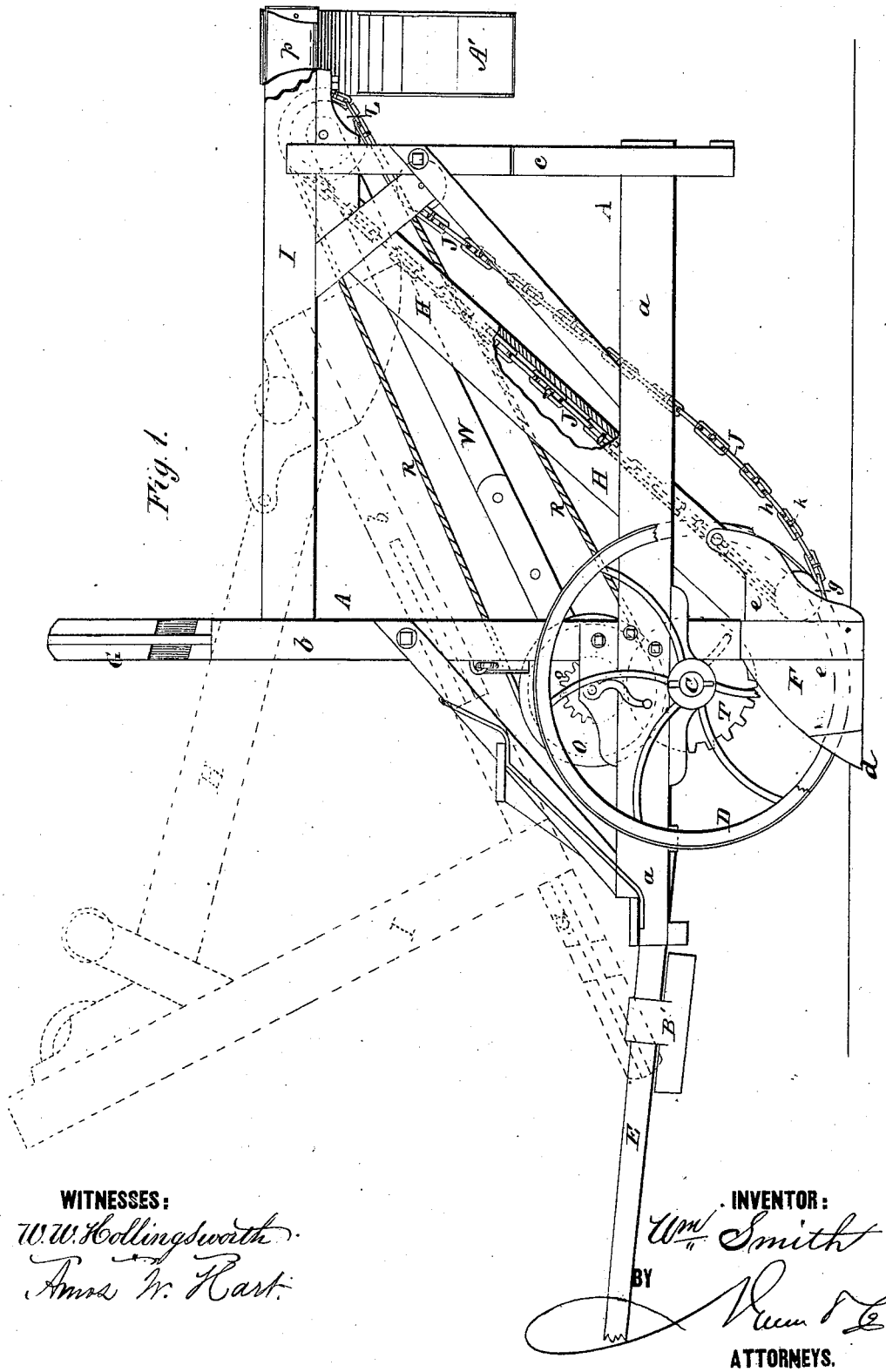
W. SMITH.

3 Sheets—Sheet 1.

Ditching-Machine.

No. 200,579. Patented Feb. 19, 1878.

Fig. 1.



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Amos W. Hart.

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3 Sheets—Sheet 2.

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Fig. 2.

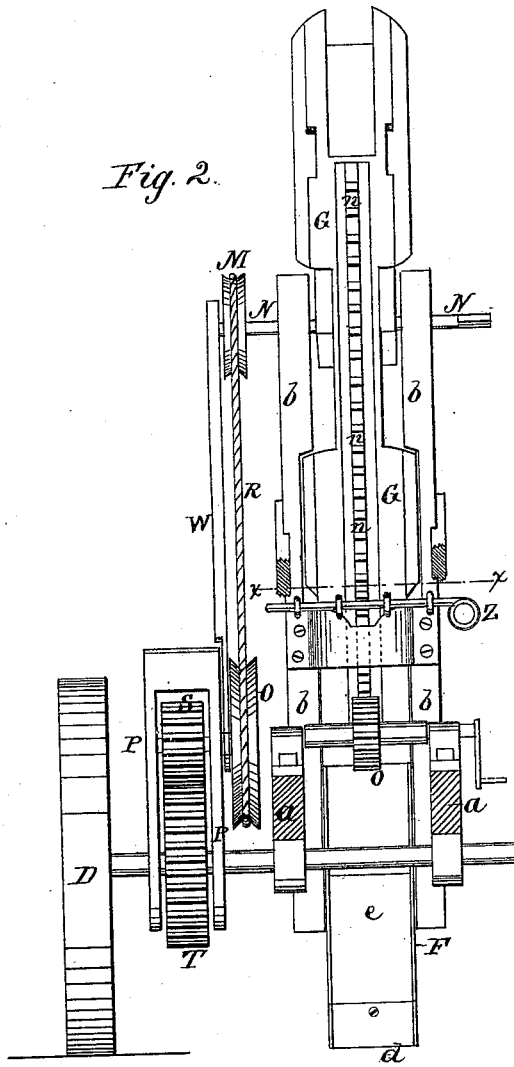

Fig. 4.

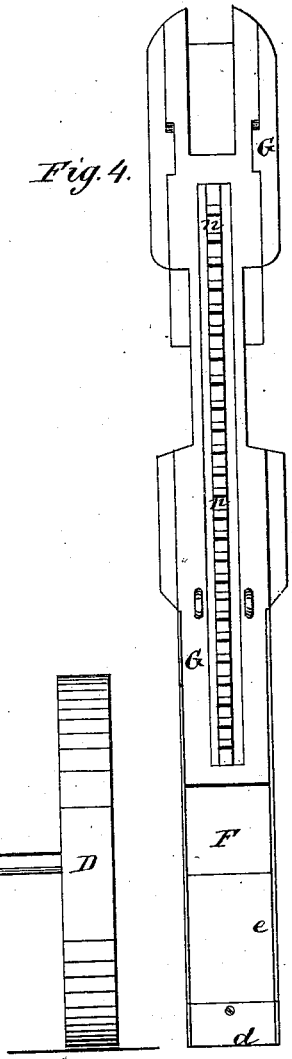

Fig. 5.

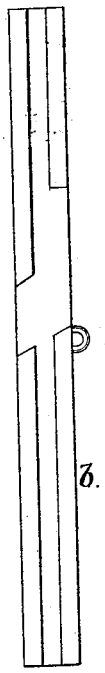

Fig. 6.

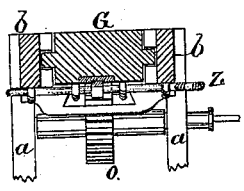

Fig. 7.

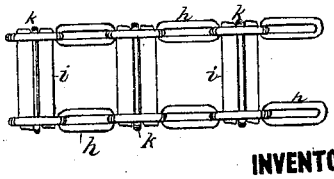

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Fig. 8.

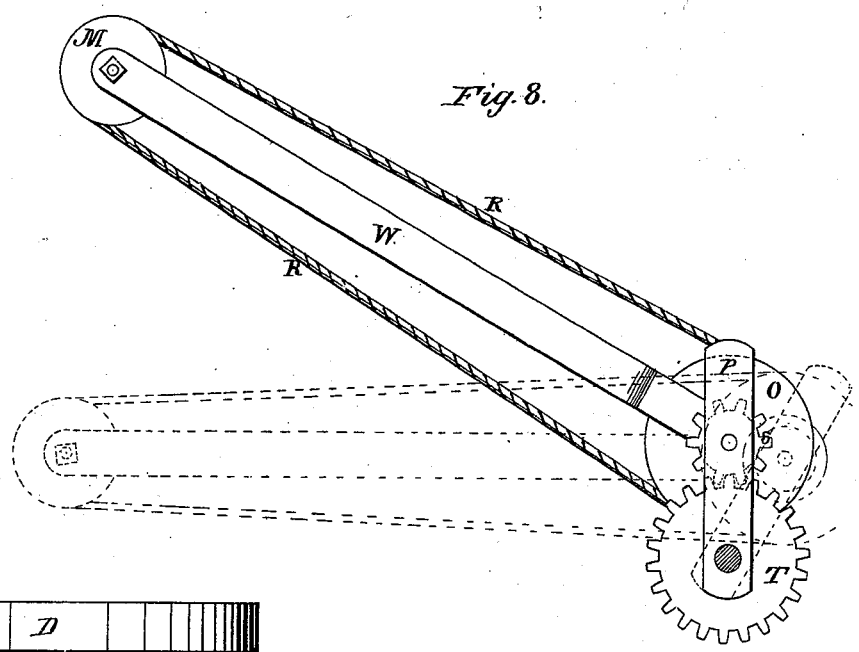

Fig. 3.

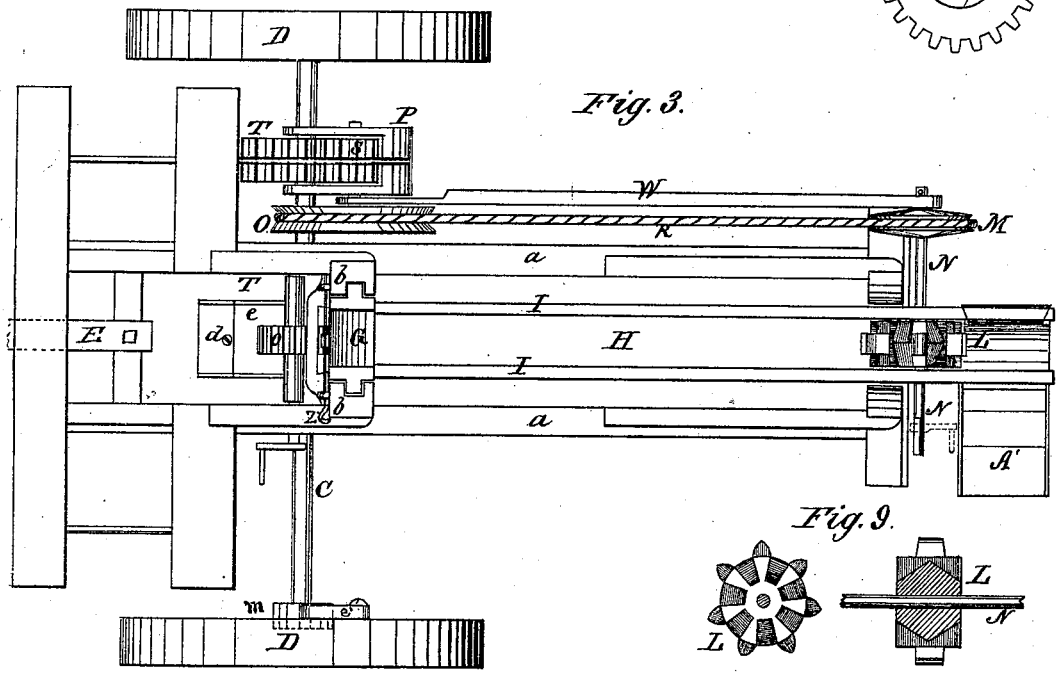

Fig. 9.

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UNITED STATES PATENT OFFICE.

WILLIAM SMITH, OF CARMI, ILLINOIS.

IMPROVEMENT IN DITCHING-MACHINES.

Specification forming part of Letters Patent No. **200,579**, dated February 19, 1878; application filed January 25, 1878.

To all whom it may concern:

Be it known that I, WILLIAM SMITH, of Carmi, in the county of White and State of Illinois, have invented a new and useful Improvement in Ditching-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same.

The invention is an improvement in that class of ditching-machines which have a vertically-adjustable plow or cutter, and an endless-chain elevator connected therewith, for carrying up or removing from the ditch the earth loosened and lifted by the plow.

The invention relates to the construction and arrangement of parts, as hereinafter described and claimed.

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation of my improved machine. Fig. 2 is a vertical section, showing a front elevation of the main parts of the machine. Fig. 3 is a plan view, with certain parts omitted. Fig. 4 is a front view of the vertically-adjustable guide-bar detached. Fig. 5 is a view of the inner side of one of the front grooved guides for the bar to which the plow is attached. Fig. 6 is a detail cross-section on line *x x* of Fig. 2. Fig. 7 is a plan view of a fragment of the elevator-chain. Fig. 8 is a detail view, showing the means for holding the driving-chain taut. Fig. 9 represents detail views of the chain-wheel.

The frame A of the machine is composed of two parallel horizontal bars, *a*, and parallel vertical front and rear guides, *b c*. This frame is supported upon the axle C of the transporting-wheels D, and the tongue E is rigidly attached thereto.

The plow F consists of two parts—first, a detachable point, *d*, having a straight front edge and vertical wings or side flanges, which act as cutters; second, a trough-shaped body or conductor, *e*, having vertical sides and an inclined bottom or floor. The point *d* is made of cast-steel, and the part *e* of cast-iron. The latter is provided with vertical arms, by which it is attached to the vertical bar G, that slides between the grooved front guides *b* of frame A.

The wooden conveyer H is rigidly attached to the plow F at an inclination of about fifty degrees, and horizontal bars I connect its upper end with the adjustable bar G. An endless-chain elevator, J, extends along the bottom of the conveyer H, and passes around a chain-wheel, L, at top of the conveyer, and around a friction-roller, *g*, at the lower end thereof, as shown.

The elevator J is composed of two chains, *h*, and connecting cross-bars *i*, whose shouldered ends are inserted in opposite links, and secured thereto by means of a wire or rod, *k*, laid in a groove in the bars *i*, and having its ends bent inward over the links, as shown in Figs. 1 and 7.

The cross-bars *i* serve as buckets to carry up the earth, and also as links, which engage the teeth of the chain-wheel L.

This construction of chain elevator has special advantages in respect to strength, lightness, cheapness, and durability.

The chain-wheel L is rotated, to cause the endless chain or elevator J to travel up the inclined conveyer H, by connection with the axle C.

A grooved or chain pulley, M, Fig. 3, is fixed on the projecting end of the shaft N, on which the chain-wheel L is mounted. A larger pulley, O, is fixed on a short shaft, which has its bearings in an arm, P, that is attached loosely to the axle, and is hence free to vibrate around it. A chain, R, passes around these pulleys M O, and it is obvious the chain elevator L will be caused to travel when the larger pulley O rotates. This rotation is communicated by a pinion, S, fixed on the shaft of pulley O, and meshing with the large gear T, fixed on the axle.

The axle is rotated by the wheels D, which have pawls *e'*, that engage ratchets *m* on the former, Fig. 3.

It is necessary that the chain R should be kept taut, and for this purpose it is requisite the arm P, carrying the large pulley O, should be inclined more or less when the plow is lowered to cut the ditch deeper.

To cause such inclination, or, in other words, to throw the arm P over from the vertical, Fig. 1, into an inclined position, as shown in dotted lines, Fig. 1, I employ a radius-bar, W, which connects the two chain-pulley shafts, Figs. 3 and 8. By this means the large pulley O is kept at an invariable distance from the smaller pulley M, whatever may be the

vertical adjustment of the plow and the frame H I G, connected therewith.

To raise and lower the plow and elevator-frame H I G, I employ the rack *n* and pinion *o*, the latter being fixed on a crank-shaft, having its bearings in front of guides *b* on the horizontal bars *a* of frame A.

The plow F and the frame connected therewith are held fixed in any adjustment by a cross-rod, Z, which passes through the guides *b* and between the teeth of the rack *n*, Fig. 2.

It will be obvious that the pin Z is drawn out and reinserted whenever the plow is adjusted higher or lower.

To adapt the machine for traveling on the road, or to and from the field, the plow and elevator-frame are turned on the cross-rod Z as a pivot, and assume the position shown in dotted lines, Fig. 1, the slotted top portion of the guide-bar G, in such case, resting on and embracing the tongue E. In order to permit the detachment of the bar G from the guides *b*, I cut away the flanges or sides of the groove, Figs. 2 and 5, in said guides, at the middle of the latter, lengthwise, and also cut away the guide-ribs of the bar G at the same point, Figs. 2 and 5. Then, by first detaching the radius bar W from the shaft N of the upper pulley M, and adjusting the guide-bar G and its attached plow F upward until the lower ribbed portion of the bar G coincides with that part of the guides *b* from which the flanges have been cut away, the bar G and connected parts can be tilted, as above stated.

The chain-pulley M will, in practice, be mounted loose on shaft N, and caused to revolve with it by means of a clutch (not shown) arranged to slide on a feathered portion of the shaft contiguous to said pulley. Thus the elevator-chain may be readily thrown out of action when the machine is not employed in ditching.

One end of the shaft N is squared, to adapt it to receive a crank, (shown in Fig. 2,) which is used, when the ditching is finished, to rotate the chain-wheel L, and thus cause the elevator-chain J to travel upward in the conveyer H and discharge the loose earth remaining therein.

A suitable device will be applied to throw the pawls *e'* out of engagement with the ratchets *m* when the machine is not employed in ditching.

Those portions of the chain-wheel L which lie between the teeth thereof are beveled each way from the center, to prevent the earth lodging or packing in such intermediate spaces, and prevent the bars *i* engaging the teeth of the wheel, in the desired manner.

It will be obvious from the foregoing description that, in the practical operation of the machine, the plow F is set to cut the desired depth—say, from two to four or six inches; and, upon starting the team, the friction of the wheels D will cause the rotation of the axle C, which will, in turn, communicate motion, through gears T S, large pulley O, pulley N, and chain-wheel L, to the elevator-chain J, so that, as the latter travels rapidly up the conveyer H, it will carry up and rapidly discharge the earth taken up by the plow. The earth is discharged laterally alongside the ditch by a curved chute, A', having a loop or socket, *p*, at its upper end, which adapts it to be attached to the projecting end of either of the horizontal top bars I of the elevator-frame. Thus the chute may be readily detached from one bar and attached to the other, as occasion requires.

A sliding weight, B', is applied to the tongue E, for use in counterbalancing the weight of the soil on the upper end of the conveyer H, since in heavy or wet soils the weight of the portion taken up by the plow in a given time will vary considerably.

The machine is simple and comparatively inexpensive in construction, and is also light and easily operated.

I am aware an inclined conveyer having a cutter and elevator-belt attached has been so connected with a wheeled frame as to be adapted for adjustment vertically, and I do not claim such combination of parts. In my machine the vertical guide-bar, with which the inclined conveyer is rigidly connected, constitutes, together with the grooved guides of the wheeled frame, the part which resists the draft-strain incident to the operation of the machine.

What I claim is—

1. In a ditching-machine, the vertical guide-bar G and inclined conveyer, rigidly connected by horizontal top bars I, all forming an adjustable whole, and the vertical grooved front guides *b b*, the vertical rear guides *c c*, and the horizontal bars *a a*, forming the wheeled frame, and the locking-rod Z, all arranged as shown and described.

2. In a ditching-machine, the combination of the plow, conveyer, and vertical bar, having a part of its guide-ribs cut away, the vertical parallel guides, similarly cut away, and the pivot-rod, all as shown and described, whereby the plow and elevator-frame are adapted to be turned or inverted in position, as and for the purpose set forth.

3. In a ditching-machine, the combination of the loose arms, the pulley and pinion connected thereto, the gear fixed on the axle, the pulley fixed on the chain-wheel shaft, the radius bar, and the vertically-adjustable elevator-frame, all as shown and described, for the purpose specified.

4. In a ditching-machine, the elevator, composed of two chains, the shouldered cross-bars, and the rods, having their ends bent to embrace and clamp the links, as shown and described.

5. In a ditching-machine, the chain-wheel L, having its interdental portion beveled in the manner described, in combination with a chain-elevator, as specified.

WM. SMITH.

Witnesses:
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SOLON C. KEMON.