

No. 646,674.

Patented Apr. 3, 1900.

H. J. BENTSON.
EXCAVATING MACHINE.

(No Model.)

(Application filed Nov. 27, 1899.)

4 Sheets—Sheet 1.

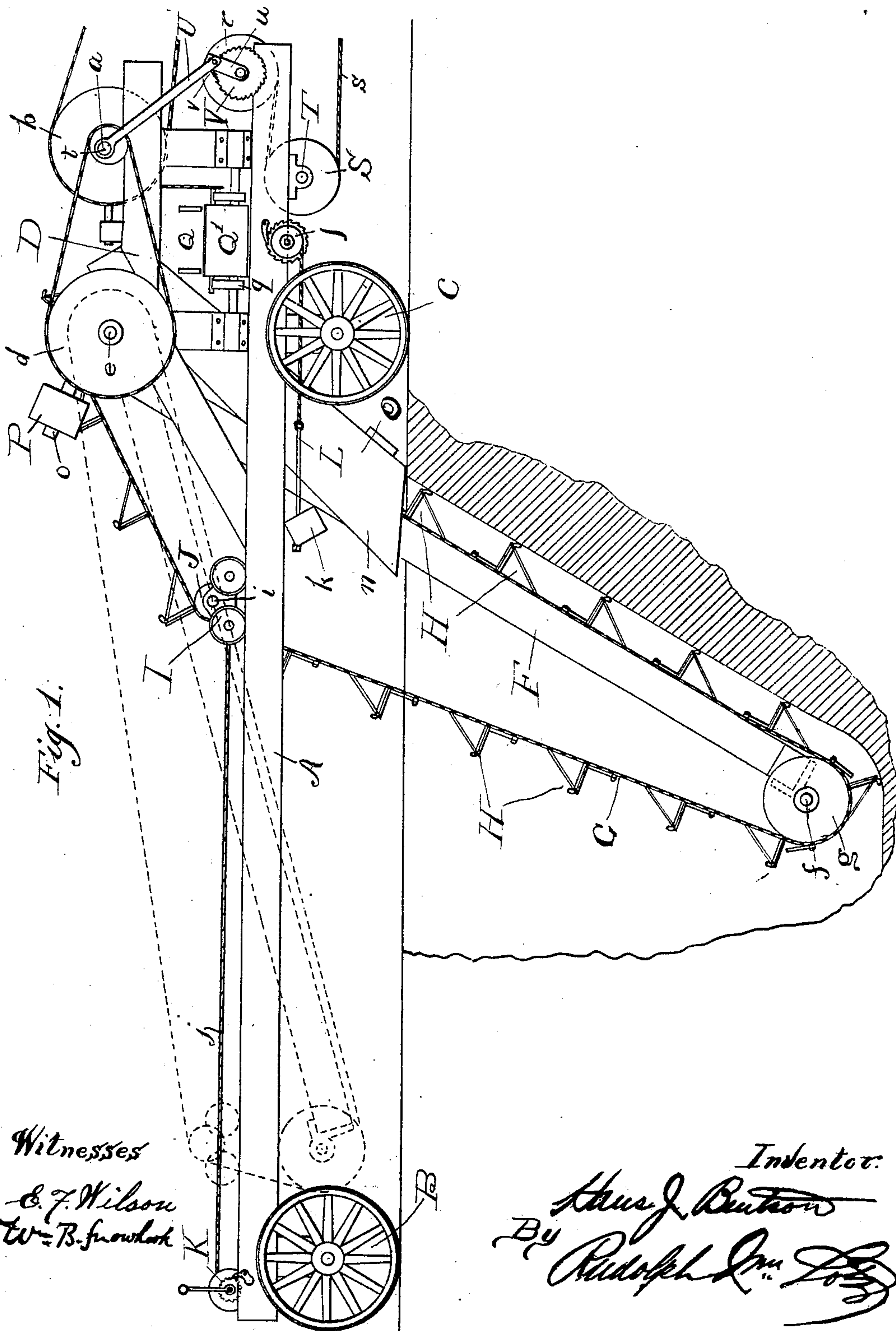


Fig. 1.

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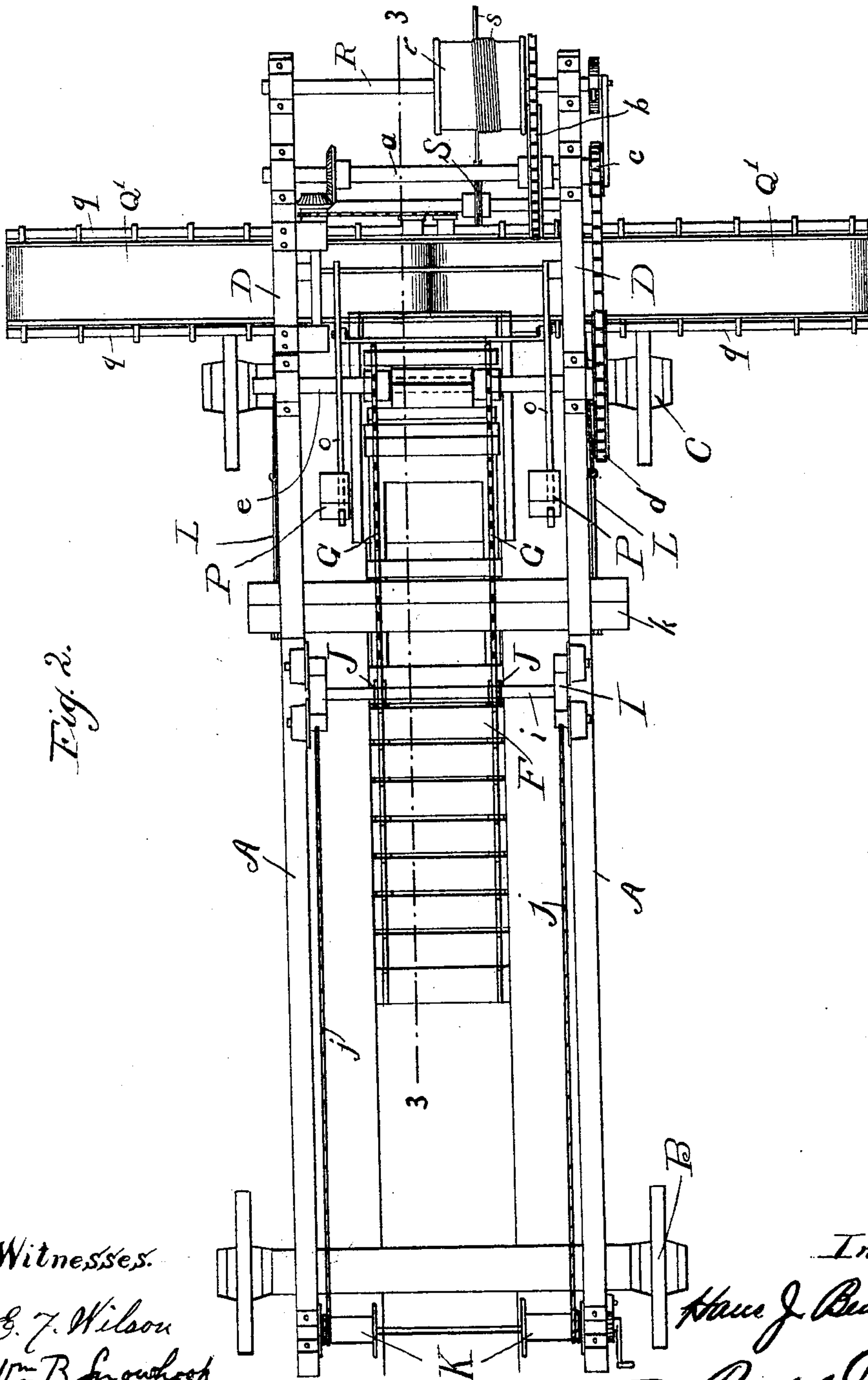
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4 Sheets—Sheet 2.



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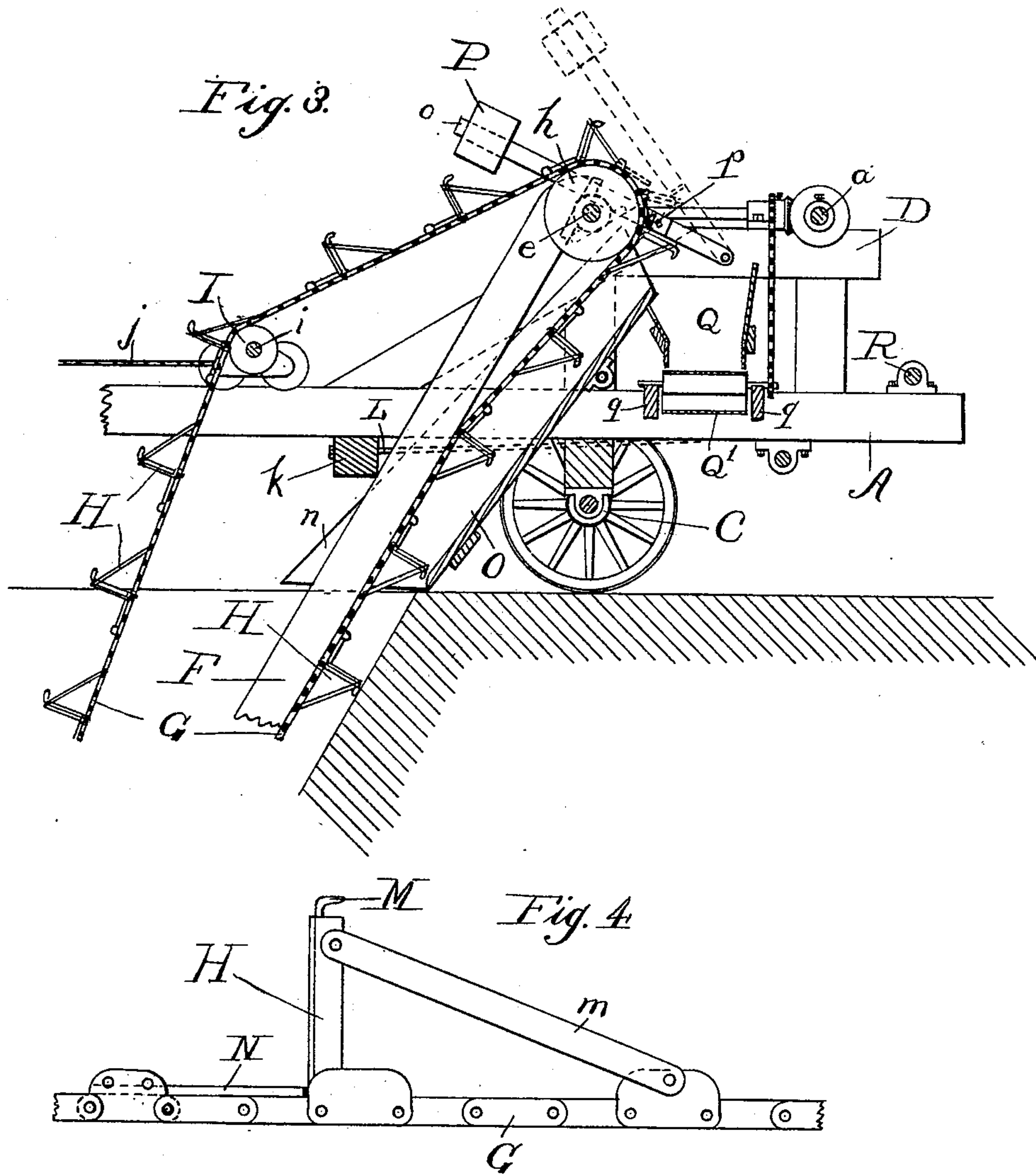
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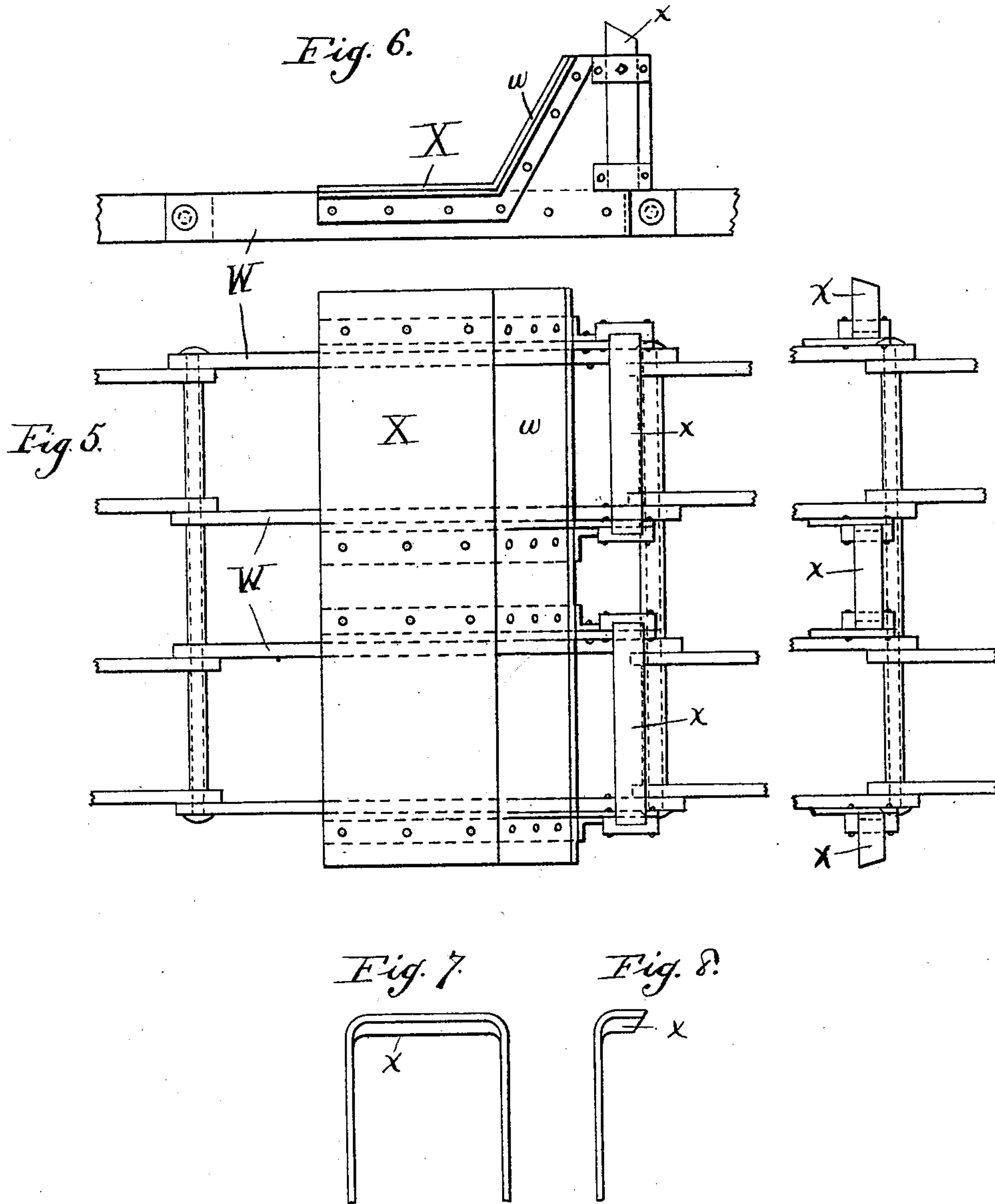
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4 Sheets—Sheet 4.



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UNITED STATES PATENT OFFICE.

HANS J. BENTSON, OF CHICAGO, ILLINOIS.

EXCAVATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 646,674, dated April 3, 1900.

Application filed November 27, 1899. Serial No. 738,371. (No model.)

To all whom it may concern:

Be it known that I, HANS J. BENTSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Excavating-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

10 which it appertains to make and use the same.

My invention relates to a novel construction in an excavating-machine, the object being to provide a simple, durable, and efficient device of this character; and it consists in the

15 features of construction and combinations of parts hereinafter fully described and claimed.

In the accompanying drawings, illustrating my invention, Figure 1 is a side elevation of a machine constructed in accordance with my

20 invention. Fig. 2 is a top plan view of same. Fig. 3 is a fragmentary longitudinal section on the line 3 3 of Fig. 2. Fig. 4 is a detail side elevation of one of the shovels I employ. Fig. 5 is a front elevation showing a modified

25 form of chain and shovel carried thereby. Fig. 6 is a side elevation of same. Figs. 7 and 8 are detail elevations of cutters which I employ for loosening the earth to be taken

up by the shovels.

30 In excavating-machines it is absolutely essential, first, to loosen the earth, so that it can be easily taken up by the shovels; second, to so construct the shovels that the earth taken up thereby can be readily removed

35 therefrom, and, third, to hold the cutters and shovels to their work, so that they will have no opportunity to slide over without taking up the earth.

So far as I am informed excavating-machines heretofore have been constructed with buckets which were provided with sharp edges to cut the earth and immediately receive same; but such machines proved inoperative owing to the fact that no adequate

45 means for emptying the buckets could be provided. This difficulty is particularly great when excavating wet earth and clay, as the latter become tightly packed into the bucket and must be dug out at the expense of great

50 labor and much time.

One feature of my present invention con-

sists in the novel construction of the shovels or scrapers for elevating the earth.

Another feature of my invention consists in the novel construction of devices for scrap- 55 ing the earth from said shovels or scrapers.

Another feature of my invention consists in the devices for adjusting the position of the beam carrying the excavating devices and regulating the tension of the chain carrying 60 the shovels or scrapers.

Still another feature of my invention consists in the devices for continually moving the machine forward in accordance with the rapidity with which the excavation is effected. 65

To these and other ends my device consists of a frame comprising two parallel beams A, mounted upon trucks B and C, the latter of which may be moved pivotally, if desired. Mounted upon said beams A above said truck 70 C are frames D, carrying the operating mechanism. The latter consists of a drive-shaft *a*, journaled in bearings on said frames D and carrying sprocket-wheels *b* and *c*, the former of which is adapted to be geared to a trac- 75 tion-engine or portable steam gasoline-engine, and the latter of which is adapted to be geared to a sprocket-wheel *d* on a counter-shaft *e*, likewise journaled in bearings on said frames D. Pivottally mounted upon said 80 counter-shaft *e* at one end is a frame F, comprising two parallel beams connected by cross-pieces at their ends. At its free end said frame F carries a shaft *f*, having sprocket-wheels *g* rigid therewith, over which and 85 sprocket-wheels *h*, carried by said counter-shaft *e*, sprocket-chains G, carrying excavating devices H, are trained. Movable on said beams A is a carriage I, carrying a shaft *i*, provided with idlers J, over which said 90 sprocket-chains G run. Said carriage I is connected by means of cords *j* with windlass devices K, mounted upon the end portions of said beams A and by means of which said carriage is moved to draw said sprocket- 95 chains taut and hold them so and likewise, when desired, to raise said frame F. The latter is held in any desired position by means of a beam *k*, interposed between it and the beams A and firmly held to prevent said 100 frame F from rising by means of cords L, connected with windlass devices *l* on said

beams A adjacent said truck C. Each of said excavating devices II comprises a plate secured at its inner end to links of said chains G in any suitable manner and held in position at an angle of about ninety degrees to said chains by means of braces *m*, pivotally secured to said plates at one end and to links of the chains at their other ends. Cutters M are also secured below said plates and project beyond the outer edge of same, so that the earth loosened thereby will be taken up by the next succeeding plate. Plates N are secured to links of said chain adjacent their upper edges and rest with their lower edges upon said excavating-plates, thereby forming aprons by means of which the earth taken up by said plates is prevented from falling back into the channel. Said aprons N likewise serve as scrapers for the inner ends of said plates, as hereinafter described. An apron O, provided with side flanges *n*, is pivotally mounted between said beams A and depends therefrom with its lower edge resting upon the ground and extending practically parallel with direction of motion of said excavating devices II, so that the latter scrape same, thereby preventing the earth from falling off same. Pivotally secured to said beams A and extending over said apron O are parallel arms *o*, carrying weights P at their free ends and connected between their ends by a cross-bar *p* lying in the path of the scraper-plates and adapted to be engaged by the latter as they turn over said sprocket-wheels *h*, thereby being raised and scraping the earth from said plates in an obvious manner. Just previous to engaging said cross-bar *p* said scraper-plates are partially scraped by said aprons N, which as they reach the sprocket-wheels *h* have their lower ends forced outwardly, as indicated in dotted lines in Fig. 3, thereby shoving the earth toward the outer edges of said scraper-plates. As each of the latter moves out of the path of and releases said cross-bar *p* said arms *o* suddenly turn to the lower limits of their movement, which is determined by a suitable stop, and being brought to a sudden standstill obviously cause any earth clinging to cross-bar *p* to drop. The earth thus scraped off the plates by said cross-bar falls into a trough Q, whence it is carried by means of belt conveyers Q' to each side of the channel and dropped upon the ground or into suitable receptacles, as desired. Said belt conveyers Q' are trained over pulleys revolubly mounted in frames *q*, removably mounted on said machine and receiving motion by means of suitable transmission devices, particular description of which is considered superfluous. Upon the extreme end portions of said beams A is a shaft R, journaled in bearings and carrying a drum *r* between its ends, upon which a cable is adapted to be wound, said cable being trained over a pulley S on a parallel shaft T, journaled in bearings on said beams A and secured at its free end to a stake driven into the ground

ahead of and in the path of the channel to be cut. The drive-shaft *a* carries a crank *t* at one end connected by means of a pitman U with an arm *u*, carrying a pawl *v*, adapted to engage a ratchet-wheel V on said shaft R, thereby slowly turning the latter and advancing the entire machine. The traction-engine driving said machine is preferably so placed that as the latter advances it pushes the traction-engine along a corresponding distance.

The excavating devices may be variously constructed, and, broadly speaking, my invention consists in providing flat plates extending transversely or at an obtuse angle to the direction of motion of the devices carrying same, so that they can be readily scraped at a suitable point in their course. As shown in Figs. 5 and 6, said excavating devices may comprise a sprocket-chain W, having links of greater length than ordinarily, so that one set of links in horizontal alinement carries a scraper-plate *w*, apron X, and cutter *x*. In this case the said apron X and scraper-plate *w* are made in one piece and firmly secured to said links by means of angle-irons riveted to both the links and plates. The cutter *x* is mounted immediately below the plate *w* and serves as a brace for the latter.

The cutter *x* may consist of a single strip of metal bent to a U shape or of two strips, each having a bent end, as shown in Fig. 8.

My machine has proven practical for excavating any character of soft earth—such as clay, sand, loam, gravel, and pebbly earth—making a clear-cut channel.

I claim as my invention—

1. In an excavating-machine, the combination with a shaft journaled in bearings on the frame of the machine and carrying parallel sprocket-wheels, of a frame swinging on an axis coincident with the axis of rotation of said shaft and adapted to depend therefrom, a shaft journaled in bearings on the free end of said frame, sprocket-wheels carried by said shaft, parallel sprocket-chains turned over said sprocket-wheels on both said shafts, scraper-plates carried by said chains, and an apron depending loosely from said frame of said machine and adapted to rest at its lower end upon the ground immediately in advance of the ditch, said apron being adapted to prevent the earth carried upwardly by said plates from leaving same at their point of exit from the ditch.

2. In an excavating-machine, the combination with a shaft carrying parallel sprocket-wheels and journaled in bearings upon the frame of the machine, of a swinging frame swinging on an axis coincident with the axis of rotation of said shaft, a shaft journaled in bearings on the free end of said frame and carrying parallel sprocket-wheels, parallel sprocket-chains trained over said respective sprocket-wheels, scraper-plates extending between said chains and carried thereby, devices for depressing the free end of said swinging frame, a traveling carriage on the frame

of said machine, a shaft carried thereby and provided with sprocket-wheel over which said sprocket-chains are trained, and means for locking said carriage against movement on said frame to hold sprocket-chains taut.

3. In an excavating-machine, the combination with a shaft journaled in bearings on the frame of the machine and carrying parallel sprocket-wheels, of a frame pivotally secured to said shaft and adapted to depend therefrom, a shaft journaled in bearings on the free end of said frame, sprocket-wheels carried by said shaft, parallel sprocket-chains trained over said sprocket-wheels on both said shafts, cutters carried by said sprocket-chains at intervals adapted to loosen the earth, plates alternated with said cutters and adapted to take the loosened earth, a scraper pivotally mounted upon the frame of the machine and adapted to be engaged by said plates to scrape the latter when they approach the upper limits of their motion.

4. In an excavating-machine, the combination with a shaft journaled in bearings on the frame of the machine and carrying parallel sprocket-wheels, of a frame pivotally secured to said shaft and adapted to depend therefrom, a shaft journaled in bearings on the free end of said frame, sprocket-wheels carried by said shaft, parallel sprocket-chains trained over said sprocket-wheels on both said shafts, cutters carried by said sprocket-chains at intervals adapted to loosen the earth, plates alternated with said cutters and adapted to take up the loosened earth, a swinging apron pivotally mounted upon the frame of the machine immediately in front of said sprocket-chains, a receptacle for earth in front of said apron, and a scraper pivotally mounted above said apron and adapted to engage said plates as they approach the upper limit of their movement to scrape the same and deliver the earth into said receptacle.

5. In an excavating-machine, the combination with a shaft journaled in bearings on the frame of the machine and carrying parallel sprocket-wheels, of a frame pivotally secured to said shaft and adapted to depend therefrom, a shaft journaled in bearings on the free end of said frame, sprocket-wheels carried by said shaft, parallel sprocket-chains trained over said sprocket-wheels on both said shafts, cutters carried by said sprocket-chains at intervals adapted to loosen the earth, plates alternated with said cutters and adapted to take up the loosened earth, a swinging apron pivotally mounted upon the frame of the machine immediately in front of said sprocket-chains, a receptacle for earth in front of said apron, conveyers leading from said receptacle, and a scraper pivotally mounted above said apron and adapted to engage said plates as they approach the upper limit of their motion to scrape the same and deliver the earth into said receptacle.

6. In an excavating-machine, the combination with a horizontal frame, drive-gear car-

ried thereby, excavating devices geared to said drive-gear, and a swinging frame carrying said excavating devices and adapted to project above and below said horizontal frame, a windlass on the rear end of said horizontal frame connected with the free end of said swinging frame, a windlass at the forward end of said swinging frame, and a cross-beam connected therewith and adapted to be drawn tightly against the rear face of said swinging frame and the lower face of said horizontal frame, to hold said swinging frame in a lowered position.

7. In an excavating-machine, the combination with a windlass carried thereby and adapted to receive a rope secured at one end to a rigid device in the earth in the direction of motion of the machine, and a ratchet-wheel rigid relatively to said windlass, a lever pivoted concentric with said ratchet-wheel, and a pawl carried by said lever and adapted to engage said wheel, of a drive-shaft, and reciprocating devices actuated from said drive-shaft and connected with said lever for imparting a rocking motion thereto, whereby said machine is gradually advanced.

8. In an excavating-machine, the combination with a windlass carried thereby, and adapted to receive a rope secured at one end to a rigid device in the earth in the direction of motion of the machine, and a ratchet-wheel rigid relatively to said windlass, a lever pivoted concentric with said ratchet-wheel, and a pawl carried by said lever and adapted to engage said wheel, of a drive-shaft, an eccentric carried by said drive-shaft, and an eccentric-rod connected therewith at one end and at its other end with said lever for imparting a rocking motion thereto, whereby said machine is gradually advanced.

9. In an excavating-machine, the combination with excavating devices carried by a moving part of the machine and comprising flat plates extending practically transversely to their direction of motion, of a scraper situated in the path of said plates and adapted to be engaged thereby and forced out of their path, to scrape said plates, said scraper comprising a frame consisting of two parallel side plates pivoted at one end to said machine, a cross-piece mounted between the ends of said side plates, and weights carried by the free ends of said side plates.

10. In an excavating-machine, the combination with excavating devices carried by a moving part of the machine and comprising flat plates extending practically transversely to their direction of motion, of a scraper situated in the path of said plates and adapted to be engaged thereby and forced out of their path, to scrape said plates, said scraper being mounted between parallel arms pivoted at one end to a part of the machine and normally held in the path of said plates by means of depressing devices engaging said frame.

11. In an excavating-machine, the combination with the drive-gear, a swinging frame

pivotaly mounted on same, and sprocket-chains carried by said frame, of excavating devices carried by said sprocket-chains and comprising flat plates extending practically
5 transversely to said chains, plates lying against said chains forward of said first-named plates, and cutters mounted immediately behind each of said first-named plates and projecting beyond the edges of the latter for

loosening earth to be taken up by the next succeeding plates.

In testimony whereof I affix my signature in presence of two witnesses.

HANS J. BENTSON.

Witnesses:

RUDOLPH WM. LOTZ,
E. F. WILSON.