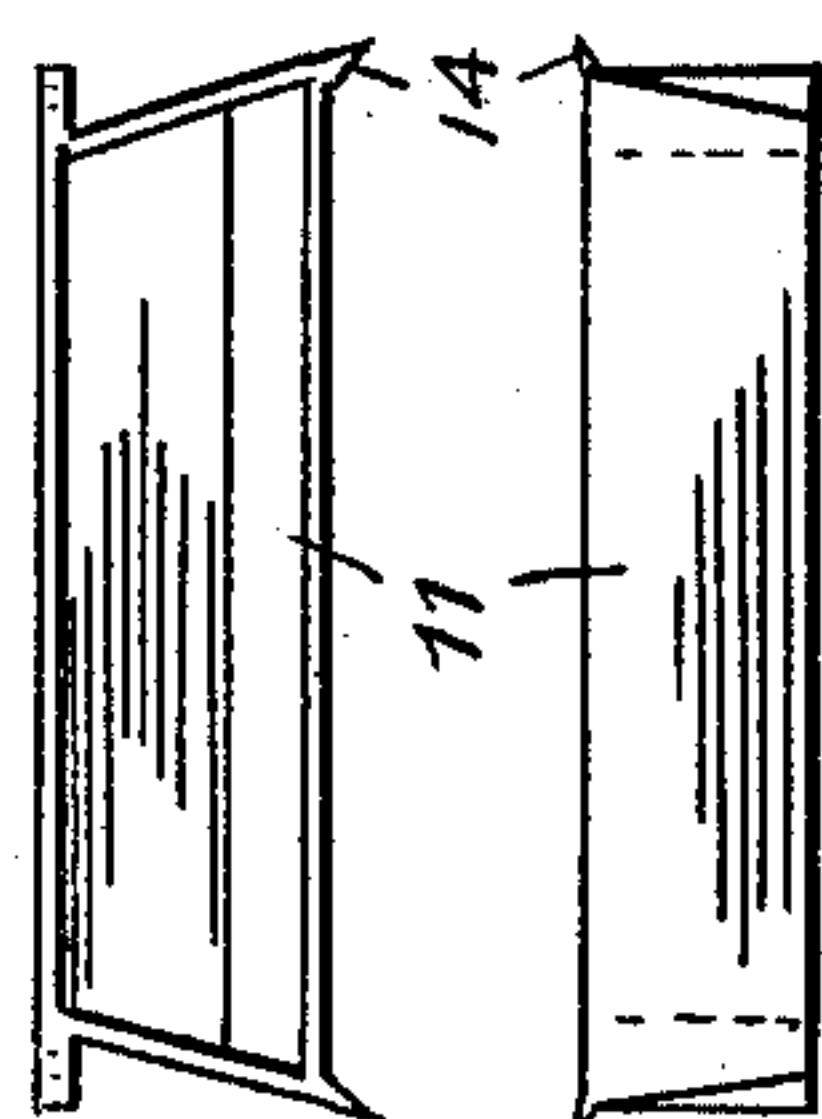


Fig. 5

Fig. 8



Fig. 7

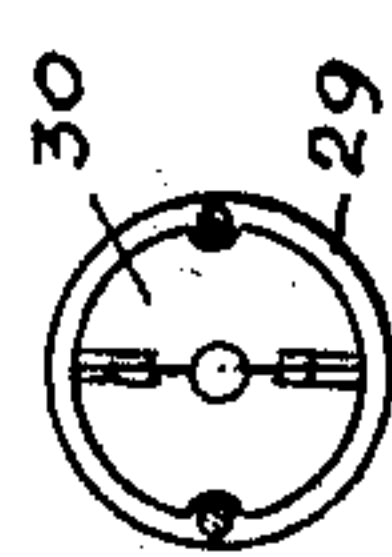


Fig. 9

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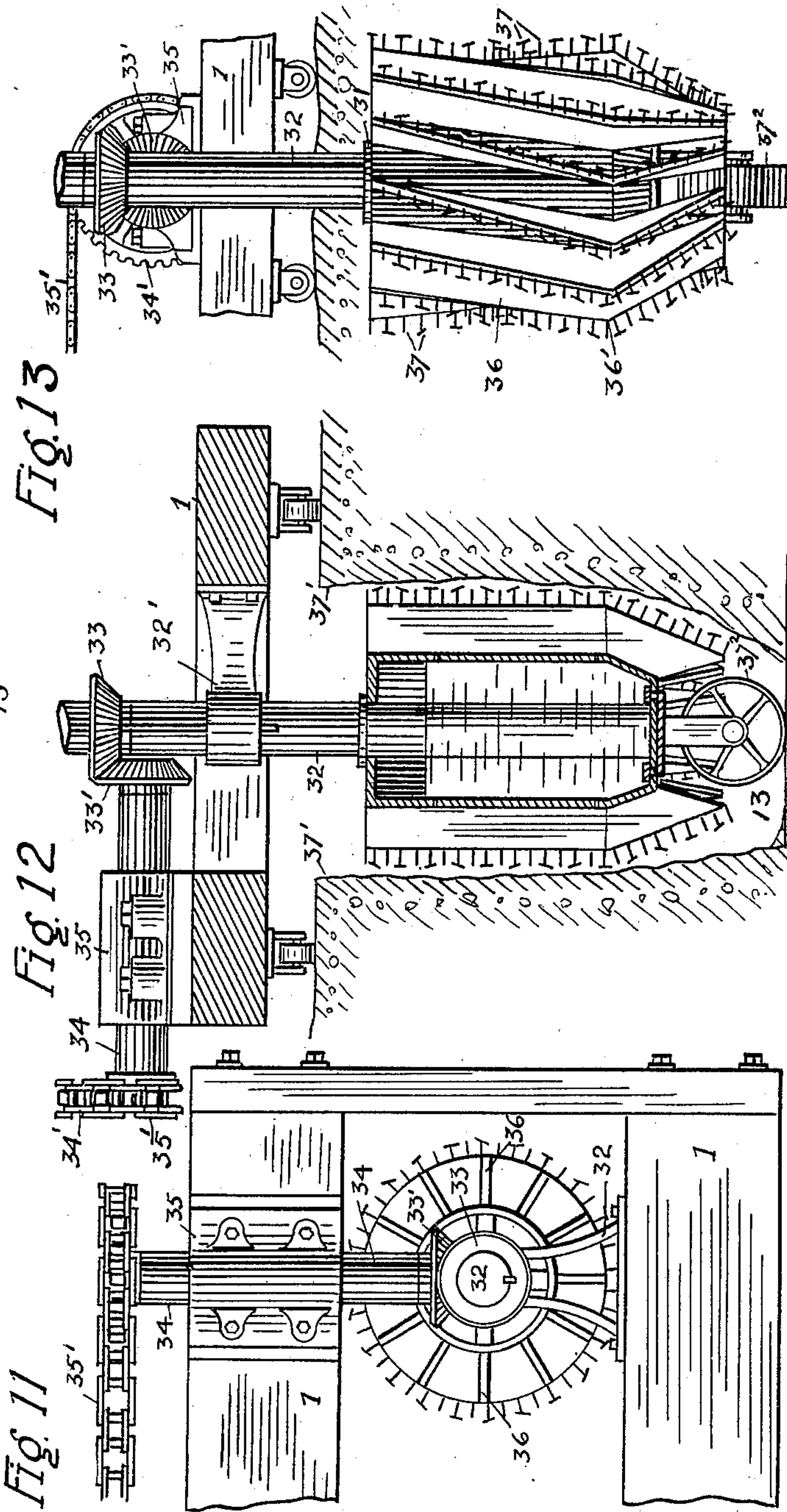
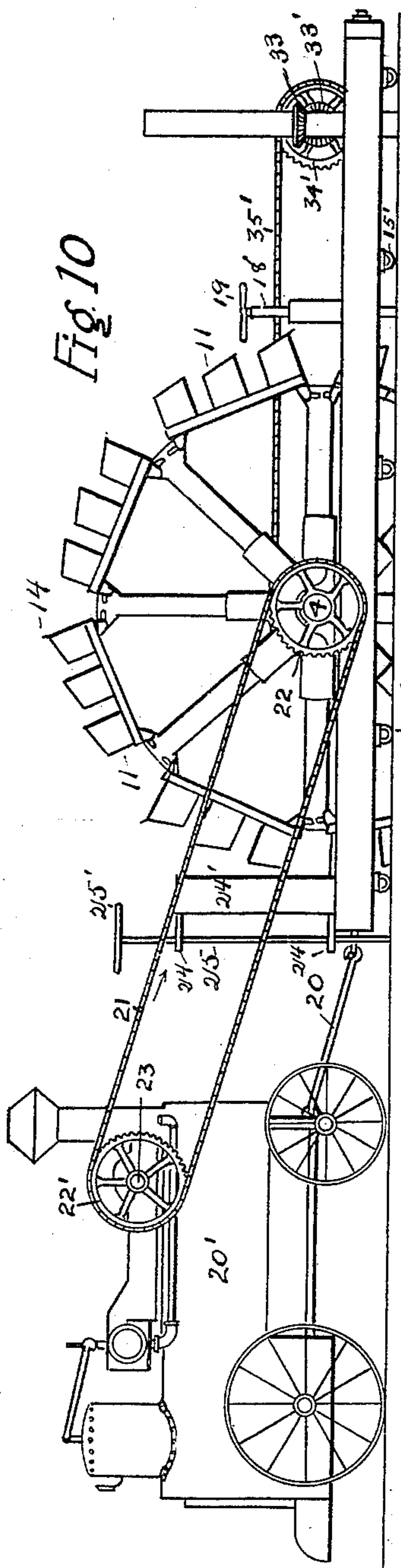
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(No Model.)

**3 Sheets—Sheet 3.**



WITNESSES:

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# UNITED STATES PATENT OFFICE.

WALTER COLE, OF SAN FRANCISCO, CALIFORNIA.

## EXCAVATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 713,750, dated November 18, 1902.

Application filed April 16, 1902. Serial No. 103,152. (No model.)

*To all whom it may concern:*

Be it known that I, WALTER COLE, a citizen of the United States, residing in the city and county of San Francisco, State of California, 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 same.

The present invention relates to a certain new and useful machine designed for use in excavating the trench or ditch for the laying of pipes in the construction of sewers. In the laying of sewer or other small-size pipe it is required that the trench be a narrow one, and for this reason much difficulty is experienced in the digging of the ditch or trench other than by hand. Where the work is done by hand, it is required that considerable unnecessary excavation be done, as the trench must be made sufficiently wide to enable the workmen to handle their tools with ease.

The object of the present invention is to provide a machine capable of cutting a ditch or trench approximately the width of the pipe to be laid therein, thereby saving the cost incident to the removal and handling of unnecessary material, whereby the cost of excavating and removing the dirt is considerably lessened, and which will facilitate the work of constructing the trench or ditch; also, to provide means whereby the excavated trench or ditch may be trimmed or shaped and means whereby holes may be dug for the insertion of posts for use in connection with shoring the wall of the cut in order to prevent the same caving in.

To comprehend the invention, reference should be had to the accompanying sheets of drawings, wherein—

Figure 1 is a side view of the machine, partly broken away, illustrating the carrier-wheel within a trench for excavation and the post-hole cutter as completing one of the holes for the posts, the discharge chute or runway being in section, the trimming mechanism and power mechanism being removed. Fig. 2 is a plan view of the mechanism disclosed in Fig. 1. Fig. 3 is a broken vertical sectional view of the carrier-hubs and the spokes thereof, with one of the cutting-buckets attached thereto; Figs. 4 and 5, detail views of one of the cutting-buckets; Fig. 6, a similar view of one of the

cutting drills or augers for the cutting of the post-holes; Fig. 7, a bottom plan view thereof; Fig. 8, a detail view of the dirt remover or follower for use in connection with the drill or auger. Fig. 9 is a bottom plan view of one of the valved disks or plates. Fig. 10 is a side view of the complete machine, the carrier-wheel, and trimmer working within the trench; Fig. 11, an enlarged plan view of the trimmer and its drive mechanism. Fig. 12 is a cross-sectional rear end view of the frame of the machine, illustrating the trimmer in vertical section and locked within the trench; and Fig. 13 is a detail view of the trimmer within the trench.

In the drawings the main frame of the machine is represented as consisting of side pieces 1, united by the end pieces 2, the side pieces 1 being located a distance apart to give a clearance-space 2' equal in width to the trench or ditch to be excavated. Within bearing-pieces 3, secured to the side pieces 1, works a cross-shaft 4. To this cross-shaft is secured the wheel-hubs 5. The spokes 5' of the carrier-wheel are adjustably fitted within sockets 6 of the hubs 5, being held in place by adjusting means 7. The outer ends of the spokes are engaged by the bucket-plates 8, which plates are adjustably secured to the spokes by means of the set-pins 9, which work in elongated openings 10 of the spokes. This adjustment of the bucket-plates is required in order that the same may be adjusted in accordance with the adjustment given the spokes of the hubs 5 to increase or decrease the wheel's diameter. To each bucket-plate there is attached a series of cutting-buckets 11, which during the rotation of the carrier-wheel cut into the embankment 12 of the ditch or trench 13 being formed. The first bucket of each series attached to the bucket-plates 8 is provided with forwardly-cutting knives or fingers 14, the object of which is to enable certain of the buckets to have an advance cut given thereto, so as to loosen the embankment or dirt in advance of the cutting edge proper of the bucket.

The carrier or excavating wheel consists of the hubs 5, spokes 5', and bucket-plates 8, with their cutting mechanism.

The loosened dirt is shoveled, so to speak, within the buckets 11 of the carrier-wheel



and lifted by the rotary travel thereof until deposited within the chute or runway 15, which chute or runway is supported at a slight incline above the frame of the machine. By means of this runway or chute all excavated material is delivered to any suitable place of deposit. If desired, the runway may be so arranged as to redeliver the excavated material to the cut ditch or trench a distance behind the machine and in this manner refill the ditch or trench upon the pipe laid therein. The carrier-frame is supported by rolls 15', secured in bearings or journals attached to the under face of the side or longitudinal pieces 1.

To support the carrier-frame at its rear end portion, there is arranged a follower or supporting wheel 17, which wheel is journaled in the lower bifurcated end of supporting-rod 18. The upper end portion of this rod is screw-threaded and works through an inner screw-threaded guide 18', attached to the carrier-frame. To the upper end of the supporting-rod is attached the handle 19, by means of which the supporting-rod may be turned to raise or lower the follower or supporting wheel 17.

Any suitable mechanism may be employed for imparting longitudinal travel to the machine and for rotating the carrier-wheel. A simple means for propulsion is to attach to the forward end of the carrier-frame, by coupling or connection 20, a traction-engine 20'. Connection between said motive mechanism and the carrier-wheel shaft 4 is made through the medium of a sprocket-chain 21, which sprocket-chain works over sprocket-gear 22, attached to one end of the carrier-shaft, and over sprocket-gear 22', attached to the driving-shaft 23 of the motor mechanism.

Inasmuch as the ditch or trench desired to be excavated for the laying of pipe therein is usually of a narrow form, it is essential that means be employed in connection with the machine for providing for the shoring of the side walls of the trench, else there is liability of the said walls caving in. With this end in view there is secured to forward portion of the carrier-frame, by means of guides 24 projecting from the supporting upright 24', the drill-rods 25, which are actuated by means of the hand-wheels 25'. These rods at their lower ends carry the drill or auger bits 26. By means of this mechanism post-holes 27 may be drilled at each side of the line of cut a distance in advance of the carrier-wheel. It will be understood in the present case that during the operation of boring holes for the posts 27' the carrier-wheel stands at rest or does not operate. After the insertion of the posts within said holes planks 28 are nailed thereto as the work of excavating the trench advances, thus shoring up the side walls of the embankment. To remove the dirt from the post-holes as the drill or auger descends, so as not to require the withdrawal of the bit or auger for such purpose, inwardly-opening

valved disks 29 are employed. These disks or circular plates work over the rods 25 and are raised or lowered by means of the hand-rods 29', attached thereto. As these rods are forced downward where water is intermixed with the soil the valves 30 of the disks or plates 29 open outwardly, thus allowing the liquid dirt to pass thereabove. During the withdrawal of the hand-rods 29' the valves close automatically and the liquid dirt is prevented from escaping through the disks or plates 29. In this manner the load of dirt may be withdrawn from the auger-holes for the posts.

In order to give a finish to the cut trench or ditch, a trimmer is provided for the machine. The same comprises a hub 31, mounted upon the vertical shaft 32, which at its upper end works through bearing-guide 32', secured to the rear end of the main frame. To the upper end of rod 32 is attached the bevel-pinion 33, which meshes with a bevel-gear 33', mounted on cross-shaft 34, working in bearing 35, secured to the end piece of the carrier-frame. To the outer end of cross-shaft 34 is attached the sprocket-wheel 34'. This cross-shaft is driven from the carrier-shaft 4 through the medium of the sprocket-chain 35', which chain works over sprocket-wheel 34 and a sprocket-wheel secured to the end of carrier-shaft opposite to that carrying sprocket-wheel 22.

The hub 31 of the trimming device has attached thereto a series of vertical ribs 36, which ribs inwardly incline from the point 36' toward their lower end. These ribs each carry a series of cutting-teeth 37, which project a distance beyond the outer edge of the ribs. As the hub 31 is rotated during the movement of the carrier-shaft at a high rate of speed, the teeth projecting from the ribs cut away or trim the side walls 37' of the trench or ditch 13 being formed. To the lower end of the vertical shaft 32 is attached a supporting-wheel 37<sup>2</sup>, which wheel rests upon the surface of the trench or ditch and serves as a support for the trimmer.

It will be understood that the width of the cutting-buckets 11 is that of the ditch or trench to be excavated.

Inasmuch as the lower half of the carrier-wheel projects a distance below the carrier or main frame to a depth approximately equal that of the trench or ditch to be excavated, it is required that an initial cut be made at the commencement of the line of trench sufficiently deep to enable the carrier-wheel to be fitted therein.

By reason of the adjustment permitted the spokes 5' and cutting-bucket plates 8 the diameter of the carrier-wheel may be varied within certain limits to meet the requirements of excavating trenches of different depth.

By the use of the described machine only such material is excavated as necessary to obtain the required width for the laying of the pipe-sections.

The present invention is not confined to the



laying of sewer-pipes, but is equally as well adapted for the excavating of trenches for the insertion of water-mains or the excavating of ditches for use as waterways or narrow trenches desired for any purpose whatever.

Having thus described the invention, what is claimed as new, and desired to be protected by Letters Patent, is—

1. In an excavating-machine for the cutting of narrow ditches or trenches, the combination with a roller-supported carrier-frame which rests on each side of the line of cut, of a carrier-wheel mounted to work within the frame, a series of adjustable spokes for said wheel, a series of excavating-buckets adjustably attached to the periphery of the wheel, and means for imparting longitudinal travel to the carrier-frame and rotary motion to the carrier-wheel.

2. In a machine for excavating narrow trenches or ditches, the combination with the longitudinally-movable carrier-frame, of a cross-shaft working in bearings thereof, a carrier-wheel secured to said shaft and working within the carrier-frame, a series of adjustable spokes for said wheel, the outer ends of the spokes being united by adjustable plates which form the periphery of the wheel, a series of excavating-buckets attached to each plate, and means for imparting longitudinal travel to the frame and rotation to the shaft of the carrier-wheel.

3. In a machine for excavating narrow ditches or trenches, the combination with the longitudinally-movable carrier-frame which spans the line of cut, of a carrier-wheel working therein, a series of adjustable spokes for the wheel, said spokes being united at their outer ends by bucket-plates, a series of excavating-buckets attached to each plate, a follower or supporting wheel for the frame, said follower or supporting wheel traveling on the bottom of the cut, and means for imparting longitudinal travel to the carrier-frame and rotation to the carrier-wheel.

4. In a machine for excavating narrow ditches or trenches, the combination with the longitudinally-movable frame which spans the line of cut, of means attached thereto for forming holes for the insertion of posts at each side of the line of cut, a carrier-wheel working within the frame, a series of excavating-buckets attached to the periphery of the wheel, and means for imparting longitudinal travel to the frame and rotation to the carrier-wheel during travel of the frame.

5. In a machine for excavating narrow trenches or ditches, the combination with the longitudinally-movable frame which spans the line of cut, of an excavating-wheel working within the frame, of trimming mechanism working within the trench or ditch formed by the excavating-wheel, said mechanism being suspended from the movable frame, drive means supported by the frame for operating the trimming mechanism, mechanism for im-

parting travel to the frame and rotation to the carrier-wheel, and connection whereby the drive means for the trimming mechanism is operated during the movement of the carrier-wheel.

6. The combination with the longitudinally-movable frame which spans the line of cut, of a carrier-wheel working therein, a series of cutting-buckets attached to the periphery thereof, means for imparting travel to the frame and rotation to the carrier-wheel, a trimmer working within the cut trench or ditch to the rear of the carrier-wheel, the same comprising a hub secured to a vertical shaft working in bearing of the frame, and a series of cutting devices secured to the hub, and means for rotating the trimmer with the movement of the rotary carrier.

7. The combination with the longitudinally-movable frame which spans the line of cut, of an excavating-wheel working therein, a rotary ditch-trimmer suspended from the rear portion of the frame within the ditch or trench, means for imparting forward travel to the frame and rotation to the excavating-wheel, and connection between the excavating-wheel and the trimmer whereby the said trimmer is operated during the working of the excavating-wheel.

8. The combination with the longitudinally-movable frame which spans the line of cut, of rotary excavating means working therein, mechanism for imparting longitudinal travel to the frame and rotation to the excavating means, a trimmer working within the trench or ditch to the rear of the excavating means, the same comprising a shaft, a series of radial ribs attached thereto and a series of cutting teeth or projections secured to the outer edge of each rib, and means secured to the frame for operating said trimmer during the rotation of the excavating means.

9. In a machine for excavating narrow ditches or trenches, the combination with the longitudinally-movable frame which spans the line of cut, of rotary excavating means working within the frame, of guides attached to the forward end of the frame, drill-rods working therein, said rods carrying bits or augers for the drilling of post-holes at each side of the line of cut, valved plates or disks working on said rods, means for raising and lowering the valved plates or disks, means located at the rear of the rotary excavator for trimming the cut ditch or trench, mechanism for imparting longitudinal travel to the frame and rotation to the excavating means, and connection whereby the trimming mechanism is operated during the working of the excavating means.

In witness whereof I have hereunto set my hand.

WALTER COLE.

Witnesses:

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D. B. RICHARDS.