No. 624,400. Patented May 2, 1899.

G. E. SURGI.

CHANNELING COMMINUTER.

(Application filed Mar. 5, 1896.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

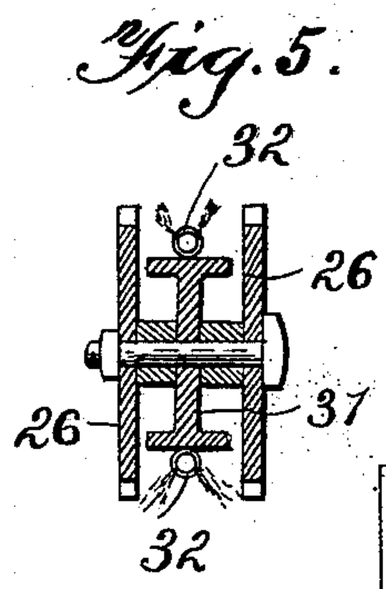

Fig. 5.

Fig. 6.

Fig. 7

WITNESSES

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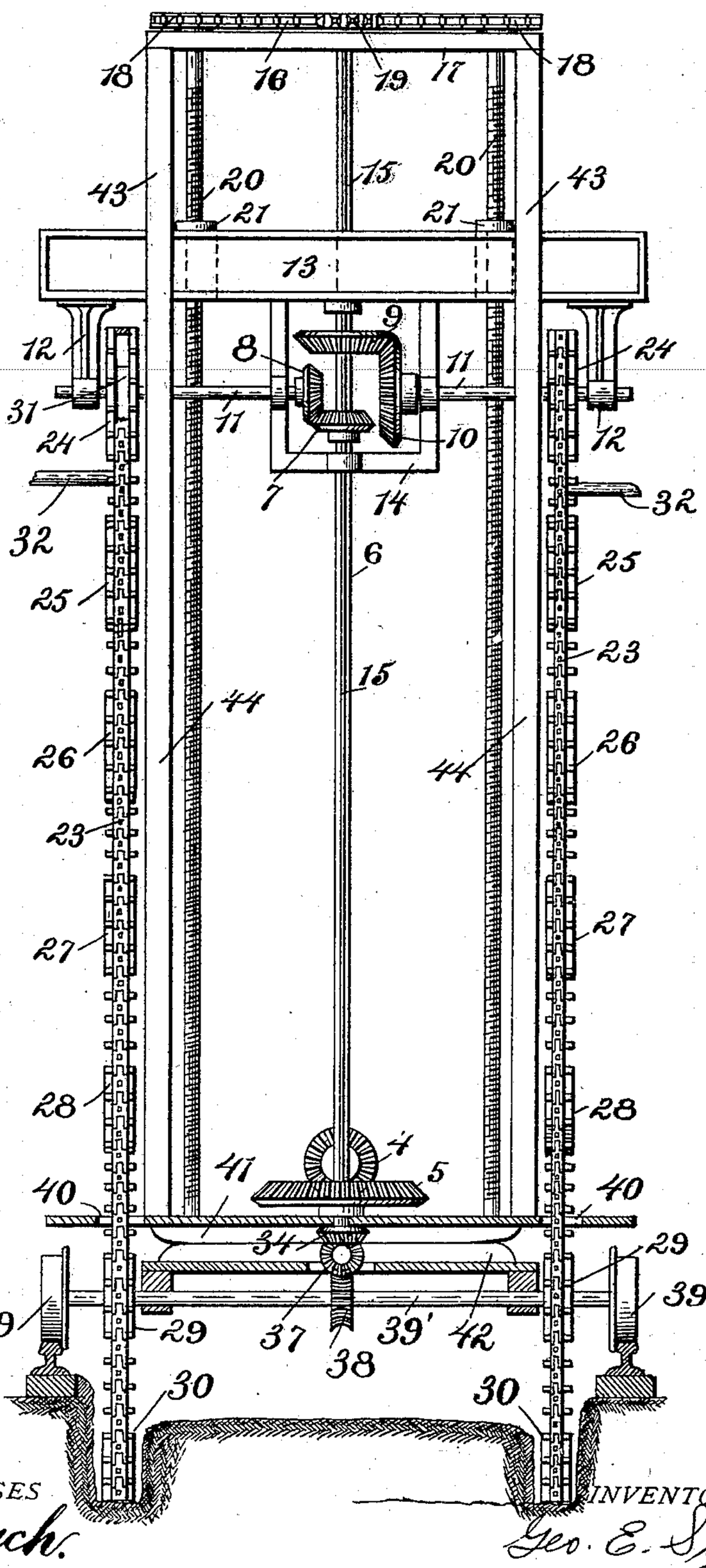
Fig. 2.



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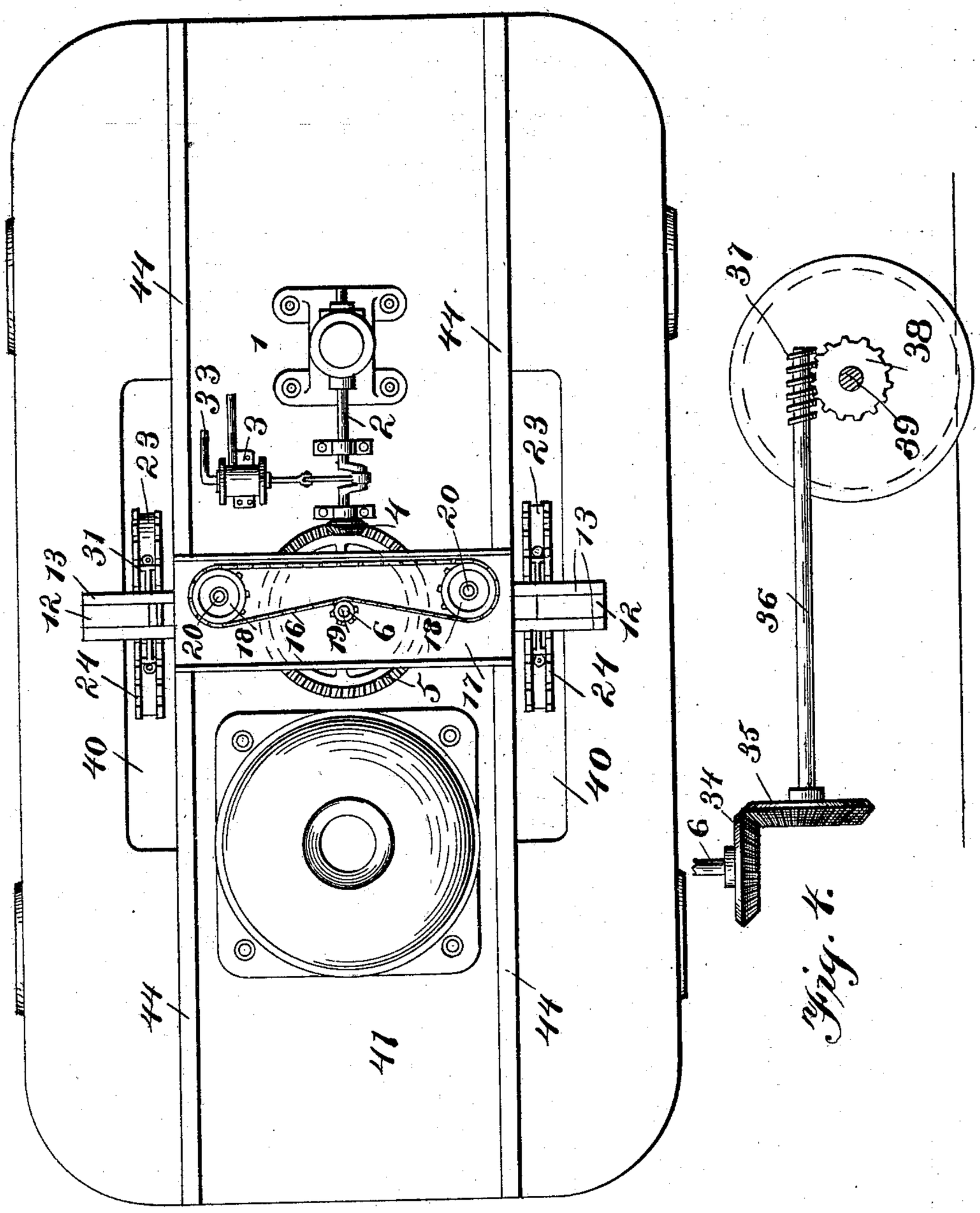

Fig. 4.

Witnesses
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Fig. 3.

Inventor
George E. Surgi.
By Attorney M. L. Moran

UNITED STATES PATENT OFFICE.

GEORGE EUGENE SURGI, OF NEW ORLEANS, LOUISIANA.

CHANNELING-COMMINUTER.

SPECIFICATION forming part of Letters Patent No. 624,400, dated May 2, 1899.

Application filed March 5, 1896. Serial No. 581,993. (No model.)

To all whom it may concern:

Be it known that I, GEORGE EUGENE SURGI, a citizen of the United States of America, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Channeling-Comminuters, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to machines for cutting up and comminuting earth or rock, and is especially designed for cutting road-beds, canals, trenches, tunnels, &c., through any kind of soil, and also in mining for channeling rock, marble, coal, or other ore beds.

In the drawings, Figure 1 shows a side elevation of the machine mounted in working order. Fig. 2 is an end elevation. Fig. 3 is a plan view, and Fig. 4 shows a detail of the connection for giving motion to the wheels of the carriage. Fig. 5 is a horizontal sectional view taken through the center of a pair of the sprocket-wheels. Figs. 6 and 7 show a side and front view, respectively, of a section of a cutting-chain.

The machine is adapted to pulverize or grind up the earth or rock into a finely-divided state by means of a series of endless revolving chains carrying cutters for that purpose, and this may be removed by an ordinary dredger or excavator in the usual way.

The machine may also be used for cutting narrow channels, in which sheet-piling may be inserted and the remaining earth excavated in the usual manner.

The drawings show the machine in its simplest form for the purpose of cutting channels on each side of the line of a proposed canal, the space left by the cutting-chains being filled in with sheet or block piling to prevent the earth on sides from caving in as the work proceeds. After this machine has passed along for fifty feet, more or less, and the piling is in place another machine is then used having a series of chains that are spaced apart in such a way as to completely comminute the earth remaining between the margins of the rows or piles on each side of the proposed canal or trench. For this purpose the chains, which are preferably four inches wide, are placed only from two to four inches apart, thus cutting up the earth or other material into small sections that are easily broken up and removed by the subsequent passage of a regular or special dredging-machine.

It is evident that chains one foot wide can be used, or as narrow as one inch if the conditions require it or any special result is desired, and the chain may be placed apart any distance or brought together so as to almost touch if found advantageous. The chains can be made long enough to reach to a depth of fifty feet, as well as short enough to penetrate to a depth of only a couple or less feet, all according to circumstances or material.

Referring to the drawings, 1 designates the engine mounted on the platform of the carriage. 2 is the driving-shaft carrying gear-wheel 4, and 3 is the pump for supplying the water.

The framework consists of two pairs of upright posts 43 and inclined braces 44, and the two pairs of uprights are joined at the top by cross-piece 17. The two upright posts of each pair are spaced apart a sufficient distance to allow the cross-girder 13 to move vertically between them, and thus form guides therefor. The cross-girder is raised and lowered by means of screw-threaded shafts 20 and is provided with hangers, in which the shafts 11 are journaled. The vertical series of sprocket-wheels 24, 25, 26, 27, 28, 29, and 30 are arranged in pairs, and the wheels of the top pair of each series are keyed to the shaft 11. The chains 23 are driven by the top pair of sprocket-wheels 24 and guided by the other pairs of sprocket-wheels 25, 26, 27, 28, 29, and 30. These wheels are made successively smaller toward the bottom and are supported on an I-beam 31. The sprocket-wheels are all very thin and work in pairs, the wheels of each pair being connected by a short belt or shaft, which passes through the web of the I-beam and has a bearing therein. The intermediate pairs of sprocket-wheels 25, 26, 27, 28, and 29 are used to guide the chain on both sides of the I-beam, so as to prevent undue strain on the chain when in use and also to insure its cutting a reasonably straight channel. The I-beam gives stiffness combined with lightness, while it serves to guide the chain and also to hold two water-pipes 32, one on each edge, as shown. These water-

pipes are perforated from about half-way down to very bottom of the I-beam and in such a direction that the water which is supplied by pump 3 through pipe 33 is forced against the inside face of the chain, and finding its way through the spaces between the links completely washes off all adhering dirt, clay, or other material and secures higher efficiency by keeping the cutting-tools that are held in the links of the chain from becoming clogged, which might be the case in working in soil containing much clay.

The cutting-teeth in chain 23 are only shown in the drawings at the point at which the chain is cutting in the soil; but it is of course understood that the whole of the chain is thus covered with cutting edges, and these are preferably placed on the individual links in every conceivable direction and as irregularly as possible or practicable.

The cutting-tools are made either of Mushet self-hardening steel, carborundum, or black diamond, as the case may be and according to the kind of material to be cut.

For fastening the cutters holes are simply drilled in the chain-links and the cutters driven in, if made of Mushet steel; but if made of carborundum or black diamond the points must be set in a special holder similar to the regular diamond setting, and this holder is then driven into the holes drilled into the links.

The chain 23 is driven by engine 1 through crank-shaft 2 and bevel-gears 4 and 5. Rotary motion is transmitted to a splined vertical shaft 6 through the bevel-gear 5. The vertical shaft has a key-seat 15 its whole length, which permits the bevel-gears 7 8 9 10 to move up and down vertically along the shaft. The train of bevel-gears, with cross-girder 13, rectangular bracket 14, outside brackets 12, and a sprocket-wheel shaft 11 are all raised and lowered by means of the vertical screws 20, actuated by sprocket-wheels 18 by means of the sprocket-chain 16 and the small sprocket-wheel 19, fastened to the splined vertical shaft 6, from which it obtains its rotary motion. Now it will be seen that the engine 1 drives shaft 2, bevel-gears 4 and 5, shaft 6, small sprocket 19, chain 16, sprocket 18, and screw-shafts 20, which work in nuts 21, secured to the cross-girder, whereby the cutting-chains and their supporting structure may be raised and lowered. In practice a right and left hand motion will be used to effect the raising and lowering of the chain at will; but this is not shown in the drawings, as it is unnecessary to a proper comprehension of the machine or its principles. The shaft 6 drives the train of bevel-gears 7 8 9 10, and the latter are so designed and arranged as to drive the chains on each side at the same speed and in the same direction.

All this framework can as a matter of course be modified to suit particular circumstances and convenience of operation as well as of building. There will be a clutch supplied between the crank-shaft 2 and the bevel-gear 4 in order to make it possible to stop or start the engine independent of the chain or any other device or devices connected with the whole apparatus. In the same manner there will be clutches attached to stop and start the vertical screws 20, so that the chain when once raised or lowered to any particular level or grade can be kept at that point without any difficulty of attention on the part of the operator. In practice the apparatus will carry its own boiler and coal-supply and will run on provisional rails arranged for that specific purpose and easily placed or removed, as required. 41 is a turn-table that will swivel on bed-plate 42, to which are attached wheels 39. This turn-table carries the weight of the whole structure and is used for the purpose of turning the chains around when the machine has to cut either forward or backward, since it may be desirable to run the chain always one way.

In order to propel the whole apparatus forward at a certain rate, it will be seen by reference to Fig. 4 that a pair of miter-gears are used connecting to a worm 37, acting on a worm-wheel 38, fastened to shaft 39, on which the car-wheels are sustained. This, like the rest of the apparatus, is so arranged that it can be actuated or not by means of proper clutches, so that whether the engine is running or not the feed can be stopped instantly. The miter-gear 34 is fastened to the lower end of shaft 6, which is driven by bevel-gear 5. As shown in Fig. 3, both chains go through the bed-plate 41 through an opening marked 40.

Operation is as follows: The engine being started and chains 23 running in the direction of the hands of a watch or the reverse, if found desirable, the clutch is put on vertical screws 20, by means of which the chain is gradually lowered into the soil, rock, marble, clay, gravel, ore, or coal bed and cuts its way down to such depths as the operator may desire, and then the water, being forced into the pipes 32 by means of pump 3 and its connecting-pipes 33, is thrown forcibly against the inner side of the chain-links and keeps the cutters clean and permits them to cut freely, while it lubricates and renders the cutting process easier and the friction less on the sides of the chain and sprocket-wheels 25, 26, 27, 28, 29, and 30. After reaching the proper depth then the lowering process is stopped by unclutching the power from screws 20, and the forward channeling-feed is started by putting on the clutch that governs the supply of power to the wheels' axles 39. This feed is in such proportion that the cutters on the chain can easily dispose of the material under action, and the operator is required to watch his chain system to see that said chain does not deviate very materially from a true vertical plane, as any such deviation is indicative and forms a guide as to the amount of feed that the chain can stand or dispose of

in a given time. If the feed is too great, then the worm-wheel arrangement is disengaged until the chain has cut ahead sufficiently to regain its perpendicular.

In some cases it may be found desirable to cut to a depth of thirty feet at one passage, while in other cases it may be necessary owing to the hardness of the soil to cut not more than a few feet at a time at the discretion of the operator.

While I have shown but one cutting-chain carried by each series of double sprocket-wheels, I do not limit myself to this construction, for it is obvious that an ordinary cutting-chain may be carried on each single set of sprocket-wheels, if desired.

What I desire to claim and secure by Letters Patent is—

1. A comminuting-machine consisting of a series of endless revolving chains provided with cutters, a series of sprocket-wheels spaced upon a support carrying each chain, the sprocket-wheels being so arranged that each wheel guides the chain on both sides of the support, and gearing for driving the sprocket-wheels substantially as described.

2. In a comminuting-machine, the series of endless revolving cutting-chains, a series of sprocket-wheels spaced upon a vertical support for carrying each chain, the wheels of each series decreasing in diameter toward the bottom and so arranged that each wheel guides the chain on both sides of the support, and gearing for driving the sprocket-wheels substantially as described.

3. In a comminuting-machine, the series of endless revolving cutting-chains, the sprocket-wheels suitably supported for carrying the chains, the perforated water-pipes arranged in close proximity to the chains and the driving-gear connected to the sprocket-wheels substantially as described.

4. In a comminuting-machine, the upright framework, the vertically-adjustable wheel-supports carried by the framework, the series of suitably-spaced sprocket-wheels on the supports, the chains revolving on said wheels and provided with cutters, the driving-gear also supported on the upright framework and connected to one of the sprocket-wheels substantially as described.

5. In a comminuting-machine a vertically-arranged series of sprocket-wheels carried on an upright framework, the series of parallel revolving cutting-chains thereon, the driving-gear connected to the shaft of one of the sprocket-wheels and the perforated water-pipes so arranged as to clean the chains substantially as described.

6. In a comminuting-machine the series of revolving cutting-chains, a series of vertically-arranged sprocket-wheels carried on a suitable support, said sprocket-wheels being arranged in pairs and one wheel of each pair being on each side of said support and the driving-gear connected to the sprocket-wheels substantially as described.

7. In a comminuting-machine the series of revolving cutting-chains, the series of sprocket-wheels arranged in pairs on the support, one wheel of each pair being on either side of the support, the perforated water-pipes arranged on both edges of the support between the sprocket-wheels and the driving-gear substantially as described.

8. In a comminuting-machine the upright framework, the cross-beam 13 adapted to slide vertically upon the frame the driving-shafts supported on the cross-beam and carrying the sprocket-wheels, the endless cutting-chains revolving thereon, the vertical shaft 6, and the train of gears for revolving the driving-shafts in the same direction substantially as described.

9. In a comminuting-machine the vertical shaft 6, with the sliding gear-wheels 7 and 9, gear-wheels 8 and 10, meshing therein, and driving sprocket-wheel shafts 11, the sprocket-wheels and the endless chains provided with cutters revolving thereon and the vertically-adjusted cross-beam carrying the cutting mechanism substantially as described.

10. In a comminuting-machine the series of sprocket-wheels and the endless cutting-chains revolving thereon the sprocket-wheel shafts and driving-gear supported by the cross-beam the vertical shaft 6, the vertical screws 20 and the connecting-gearing whereby the cutting mechanism may be adjusted vertically by turning the screws substantially as described.

11. In a comminuting-machine the upright frame and vertical screws, the cross-beam, the sprocket-wheel shafts and driving-gear supported on the cross-beam, the I-beams carried on the shafts, the vertical series of sprocket-wheels pivoted on the I-beams and the endless cutting-chains revolving on the sprocket-wheels substantially as described.

12. In a comminuting-machine the cross-beams with the sprocket-wheel shafts and the driving-gears carried thereby, the upright frames and screws upon which the cutting mechanism is moved vertically, the shaft 6 with its sliding gear-wheels 7 and 9 and top gear-wheel connected to the screws for turning the same, the series of supported sprocket-wheels and the endless cutting-chains revolving thereon substantially as described.

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

GEORGE EUGENE SURGI.

Witnesses:
IVY G. KITTREDGE,
JAMES J. MCLOUGHLIN.