

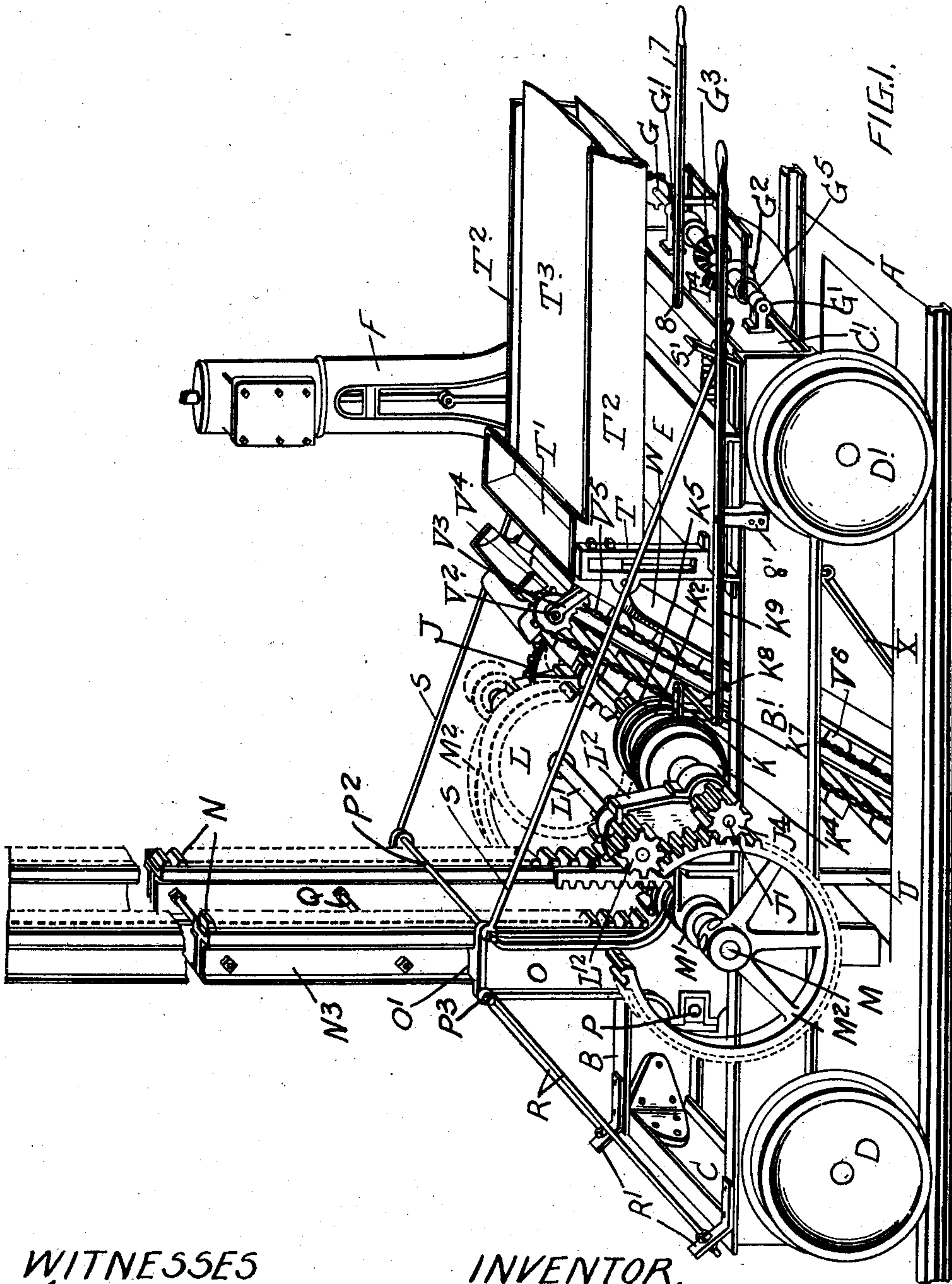
J. P. FARRELLY.  
EXCAVATOR.

APPLICATION FILED NOV. 12, 1907. RENEWED NOV. 4, 1910.

994,380.

Patented June 6, 1911.

3 SHEETS—SHEET 1.



WITNESSES  
A. Young  
Bert Disney

INVENTOR.  
J. P. Farrelly  
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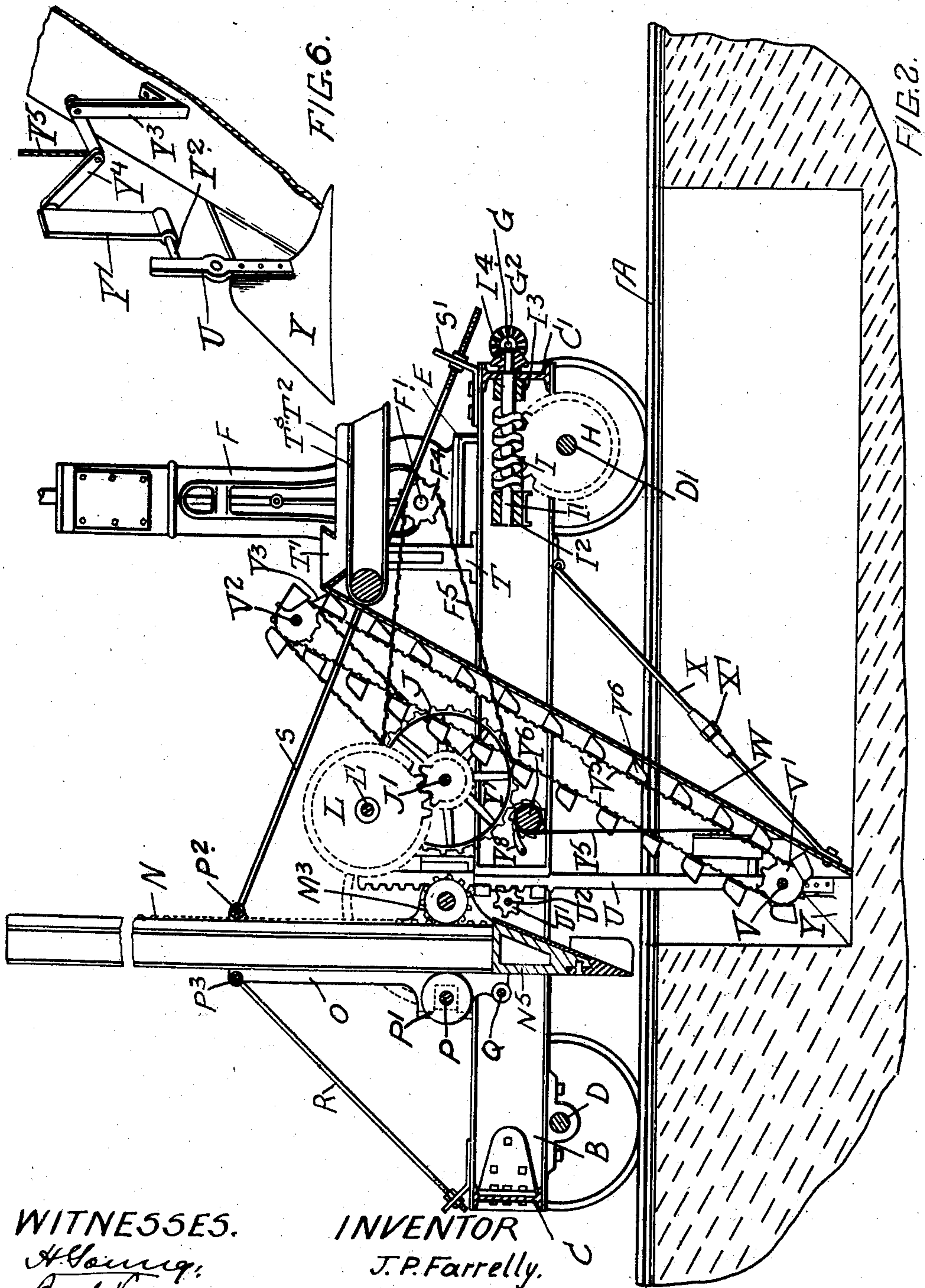
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WITNESSES.

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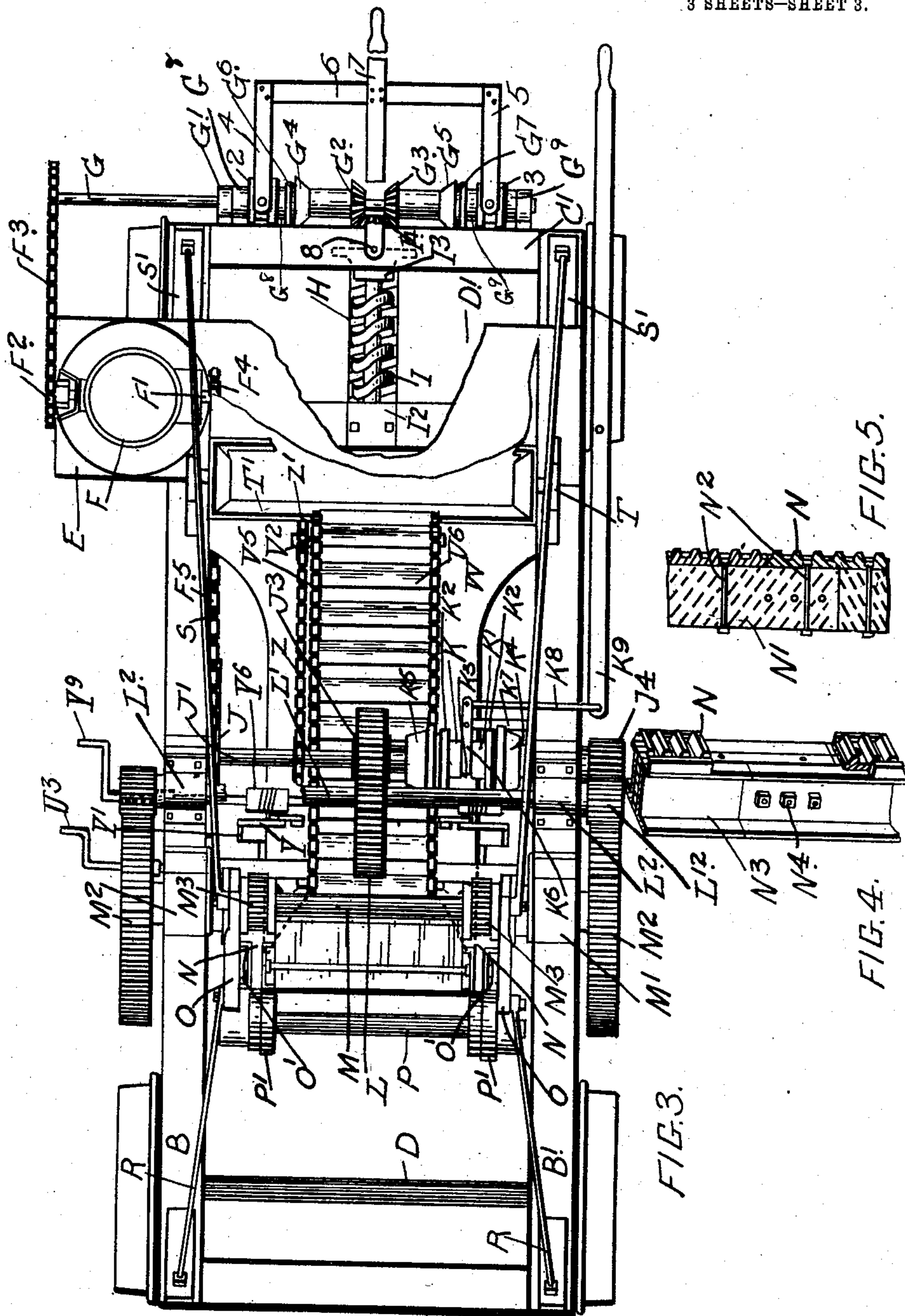
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WITNESSES  
A. Young.  
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# UNITED STATES PATENT OFFICE.

JAMES PETER FARRELLY, OF TORONTO, ONTARIO, CANADA.

## EXCAVATOR.

994,380.

Specification of Letters Patent.

Patented June 6, 1911.

Application filed November 12, 1907, Serial No. 401,878. Renewed November 4, 1910. Serial No. 590,750.

*To all whom it may concern:*

Be it known that I, JAMES PETER FARRELLY, of the city of Toronto, in the county of York, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Excavators, of which the following is the specification.

My invention relates to improvements in excavators, which forms the subject matter of Letters Patent of the United States Number 870,943 granted November 12, 1907, and the object of the invention is—first—to improve the construction of the excavator, the shovel, the engine and endless conveyer continuously driven therefrom and which may be always completely under the control of the attendant of the machine located at a definite point—secondly—to provide means whereby the earth loosened by the shovel may be removed continuously to the opposite end of the drain without the necessity of employing manual labor and at the same time allow of the pipes being laid immediately of the point of excavation and the point of the discharge—thirdly—to provide a positive and effectual drive for the shovel, which will not only provide for a maximum downward pressure of the shovel at its low speed, but also a quick withdrawal of the shovel and the consequent saving of time incident thereto—fourthly—to provide means for holding the machine down to its work and obviate any liability of it lifting from the rails should the excavator be employed in particularly hard soil—fifthly—to provide for the excavation of material of any desired depth within practical limits—sixthly—to provide means for adjusting the shovel, guides and driving gear therefor, whereby the shovel may be driven downwardly vertically or at any desired slant or batter, and also adjust the conveyer to suit the position and movement of the shovel. To effect these objects I have constructed and arranged my excavator in the manner, which I shall presently describe.

Figure 1, is a perspective view of my machine complete. Fig. 2, is a longitudinal section showing it at work. Fig. 3, is a plan view. Fig. 4 is a detail showing the method of connection of the extensible rack. Fig. 5, is a vertical section through Fig. 4. Fig. 6, is a detail of the mechanism by which the machine is held down to its work.

In the drawings like letters of reference indicate corresponding parts in each figure.

A A are the rails on which my excavator is supported and which are designed to run along on each side of the path of the excavation as it proceeds.

B and B' are the sides, which are preferably formed of double channel iron and C C' are the ends, which are also preferably formed of channel iron and suitably connected to the sides, these sides and ends forming a truck frame.

D and D' are the front and rear wheels and axles respectively, which are suitably journaled under the truck and support the same.

E is the platform supported at one side of the frame or truck of the excavator, and F is an engine secured thereon and having a main shaft F'. At the outer end of the shaft F' is a sprocket F<sup>2</sup>, which is connected by a chain F<sup>3</sup> to a shaft G journaled in suitable bearings G' at the rear of the truck or frame.

H is a worm wheel secured on the shaft D' and with which meshes a worm I formed on the spindle I', which is journaled in suitable bearings I<sup>2</sup> and I<sup>3</sup> suitably supported in the truck. The rear end of the spindle I' is provided with a miter gear I<sup>4</sup>. Located on the shaft G are the miter gears G<sup>2</sup> G<sup>3</sup> having elongated heads formed with the interior female coned clutches with which co-act the male clutches G<sup>4</sup> and G<sup>5</sup> respectively. The gears G<sup>2</sup> and G<sup>3</sup> are loose on the shaft and are provided with the female conical cups G<sup>4</sup> and G<sup>5</sup> with which the male cones G<sup>6</sup> and G<sup>7</sup> co-act. The cones G<sup>6</sup> and G<sup>7</sup> are secured on the sleeves G<sup>8</sup> and G<sup>9</sup>.

2 and 3 are grooved collars attached to or forming part of the sleeves G<sup>8</sup> and G<sup>9</sup>.

4 and 5 are forked bars having at the inner ends pins extending into the grooved collars.

6 is a connecting bar connecting the outer ends of the forked bars 4 and 5.

7 is a lever secured centrally to the bar 6 and pivoted on a pin 8 on the rear portion of the frame.

It will now be seen that by manipulating the lever 7 the drive may be shifted from the gear wheel G<sup>2</sup> or G<sup>3</sup>, so either one or the other is solid with the shaft G and thereby impel through the medium of the miter gear I<sup>4</sup> the worm I and thus move the truck backward and forward as required. It will, of course, be understood that the shaft G is always being rotated as



long as the engine is running and when the lever 7 is in the central position the truck or carriage will remain stationary.

On the opposite end of the shaft  $F'$  to that on which the sprocket wheel  $F^2$  is situated I secure a sprocket wheel  $F^4$ , which is connected by a sprocket chain  $F^5$  to a sprocket wheel  $J$  on the cross shaft  $J'$ . The cross shaft  $J'$  is journaled in suitable bearings on the side bars of the frame and is provided with a pinion  $J^3$  and clutch mechanism  $K$  comprising the sleeve  $K'$  having the male end cones  $K^2$  and annular groove  $K^3$ , and the female cones  $K^4$  and  $K^5$ . The sleeve  $K'$  is loose on the shaft and the cones  $K^4$  and  $K^5$  are secured to the shaft.

$K^6$  is a forked lever pivoted on the bracket  $K^7$  and having the inner forked end projecting into the annular groove  $K^3$ , and the outer end connected by a rod  $K^8$  to the controlling lever  $K^9$  pivoted on a bracket  $8'$  secured to the side bar of the machine, and having the handle hand within easy reach of the operator of the machine, who would stand at the rear thereof.

The shaft  $J'$  is provided at one end with the pinion  $J^4$  for a purpose, which will hereinafter appear. The pinion  $J^3$  meshes with the gear wheel  $L$  on the cross shaft  $L'$ , which is journaled in bearings  $L^2$  on the side bars of the frame.

$M$  is a cross shaft journaled in bearings  $M'$  and provided with gear wheels  $M^2$   $M^2$ , which mesh with the gear pinions  $L^2$  on the cross shaft  $L'$ . The pinion  $J^4$  also meshes with one gear wheel  $M^2$  at the inner side of the machine as indicated.

$M^3$  are shrouded pinions, which are secured on the shaft  $M$  and mesh with the racks  $N$ . The racks  $N$  are secured to the upright bars  $N'$  by bolts  $N^2$ . Both racks and the upright bars  $N'$  are made in sections, the uprights being fastened together by channel iron bars  $N^3$ , which break joint with the bars  $N'$  and are suitably bolted to them by bolts  $N^4$ . As the racks and upright bars to which they are secured and angle plates are made in sections it will be understood that they may be made of any desired height within definite limits, and thereby provide for excavation of more or less depth. To the bottom of the lowermost bars  $N'$  is suitably secured the spade or shovel  $N^5$ , the cross bar of such spade or shovel being formed hollow and bridging the bottom ends of the bars  $N'$ .

$O$  are uprights, which are journaled on the shaft  $M$  at the front and have tongues  $O'$  formed in them, which extend into the channel iron sides of the racks.

$P$  is a shaft journaled in suitable bearings in the upright  $O$  and carrying the friction rollers  $P'$ , which abut the back edge of the racks and thereby insure of the even movement of the racks.

$P^2$  and  $P^3$  are cross bars connecting the lugs formed at the tops of the uprights  $O$  to the front and bottom of the rack respectively. The uprights  $O$  have tongues, which fit into the ways formed by the channel irons and thereby permit of the guiding of the racks as they are moved up or down.

$Q$  is a cross rod, which extends through the side bars and pivot bearing of the upright, and holds such upright in the vertical position normally.

$R$  are bracing rods, which extend from the rods  $P^3$  to and through brackets  $R'$  on the front of the machine. The rods  $R$  are provided with suitable clamping nuts at each side of the brackets, whereby the position of the rods in the brackets may be adjusted.

$S$  are bracing rods connected to the rods  $P^2$  at one end and at the opposite end threaded and extending through the brackets  $S'$  and provided with suitable clamping nuts on each side of the bracket, whereby the rod may be adjusted. By the attachment of the rods  $R$  and  $S$  and the withdrawal of the cross bar or shaft  $Q$  the racks may be swung to any oblique position desired.

$T$  are uprights supporting the hopper  $T'$  and casing  $T^2$  at one end.

$T^3$  is a belt, which extends through the casing underneath the hopper at one end and at the other end passes through a suitable place of deposit, which will be preferably at the far end of the drain or ditch, which is being dug, so that as the earth is being excavated from one end such excavation is passed to the far end of the ditch as will hereinafter appear.

$U$  are bars provided with rack-shaped upper ends with which mesh the pinions  $U'$ , which are secured on a suitable cross shaft  $U^2$ , which is provided with a crank  $U^3$  for a purpose which will hereinafter appear.

$V$  is a cross shaft journaled in suitable bearings at the bottom of the bar  $U$  and carrying the sprockets  $V'$ .

$W$  is an inclined way extending from the bottom of the bars  $U$  to the front edge of the hopper  $T'$ .

$X$  are swinging braces rigidly secured to the bottom of the way  $W$  and at the top hinged to the side bars of the truck. The braces  $X$  are provided with suitable turn buckles  $X'$ , whereby they may be shortened or lengthened in order to allow of the way  $W$  being raised or lowered with facility.

$V^2$  is a cross shaft located at the top of the way  $W$  being journaled in suitable brackets  $V^3$  secured to the top and carrying sprockets  $V^4$ .

$V^5$  are endless chains extending over the sprockets  $V'$  and  $V^4$  and carrying the buckets  $V^6$ .

It will be noticed on reference to the plan



shown in Fig. 3, that the way W is wider than the width between the sprocket chains V<sup>5</sup> and the buckets carried thereby leaving a space on each side of the sprockets.

5 Y are scrapers attached to or secured to the bottom of the way W and formed substantially in the shape of a mold board, so as to direct the earth inwardly toward the buckets. The bottom of the bars U are se-  
10 cured to the scrapers Y as indicated.

Y' are clamping plates hinged at the bot-  
tom by the rods Y<sup>2</sup> on to the bars U.

Y<sup>3</sup> are uprights secured to the ways on  
each side of the endless bucket conveyers  
15 hereinbefore referred to and located in prox-  
imity thereto.

Y<sup>4</sup> is a toggle-jointed bar pivotally con-  
nected at the top to the bar Y<sup>3</sup> and to the  
plate Y'.

20 Y<sup>5</sup> is a wire rope connected to the center  
of the toggle jointed bars Y<sup>4</sup> and extending  
over a roller Y<sup>6</sup> having a ratchet Y<sup>7</sup> attached  
to one end thereof with which engages a  
pawl Y<sup>8</sup>. A crank handle Y<sup>9</sup> is provided at  
25 the opposite end of the roller Y<sup>6</sup> and by  
means of this crank handle the rope Y may  
be pulled upwardly, so as to straighten the  
toggle-jointed bar Y<sup>4</sup> and thereby press  
the side plates Y' as shown in Figs. 2 and 6  
30 against each side of the excavation, and  
thus securely hold the machine down to its  
work during the period that the shovel is  
moving downwardly. The endless convey-  
ing buckets V<sup>5</sup> are driven by means of a  
35 sprocket chain Z, which extends from a  
sprocket wheel Z' on the shaft J to a sprocket  
wheel on the shaft V<sup>2</sup>.

40 Having now described the principal parts  
involved in my invention I shall briefly de-  
scribe its operation and utility.

The engine F during the operation of my  
machine is kept continuously running. By  
manipulating the lever 7 the worm I may  
be rotated, so as to move the truck either  
45 backwardly or forwardly upon the rails to  
the desired position. A hole is dug in the  
ground to start my machine, such hole be-  
ing made of the desired depth and the  
clutch K is thrown into operation, so as to  
50 impart motion to the shaft M and conse-  
quently a downward movement of the racks  
N and shovel, thereby paring or digging  
off the front of the excavation and depos-  
iting it at the bottom within the scrapers.  
55 The endless buckets being driven from the  
shaft continuously by the sprocket chain  
hereinbefore referred to the material col-  
lected by the scrapers is elevated into the  
hopper T' and carried away to the opposite  
60 end of the ditch, drain or excavation to  
fill it in. Of course, when the hole is first  
made it has to be thrown back of the end  
of the excavation until such excavation is  
long enough to receive it. When the shovel  
65 has reached the limit of its downward

stroke the clutch K is reversely set and  
thereby the movement of the rack reversed.  
The sprocket chain F<sup>5</sup> is always driving  
the sprocket wheel J and consequently the  
shaft J'. The pinion J<sup>3</sup> forming one por- 70  
tion of the shaft engages as hereinbefore de-  
scribed with the spur wheel L. When the  
clutch K is set the central portion of the  
clutch is thrown into the cone K<sup>3</sup> and there-  
by connects the spur pinion J<sup>3</sup> with the 75  
shaft J' and thus drives the spur wheel L  
pinion L<sup>2</sup> and gear wheel M<sup>2</sup> and shrouded  
gears M<sup>3</sup>, thereby depressing the shovel at  
a slow speed. When, however, the clutch is  
operated, so as to throw the central portion 80  
into the cone K<sup>5</sup> the pinion J<sup>3</sup> then rotates  
loosely on the shaft and does not drive the  
spur wheel L, but the shaft drives directly  
the pinion J<sup>4</sup>, which meshes with the gear  
wheel M<sup>2</sup> and thereby causes such pinion 85  
to move comparatively quickly and drive  
the shrouded gears M<sup>3</sup> and racks with which  
they mesh also quickly in their upward  
ascent, thereby saving much time in the  
operation of my machine. 90

What I claim as my invention is:

1. In combination a truck, a shaft jour-  
naled therein, uprights having laterally ex-  
tended portions pivotally supported on the  
shaft, bracing means connected to the up- 95  
rights, racks guided by said uprights, a  
shovel carried at the lower ends of the  
racks, gears on the shaft meshing with said  
racks, and means for operating the shaft,  
substantially as described. 100

2. The combination with the truck and up-  
right suitably supported thereon having  
tongues on the inner sides thereof, of the  
rack consisting of the front toothed portion,  
the central portions bolted thereto and the 105  
channel iron side portions as and for the  
purpose specified.

3. The combination with the truck and up-  
right suitably supported thereon having  
tongues on the inner sides thereof, of the 110  
rack consisting of the front toothed por-  
tion, the central portions bolted thereto and  
the channel iron side portions, the said cen-  
tral portions and channel iron side portions  
being made in sections and breaking joint 115  
with each other and the shovel attached to  
the bottom of the racks as and for the pur-  
pose specified.

4. The combination with the uprights suit-  
ably supported and the racks and shovel 120  
connecting the bottom of the same, of a shaft  
journaled in bearings in the frame and pro-  
vided with pinions meshing with the racks,  
gear wheels at the outer ends of the shaft, a  
cross shaft provided with pinions meshing 125  
with the gear wheels aforesaid, a gear wheel  
on the latter cross shaft, a supplemental  
cross shaft provided with a gear pinion  
meshing with the aforesaid gear wheel on  
the cross shaft and means for throwing the 130



pinion into and out of gear with the gear wheel with which it meshes as and for the purpose specified.

5. The combination with the uprights suitably supported and the racks and shovel connecting the bottom of the same, of a shaft journaled in bearings in the frame and provided with pinions meshing with the racks, gear wheels at the outer ends of the shaft, a cross shaft provided with pinions meshing with the gear wheels aforesaid, a gear wheel on the latter cross shaft, a supplemental cross shaft provided with a gear pinion meshing with the aforesaid gear wheel on the cross shaft, means for throwing the pinion into and out of gear with the gear wheel with which it meshes, a sprocket wheel on the supplemental cross shaft and a sprocket pinion on the engine shaft, and a sprocket chain connecting the two sprockets as and for the purpose specified.

6. The combination with the uprights suitably supported and the racks and shovel connecting the bottom of the same, of a shaft journaled in bearings in the frame and provided with pinions meshing with the racks, gear wheels at the outer ends of the shaft, a cross shaft provided with pinions meshing with the gear wheels aforesaid, a gear wheel on the latter cross shaft, a supplemental cross shaft provided with a gear pinion meshing with the aforesaid gear wheel on the cross shaft, double cone frictions located on the supplemental shaft having the two internal frictions connected by a collar secured from rotating on the shaft, a forked lever extending into the collar, a lever extending to the front of the machine in proximity to where the attendant stands and suitably pivoted, and a rod connecting the latter lever with the aforesaid lever as and for the purpose specified.

7. The combination with the shovel and racks and guides therefor and means for manipulating the racks, of an inclined way adjustably connected to the truck and designed to extend normally in proximity to the path of the shovel, and means for raising the dug material on the inclined way as and for the purpose specified.

8. The combination with the shovel and racks and guides therefor and means for manipulating the racks, of an inclined way adjustably connected to the truck and designed to extend normally in proximity to the path of the shovel, means for raising the dug material on the inclined way and a hopper suitably supported in the frame and an

endless belt extending outwardly from the hopper for conveying the earth away from the machine as and for the purpose specified.

9. In a device of the class described, the combination with the inclined way suitably supported on the truck and extending there- through to the bottom of the ditch, of uprights connected to the bottom of the inclined way and provided with racks at the upper end, a cross shaft provided with a pinion meshing with the aforesaid racks and a crank handle for turning the cross shaft as and for the purpose specified.

10. The combination with the truck, shovel, racks and inclined way and the endless chain of buckets suitably supported in bearings on the inclined way and of a less width than the same, of the scrapers located at the bottom of the inclined way and secured thereto and of the full width of the inclined way at the front and converging to the width of the buckets next the way as and for the purpose specified.

11. The combination with the truck, shovel, racks and inclined way and the endless chain of buckets suitably supported in bearings on the inclined way and of a less width than the same, of the clamping plates suitably pivoted at the bottom of the inclined way, uprights secured to the inclined way in proximity to the endless chain of buckets, a toggle joint connecting the top of the upright to the clamping plates and means for straightening the joint, so as to cause the clamping plates to press against the side of the ditch as and for the purpose specified.

12. The combination with the truck, shovel, racks and inclined way and the endless chain of buckets suitably supported in bearings on the inclined way and of a less width than the same, of the clamping plates suitably pivoted at the bottom of the inclined way, uprights secured to the inclined way in proximity to the endless chain of buckets, a toggle joint connecting the top of the upright to the clamping plates, ropes connected to the center of the toggle, a drum around which such ropes extend provided with a ratchet and a crank handle and a ball meshing with the ratchet wheel as and for the purpose specified.

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Witnesses:

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