(No Model.) 3 Sheets—Sheet 1.

W. S. MORTON.

EXCAVATING MACHINE.

No. 287,563. Patented Oct. 30, 1883.

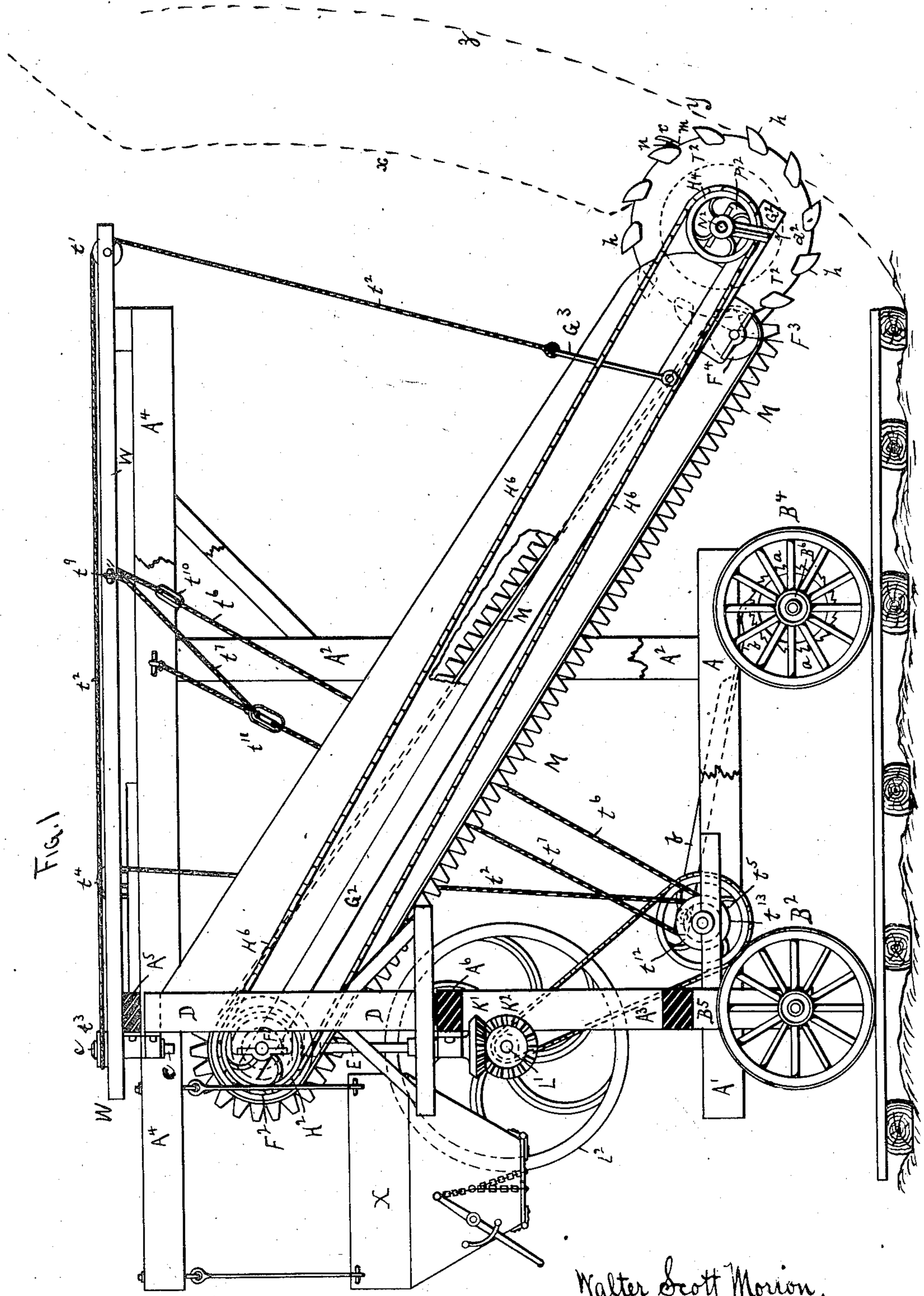

FIG. 1

WITNESSES.
Daniel Murphy
Louis Fecser Jr.

Walter Scott Morton,
INVENTOR, BY
Louis Fecser & Co.
Atty's.

(No Model.)

3 Sheets—Sheet 2.

W. S. MORTON.

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No. 287,563. Patented Oct. 30, 1883.

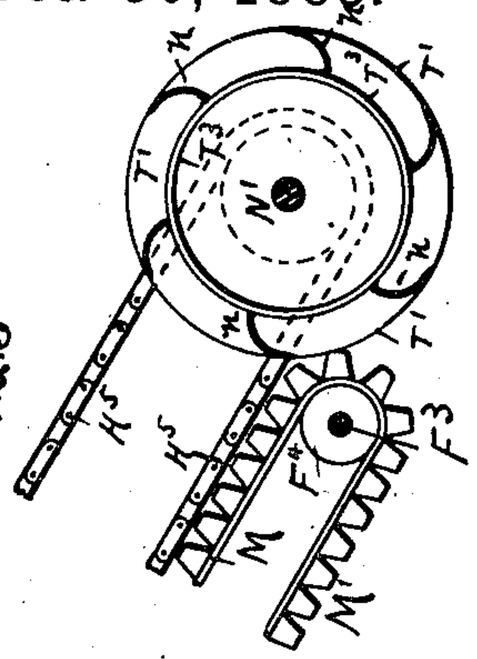

FIG. 3

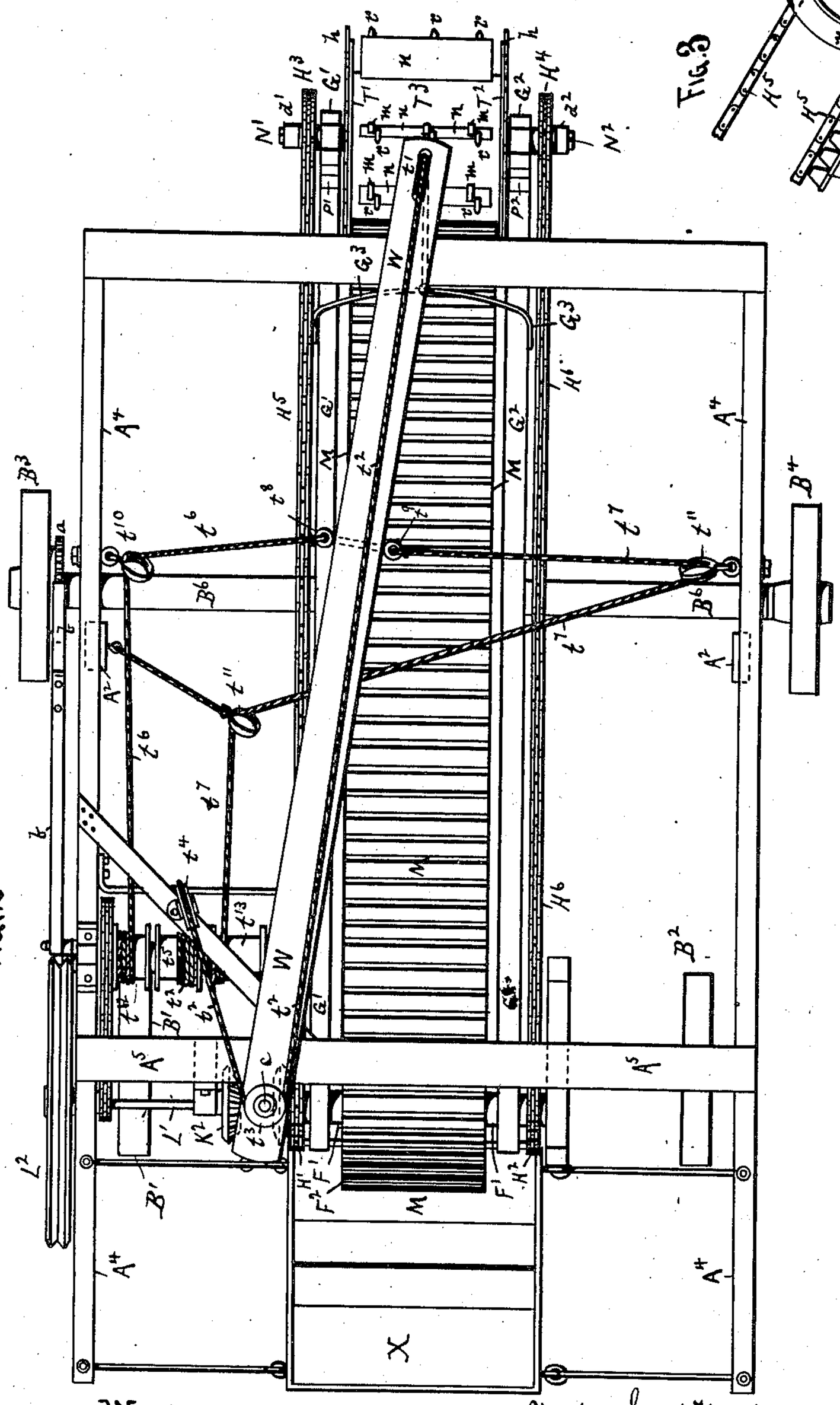

FIG. 2

WITNESSES.
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(No Model.) 3 Sheets—Sheet 3.

W. S. MORTON.

EXCAVATING MACHINE.

No. 287,563. Patented Oct. 30, 1883.

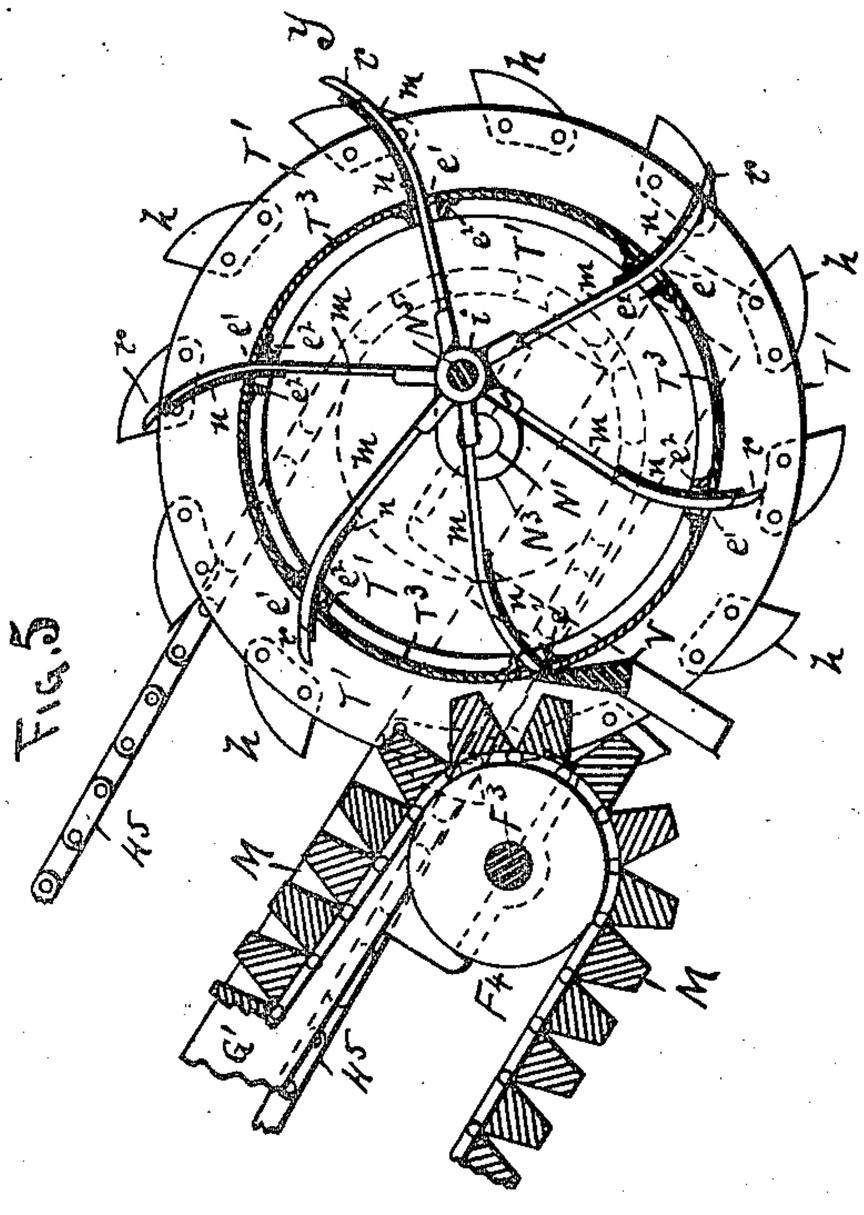

FIG. 5.

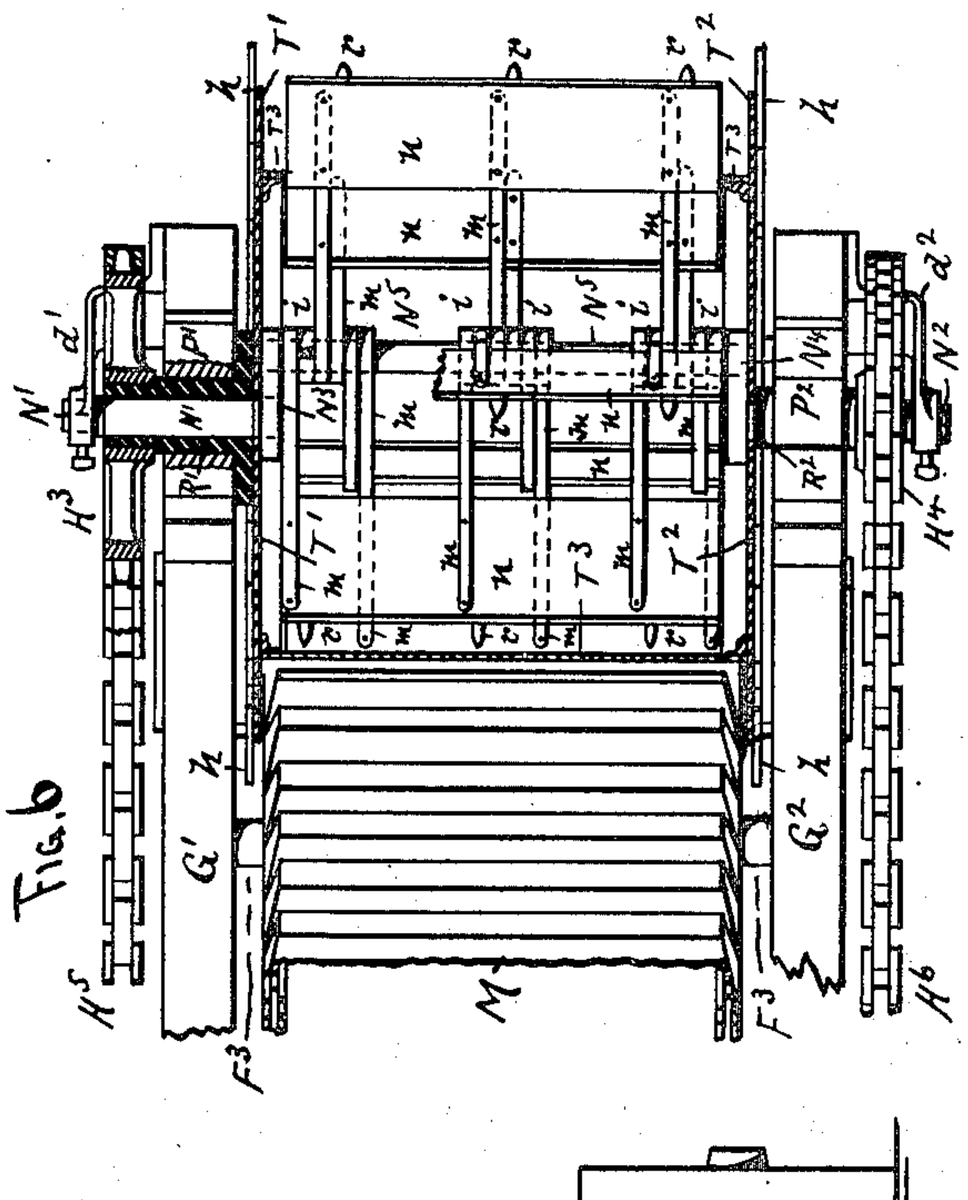

FIG. 6.

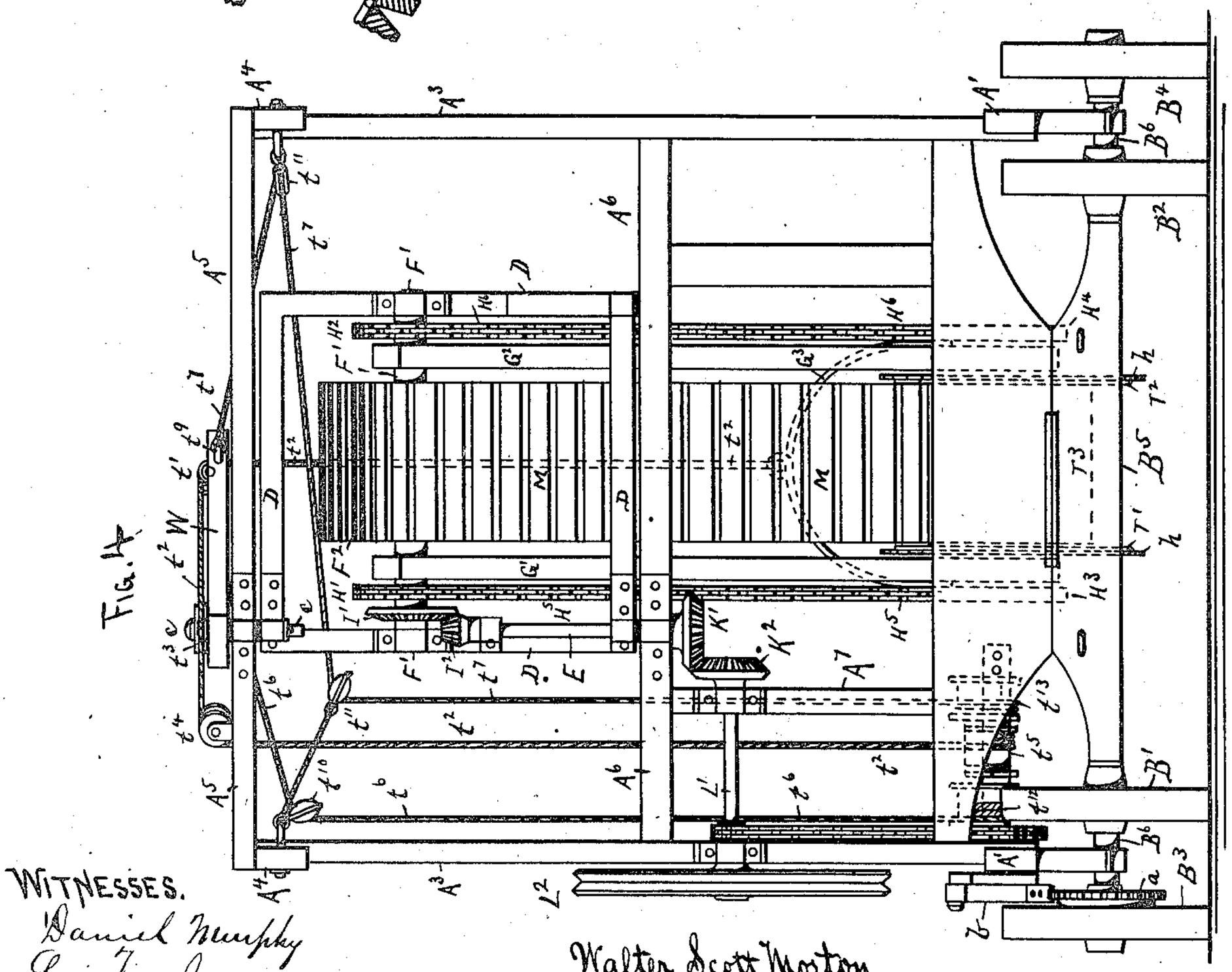

FIG. 4.

WITNESSES.
Daniel Murphy
Louis Fieser Jr

Walter Scott Morton,
INVENTOR, BY
Louis Fieser Sles. Atty's.

UNITED STATES PATENT OFFICE.

WALTER SCOTT MORTON, OF ST. PAUL, MINNESOTA.

EXCAVATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 287,563, dated October 30, 1883.

Application filed January 11, 1883. (No model.)

To all whom it may concern:

Be it known that I, WALTER SCOTT MORTON, a citizen of the United States, and a resident of St. Paul, in the county of Ramsey, in the State of Minnesota, have invented certain new and useful Improvements in Excavating-Machines, of which the following specification is a full, clear, and exact description, reference being also had to the accompanying drawings, in which—

Figure 1 is a semi-sectional side elevation. Fig. 2 is a plan view; Fig. 3, a detached view of the cutting-cylinder, showing a variation in its construction. Fig. 4 is a rear elevation. Fig. 5 is a sectional side view; and Fig. 6 is a sectional plan view, enlarged, of the excavating-drum and a portion of the conveyer-belt.

The main frame-work of the machine consists of a base-frame, A′, forward uprights, A^2, and rear uprights, A^3, and top frame, A^4, made in any desired manner and suitably braced, and mounted upon wheels B′ B^2 B^3 B^4, so that it can be transported from place to place or moved ahead as fast as the earth is excavated. In the drawings, one pair of these wheels, B′ B^2, are arranged upon a swivel-axle, B^5, (see Fig. 4,) so that the machine may be guided and turned in any direction in the same manner as an ordinary wagon. The other set of wheels, B^3 B^4, are shown fixed to a cylindrical axle, B^6, so that the axle and wheels revolve together, and one of the wheels, B^3, is provided with a ratchet-wheel, *a*, adapted to be acted upon by a bar or dog, *b*, vibrated in any suitable manner by the mechanism that operates the excavator, as hereinafter shown, to revolve the wheels B^3 B^4 and axle B^6 and move the machine slowly and steadily forward as the excavator cuts into the bank of earth.

The wheels B′ B^2 may be firmly fixed upon their axles, if preferred, or made to be either fixed or swiveled, as desired, and the machine may be arranged to be transported from place to place by horse, steam, or other power. The ratchet-wheel *a* and dog *b* may also be dispensed with, and the machine moved forward by hand-power or in any other suitable manner.

Arranged between cross-timbers A^5 A^6 in the rear part of the main frame is a smaller frame, D, as shown. This frame D is pivoted at one of its upper corners by a pin, *c*, in the cross-bar A^5, and by the opposite lower corner with an upright shaft, E, in the cross-bar A^6, so that the frame is free to oscillate back and forth within its supports A^5 A^6.

F′ is a horizontal shaft journaled in suitable boxes on the sides of the frame D, and carrying a drum, F^2, on its center, and two wooden side bars, G′ G^2, outside the ends of the drum, and running forward and downward, as shown, and two chain-pulleys, H′ H^2, outside the wooden bars. Upon the shaft F′, nearest to the pivoted side of the frame D, is a bevel-gear wheel, I′, adapted to engage with a bevel-pinion, I^2, on the upper end of the upright-shaft E. The shaft E passes down below the cross-piece A^6, and is provided on its lower end with a "miter-gear," K′, arranged to engage with a similar miter-gear, K^2, on a horizontal shaft, L′, journaled across one of the rear uprights, A^3, and a short upright, A^7, and provided with a grooved "wire-cable" pulley, L^2, on its end outside the upright A^3. By this arrangement, if motion be applied by a wire cable to the shaft L′, the miter-gears K′ K^2 will transfer the motion to shaft E, and from thence through the bevel-gears I′ I^2 to the shaft F′ and its drum F^2 and chain-pulleys H′ H^2, while at the same time, by utilizing the shaft E as one of the pivots of the frame D, the latter may be oscillated without interfering with the action of the shafts and gears, &c.

Any other means may be used to revolve the shaft L′ than a wire cable; but this power will do the work effectually and advantageously.

Journaled across and beneath the lower ends of the bars G′ G^2 is a shaft, F^3, carrying a drum, F^4, similar to the shaft F′, and drum F^2, over which two drums an endless slatted belt, M, is adapted to be run. When belts are used to support the slats of this belt, the drums F^2 F^4 will be as long as the distance between the bars G′ G^2; but when chains are used to support the slats, chain-pulleys will replace the drums.

Journaled in boxes P′ P^2 upon the upper sides of the lower ends of the bars G′ G^2 are two hollow sleeves, R′ R^2, through which short shafts N′ N^2 fit loosely, the sleeves being adapt-

ed to be revolved around the shafts, while the latter are held stationary by dogs or clamps d' d^2, which secure the shafts to the bars G′ G².

Attached to the inner ends of the sleeves R′ R² are two sheet-steel or other metallic disks, T′ T², whose outer rims project outward and beyond the ends of the drum F⁴ a short distance, as shown. These two disks T′ T² are connected to each other by a sheet-steel cylinder, T³, through which a number of narrow slots, e', Fig. 5, are cut at regular intervals, parallel with the shafts N′ N². Six of these slots e' are shown in the drawings; but any desired number may be used. The cylinder T³, where the slots are cut through, is strengthened by strips of "L-iron," e^2, as shown, the adjacent faces of the L-irons forming deeper slots than the thickness of the steel of the cylinder. The short shafts N′ N² pass inward through the disks T′ T², and are provided on their inner ends, inside the disks, with crank-arms N³ N⁴, the outer ends of the crank-arms being connected together by a shaft, N⁵, inside the cylinder T³.

The shafts N′ N², crank-arms N³ N⁴, and shaft N⁵ are all firmly connected together, and held rigidly by the dogs d' d^2, the center line of the drum F⁴, shafts N′ N², and shaft N⁵ all being about in the same plane, the crank-arms pointing away from the drum F⁴ and shafts N′ N², as shown.

Encircling the shaft N⁵ loosely at its ends next the crank-arms N³ N⁴, and at suitable intermediate points, are sets of collars i, to which arms m are attached by their inner ends, and with their outer ends passing out through the slots e'. There will be as many of the collars i in each set as there are slots e' in the cylinder T³, and the number will be increased or decreased to correspond to the slots in the cylinder. In the drawings, six slots, e', being shown, six collars, i, are shown in each set. Three sets of the collars are shown, one at each end and one in the center of the shaft N⁵, which will be enough ordinarily; but the longer the cylinder T³ is made the more sets of collars i and arms m will be required, while a very short cylinder would only require two sets. In the drawings, where three sets of collars i are shown, three of the arms m pass out through each of the slots e', and across the outer ends of each set of the arms that pass through the same slot a curved sheet-steel "shovel" or blade, n, is fixed, with small sharp-pointed fingers r attached to and projecting beyond the outer edges of the blades n.

The outer ends of the sleeves R′ R² project beyond the bars G′ G², and are provided on said projecting ends with chain-pulleys H³ H⁴ in line with the chain-pulleys H′ H², so that endless chains H⁵ H⁶, passing over the two sets of chain-pulleys, will revolve the cylinder T³ and disks T′ T² around the shafts N′ N² N⁵ at the same time with the slatted belt M. By this means the revolution of the cylinder will carry the arms m around the shaft N⁵, by reason of the outer ends of the arms passing through the slots e', and the collars i being loose upon the shaft N⁵.

The crank-arms N³ N⁴ pointing away from the drum F⁴, as shown, and the arms m being just long enough so that the outer points of the fingers r will be flush with or a little inside the outer surface of the cylinder T³ when the slots e' pass the drum F⁴, it follows as a matter of course (the arms m being all the same length) that when the slots e' pass the point y, directly opposite the drum F⁴, the arms m will project beyond the cylinder T their greatest distance. The arms m will gradually pass farther and farther out through the slots e' as the cylinder, in revolving, carries the slots around from the drum F⁴ to the point y, and then gradually recede into the cylinder again as the slots pass around to the drum. The blades n and fingers r, being attached to the arms m, will run in and out with them.

In the drawings, Figs. 5 and 6, one set of the arms m and its blade n are shown next the drum F⁴ and entirely inside the cylinder, and the opposite arm and its attached blade and fingers at the farthest point of projection, while those below the center are shown gradually projecting farther and farther outward, and the blades above the center gradually receding farther and farther inward.

h are cutting fingers or blades attached to the outer rims of the disks T′ T², to cut grooves in the earth on each side of the cylinder and in advance of it, to assist the blades n and fingers r in their work.

V is a scraper attached to the bars G′ G², with its upper edge in close contact with the outer surface of the cylinder T³ at the point where the fingers r are withdrawn entirely inside the cylinder, to remove any adhering earth, as shown in Fig. 5. This scraper may be placed above the drum F⁴ and its slatted belt M, if desired, to form not only a scraper, but to also act as a "chute" to run the earth from the cylinder up onto the belt M.

As before stated, the frame D is free to be oscillated horizontally on its pivot c and shaft E. This is to permit the side bars, G′ G², and their attached endless chain M and cutting-cylinder T³ to be swept around from side to side to increase the scope of the cutting-power, while at the same time the cylinder T³ and belt M may be raised and lowered by any suitable means to cut upward through a bank.

Lying along over the top of the cross-bar A⁵, with one end pivoted on the pin c and the other end free and ending above the drum T³, is a wooden arm or lever, W. In the free end of the lever a grooved pulley, t', is pivoted, over which a rope, t^2, leading from a bail, G³, on the bars G′ G², runs and is carried back and around a sheave, t^3, on the upper end of the pivot c, and from thence over an angularly-set sheave, t^4, and down to a windlass, t^5, on the base-frame A′. By this arrange-

ment, if the windlass be revolved, the rope t^2 will be wound up and raise the lower ends of the bars G' G² and their attached belt M and cylinder T³ upward.

t^6 t^7 are two other ropes, attached to opposite sides of the lever W at t^8 t^9, and passing in opposite directions over to the sides of the upper frame, A⁴, and thence through suitable blocks or pulleys, t^{10} t^{11}, down to two windlasses, t^{12} t^{13}, and by revolving either one of these windlasses the ropes t^6 t^7 will be wound up and draw lever W from side to side, according to which windlass is revolved. This side movement of the lever W will be communicated to the bars G' G² and their attached belt M and cylinder T³ through the rope t^2, and the cutting mechanism moved from side to side on its pivots *c* E.

I have shown the above-described system of ropes and windlasses to operate the machine; but I do not wish to confine myself to this specific mechanism, as I am aware that many well-known mechanical devices may be employed to secure the required movements. Steam, hand, or any other power may be employed to operate the cutting and elevating mechanism.

By this apparatus a bank of earth will be cut out by the revolving blades *n*, carried up over the cylinder T³, and delivered upon the belt M, and carried by it up over the drum F² and dumped into any suitable receptacle or car. I have shown a hopper-bottomed dump-box, X, suspended beneath the upper end of the belt M, adapted to receive the earth and dump it, when required, into a car or wagon placed beneath it. A section of the bank as wide as the horizontal sweep of the cutting-frame may be cut through, and by turning and guiding the machine on its wheels B' B² B³ B⁴ it may be made to cut in any direction. The cutting-cylinder may also be arranged to cut below the level of the earth on which the wheels B' B² B³ B⁴ stand, if required. In Fig. 1 the dotted line *x* represents the last line of the cut of the cutting-cylinder, and the dotted line *z* represents the cut about to be made.

The crank-arms N³ N⁴ may be made adjustable, to alter the cutting-point higher or lower, if desired. In some kinds of dry sandy soil the form of cutting shown in Fig. 3 may be used.

Excavating-machines have before been constructed in which a vertically-swinging frame carrying an endless apron or endless chain of buckets was pivoted to a vertical shaft, and I do not claim such a construction.

Having described my invention and set forth its merits, what I claim is—

1. In an excavator, the combination of a horizontally-swinging frame, a vertically-swinging frame or bars pivoted to the said frame, an excavating-cylinder on the lower end of the vertically-swinging frame, and an endless apron mounted on the vertically-swinging frame, substantially as and for the purpose herein specified.

2. In an excavator, the combination of a horizontally-swinging frame, a vertically-swinging frame pivoted thereto, an excavating-cylinder mounted on the lower end of the vertically-swinging frame, and provided with a series of blades, means for projecting and retracting the blades in the cylinder, and an endless apron for receiving and delivering the earth from the cylinder, substantially as and for the purpose herein specified.

3. In an excavator, the combination of a frame swung at one end so as to have a vertical and transverse movement, a revolving cylinder connected to the free end of said frame and carrying a series of blades, and means for projecting and retracting said blades, substantially as and for the purpose set forth.

4. In an excavator, the combination of the frame swung at one end in the pivoted frame, the revolving cylinder provided with blades and connected to the free end of the swinging frame, means for projecting and retracting said blades, an endless apron for removing and delivering the earth discharged from the cylinder, and the chain and lever for raising and lowering and laterally moving the revolving cylinder, substantially as and for the purpose set forth.

5. In an excavator, the combination of a horizontally-swinging frame, a vertically-swinging frame pivoted thereto, an excavating-cylinder mounted on the lower end of the vertically-swinging frame, an endless apron mounted on the vertically-swinging frame, means for driving the cylinder by a shaft on the horizontally-swinging frame, and means for driving the endless apron by the shaft driving the excavating-cylinder, substantially as and for the purpose herein specified.

6. In an excavator, the combination of a horizontally-swinging frame, a vertically-swinging frame pivoted thereto, an excavating-cylinder mounted on the lower end of the vertically-swinging frame, and provided with projecting and retreating blades, an endless apron mounted on the vertically-swinging frame, and a clearing-scraper located between the cylinder and the endless apron, substantially as and for the purpose herein specified.

7. In an excavator, the combination of an excavating-cylinder mounted on the lower end of a vertically-swinging frame, and provided with projecting and retreating blades journaled on an eccentric shaft inside of the cylinder, and an endless apron mounted on the same frame, substantially as and for the purpose herein specified.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WALTER SCOTT MORTON.

Witnesses:

LOUIS FEESER,

C. N. WOODWARD.