(No Model.) 4 Sheets—Sheet 1.

W. WATSON.

CUTTING DEVICE FOR SEWERS AND OTHER EXCAVATIONS.

No. 382,573. Patented May 8, 1888.

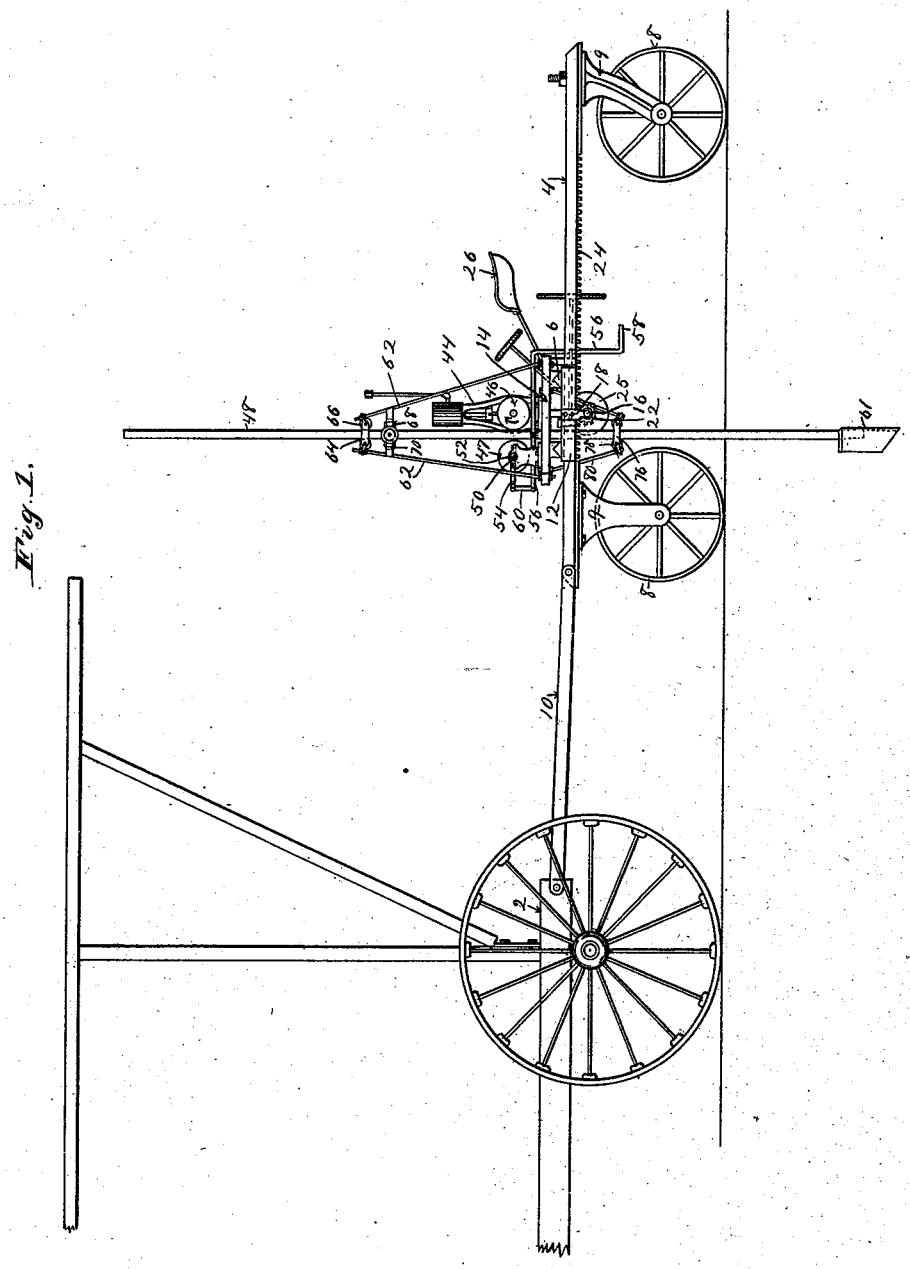

Fig. 1.

Witnesses.
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J. Jessen.

Inventor.
William Watson.
By his Attorneys
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(No Model.) 4 Sheets—Sheet 2.

W. WATSON.

CUTTING DEVICE FOR SEWERS AND OTHER EXCAVATIONS.

No. 382,573. Patented May 8, 1888.

Fig. 2.

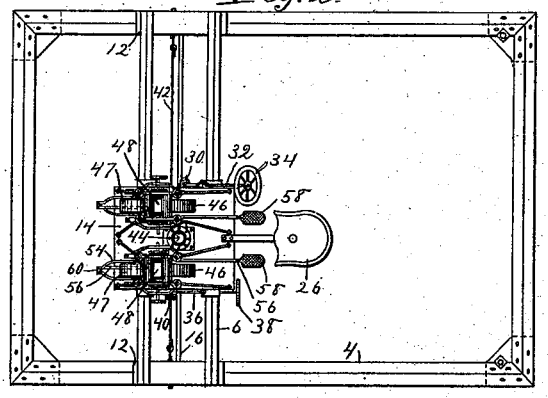


Fig. 3.

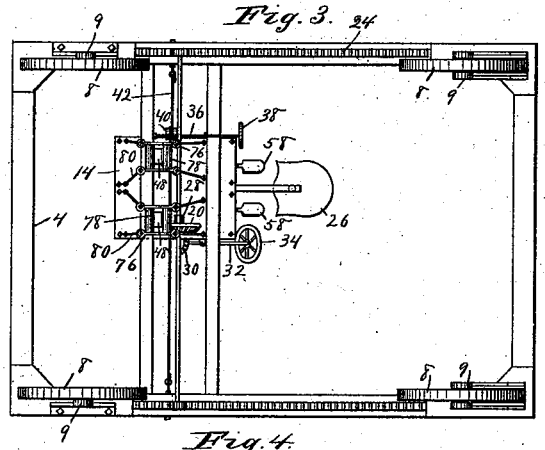
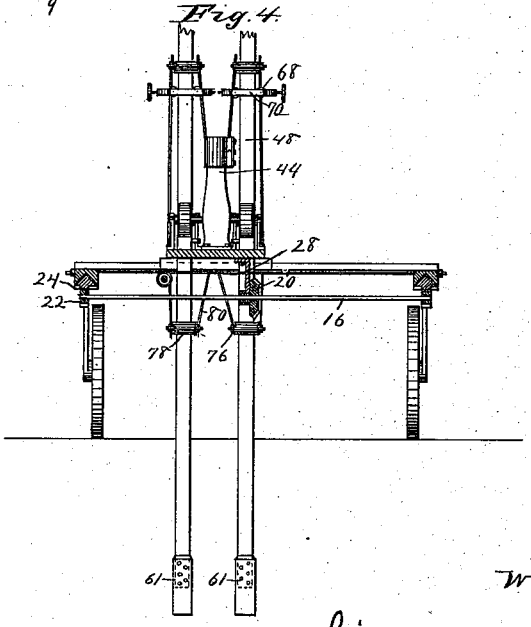


Fig. 4.



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(No Model.) 4 Sheets—Sheet 3.

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CUTTING DEVICE FOR SEWERS AND OTHER EXCAVATIONS.

No. 382,573. Patented May 8, 1888.

Fig. 5.

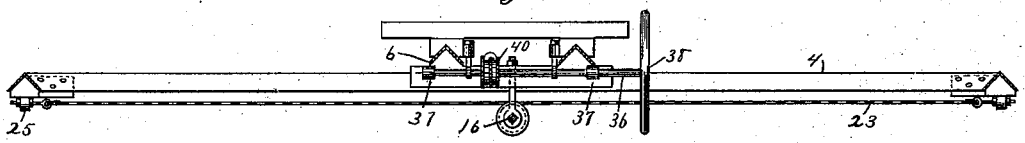


Fig. 6.

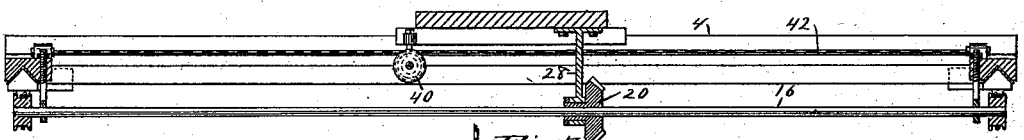


Fig. 7.

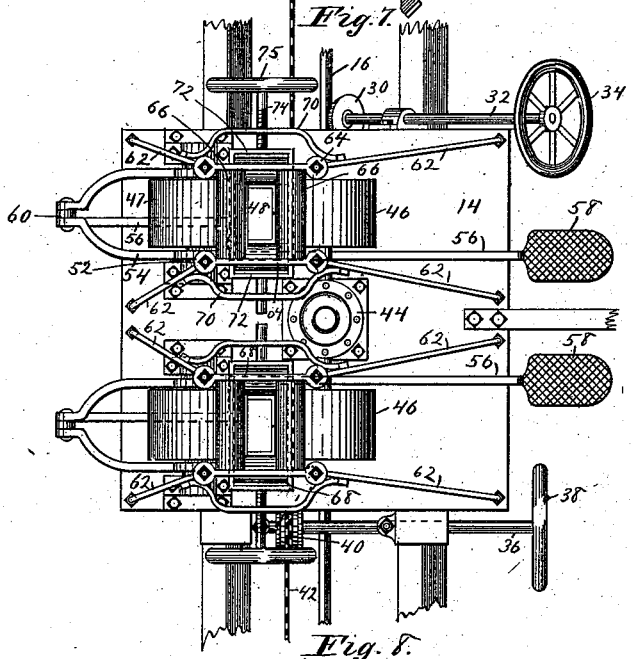
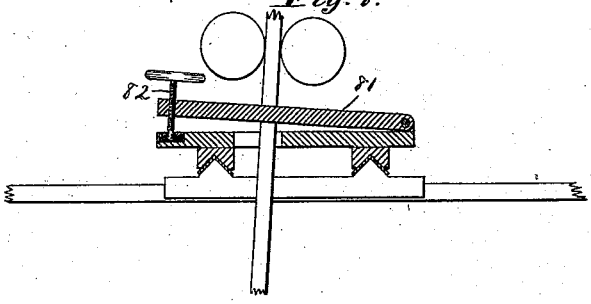


Fig. 8.



Witnesses.
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(No Model.) 4 Sheets—Sheet 4.

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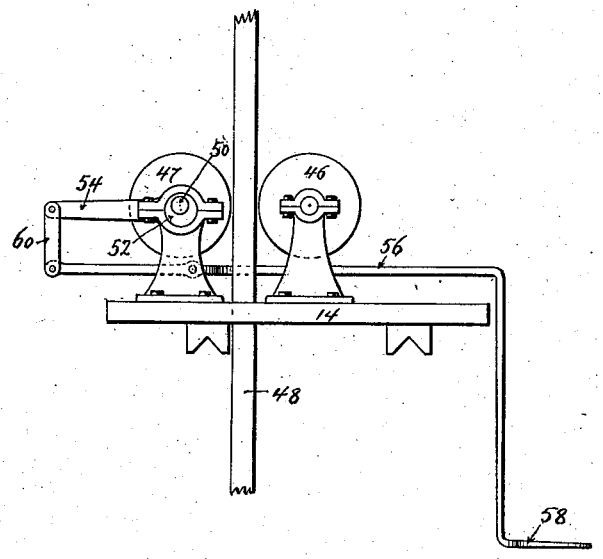
CUTTING DEVICE FOR SEWERS AND OTHER EXCAVATIONS.

No. 382,573. Patented May 8, 1888.

Fig. 9.



Witnesses.
A. M. Gaskell.
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Inventor.
William Watson.
By his Attorneys
Paul, Sanford & Merwin.

UNITED STATES PATENT OFFICE.

WILLIAM WATSON, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR TO THE NATIONAL STEAM EXCAVATING COMPANY, OF MINNESOTA.

CUTTING DEVICE FOR SEWERS AND OTHER EXCAVATIONS.

SPECIFICATION forming part of Letters Patent No. 382,573, dated May 8, 1888.

Application filed January 20, 1888. Serial No. 261,367. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WATSON, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Cutting Devices for Sewers and other Excavations, of which the following is a specification.

My invention relates to improvements in a machine for laying out and cutting down the banks or sides of excavations; and the object I have in view is to provide a machine which shall precede or work in conjunction with an excavating-machine and prepare the way by pulverizing or loosening the material, in order that it can be easily and readily taken out of the cut or excavation.

My invention is particularly adapted to use in preparing the cuts for laying sewer and other pipes when sheathing-plank is used, in which case a clean straight cut is of great advantage for facilitating the introduction of the plank. By my invention I am enabled to actuate the cutter by the force of the driving mechanism to shear or cut down the bank from the top to bottom with one continuous operation; or I can use the cutting device with an intermittent or drop motion, whereby the weight of the cutting device is brought suddenly in contact with the material, which is loosened or pulverized and put in a condition to be readily removed from the cut.

My invention consists, generally, in the construction and combination hereinafter described, and particularly pointed out in the claims.

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation of my machine, showing it in position in front of an excavator. Fig. 2 is a plan view looking from the top. Fig. 3 is a similar view looking from the bottom. Fig. 4 is a vertical transverse section. Figs. 5 and 6 are details showing a modification in the traveling mechanism of the carriage. Fig. 7 is a detail of the platform, enlarged, to more clearly show the arrangement of the guide-rolls. Fig. 8 is a detail showing the bar arranged to operate on an angle. Fig. 9 is a detail showing the eccentric box.

In the drawings, 2 represents the frame of an excavator, which may be of any suitable construction.

4 represents a frame carrying my improved cutting device. This frame may be constructed in any suitable form. The one I have shown and which I prefer to use is of square or rectangular shape, the side and end bars of the frame being composed of suitable sized angle-iron, so placed as to bring the apex of the angle-bar uppermost. These bars are preferably mitered together at the four corners, and suitable re-enforcements or corner-irons are provided to securely hold the members together. By forming the frame in the manner described I am enabled to utilize the side bars as V-shaped guides, upon which the carriage 6 slides longitudinally of the frame. The frame 4 is preferably supported upon rollers or truck-wheels 8, secured to the frame at or near the four corners, and the frame may be attached to the excavator by pivoted links or connecting-bars 10, so that as the excavating-machine is moved forward the truck supporting the cutting device will also be advanced.

The truck-wheels 8 are secured to the frame by suitable hangers, 9, which preferably support each wheel independently at the sides of the cut, as the axle passing across the machine would interfere with the sheathing-boards. One or both sets of wheels may be arranged to swivel, if desired, for convenience in turning the machine.

The carriage 6 extends across the frame substantially at right angles to the cut, and is provided with sliding supports 12, which fit over the V-shaped angle-bars at each side, upon which they are arranged to slide longitudinally of the machine.

The cross-frame of the carriage is preferably constructed of two pieces of angle-iron secured to the sliding supports 12, which form ways for the platform 14. A shaft, 16, is held in bearings 18 on the slides 12 and extends across the machine. The central portion of this shaft is preferably made square, and a bevel-gear, 20, is fitted with a square opening and arranged to slide lengthwise of the said shaft. This shaft may be made round and provided with a spline or feather-way, and the gear fitted with a corresponding feather

to allow it to be moved lengthwise of the shaft and still operate to revolve it. Pinions 22 are secured to the shaft 16 at the two sides of the machine under the side bars, and are arranged to mesh with a rack, 24, secured to said side bars. As the shaft 16 is revolved, the pinions thereon, meshing in the rack 24, will cause the carriage to travel forward or back over the frame. I have shown another means of accomplishing this result in Figs. 5 and 6, in which a spool or sheave is substituted in place of the pinion. A small cable or wire rope, 23, is fastened at the front and rear ends of the frame and carried over and around the spool a sufficient number of times to prevent it from slipping. As the spool is revolved by the shaft 16, to which it is attached, it will travel upon the cable and the carriage will be moved forward or back, as desired. This construction is preferable in some respects to the rack and pinion, as it is not as liable to the wear occasioned from sand or dust.

The platform 14 is constructed to support the cutter and the mechanism for operating the same. This platform travels with the carriage 6 lengthwise of the frame, and also crosswise upon the angle-bar frame of said carriage. The mechanism for moving the carriage in both directions, as well as for moving the cutter, is placed within convenient reach of the operator. A seat, 26, is preferably provided at the front of the platform, from which point the operator can see and direct the working of the machine. A suitable guide or hanger, 28, is attached to the platform and supports the bevel-gear 20, so that as the platform is moved the said gear will also be moved upon the shaft 16. A bevel-pinion, 30, meshes with the gear 20, and is mounted upon the shaft 32, supported in bearings upon the platform, and is preferably provided with a hand-wheel, 34, by the operation of which the gear 20 and shaft 16 are revolved and the carriage moved lengthwise of the frame.

A shaft, 36, is provided with a hand-wheel, 38, which is preferably placed at the opposite side of the platform, upon which it is supported in suitable bearings. This shaft is provided with a spool, 40, around which a small cable or rope, 42, is passed. The ends of the cable are secured to the slide 12 upon the carriage 6, and are provided with means for adjusting the tension on the said rope. This is done, preferably, by attaching the cable to an eyebolt with a screw-threaded shank, the said shank being passed through a suitable opening in the slide and provided with nuts bearing against the inner and outer surfaces of the slide. By turning the nuts the proper tension can be brought upon the rope.

The rope 23, operating the carriage, may also be provided with a similar device for regulating the tension, in which case the eyebolts may be attached to lugs 25 upon the corner-irons of the frame. The power for operating the cutters is preferably furnished by a small engine, 44, located upon the platform 14.

The driving-shaft of this engine may be provided with one or more friction-wheels, 46. Friction-wheels 47 are mounted in bearings upon the platform, and are arranged opposite each of the wheels 46, in the same plane, and revolve freely in said bearings. Between these two friction-wheels a bar, 48, is passed. The outer friction-wheel, 47, is preferably mounted in movable bearings, so that the bar 48 may be grasped between the two, and the revolving motion of the engine will cause the bar to be moved up or down, according to the direction in which the friction-wheel is driven.

I prefer to provide a means for operating the movable friction, and the device shown is as follows: The shaft 50, upon which the friction-wheel 47 is mounted, is held in eccentric boxes 52. These boxes are moved about the shaft by a lever, 54, secured to them. A lever, 56, is fulcrumed upon the platform 14, and is preferably bent downward in front of the said platform and provided with a treadle, 58, within convenient reach of the foot of the operator. The opposite end of the lever 56 is attached by means of a connecting-rod, 60, to the lever 54 on the eccentric 52. By depressing the treadle 58 the lever 56 is operated upon its fulcrum, which in turn operates the lever 54 through the connecting-rod 60, partially revolving the eccentric bearings and forcing the friction-wheel 47 against the bar 48, and clamping said bar between the two friction-wheels 46 and 47. I do not confine myself to this device for operating the movable friction-wheel, as other means may be substituted for this purpose without departing from my invention. The engine-shaft and friction-wheels will ordinarily be kept in continuous motion and in the direction denoted by the arrow in Fig. 1, in which case the friction-wheels will act to raise the bar. The operator places his foot upon the treadle 58 and depresses it, which operation throws the friction-wheels in contact with the bar 48, and the said bar is raised to any desired height. The treadle is then released, the friction-wheels thrown out, and the bar 48 freed from the friction. The said bar will fall by its own gravity, and the sharpened end of the said bar or the cutter 61, attached to said end, will strike the material through which the excavation is being made and embed itself therein. Repeated blows of this kind may be given until the material is thoroughly loosened. When one cut has been made to a sufficient depth, the hand-wheel 38 may be turned sufficiently to move the platform and bring the cutter in contact with another portion of the material. This operation is continued until the cutter has been fed the full width of the cut and the material on the line of the cut has been sufficiently pulverized. The carriage 6 is now advanced by operating the hand-wheel 34, and a new line or section of material is cut down or loosened. This operation is continued until the carriage has reached the forward end of the frame. When the carriage has reached this point, it

will be necessary to advance the frame or truck in order to continue the cut. If used in connection with an excavator, as shown in Fig. 1, the forward movement of the excavator will cause a corresponding advance of the truck. After the machine is moved, the carriage 6 is run back by reversing the motion of the shaft 16, and the cutters are again brought in position in advance of the excavation, and the cut is continued as before. When the machine is used in loose or sandy soil, it may be more convenient to use the cutter without the intermittent drop motion and force it down through the material. This may be done by holding the friction-wheels in contact with the bar and reversing the engine. The bar will in that case be forced down by the friction-wheels and a shearing cut made to the required depth. The engine is again reversed and the bar raised.

I have shown in the drawings and may prefer to use two bars and cutters placed side by side, and operated by friction-wheels on the same driving-shaft.

The two cutter-bars are substantially similar in construction and operation, and the description which I have given for one will answer for both. They may be operated singly or both together, as may be most convenient.

It may be found necessary in some instances to provide a support for the bar 48 at points above and below the friction-wheels. For this purpose I provide a frame consisting of standards 62, secured to the platform and extending above it for a given distance, and supporting the bearing-bars 64, in which are journaled the guide-rolls 66, in contact with the flat sides of the bar 48. Other rolls, 68, are held in a frame, 70, secured to the standards 62 below the rolls 66. The rolls 68 bear against the edge of the bar 48, and by these two sets of rolls I am enabled to guide and support the upper portion of the said bar. The rolls 68, which bear upon the edge of the bar, are preferably journaled in the sliding yoke 72, mounted in the frame 70, and moved laterally by means of a screw-threaded rod, 74, the end of which is attached to the said yoke 72 and passes through a correspondingly screw-threaded opening in the frame 70. The rod is provided with a suitable hand-wheel, 75, by which it is operated. By turning the rod the yoke 72 and rolls 68 are moved laterally in the frame 70, and the bar 48, which is held between them, will be correspondingly moved. The object of this is to line up the bar when the truck-frame stands on a slight angle or to set the bar to give a slight batter to the side of the cut or excavation.

A frame, 76, carrying rolls 78 and supported upon standards 80, may be located below the platform for steadying the bar below the point of contact with the friction-wheels.

I may prefer in some instances to provide a means for operating the cutter on an angle or cutting the excavation on an angle, and in Fig. 8 I have shown a device for this purpose. A separate platform, 81, is mounted upon the main sliding platform, to which it is hinged or pivoted at the front. A device for raising the rear side, consisting of one or more screws, 82, is provided. The engine, friction-wheels, and guide-frame are all attached to and supported upon the tilting platform 81, and are all raised upon it by the screws 82, to give the required angularity to the bar 48. The operation of the machine with the bar on the angle is substantially the same as that already described.

In order to prevent the raising of the platform when the cutter is forced down, I prefer to provide the shaft 36 with a friction-roll, 37, which bears upon the under side of the angle-bars forming the carriage, holding said platform in its proper position. A similar roll may be placed upon one or both of the opposite corners of the platform and bear upon the under side of the said angle-bar in a similar manner to that already described.

I claim as my invention—

1. The combination, in a machine of the class described, of a suitable truck-frame, a carriage arranged to slide longitudinally of the said frame, a platform arranged to slide laterally on said carriage, means for moving said carriage and said frame, the rolls mounted on said platform, the vertically-sliding cutter-bar arranged between said rolls, and means for driving said rolls in either direction, substantially as described.

2. The combination, in a machine of the class described, of a suitable truck-frame, a carriage arranged to slide longitudinally of said frame, a platform arranged to slide laterally on said carriage, a shaft journaled upon said carriage and operated from said platform, the rolls or sheaves upon said shaft, the cable or rope passing around said sheaves and having its ends secured to the truck-frame, the rolls mounted on said platform, the vertically-sliding cutting-bar arranged between said rolls, and means for driving said rolls in either direction, substantially as described.

3. The combination, in a machine of the class described, of a suitable truck-frame, a sliding carriage on said frame, a platform supporting the operating mechanism of the machine and sliding on said carriage, means for operating said carriage from said platform, consisting of the shaft 16, revolving in bearings on the carriage and connected to the frame by the cable 23, the gear 20 on the shaft 16 moving with the platform, and a suitable pinion-shaft and hand-wheel secured to the platform for operating the gear 20, substantially as described.

4. The combination, in a machine of the class described, of a suitable truck-frame, a sliding carriage on said frame, a platform supporting the operating mechanism of the machine and sliding on said carriage, the cable 42, having its ends secured to the carriage, the spool or sheave 40, around which the cable is turned and by which the said cable is gripped, the shaft 36, journaled upon the platform, and the hand-wheel 38, for operating said shaft, where-

by the platform and the operating mechanism of the machine are moved upon the carriage, substantially as described.

5. In a machine of the class described, the combination, with a suitable truck-frame, of a carriage sliding longitudinally on said truck-frame, a platform sliding laterally on said carriage, a friction-wheel mounted in fixed bearings upon said platform, a friction-wheel mounted in movable bearings, also supported upon said platform, a cutter-bar arranged to pass between the faces of the two friction-wheels, means for operating the movable friction-wheel against said bar, and means for driving said friction-wheels in either direction, substantially as described.

6. In a machine of the class described, the combination, with the platform sliding in two directions at right angles to each other, of one or more cutter-bars, 48, provided with the picks or cutters 61, the friction-wheels 46, mounted in stationary bearings, the movable friction-wheels 47, the faces of the said wheels so arranged as to be brought in contact with the bars 48, the eccentric bearings 52, in which the shaft of the movable wheel is mounted, the lever 56, fulcrumed upon the platform and connected to a lever or arm on the eccentric box, whereby, by operating the said lever, the movable friction-wheel is clamped against the bar 48, substantially as described.

7. In a machine of the class described, the combination, with a suitable platform and a driving mechanism located thereon, of the cutter-bar 48, the friction-wheels 46 and 47, actuated by said driving mechanism for raising said bar, the rolls 66, located above the friction-wheels in contact with the side of the bar 48, the standards 62, for supporting and bracing said rolls, and the rolls 68 in contact with the edge of the bar and mounted in the adjustable yoke 72, supported upon a frame, 70, secured to the standards 62, all substantially as described.

8. In a machine of the class described, the combination, with the sliding cutter-bar and the friction-rolls actuating said bar, of an adjustable platform, 81, supporting said rolls, and means for raising and lowering said platform, substantially as described.

In testimony whereof I have hereunto set my hand this 14th day of January, 1888.

WILLIAM WATSON.

In presence of—
R. H. SANFORD,
S. J. BEARDSLEE.