S. KELLY.

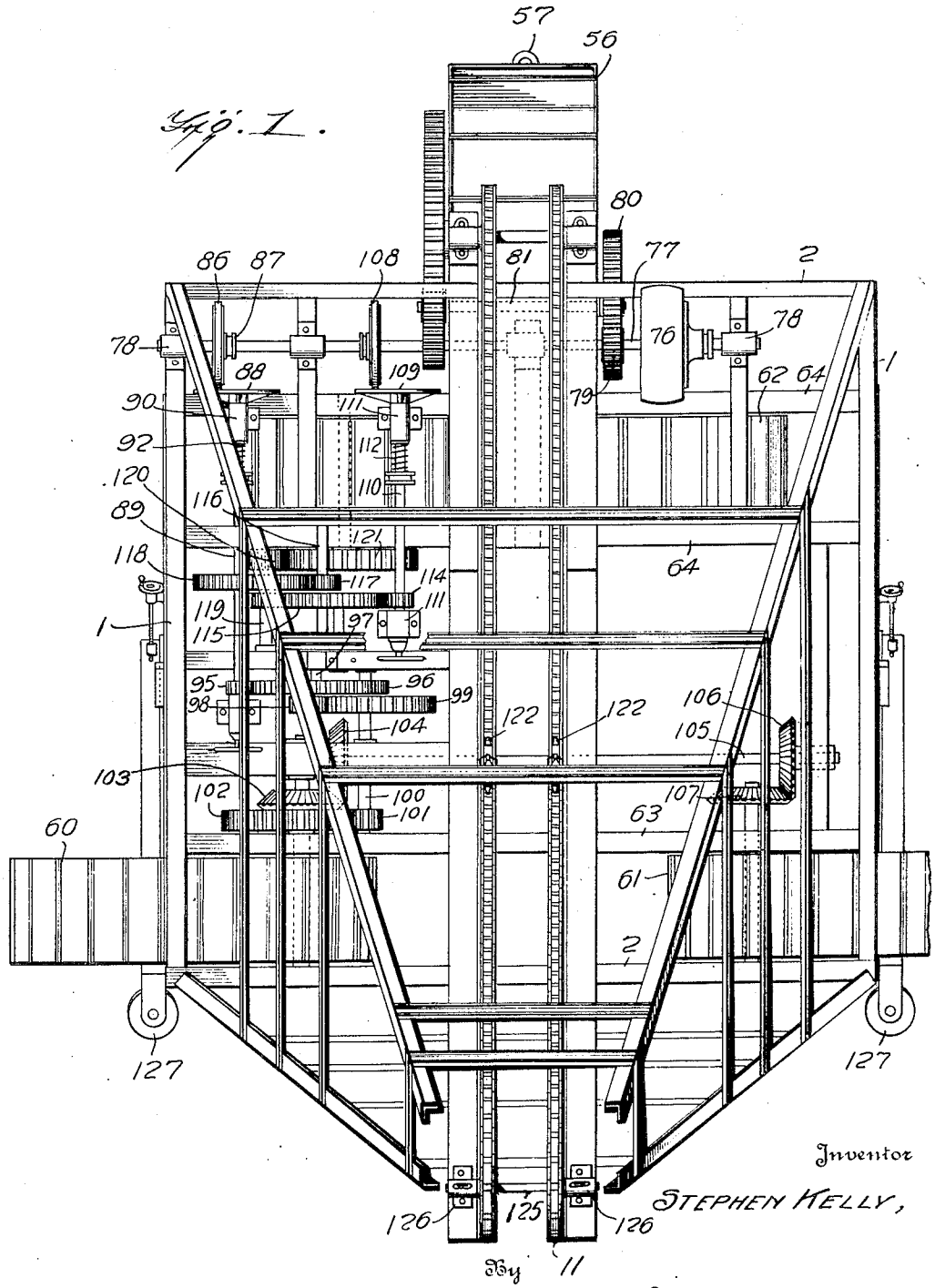
EXCAVATING MACHINE.

APPLICATION FILED DEC. 3, 1920.

1,437,594. Patented Dec. 5, 1922.

8 SHEETS—SHEET 1.

Fig. 1.



Inventor

STEPHEN KELLY,

By

Attorney

S. KELLY.

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8 SHEETS—SHEET 2.

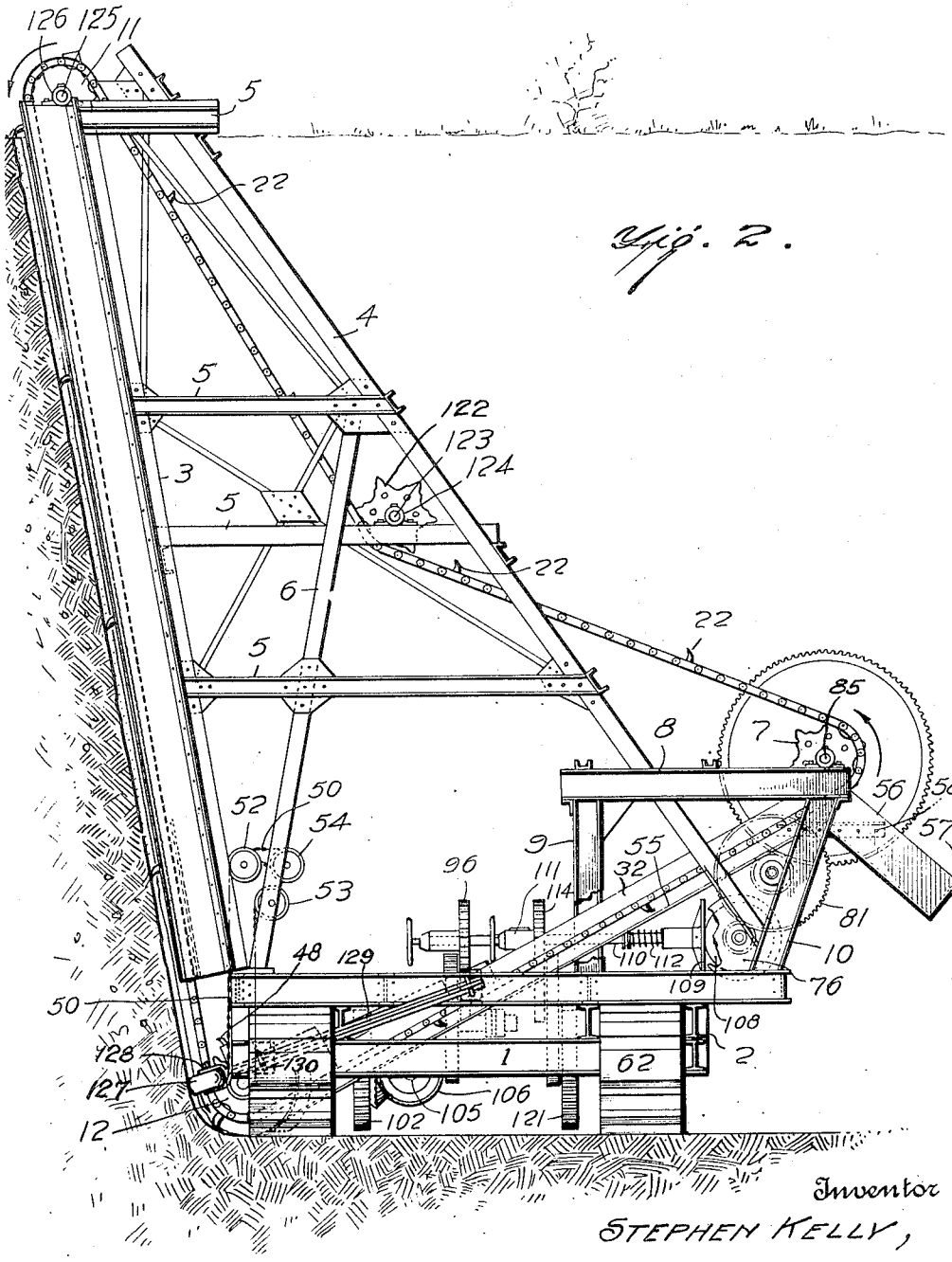


Fig. 2.

Inventor

STEPHEN KELLY,

Attorney

S. KELLY.

EXCAVATING MACHINE.

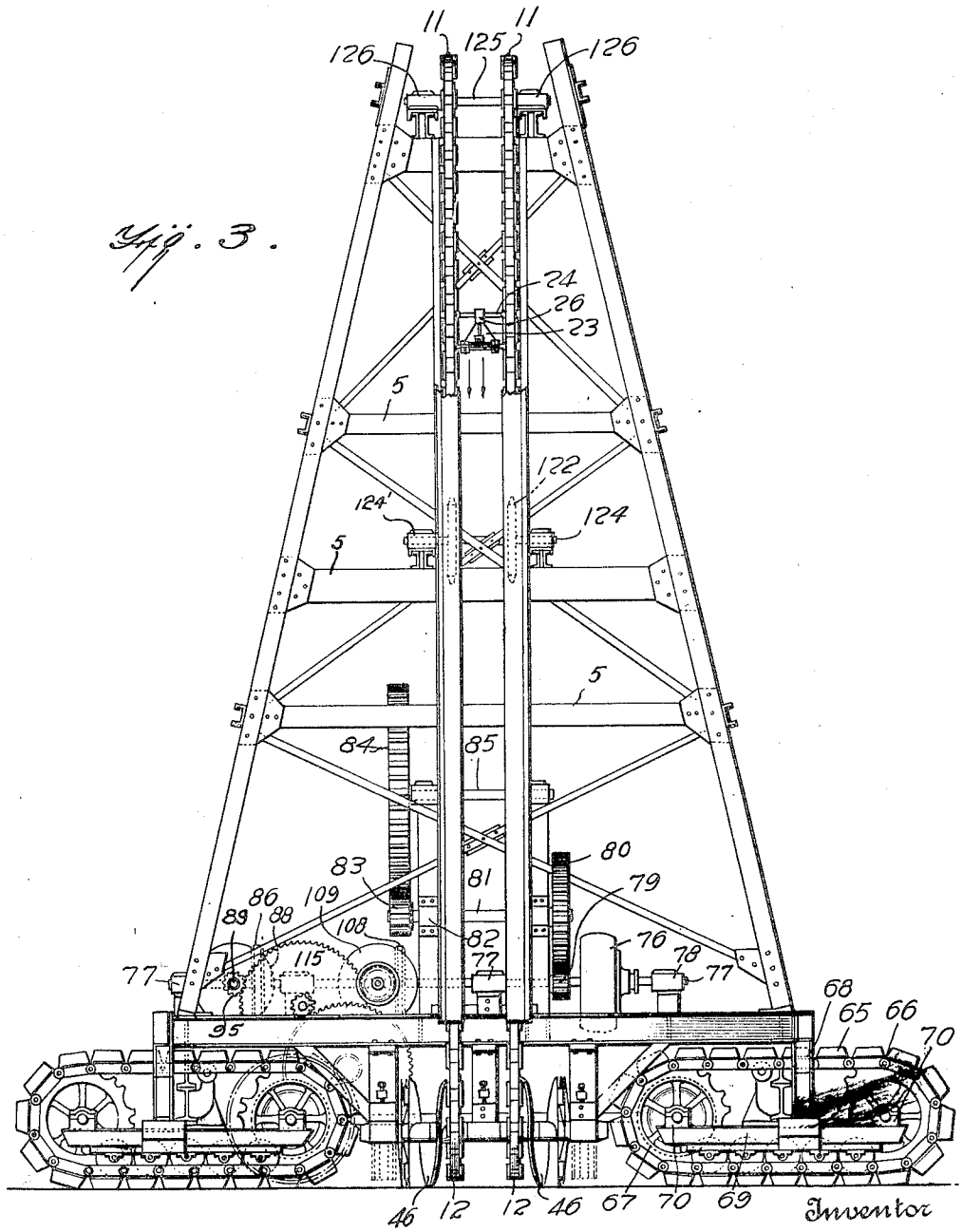
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8 SHEETS—SHEET 3.

Fig. 3.



Inventor

STEPHEN KELLY,

Ch. Parker Attorney

S. KELLY.

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8 SHEETS—SHEET 4.

Fig. 4.

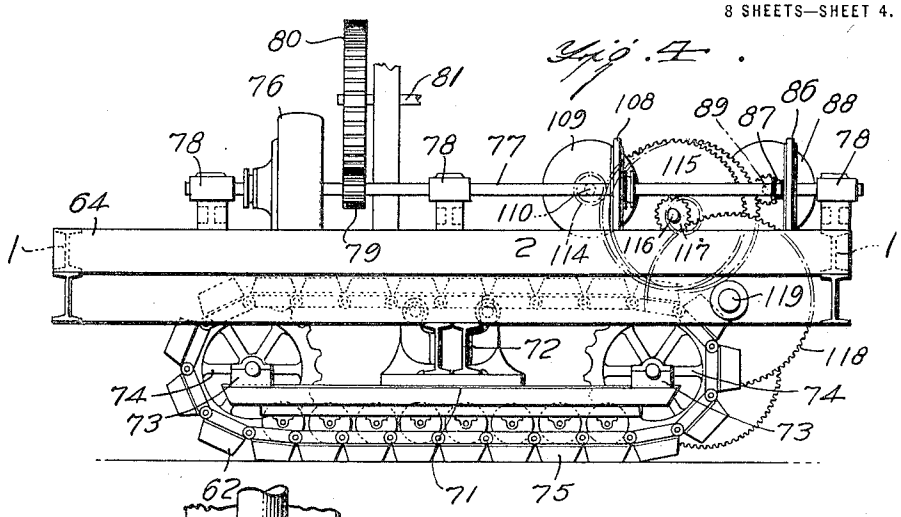


Fig. 5.

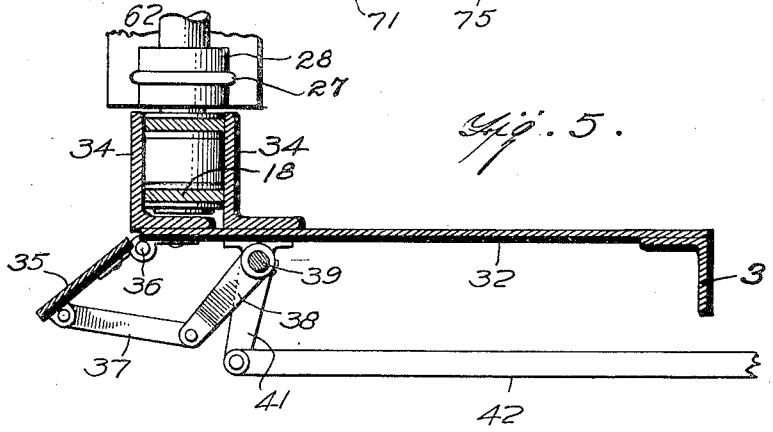
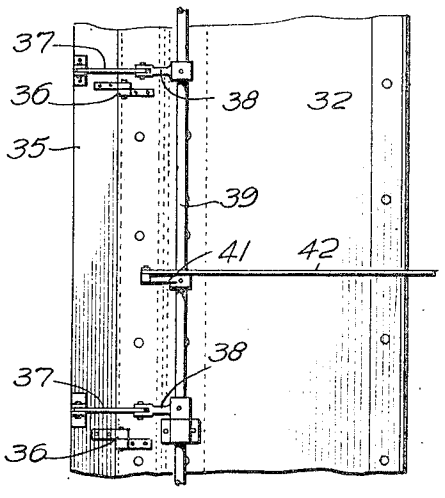


Fig. 6.



Inventor

STEPHEN KELLY,

By

C. L. Parker Attorney

S. KELLY.

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8 SHEETS—SHEET 5.

Fig. 7.

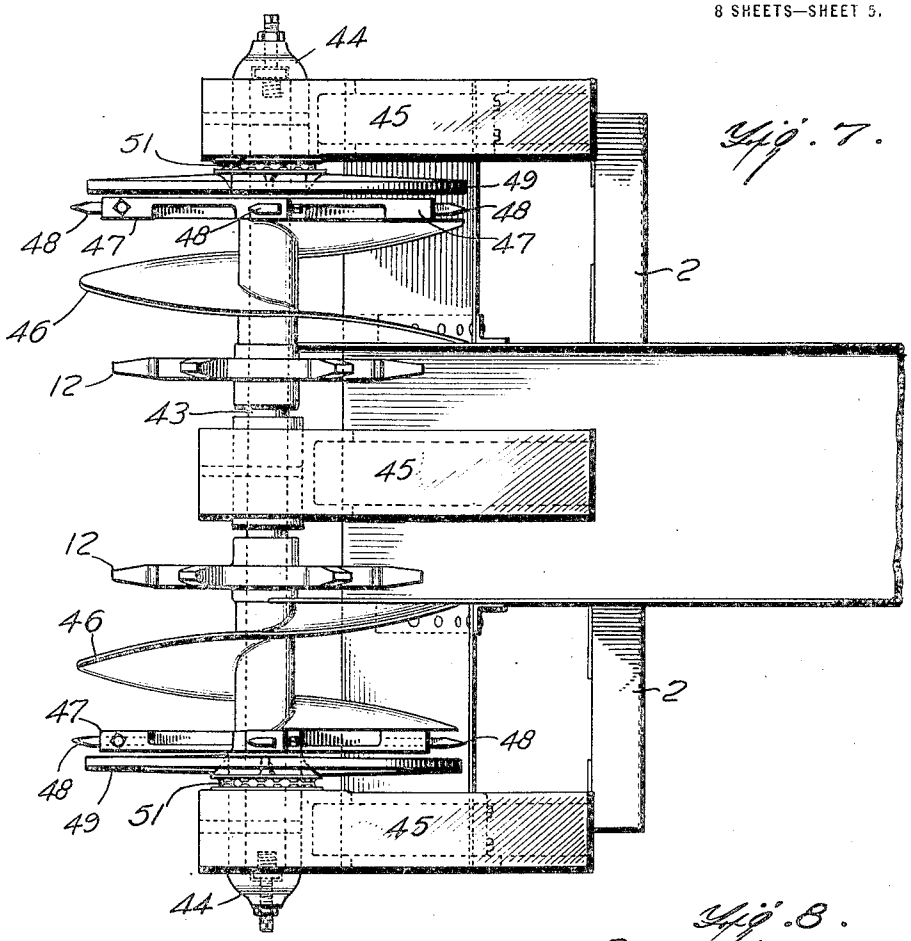
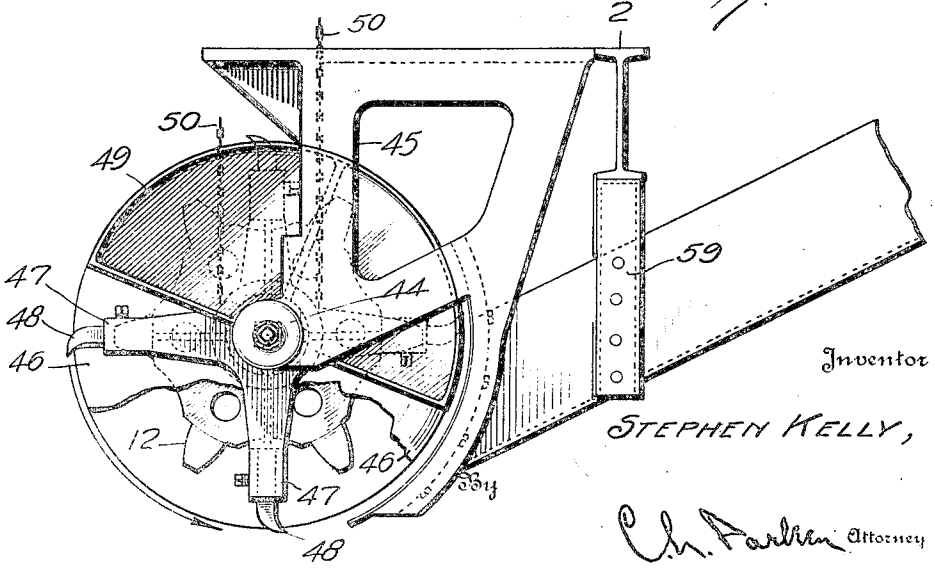


Fig. 8.



Inventor

STEPHEN KELLY,

By

Chas. Faulkner Attorney

S. KELLY.

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8 SHEETS—SHEET 6.

Fig. 9.

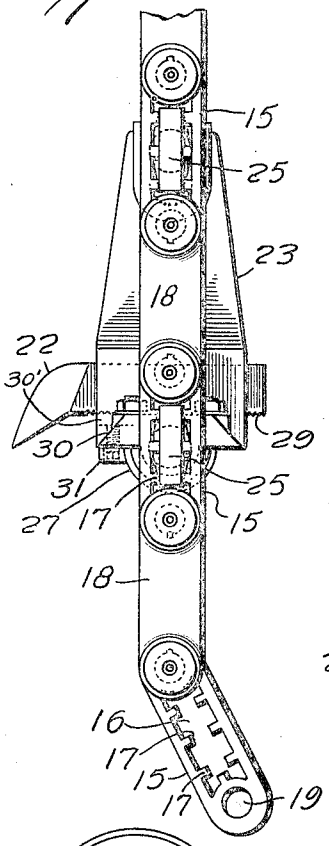


Fig. 10.

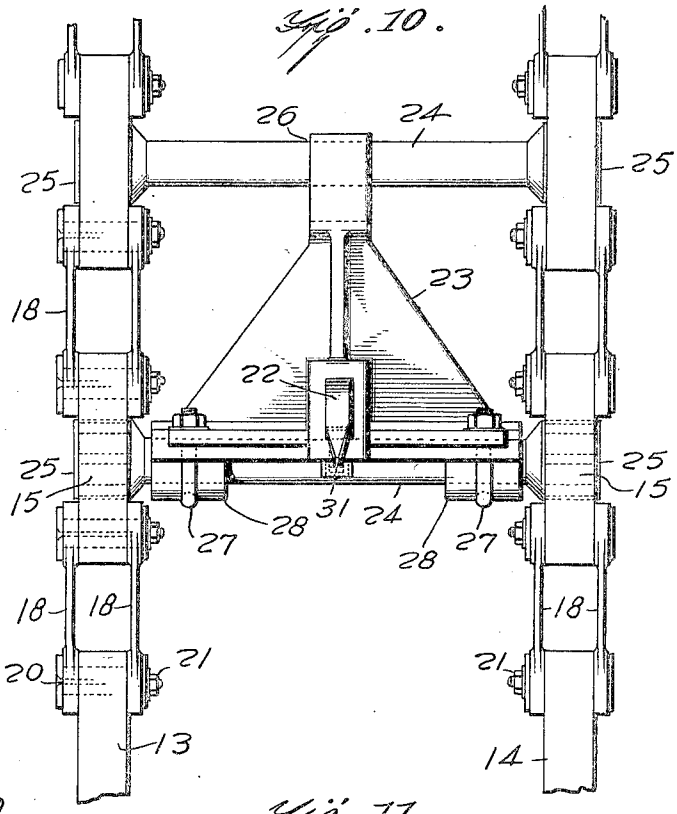


Fig. 11.

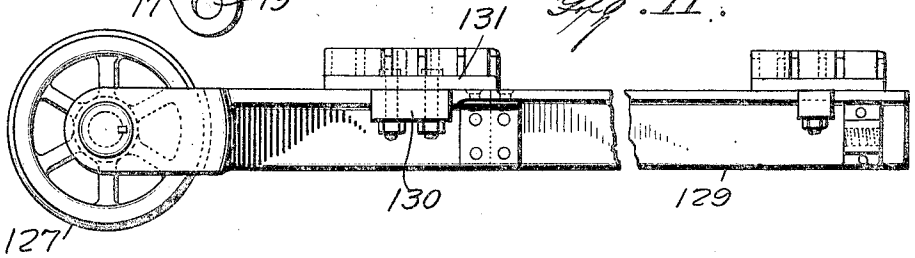
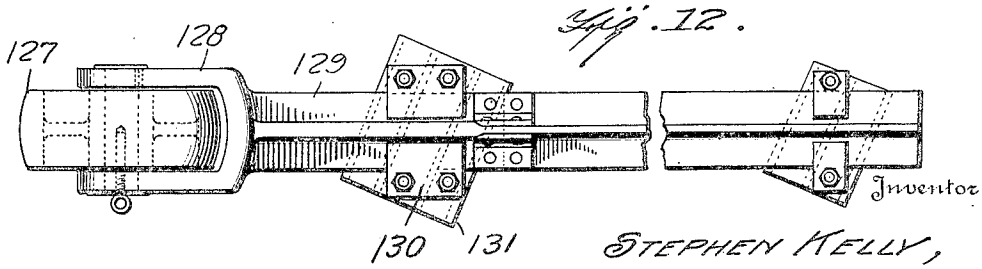


Fig. 12.



Inventor

STEPHEN KELLY,

By

Attorney

S. KELLY.

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8 SHEETS—SHEET 7.

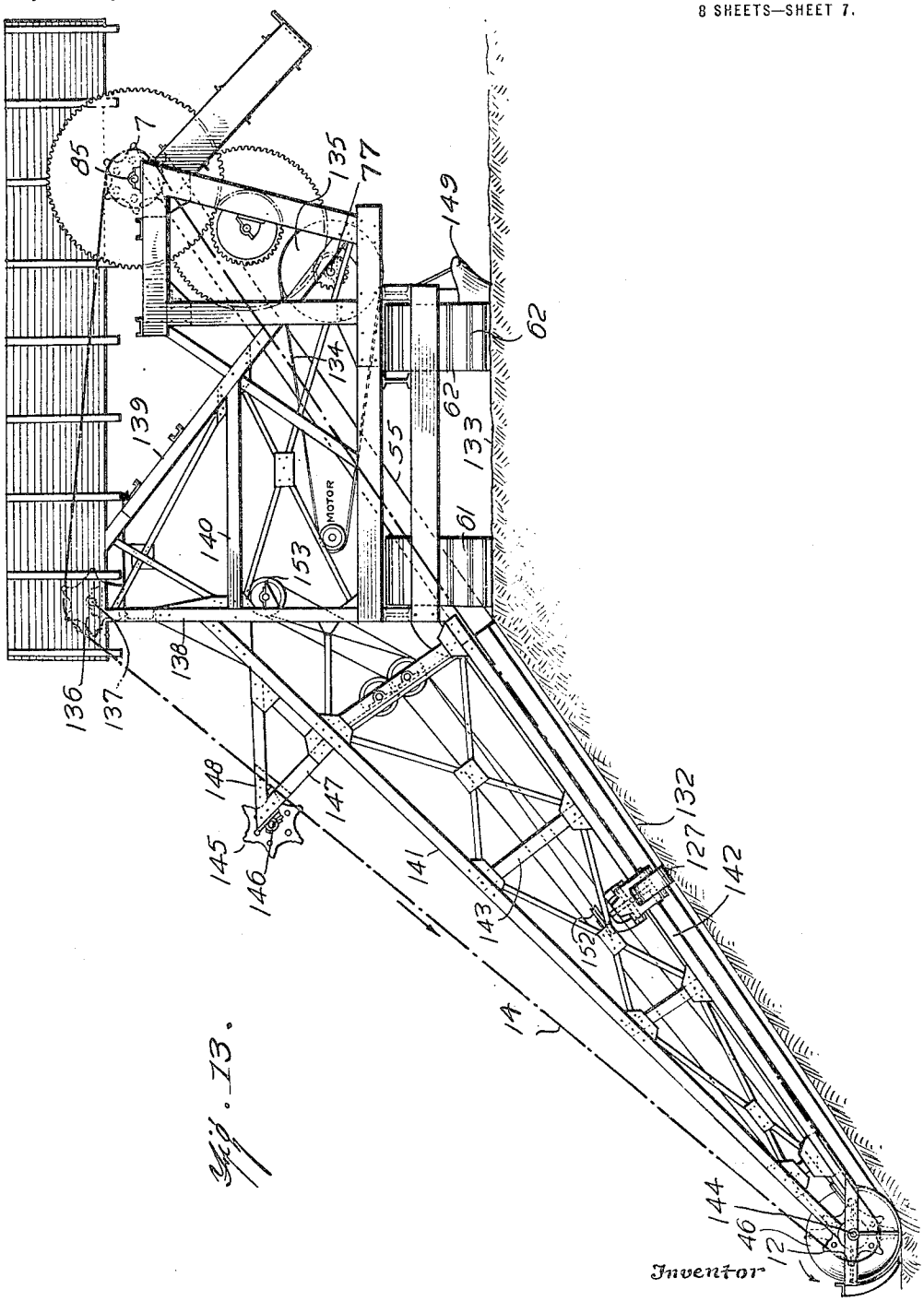


Fig. 13.

Inventor

STEPHEN KELLY,

Attorney

S. KELLY.

EXCAVATING MACHINE.

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8 SHEETS—SHEET 8.

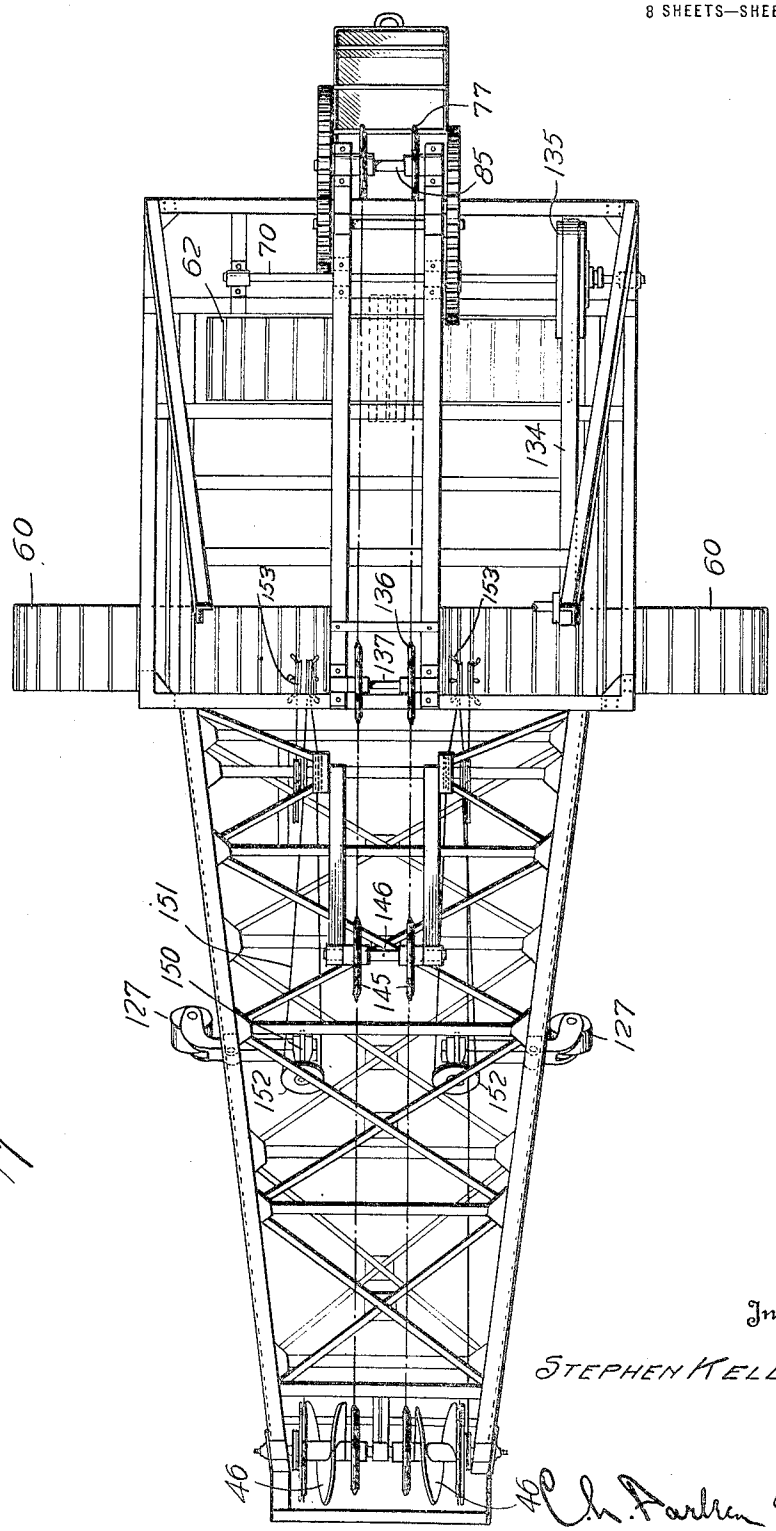


Fig. 11.

Inventor

STEPHEN KELLY,

Ch. Parker Attorney

Patented Dec. 5, 1922. 1,437,594

UNITED STATES PATENT OFFICE.

STEPHEN KELLY, OF LOUISVILLE, KENTUCKY.

EXCAVATING MACHINE.

Application filed December 3, 1920. Serial No. 427,984.

To all whom it may concern:

Be it known that I, STEPHEN KELLY, a citizen of the United States, residing at Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Excavating Machines, of which the following is a specification.

This invention relates to excavating machines, and it comprises a suitable support, a pair of tractors arranged at the front of the machine, a rear tractor, means for driving said front and rear tractors independently of each other, cutting mechanism comprising an endless chain carrying knives or other suitable cutting devices, said chain being arranged to travel downwardly in a substantially vertical line on its operating flight, means for delivering the cut material inwardly toward the center of the machine, and means for conveying said material to the rear of the machine.

In the present invention, I have produced a machine suitable for use in mining shale, or as an excavator to be used in place of the present type of steam shovel.

In this machine, the cutting elements are mounted on an endless chain traveling over suitable sprockets. On the cutting flight, knives carried by the chain are adapted to dig into the surface of the bank being cut and to convey the loose earth or other material so cut toward the rear of the machine. The material is carried over the frame of the machine through a suitable trough and may be deposited in trucks or carts arranged at the back of the machine.

In the present invention, I employ three tractors of the endless belt construction, two at the front of the machine and one at the rear. The front and rear tractors are independently driven, and may be run in reverse directions, at differential speeds, or at equal speeds enabling the machine to turn on a short circle to travel on a curved line or on a straight line, respectively.

In the present invention, I employ a plurality of rollers which are adapted to engage the surface being cut to prevent the machine from working inwardly beyond the desired point. These rollers are mounted in suitable guides and may be adjusted by means of suitable adjusting screws.

The cutting mechanism is arranged substantially centrally of the machine and the trough which conveys the material over the frame of the machine is arranged beneath the cutting mechanism. Suitable means are provided for feeding the cut material inwardly toward the trough and prevent accumulation of material at the end of the operating flight of the conveyor.

In the accompanying drawings, I have shown several embodiments of the invention. In this showing:

Figure 1 is a plan view of one form of the machine,

Figure 2 is a side elevation thereof,

Figure 3 is a front elevation,

Figure 4 is a detail view showing the main drive shaft,

Figure 5 is a detail sectional view of a chute in which the conveyor travels on its operating flight, on line 5—5 of Figure 3,

Figure 6 is a plan view of the chute,

Figure 7 is a detail view showing the means for feeding the material into the trough,

Figure 8 is an end elevation of the construction shown in Figure 7,

Figure 9 is a side elevation of a portion of the conveyor chain,

Figure 10 is a front view thereof,

Figure 11 is a side elevation of one of the adjusting rollers,

Figure 12 is a plan view thereof,

Figure 13 is a side elevation of a modified type of machine, and,

Figure 14 is a plan view thereof.

Referring to Figures 1 to 12 of the drawings, the machine comprises a substantially horizontal frame having longitudinal side bars 1, and transverse front and rear bars 2. An upper frame is provided, comprising inclined bars 3 and 4, and horizontal connecting bars 5. Suitable braces 6 may be provided. The main sprocket wheel 7 of the conveyor is supported on a sub-frame 8 which is suitably spaced from the main frame by vertical bars 9 and inclined bars 10. A second sprocket wheel 11 is arranged at the upper end of the upper frame and a

sprocket wheel 12 is disposed beneath the frame and slightly spaced from the ground.

Referring in detail to Figures 9 and 10 of the drawings, the cutting mechanism comprises an endless conveyor consisting of two chains 13 and 14, suitably spaced from each other and adapted to pass over the sprockets 7, 11, and 12, a pair of sprockets being provided in each instance to engage the two chains. Each chain includes a plurality of center links 15, having substantially rectangular openings 16 formed therein, the openings being provided with lugs or projections 17. A pair of side links 18 are secured to each of the center links and the space between each pair of side links is adapted to be engaged by the sprocket teeth in the usual manner. As shown, the ends of the side links are provided with openings adapted to register with an opening 19, in the center link for the reception of a suitable pivot pin 20 which may be retained in place in any suitable manner, as by nut 21.

The cutting device 22 is suitably supported on a knife holder 23, carried by the chain. As shown, a pair of spacing bars 24 are provided, and these spacing bars are provided with enlarged heads 25, adapted to be received in the rectangular openings of the center links of the chain (see Figure 9) and retained in position by lugs 17. One of the spacing bars is adapted to be received in an opening formed in the knife holder, as at 26, the opposite end of the knife holder being secured to the other spacing bar by means of U-shaped bolts 27, surrounding the spacing bar and passing through the knife holder. A cap 28 is clamped to each end of the knife holder 23 by U-bolt 27. The bore of 28 and 23 being larger than the diameter of spacing bar 24 permits the latter to turn freely when traveling around sprockets. As shown, the cutting element 22 is arranged in an opening in the knife holder, and its lower edge is provided with serrations or saw-teeth 29. A set screw 30 is adapted to engage a short, soft steel shoe 30′ having a serrated face which fits into serrations 29. The point of set screw 30, engages a depression in the back of the shoe. The head of the set screw is surrounded by a cast on ring 31 to prevent it being damaged or broken.

Referring to Figures 5 and 6 of the drawings, a plate 32 is supported on each of the inclined members 3. A pair of L-shaped plates 34 are secured to each of the plates 32 forming troughs to form guides for the chains. The troughs are provided with a pivoted extension 35 which may be arranged in operative position substantially in alinement with the body of the trough when the machine is operating to prevent the loose earth or other cut material from falling on to the frame of the machine. As shown, the extension is pivoted to the body of the trough at suitable intervals, as at 36, and connected to the body by a plurality of links 37 which are in turn connected to cranks 38, carried on a shaft 39, supported in bearings 40 on the bottom of the trough. The shaft may be operated to move the extensions in and out by means of a crank 41, and a control rod 42.

The lower sprockets 12 are arranged on a shaft 43 supported in suitable thrust bearings 44, carried by a plate 45, secured to the front cross bar 2 of the machine. A pair of ribbon conveyors 46 are arranged on the shaft on each side of the sprockets and adapted to deliver material inwardly toward the center of the machine. Beyond the scrapers, the machine is provided with a pair of star wheels 47, the points of which are provided with suitable cutting elements 48 which are adapted to engage the earth at the bottom of the cut and furnish a complete cut. A substantially semi-circular scraping plate 49 is arranged beside each of the star wheels. As shown, the scraper is loosely mounted on a "quill" or short turned extension of bearing 44, and may be lowered behind each cut or raised before the cut by means of chain 50 which passes over sprocket 51 carried on the hub of the scraper. The chain passes upwardly over sprocket wheels 52, 53, and 54, mounted on the upper frame of the machine, one of which is provided with a crank (not shown).

A trough 55 is arranged over the machine substantially in alinement with the sprockets 7 and 12. On the first portion of the return flight, the conveyor chain travels in this trough and carries the earth upwardly to the rear of the machine where it is delivered to a spout 56. Trucks or cars may be arranged below the spout to receive the material and the spout may be provided with a gate 57, whereby the delivery of material from the spout may be controlled. The upper end of the trough is supported by a plate 58, secured to the inclined beam 10 and the lower end is secured to a plate 59 connected to the cross beam 2 of the main frame.

The frame of the machine is mounted on a pair of front tractors 60 and 61, and a rear tractor 62, giving a three point suspension whereby the machine may be readily used on rough ground. The forward tractors are supported between the front cross beam 2 and a lateral beam 63, and the rear tractor is supported by a pair of transverse beams 64. Each of the forward tractors comprises a traction member 65, formed of links pivotally connected to each other, as at 66, and adapted to engage sprocket wheels 67. The sprocket wheels are supported from the main frame by a vertical beam 68 and horizontal beams 69. Suitable bearings 70 are arranged in the horizontal beams for the sprocket wheels.

The rear tractor is likewise supported by a horizontal beam 71, secured to the transverse beams 64 by means of longitudinal beam 72. Bearings 73 are arranged at the ends of the horizontal beams adapted to receive sprocket wheels 74 which engage the links 75 of the traction member.

The machine may be driven from any source of power which, in this instance is designated as a motor 76, supported on the main frame of the machine. The main shaft 77 is supported in suitable bearings 78 and extends transversely of the machine. A pinion 79 is arranged on the main shaft and is adapted to mesh with a pinion 80, mounted on stub shaft 81 supported in bearings 82, carried by the inclined beam 10. A pinion 83 is arranged on this stub shaft and meshes with a gear 84 on shaft 85. The sprockets 7 are arranged on the shaft 85 and are thus the main sprockets or driving sprockets of the conveyor.

The front and rear tractors are independently driven from the main shaft whereby the front tractors may be driven at a different speed, or in a different direction from the rear tractor to turn the machine, or to permit it to work on a curved surface. As shown, a friction wheel 86 is arranged on the main shaft and is adapted to drive the front tractors. The friction wheel is mounted on the shaft to revolve therewith, and to permit sliding movement whereby the speed and direction of the front tractors may be controlled. As shown, it is provided with a collar 87 for the reception of a control lever, (not shown). The friction wheel is adapted to engage a friction disk 88, carried by shaft 89, arranged longitudinally of the machine. The shaft is supported in suitable bearings 90 and 91, and is provided with a spring 92 which normally holds the disk out of engagement with the friction wheel. Any suitable means may be employed for retaining the disk in engagement with the friction wheel when desired. A pinion 95 is arranged on the shaft 89 and is adapted to mesh with a gear 96 carried by a stub shaft 97. This shaft is in turn, provided with a pinion 98, meshing with a gear 99 on shaft 100. The shaft 100 is provided with a pinion 101, meshing with a gear 102 carried by the shaft of one of the sprocket wheels 67 of the traction member. A bevel gear 103 is also arranged on this shaft and is adapted to mesh with a bevel gear 104, on transverse shaft 105. A bevel gear 106 is arranged on the opposite end of the shaft, and meshes with a bevel gear 107 on the shaft of one of the sprocket wheels 67 of the other front tractor.

The rear tractor is similarly driven by means of a friction wheel 108 slidably mounted on the main drive shaft and engaging a friction disk 109 on shaft 110. This shaft is mounted in suitable bearings 111 and is provided with a spring 112 to normally maintain the disk and the wheel out of engagement with each other. The shaft is held in engagement by any suitable means. The shaft is provided with a pinion 114, meshing with a gear 115, on a shaft 116. This shaft is in turn provided with a pinion 117, meshing with a gear 118, carried by a shaft 119. Shaft 119 is provided with a pinion 120, meshing with a gear 121, carried by the shaft of one of the sprocket wheels 74.

A pair of sprocket wheels 122 are mounted on horizontal members 5 of the upper frame, the wheels being supported by the shaft 123, arranged in bearings 124. The upper sprocket wheels 11 are supported on a shaft 125, mounted in suitable bearings 126.

A pair of guiding rollers 127 are slidably supported in the frame of the machine, whereby any tendency of the machine to creep or crawl inwardly toward the bank being cut may be overcome. As shown (see Figures 11 and 12), the rollers are supported in yokes 128, carried by rods 129. These rods are adapted to be received in guides 130 which engage a portion of the machine, as at 131. By the use of the hand wheel and screw at the end of 129, the rollers may be adjusted longitudinally of the machine, and will thus engage the sides of the bank and prevent the machine from unduly crowding into it.

In Figures 13 and 14 of the drawings, I have shown a slightly different form of the invention, adapted to be used as a depressed face clay mining machine. This machine is capable of use in cutting an incline 132, at an angle to the surface 133 on which the machine rests. The two forward tractors 60 and 61 and the rear tractor 62 are employed, as in the other form of the invention, and are adapted to be driven in the same manner. The main drive shaft 77 is driven from the motor by means of a belt 134, passing over pulley 135. The tractors are driven from the main shaft in the same manner as in the other form of the invention, and this detail has been omitted from these figures of the drawings. The shaft 85 on which the drive sprockets 7 are mounted, is driven in the same manner. From the drive sprockets, the chain passes upwardly over a pair of sprockets 136, supported on a shaft 137, arranged on an upper frame. The upper frame comprises vertical beams 138, inclined beams 139, and horizontal beams 140. A downwardly inclined frame comprising two series of downwardly inclined beams 141 and 142 is arranged at the front of the machine, the two series of beam being connected by transverse beams 143. The sprocket wheels 12 are mounted on a shaft 144, arranged at the bottom of this frame and the ribbon conveyors 46 and other elements associated with the sprockets 12 are

supported on this shaft. The operating stroke of the cutting elements takes place between the sprocket wheels 12 and the front of the machine, the material being delivered into the chute 55 and conveyed through the chute in the manner heretofore described. A pair of idler sprockets 145 may be arranged in the shaft 146 supported by a pair of beams 147 and 148. A plow 149 is arranged behind the rear tractor to remove any irregularities in the surface over which the machine travels. The adjusting rollers 127 are mounted on depending arms or cranks 150, and are controlled by ropes or cables 151 passing over a grooved pulley 152 on the depending arm 150 and adapted to be wound on a drum 153, on the frame of the machine.

The operation of the machine will be apparent from the foregoing description. In the use of the type of machine shown in Figures 1 to 12 of the drawings, the machine is arranged beside the bank to be cut and travels laterally of the bank on the tractors 60, 61, and 62. The machine may be turned by disconnecting the friction wheel 108 and friction disk 109 to supply power to the front tractors alone, or it may be caused to travel in an arc of a circle by supplying power to the front or rear tractors alone. The earth loosened by the knives 22 falls to the bottom of the bank whence it is conveyed to the trough by the ribbon conveyors 46 and delivered to the rear of the machine.

In the form of the invention shown in Figures 13 and 14 of the drawings, the loose material is carried upwardly by the chain to the trough and delivered to the rear of the machine. Any material escaping will travel down the inclined surface 132 whence it will again be delivered to the chain by the ribbon conveyors 46.

It is to be understood that the forms of my invention herewith shown and described are to be taken as preferred examples of the same, and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. In an excavating machine, a supporting frame, a conveyor frame mounted thereon and extending transversely of said supporting frame, guide members arranged at the front of said conveyor frame and extending vertically, said guide members being in alinement with one side of the supporting frame, an endless conveyor mounted on said conveyor frame and adapted to pass downwardly over said guide members on its operative flight, cutting mechanism carried by said conveyor, a trough arranged on said supporting frame, the front of said trough being disposed beneath said guide members, ribbon conveyors disposed near the forward end of said trough and adapted to deliver cut material thereto, and a spout arranged at the rear of said trough.

2. In an excavating machine, a supporting frame, an endless conveyor mounted thereon, cutting mechanism carried by said conveyor, and a plurality of rollers mounted on said frame and adapted to engage the surface being cut to limit the movement of the machine toward said surface.

3. In an excavating machine, a supporting frame, a conveying frame mounted thereon, said conveying frame comprising a pair of substantially vertical guide members, an endless conveyor arranged in said conveyor frame, cutting mechanism carried thereby, means for conveying cut material from one side of the supporting frame to the opposite side thereof, and a hinged extension formed on the side of the conveyor frame to prevent cut material from falling on to the supporting frame.

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

STEPHEN KELLY.

Witnesses:
E. L. O'BRYAN,
C. S. BURBA.