

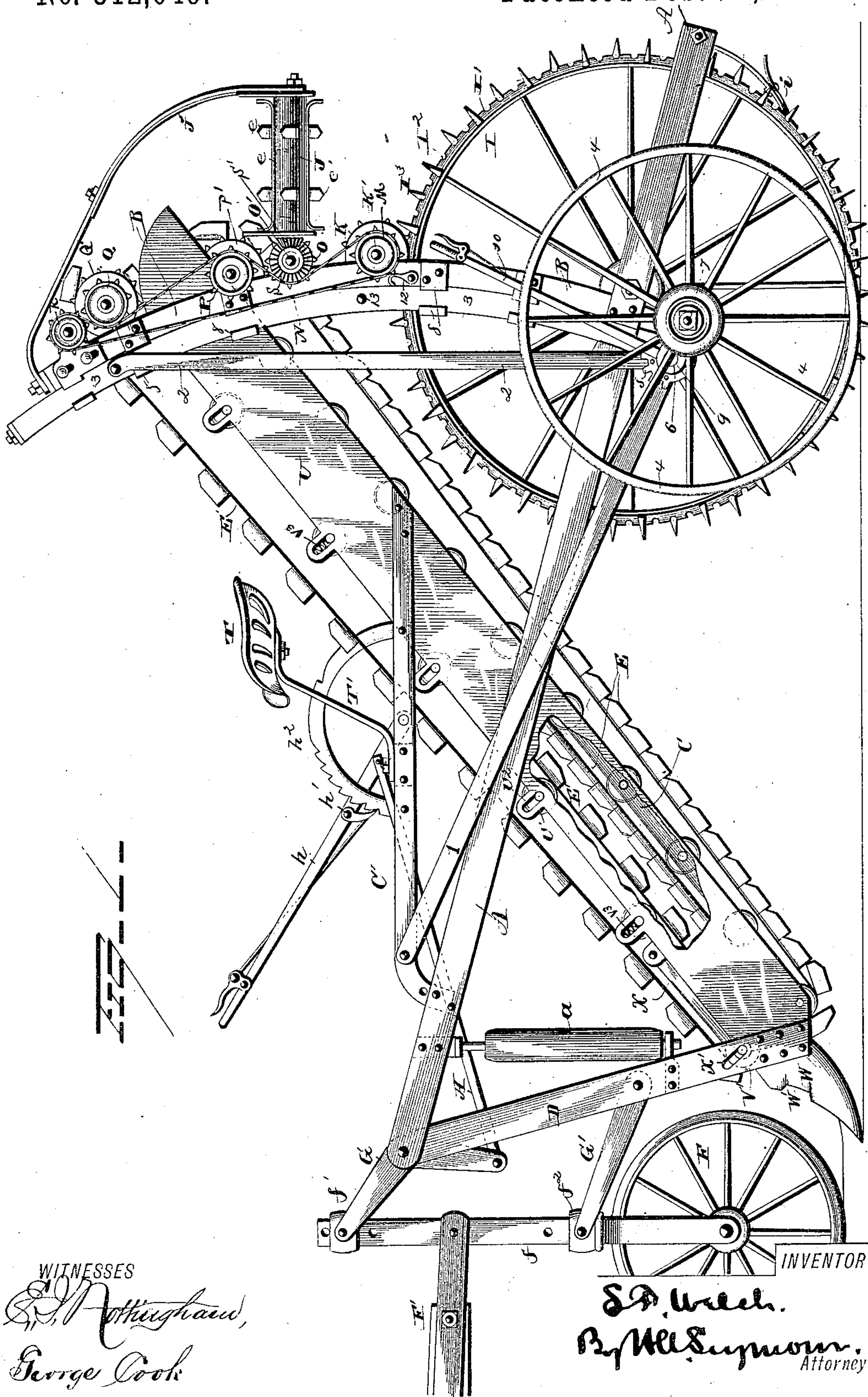
(No Model.)

2 Sheets—Sheet 1.

S. F. WELCH.
DITCHING MACHINE.

No. 312,049.

Patented Feb. 10, 1885.



WITNESSES

E. Nottingham,
George Cook

INVENTOR

S. F. Welch.
By M. S. Symon.
Attorney

(No Model.)

2 Sheets—Sheet 2.

S. F. WELCH.
DITCHING MACHINE.

No. 312,049.

Patented Feb. 10, 1885.

FIG. 2.

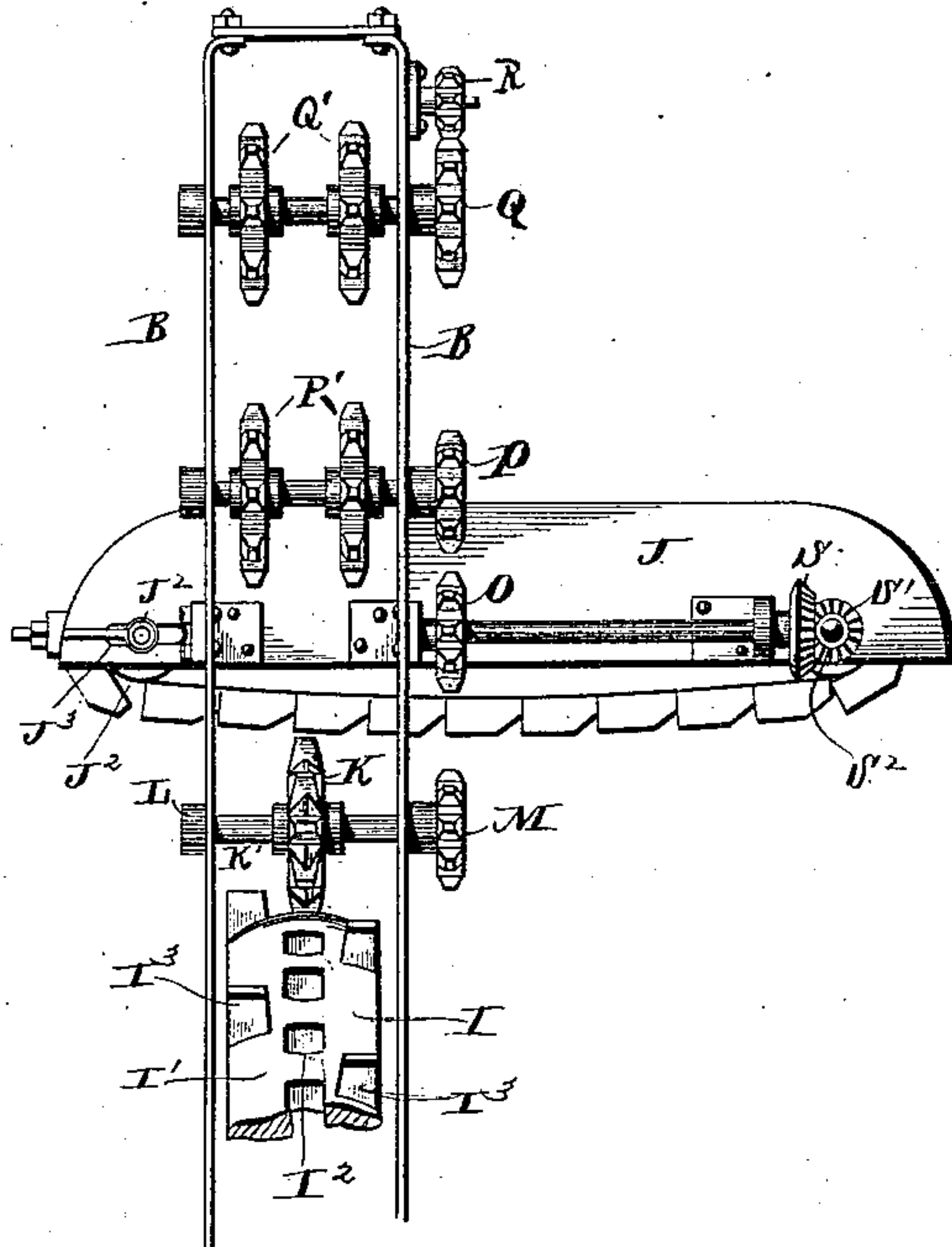


FIG. 3.

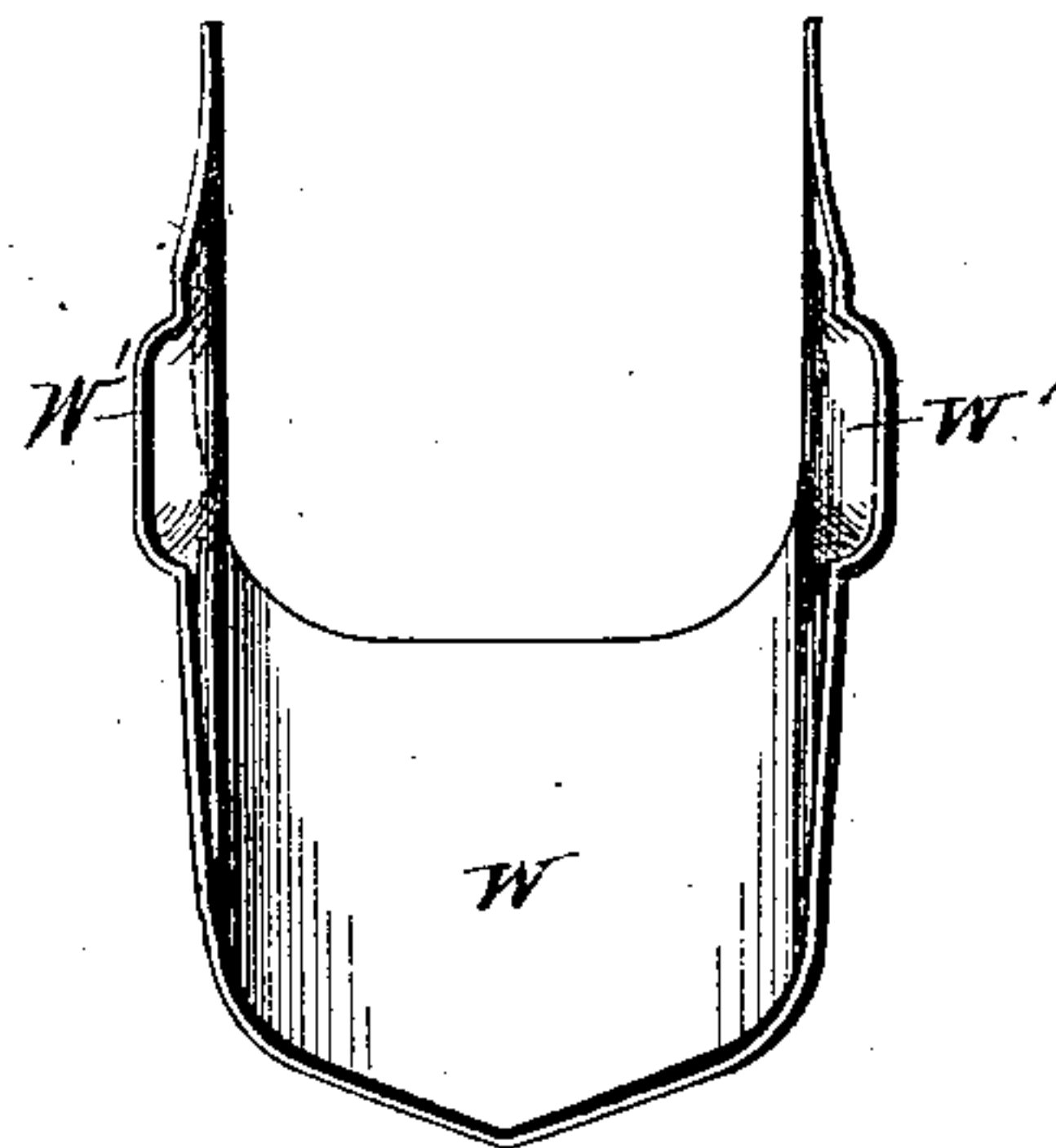
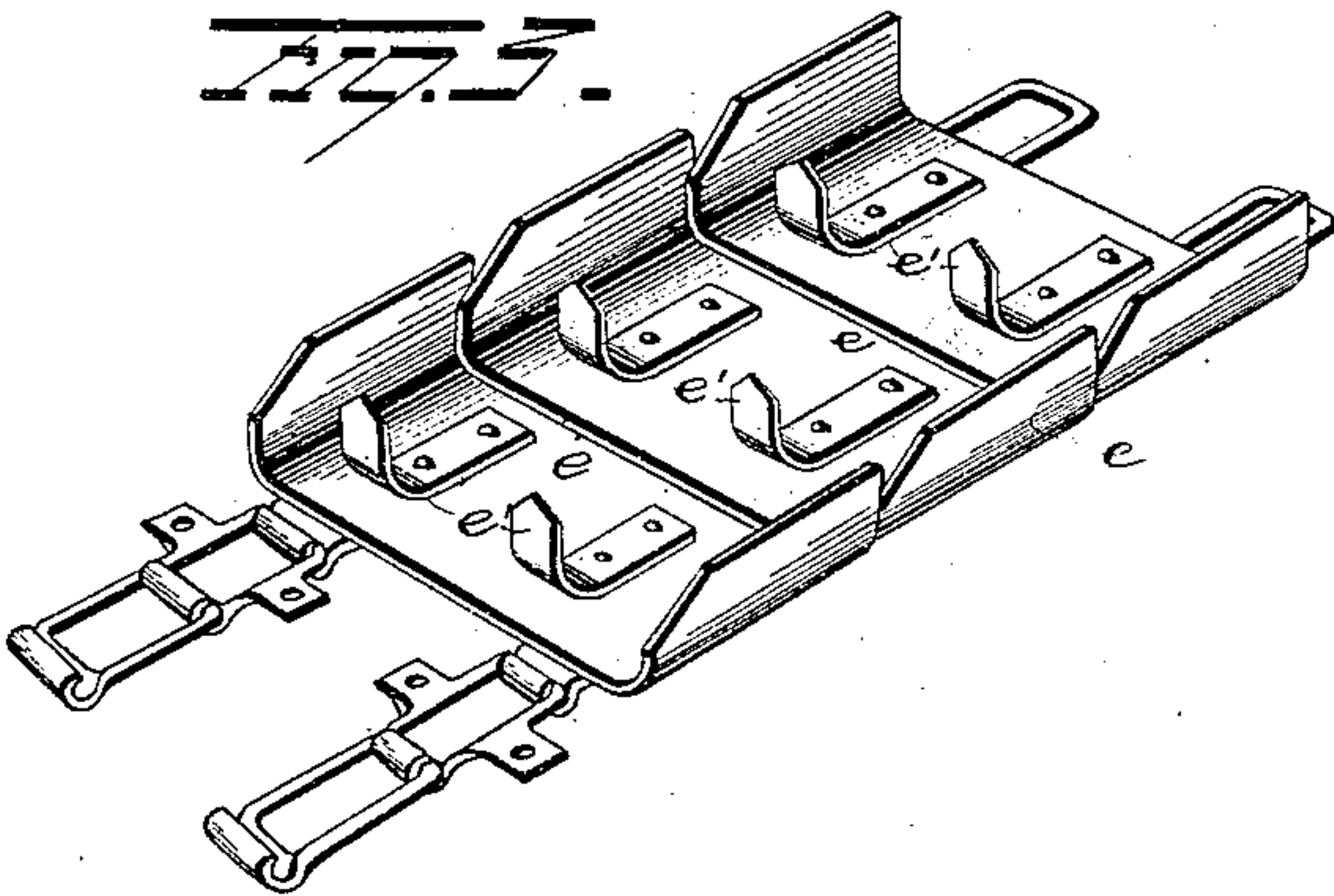


FIG. 4.

WITNESSES

S. Nottingham,
George Cook.

INVENTOR

S. F. Welch.
B. H. Symmons.
Attorney

UNITED STATES PATENT OFFICE.

S. FRANK WELCH, OF MOUNT PLEASANT, IOWA.

DITCHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 312,049, dated February 10, 1885.

Application filed March 29, 1884. (No model.)

To all whom it may concern:

Be it known that I, S. FRANK WELCH, of Mount Pleasant, in the county of Henry and State of Iowa, have invented certain new and useful Improvements in Ditching-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement on my ditching-machine patented December 4, 1883, No. 289,734, the object being to provide new devices for cutting the earth, and also for elevating the same. A further object is to provide new and improved devices for regulating the depth of cut; and, further, to provide a device of this character which shall be simple and economical in construction, and at the same time durable and efficient in use.

With these ends in view my invention consists in the parts and combinations of parts as will be more fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view of my improved excavating-machine in side elevation. Fig. 2 is a detached front view of the vertical standards, sprocket-wheels, their shafts and boxes, and the chain and gears for actuating the elevating-belts and discharging-apron. Fig. 3 is a detached view showing the chain and open buckets secured thereto. Fig. 4 is a detached view of the plow or scoop.

In constructing my machine I preferably employ a main frame and an auxiliary frame, with which the excavating, elevating, and delivering devices are associated, as will be hereinafter described.

The main frame consists, essentially, of the two parallel bars A, connected by cross-bars, and of two curved uprights, B, the upper ends of which are also connected by a cross-bar, having their lower ends secured to and near the rear ends of the said bars A. The main frame further consists of two parallel bars C, arranged diagonally with respect to the bars A and bolted thereto, and also secured at their upper ends to the uprights B, and adapted to support and guide the elevating-belts E E';

also of two parallel bars, D, bolted to and connecting the forward ends of the bars A and C, and two horizontal bars, C', bolted to the bars A and C, and serving to support the seat and operating-lever. A wheel, F, adapted to support the forward end of the machine is journaled in the fork of a bifurcated standard, *f*, to which is secured a vertically-adjustable draft-bar, F'. The said standard *f* is journaled in two collars, *f*² and *f*', provided with trunnions, which receive the forward ends of the bifurcated connecting-rod G' and bell-crank lever G, respectively, the rear end of said rod G' being pivotally secured to the bars D.

To the forward ends of the bars A is pivotally secured the lever G, the lower end of said lever being connected to the operating-lever *h* by means of the pitman H, the lower end of said lever *h* being secured to one of the curved bars C' of the main frame.

To the bar C' is also secured the sector *h*², with the teeth of which is adapted to engage the spring-actuated dog *h*', secured to the lever *h*. By this construction it will be readily seen that when the lever *h* is pulled back the pitman H transmits a similar motion to the lower arm of the bell-crank G, which raises the bar D, guided by the rod G', and thereby raises the plow or scoop W, secured to said bars D; and, again, if the lever *h* is depressed, the plow is likewise, by means of the bar D, bell-crank G, and pitman H, depressed, in which manner the plow may be raised or lowered as desired, and adapted to be retained in any adjustment by means of the spring-dog *h*'.

The auxiliary frame consists of bars 1, having their front ends pivotally secured to the bars C' of the main frame, of upright bars 2, to the lower ends of which the rear ends of the bars 1 are secured, of upright curved bars 3, secured to the bars B and conforming to the shape thereof, the upper ends of said bars 3 being bolted together, and of shafts 6 and axles 7, on which are journaled the wheels 4. The upper ends of the bars 2 are respectively bolted to the uprights 3, while the lower ends are rigidly secured to segmental racks 5, secured to the shafts 6, the inner ends of said shafts being supported by the lower ends of the uprights 3, which are mounted and adapt-

ed to be vertically reciprocated in bearings or guides 8, secured to the uprights B of the main frame.

The axles 7, supporting the carrying-wheels 4, are mounted in the outer ends of crank-arms 9, journaled on the shafts 6. Operating-levers 10, attached to the outer ends of the crank-arms 9, are provided with spring-actuated dogs adapted to be engaged with the teeth of the racks 5, and thus maintain the shafts in any desired elevation with respect to the axles and the auxiliary frame.

In virtue of the attachment of the auxiliary to the main frame, the motions imparted to the former by the undulations in the surfaces passed over by the wheels are not transmitted to the latter, thereby permitting the execution of a perfect grade-line in the bottom of the ditch. When, however, the machine is not in use, the two frames are locked together by means of hooks 12, pivoted to the uprights B and adapted to engage with studs 13, projecting from the outer faces of the uprights 3, the object of locking the two frames being to elevate the driving-wheel above the ground and to throw the weight of the rear end of the machine upon the carrying-wheels 4. In this adjustment the machine may be moved from place to place.

I represents the drive-wheel, journaled between the bars A, immediately in the rear of the uprights B, and is provided with a convexed periphery, I', the latter being provided with a series of recesses or depressions, I², and also with teeth I³, adapted to loosen the earth and increase the traction. The recesses I² are adapted to fit the teeth of the pinion K, mounted on the shaft K', journaled in bearings L, secured to the uprights B. A sprocket-wheel, M, also mounted on the said shaft K', carries an endless open-link chain, N, which, passing from said sprocket M, passes in front of and partially around the sprocket-wheel O, mounted on the shaft O', one end of which is journaled in a bearing attached to one of the uprights B, and the other end in a bearing attached to and near the outer end of the delivering-apron J. After leaving the sprocket-wheel O, the chain N passes to the rear of the sprocket P, thence to the front of sprocket Q, then around the idle-sprocket R, arranged to regulate the tension of the chain, and finally returns to the sprocket M. On the outer end of the shaft O' is keyed a bevel gear-wheel, S, meshing into a similar gear, S', keyed to the end of a shaft, S², around which passes the delivery-apron J, and which is supported in brackets j, secured to the uprights B. The other end of the apron J passes around the roller J², journaled on the shaft j², adjustably secured to the guides J³, attached to the brackets j, the said guides being adapted to prevent the earth from falling over the sides of the delivery-apron J.

E and E' represent the elevating belts or chains, and are inclosed between two shields, U, preferably made of sheet metal and bolted

or otherwise secured to and outside of the diagonal bars C, said shields serving to guide the earth as it is carried upwardly by the elevating-belts, and adapted to protect the latter. The upper ends of the belts E and E' travel over sprockets P' and Q', respectively, journaled between the uprights B and on the same shafts with sprocket-wheels P and Q, said shafts being attached to said uprights B, as shown in Fig. 2 of the drawings. The lower ends of the elevating-belts E and E' pass over smaller sprockets journaled between the bars C and the bars D D, respectively. Rollers or sprockets journaled between bars C are employed to guide and support the lower elevating-belt, E, at intermediate points, and similar sprockets, v', are journaled on shafts supported in slots v², formed in the upper edge of the shields U. By means of this construction, when the elevating-belt E is in motion and carrying the earth upwardly the lower portion of the upper belt, E', will travel in the same direction, and, bearing on the earth carried by the said belt E, will aid in raising the earth, and at the same time prevent its falling back. By forming the slots v² in the upper edge of the shields U and allowing the shafts to which the sprockets v' are secured to move therein, the upper belt, E', is permitted to adjust itself to carry varying quantities of earth. The sprockets v', carrying the lower end of the belt E', are mounted on a shaft which passes through the ends of two parallel bars, X, and into slots x', formed in the bars D, the opposite ends of said bars X being pivotally secured to lugs formed on the shields U. These bars serve to resist the tension of the belt E', and permit the sprockets v' to move freely up and down through the limit of the slots formed in the bars D. If desired, springs v³ or their equivalent may be inserted in the slots v², between shafts of the sprockets v' and the shield U, and thereby regulate the bearing of the upper belt, E', on the earth carried by the belt E.

e represents the buckets, secured to one or more chains by means of lugs formed on the latter, and formed with upwardly-projecting sides adapted to prevent friction between the moving earth and the shields U, the rear ends of the buckets being left open to facilitate the discharging of the earth and prevent clogging with wet earth. The floors of the buckets e are provided with fingers or teeth e', adapted to more securely hold the earth therein, said teeth being pointed, to easily penetrate the clods or hard earth and not hold them up off the floor of the buckets, and preferably formed slanting to readily free themselves of their load. In the lower belt, E, and apron J each bucket is adapted to slightly overlap the one immediately in its rear; but in the upper belt, E', each alternate bucket may be omitted. The plow or scoop W is mounted between and bolted to the bars D, the sides of said scoop abutting against the shields U, thus preventing any earth from escaping over the sides of the plow.

The principle upon which the plow is constructed is with reference to free clearance for the plow in passing through the earth and free clearance for the earth in passing through the plow. This is attained by taking into consideration its line of motion in passing through the earth and the line of direction which the earth takes in passing through the plow. By converging the front cutting-edges of the plow from the top to the point of juncture with the bottom of the plow, and by longitudinally rounding the bottom, ample clearance is cut for the plow and also for the parts of the machine attached to the plow. By widening or separating the front cutting-edges of the plow, as described, and as the plow rests in an inclined position, as shown in Fig. 1, it follows that the portion of the plow at the line of juncture of the curved bottom and sides can diverge rearwardly without impinging too closely on the sides of the ditch. When the parts are thus constructed and arranged, the largest or widest portion of the rear end of the plow rests behind the widest portion of the front end of the plow and follows in the track thereof. As this widened portion of the rear end of the plow is in line of motion of the earth in passing through the plow, ample clearance is made for the excavated earth and all compression of the earth avoided.

As the plow can only cut the width of the elevating-belt without compressing the earth, it is necessary that clearance be made for the parts of the machine which follow in the ditch beyond the elevating-belts. To accomplish this purpose I provide the upper front edges of the plow with two auxiliary cutters, W' , adapted to cut the earth from the sides of the ditch and turn it over onto the top of the earth passing through the plow, and pass upwardly with it, at the same time offering no impediment to the free travel of the earth raised by the lower end of the plow. By this construction free clearance is made for the outside of the plow, for the earth in passing through the plow, and for the parts of the machine following in the ditch, and all compression of the earth and consequent clogging of the plow obviated.

a represents two friction-rollers, journaled in bearings secured to the bars D and A of the main frame, and near the forward part of the machine, said rollers projecting slightly outside of the said frame on each side of the machine, serving to reduce the friction of the earth on the machine caused by the irregularities in the line of the ditch. The frame-bars A extend rearwardly to the rear edge of the drive-wheel I , the rear ends of the bars being connected by a cross-bar, to which latter is secured a scraper, i , adapted to bear on the periphery of the wheel I and keep the same, between the teeth I^3 , free from dirt. A seat, T , provided for the operator is secured by means of a spring, T' , to a cross-bar connecting the two bars C' , the seat being so situated

that the lever h will be within easy reach of the operator.

Having described the construction of my machine, I will now set forth its operation. The drive-wheel is first lowered to the ground by means of the levers 10, and the main and the auxiliary frames unlocked. Upon starting the machine the operator allows the lever h to move forward until the plow enters the ground to a sufficient depth, at which time he engages the said lever with teeth of the sector h^2 by means of the dog h' . As the earth moves up through the plow it is delivered on the belt E and carried upwardly, being prevented from falling back by means of the upper belt, E' , as already described. The earth carried upwardly by the belt E falls on the belt or apron J , which delivers it to one side of the ditch.

It is evident that many slight changes in the construction and relative arrangement of the different parts might be resorted to without involving a departure from my invention.

I would have it understood that I in nowise limit myself to the exact construction herein shown and described.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an excavating-machine, the combination, with a plow or scoop, of a lower carrying belt or elevator, an upper belt or elevator, and rollers resting on the upper elevator for yieldingly holding the latter in contact with the earth on the lower elevator, substantially as set forth.

2. In an excavating-machine, the combination, with a plow or scoop, of an elevating belt or apron, a belt or apron situated above said former belt and arranged to bear on the contents thereof and aid in raising the same, and rollers resting on the upper belt and journaled in elongated bearings, substantially as set forth.

3. In an excavating-machine, the combination, with a plow and shields extending rearwardly from said plow, of elevating belts or aprons consisting of open-link chains, and buckets secured to said chains and having up-turned sides to prevent the earth from coming in contact with the shields, and open at their ends for the free passage of the earth, substantially as set forth.

4. In an excavating-machine, the combination, with a plow and shields extending rearwardly from said plow, of elevating-chains, the buckets, constructed as described, and secured to said chains, and teeth or fingers secured to the buckets, substantially as set forth.

5. In an excavating-machine, the combination, with a plow or scoop, of an elevating belt or apron, a belt or apron situated above the latter, a shield partially inclosing said belts, and spring-pressed rollers resting on the upper belt, substantially as set forth.

6. In an excavating-machine, a plow hav-

ing its sides and curved bottom diverging upwardly and rearwardly, and the sides converging toward the bottom, and provided near the upper front cutting-edges with auxiliary cutters, which latter project laterally beyond the sides of the plow, substantially as set forth.

7. The combination, with the wheel I, of pinion K, sprocket-wheels M, O, P, Q, and R, chain N, gears S S', and elevating and discharging aprons, all the above parts combined and adapted to operate substantially as described.

8. The combination, with a main frame, a standard to which the draft-bar is attached, and a wheel journaled in the lower bifurcated end of said standard, of a bell-crank lever, and the lever G', loosely connecting the main

frame to the standard, the lever h, and the pitman connecting said lever h and bell-crank lever, substantially as set forth. 20

9. In an excavating-machine, the combination, with the main frame, of a vertically-adjustable plow, and elevating-belts having buckets thereon for elevating the earth, and rollers a a, located above the plow and lower end of the elevating-belts, and vertically-adjustable therewith, substantially as set forth. 25

In testimony whereof I have signed this specification in the presence of two subscribing witnesses. 30

S. FRANK WELCH.

Witnesses:

C. C. WELCH,
C. M. SNYDER.