(No Model.) 3 Sheets—Sheet 1.

J. T. DOUGINE.

DITCHING AND TILE LAYING MACHINE.

No. 333,114. Patented Dec. 29, 1885.

Fig. 1

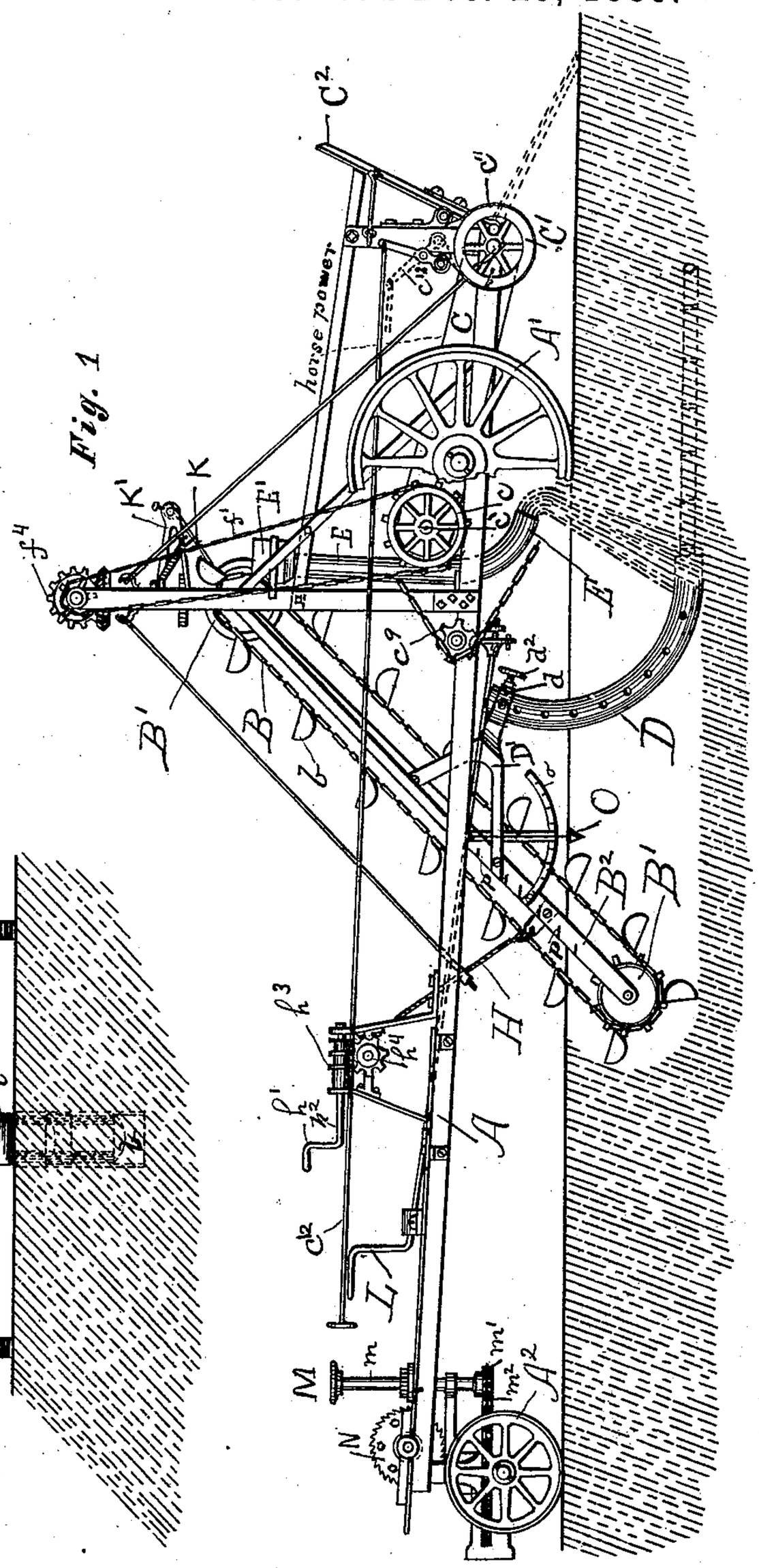
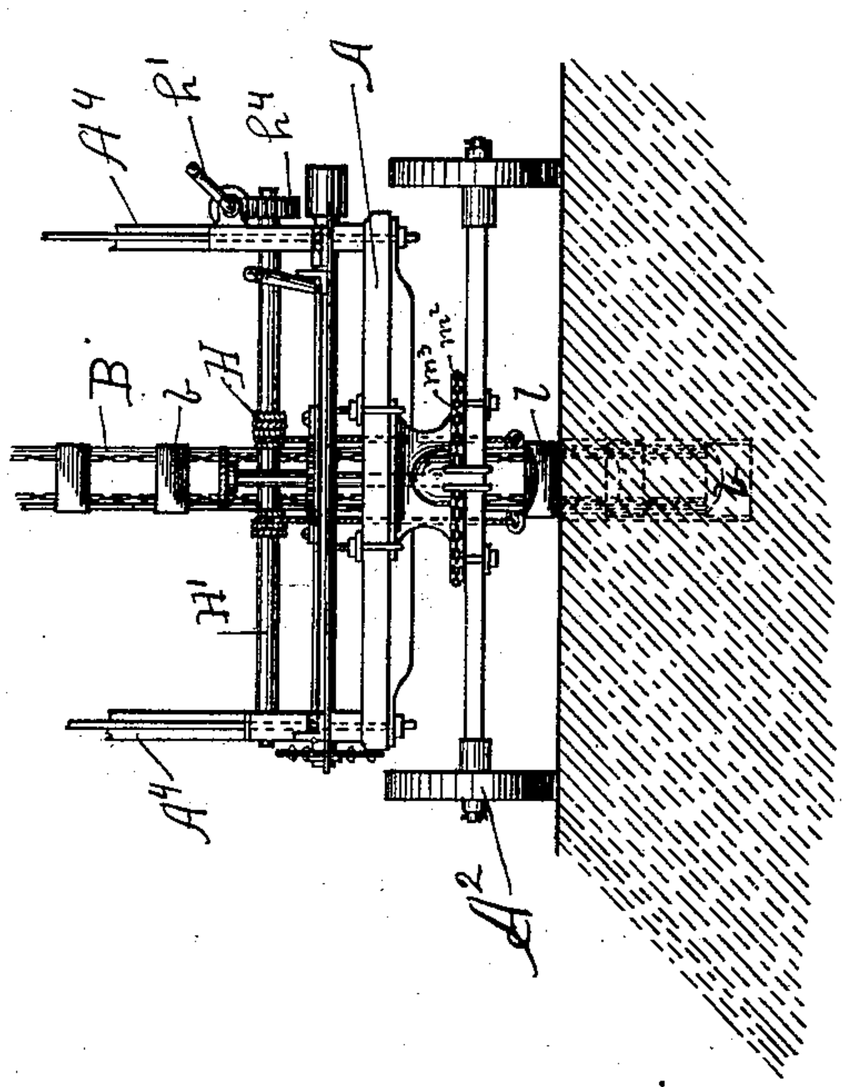


Fig. 2



Witnesses:

A. W. Munday.

Chas. J. Baum.

Inventor:

James T. Dougine.

by Munday, Everts and Adcock

his Attys.

(No Model.) 3 Sheets—Sheet 2.

J. T. DOUGINE.

DITCHING AND TILE LAYING MACHINE.

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Fig. 3

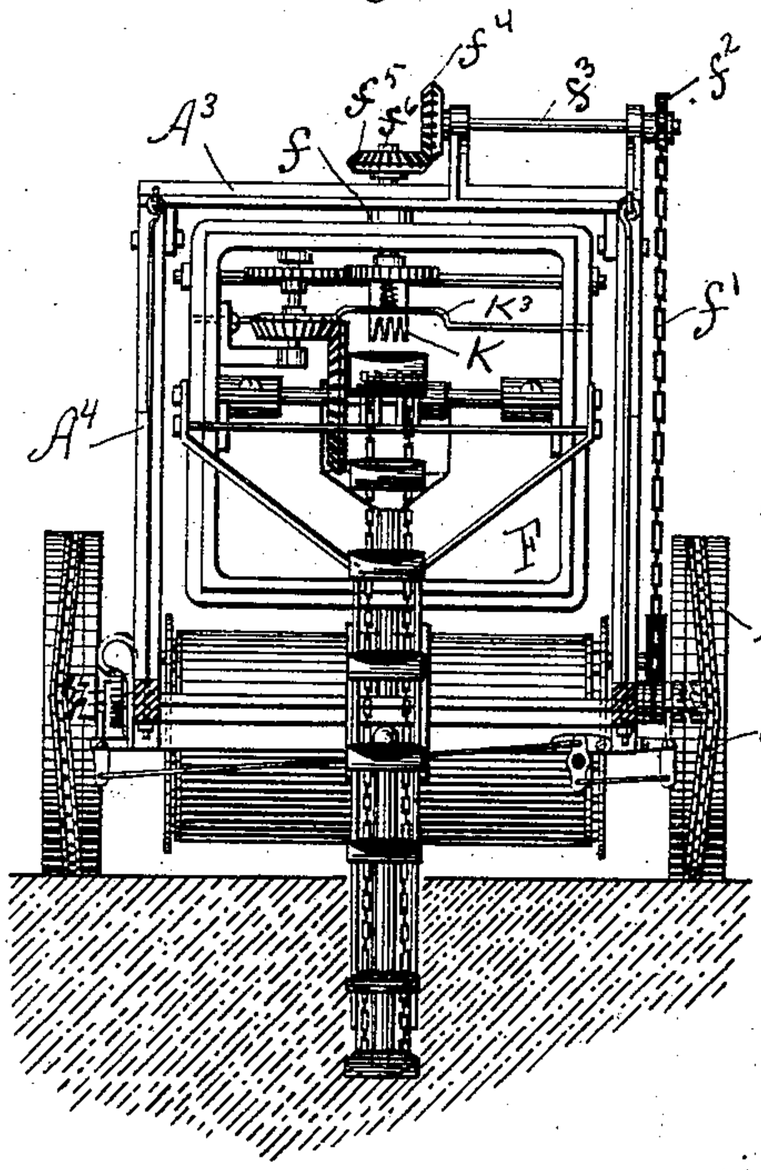


Fig. 4

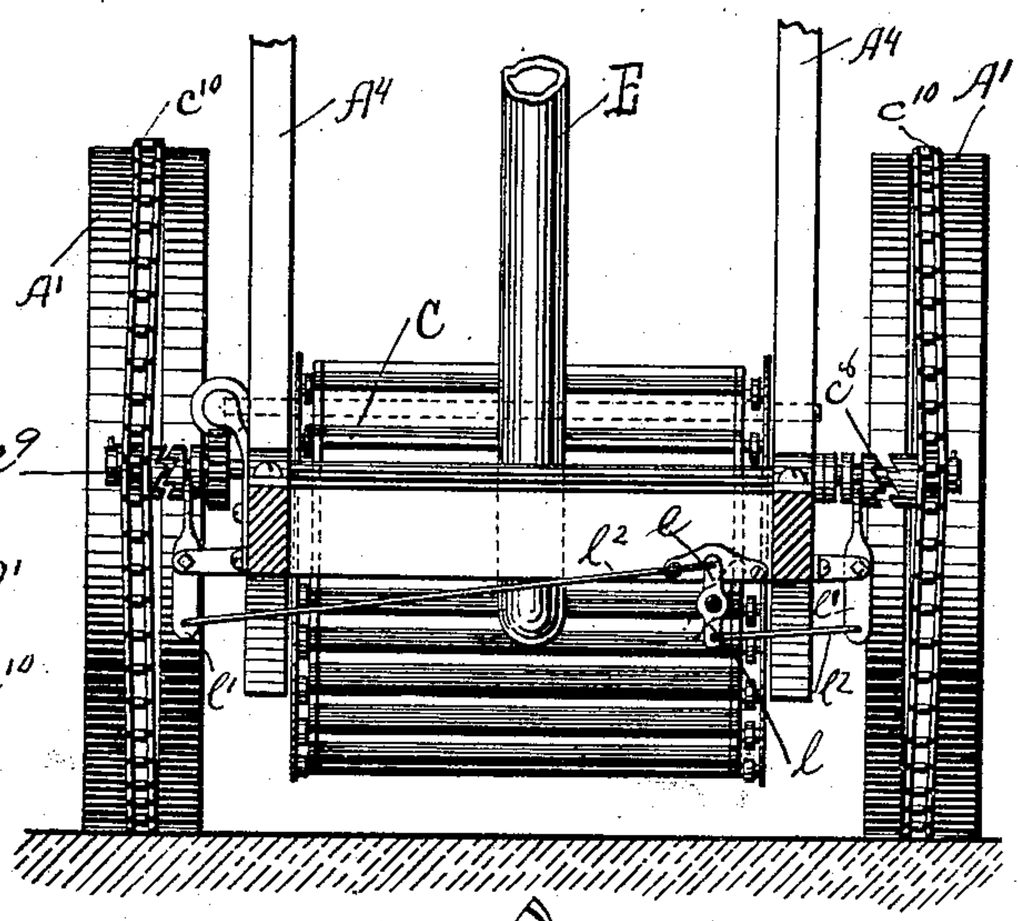
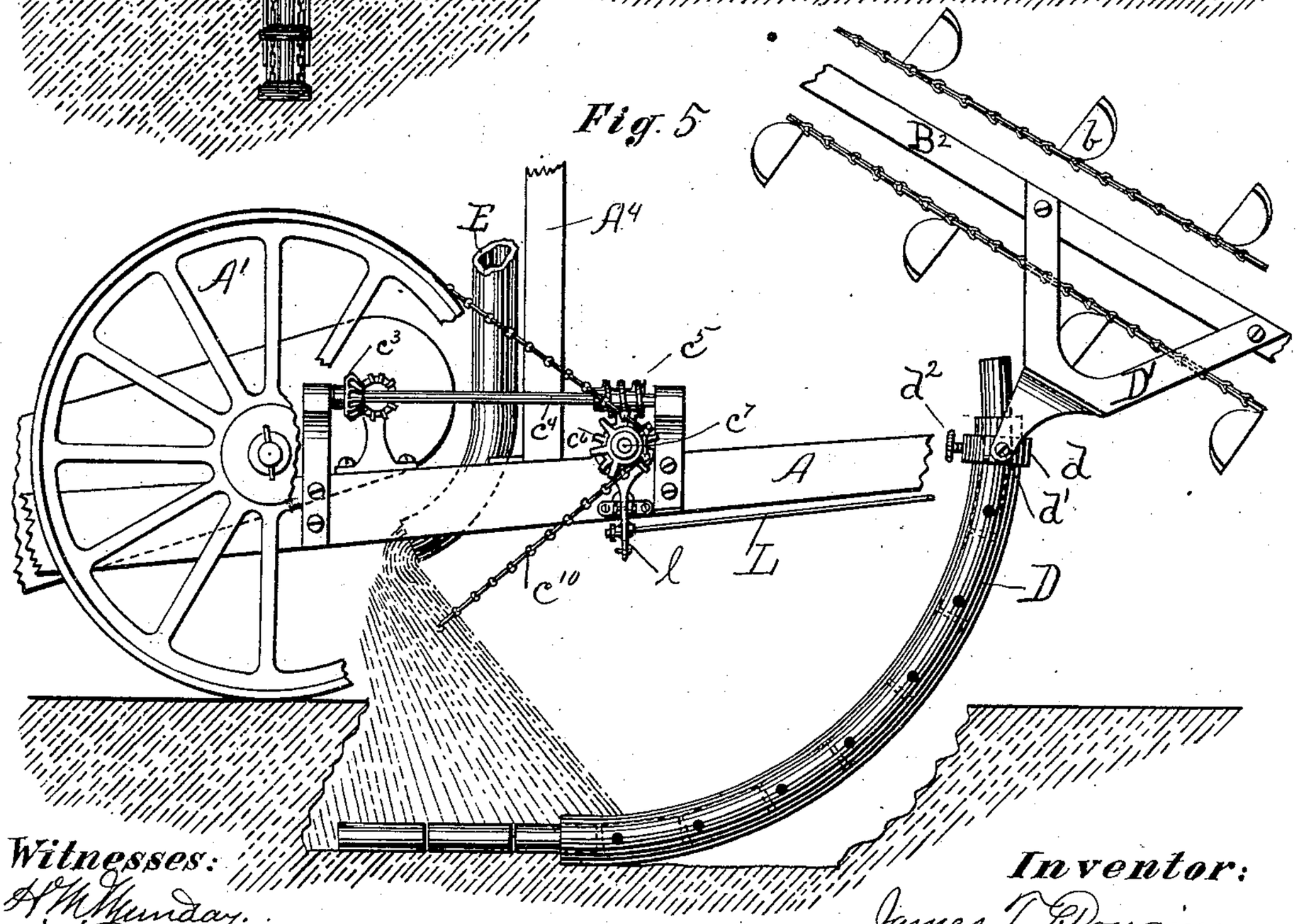


Fig. 5



Witnesses:
H. M. Munday.
Chas. J. Bauer.

Inventor:
James T. Dougine
by Munday, Evarts and Adcock
his Attys.

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J. T. DOUGINE.

DITCHING AND TILE LAYING MACHINE.

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Fig. 6

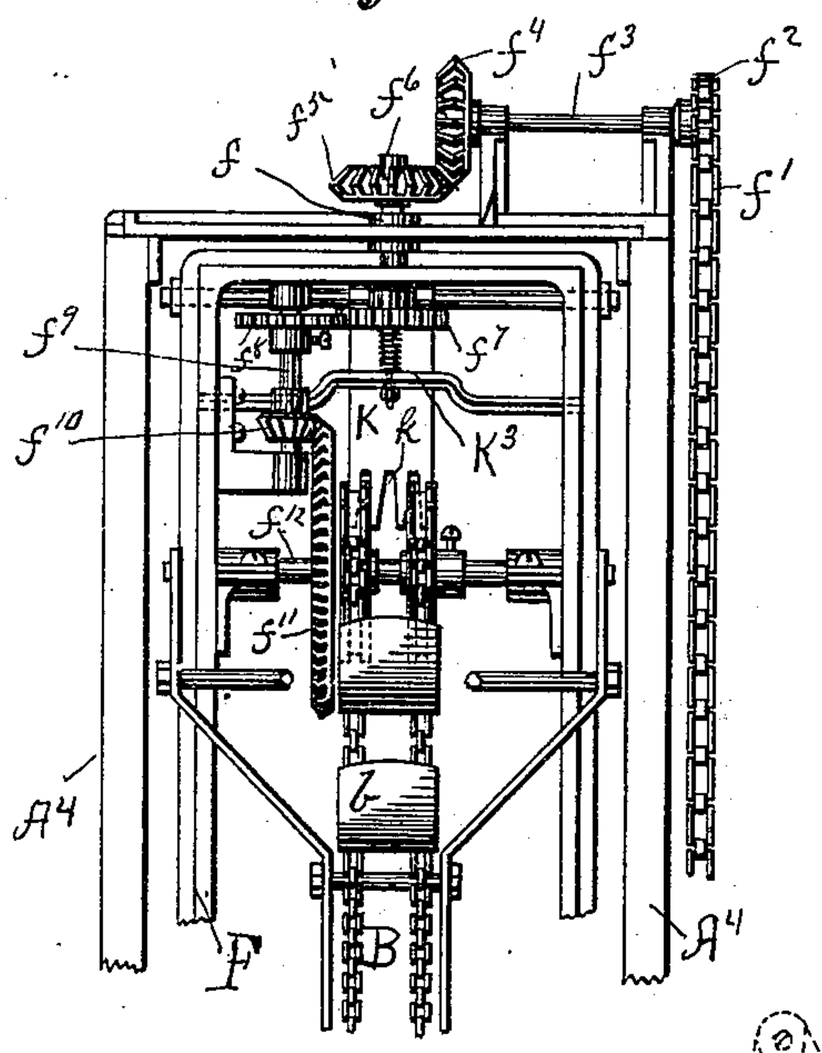


Fig. 7

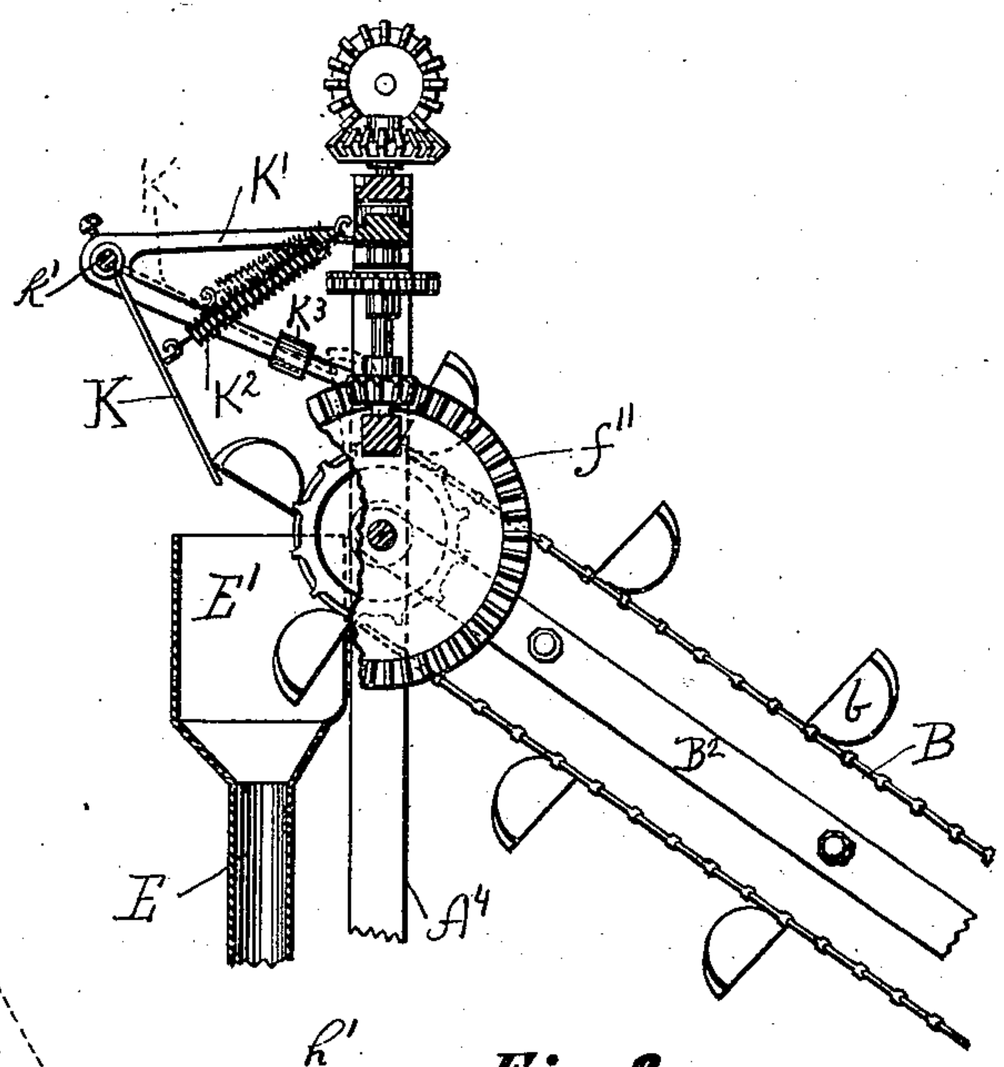


Fig. 8

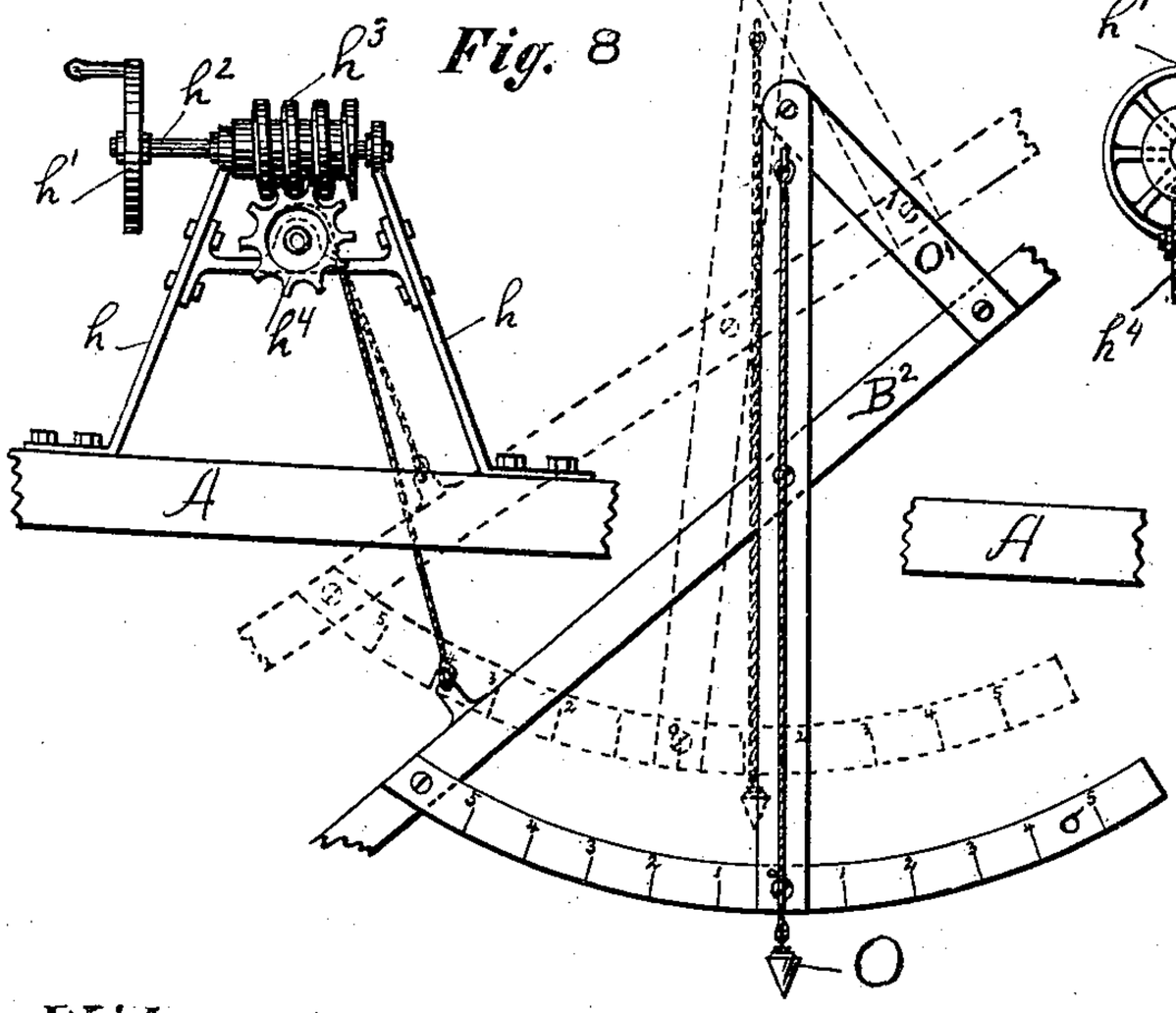
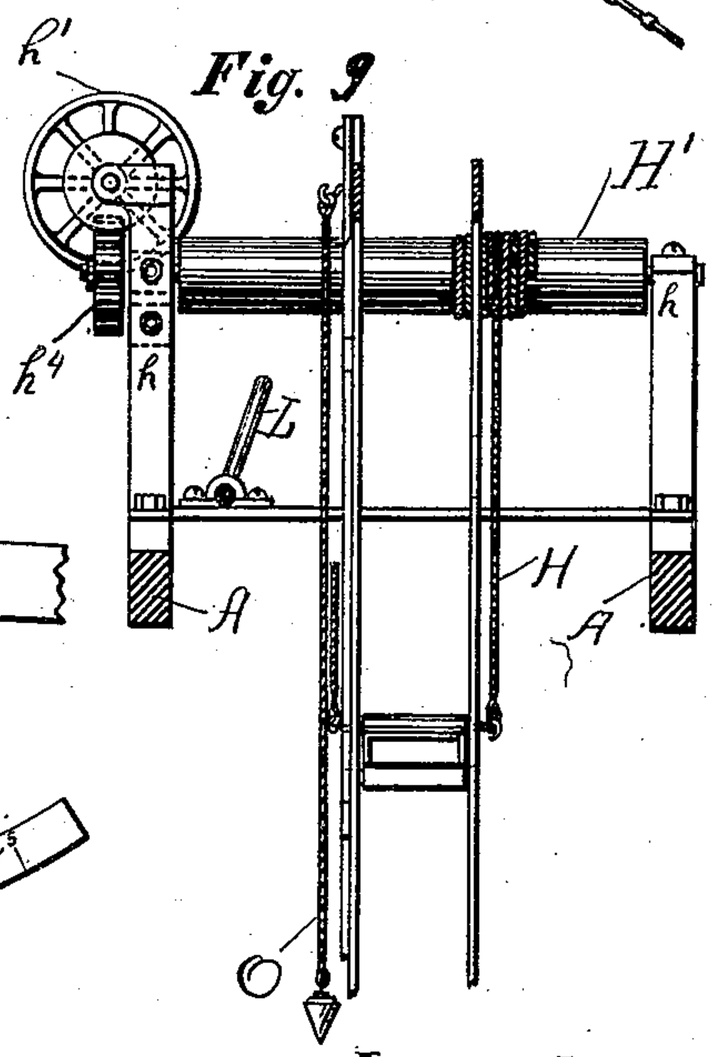


Fig. 9



Witnesses:

A. W. Munday.

Chas. J. Baum

Inventor:

James T. Dougine.

by Munday, Evarts and Adcock

his Attys.

UNITED STATES PATENT OFFICE.

JAMES T. DOUGINE, OF CHICAGO, ILLINOIS.

DITCHING AND TILE-LAYING MACHINE.

SPECIFICATION forming part of Letters Patent No. 333,114, dated December 29, 1885.

Application filed February 16, 1885. Serial No. 156,078. (No model.)

To all whom it may concern:

Be it known that I, JAMES T. DOUGINE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Ditching and Tile-Laying Machines, of which the following is a specification.

This invention relates to machines for digging ditches and laying tile therein.

In this class of machines heretofore great difficulty has been experienced in cleaning or discharging the clay or dirt from the buckets, owing to its sticky character. This I overcome by a very simple device, consisting of a pivoted blade or scoop, which enters each bucket as it passes around the upper sprocket-wheel and discharges its contents.

The tile in my invention are delivered to the bottom of the ditch, as it is dug, by a curved tube or spout of sufficient length or height, so that the column of tile therein will by their own gravity cause the separate tile to issue at the bottom in close contiguity, end to end. This curved pipe is mounted so as to slide or telescope in a pivoted ring, so that, whatever the depth of the ditch or the inclination of the elevator-frame, the lower end of this tile-laying spout will remain in a horizontal position. The dirt is discharged from the elevator, either directly therefrom or through a suitable discharge pipe or spout, in such position in relation to the lower end of the tile-laying spout that the dirt will fall thereon, and thus not only hold the tile in position as they issue from the spout, but in a measure serve to pull the tile out of the pipe. A tread-power is employed to operate the elevator, and also to propel the machine forward as the ditch is dug. A steam or other engine may, however, be used in place of the tread, if desired.

The invention also consists in the novel devices and novel combinations of devices herein shown and described.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts throughout the drawings, Figure 1 is a side elevation of a machine embodying my invention. Fig. 2 is a front elevation. Fig. 3 is a vertical cross-section taken in front of the elevator. Fig. 4 is a section on line 4 4 of Fig. 1. Fig. 5 is a detail side elevation of parts shown in Fig. 4. Fig. 6 is a detail elevation, looking toward the rear, of the swiveling frame and bucket-discharge. Fig. 7 is a vertical section taken centrally at right angles to Fig. 6. Figs. 8 and 9 are side and rear elevations of the windlass for regulating the depth of the cut.

In said drawings, A represents the frame of the machine, mounted on the drive-wheels A′ at the rear end and on the steering-wheels A^2 at the front end thereof.

B is an endless-chain elevator furnished with buckets *b* and mounted on sprocket-wheels B′ on the elevator-frame B^2.

C is a tread-mill, engine, or other source of power, mounted on the frame of the machine, and by which power is communicated both to the ditch-cutter or elevator B and to the driving-wheels A′ to propel the machine forward as the ditch is excavated.

D is an inclined curved spout or tile-guide, by which the tile are automatically conveyed and delivered at the bottom of the ditch in a horizontal position and laid therein.

E is a discharge-spout for delivering the dirt or excavated material back into the ditch or to the side thereof, as may be desired. Its relation to the tile-laying spout D is or should be such that the discharged dirt will fall upon the lower extremity of said spout, and thus not only prevent the tile from moving laterally when delivered from said spout, but also, by falling upon the end of the tile, serve to pull them out of the spout and prevent their dragging forward.

The upper end of the elevator-frame B^2 is secured to and supported in a swiveling frame, F, having bearings *f* at its upper and lower ends on the cross-frame pieces A^3, extending between the vertical standards A^4 of the main frame.

Power is communicated from the tread-mill to the upper driving sprocket-wheel, B′, of the excavator by means of a sprocket-chain, *f′*, extending from wheel *c* on the driving-shaft *c′* of the tread-mill to wheel f^2 on shaft f^3, bevel-gear f^4 thereon meshing with bevel-gear f^5 on the short vertical shaft f^6, which extends

through the hollow pivot or bearing *f* of the swiveling frame, gear f^7 thereon meshing with gear f^8 on shaft f^9, and bevel-gear f^{10} on shaft f^9 meshing with bevel-gear f^{11} on the shaft f^{12} of the sprocket-wheel B′. The lower end of the elevator-frame B^2 is suspended by the cords H from the windlass H′, journaled on the brackets *h* on the main frame. The windlass is turned one way or the other, to raise or lower the ditcher and regulate the depth of the cut from time to time, as may be required, by means of a hand-wheel or crank, *h′*, the shaft h^2 of which is furnished with a worm, h^3, that engages a toothed wheel, h^4, on the windlass-shaft.

The tile-delivering spout D is preferably made about quadrant-shaped, and it is suspended at its upper end in a swivel-ring, *d*, pivoted by pins or screws *d′* to the yoke-bracket D′, which is secured to the elevator-frame B^2. The spout D may be set or fixed at any desired position in the ring *d*, according to the depth of the ditch, by means of the set-screw d^2; and, whatever the depth of the ditch or the position of the frame B^2, owing to the curved form of the spout, the lower end of it, which rides loosely upon the bottom of the ditch, will occupy approximately a horizontal position and deliver the tile into the ditch in a level and proper position. As the spout is mounted directly upon the elevator-frame, its position will always be governed thereby, and thus not be affected by any inequalities in the surface of the ground over which the machine runs. By reason of the swivel or pivot the lower end of the spout will always rest smoothly upon the bottom of the ditch. Ordinarily in operation the set-screw d^2 is not tightened, so that the spout can telescope or slide up and down through the ring *d*, as the distance from the ring to the bottom of the ditch varies according to the changing inclinations of the elevator-frame B^2, and thus, by means of a telescoping and swiveling or pivoted curved spout, I am enabled to deliver the tile at all times in a level or horizontal position into the bottom of the ditch. The discharge-pipe E is furnished with a hopper or enlargement, E′, at its upper end to receive the dirt as it is delivered from the buckets *b*. The back side of the hopper, adjacent to the sprocket-wheel B′ of the elevator, is cut away to allow the passage of the buckets, as indicated in Fig. 7. The dirt or material excavated, which frequently is of a very sticky character—as, for example, black mud or moist clays, especially when very moist—is cleaned or discharged from the buckets *b* positively by means of a pivoted discharge scoop or paddle, K, the end or point of which traverses the back or bottom of the bucket as each bucket passes over the upper sprocket-wheel. The blade or scoop K or its end should correspond in shape to that of the bucket, and if the bucket has divisions or strengthening-ribs the blade should of course be slotted or forked, as represented at *k*, to correspond to such ribs or divisions and fit astride the same. The blade K is or should be pivoted somewhat above the upper line of the buckets as they pass over the sprocket-wheel, so that the blade will enter the outer edge of the bucket on an incline. As the bucket revolves around its sprocket-wheel, the end of the blade will follow the back or bottom of the bucket, and thus turn the blade on its pivot, until, when the blade stands radially or on a line with the center of the sprocket-wheel B, the end of the blade will have reached the inner or lower edge of the bucket and stand directly across its face, thus completely discharging its contents. As the bucket continues to revolve, it will be carried past the end of the blade, as indicated in full lines in Fig. 7, when the pivoted blade will be restored to its original position, ready for the next bucket.

K′ is a bracket secured to the swiveling frame F, upon which bracket the bucket-discharger K is pivoted or hinged by the bolt *k′*. A spring, K^2, serves to restore the pivoted blade K to its position against the stop or cross-arm K^3, and also to hold it in position against the advancing bucket and cause it to properly enter and clear the same. If the blade is, however, set at the proper inclination, little, if anything, will be required of the spring but to pull the blade back against its stop K^3, and though the pivoted blade may be made of any suitable shape, I deem an ordinary flat plate the best, as well as cheapest.

The tread-mill or power C may be of any ordinary construction, and, if preferred, a steam or other engine may be used for driving the machine.

The brake-wheel C′ of the tread-power is furnished with a strap friction-brake, c^{11}, operated by a lever, c^{13}, through a rod, c^{12}, which should extend to near the front or steering end of the machine, so that the operator may conveniently regulate the speed of the machine or stop it when required.

The drive-wheels A′ are operated to cause the machine to advance, as fast as the ditch is opened, by means of a bevel-gear, c^3, on the shaft c^4, which is provided with a worm, c^5, that meshes with a toothed gear, c^6, on the shaft c^7. This shaft c^7 is furnished with sliding clutches c^8, that engage the loose sprocket-wheels c^9, from which the chains c^{10} pass around the wheels A′, and thus cause them to revolve.

The clutches c^8 c^8 are simultaneously operated from near the front end of the machine by means of the long crank-rod L, which is provided with opposite arms *l*, connected with the clutch-levers *l′* by the rods l^2.

The machine is guided or steered, as required to conform to the sinuosities of the ditch to be dug, by means of a hand-wheel, M, on the vertical shaft *m*, which is furnished with a sprocket-wheel, *m′*, around which and a wheel or disk, m^3, secured rigidly to the front axle, passes a chain, m^2, so that the axle

can be easily turned. As the connection between the shaft *m* and axle is only through a flexible chain, it is obvious that no strain will be thrown upon the shaft *m* by reason of the machine passing over uneven ground.

N represents a saw, which may be used for squaring the ends of broken tile, when desired, by placing a belt on its arbor-pulley. The rear end piece, C^2, of the tread is hinged to the frame, and made long enough to serve as a bridge, over which the horses or animals may be led into the tread.

In order to indicate the depth of the ditch when passing over uneven ground, and to enable the operator to keep the bottom of the ditch at the proper grade, notwithstanding inequalities over which first one end and then the other of the machine may pass, I provide it with a plumb-line, O, suspended from a standard, O′, and a graduated arc, *o*, both mounted on the elevator-frame B^2, so that the deflection of the zero-point of the arc from the plumb-line will indicate when one end of the machine is elevated or depressed, and thus show the operator that the end of the ditcher-frame B^2 should be raised or lowered by the windlass H′.

Though the pivoted bucket-discharger K is specially designed for use upon elevators of ditching-machines, it is obvious that the same device is applicable to other elevators, and to discharging from buckets any kind of sticky or adhesive material that will pack in or not readily be discharged from the bucket; and I do not wish to be limited to the use of this device upon ditching-machines.

The elevator-frame B^2 is provided with a graduated scale, *p*, to indicate the number of feet the lower end of the elevator is depressed below the frame A or the depth of the ditch being cut. Of course, it will be understood that a counterpoise is an equivalent for the spring K^2 for operating the pivoted blade K.

I claim—

1. The improved ditching and tiling machine, consisting in the combination of an excavating elevator or ditch-cutter, with a curved tile-laying spout suspended therefrom, a discharge spout adapted and arranged to deliver the dirt or excavated material upon the lower or rear end of said tile-laying spout and upon the tile issuing therefrom, a tread or other power for operating said elevator, driving-wheels, mechanism operated by said power to propel the machine forward as the ditch is cut, and steering-wheels and mechanism for operating the same, substantially as specified.

2. The combination, with an excavating elevator or ditcher, of a tile-laying spout suspended therefrom, substantially as specified.

3. The combination, with an excavating elevator or ditcher, of a quadrant-shaped tile-laying spout, the lower end of said spout occupying a horizontal position, while its upper end remains vertical, whereby the tile are delivered into the ditch in a horizontal position by their own gravity, and said spout being suspended from said elevator, substantially as specified.

4. The combination, with an excavating elevator or ditcher, of a quadrant-shaped tile-laying spout, the lower or rear end of which extends back of the point of discharge, so that as the dirt is discharged from said elevator it will fall upon the rear end of said spout and upon the tile issuing therefrom, and thus serve to pull the tile from the spout, and to prevent their being drawn forward by the advancing spout, substantially as specified.

5. The combination, with an excavating elevator or ditcher, of a quadrant-shaped tile-laying spout suspended pivotally therefrom, substantially as specified.

6. The combination, with an excavating elevator or ditcher, of a curved telescopic pivoted tile-laying spout, substantially as specified.

7. The combination, with an excavating elevator or ditcher, of a curved spout and a pivoted ring from which said spout is suspended, substantially as specified.

8. The combination of excavating elevator-frame B^2, bracket D′, ring *d*, and curved tile-laying spout D, substantially as specified.

9. The combination of a curved sliding tile-laying spout, C, with a pivoted ring in which it is mounted, substantially as specified.

10. The combination of an endless belt or chain bucket-elevator with a vibrating pivoted or hinged bucket-clearer blade or scoop and a stop to limit its upward vibration, substantially as specified.

11. The combination of an endless belt or chain bucket-elevator with a pivoted or hinged bucket-clearer blade or scoop and a spring for restoring the same to position, substantially as specified.

12. The combination of an endless belt or chain bucket-elevator with a pivoted or hinged bucket-clearer blade or scoop, and a spring for restoring the same to position, and a stop or rest to limit its backward movement, substantially as specified.

13. The combination of endless elevator-chain B, having buckets *b*, sprocket-wheel B′, stationary bracket K′, bucket-clearing blade K, pivoted thereto, stop or rest *k*, and spring *k′*, substantially as specified.

14. The combination, with a swiveling frame, of an endless-chain elevator having its end mounted therein, and a vibrating pivoted bucket-clearer, K, mounted on an arm or bracket extending from said swiveling frame, and a stop to limit the upward vibration of said bucket-clearer, substantially as specified.

15. The combination of an excavating-elevator mounted on a carriage with a curved tile-laying spout, a windlass for raising and lowering the digging end of said elevator, a discharge-pipe, a pivoted bucket-clearer blade,

K, and a plumb-line, O, and graduated arc, substantially as specified.

16. The bucket-discharge consisting of the vibrating pivoted blade K and a stop to limit its upward vibration, substantially as specified.

17. The bucket-discharge consisting of the pivoted blade K, in combination with spring K^2 and stop K^3, substantially as specified.

18. The combination, with the driving-shaft c', of the gears c^3, shaft c^4, worm c^5, gear c^6, shaft c^7, sprocket-wheel c^9, chain c^{10}, and drive-wheels A', carrying said chain, substantially as specified.

JAMES T. DOUGINE.

Witnesses:
H. M. MUNDAY,
EDMUND ADCOCK.