(No Model.) 2 Sheets—Sheet 1.

J. C. TITUS & J. & S. E. MORRAL.

DITCHING MACHINE.

No. 322,656. Patented July 21, 1885.

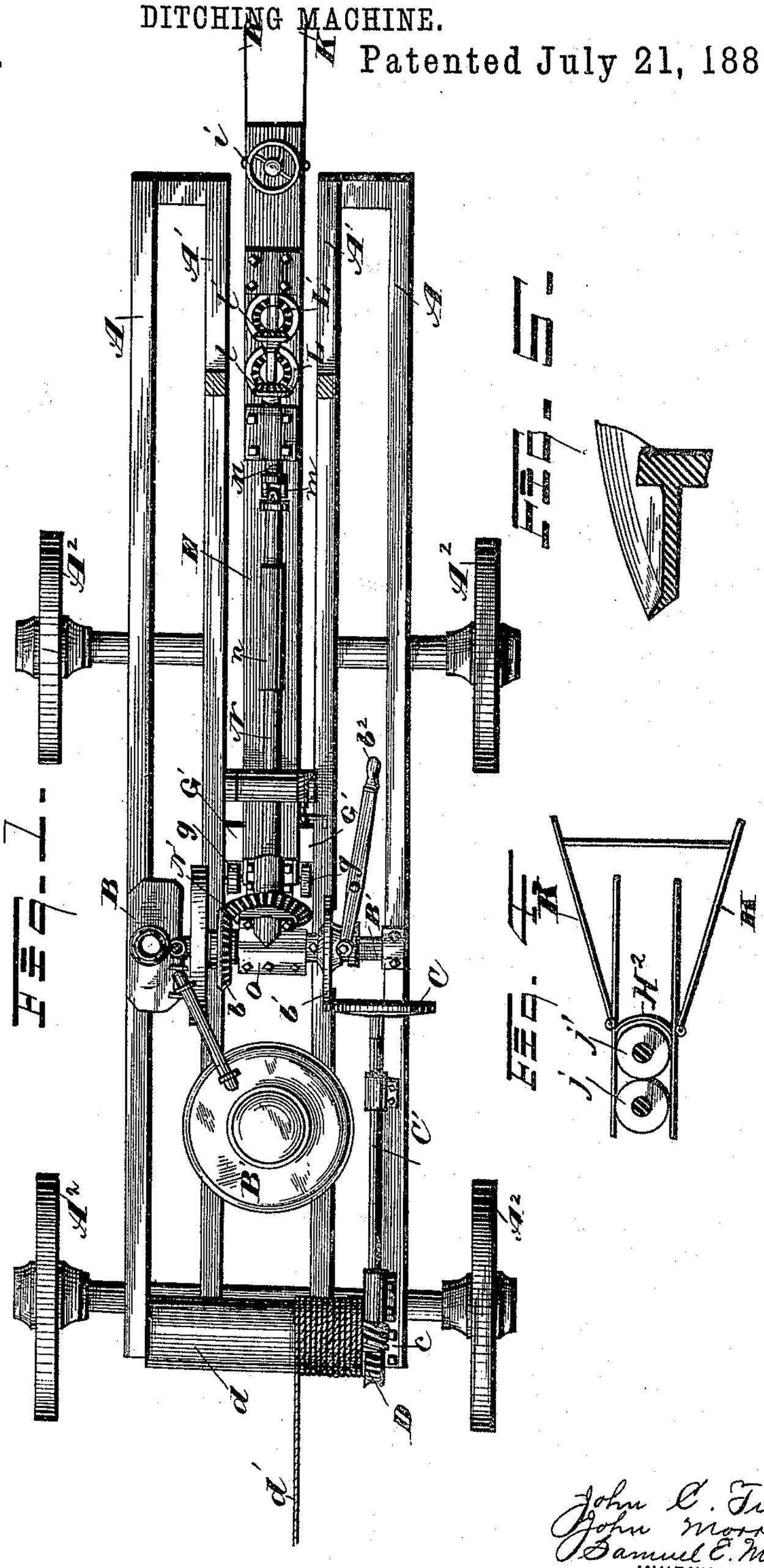

FIG. 6.

FIG. 8.

WITNESSES

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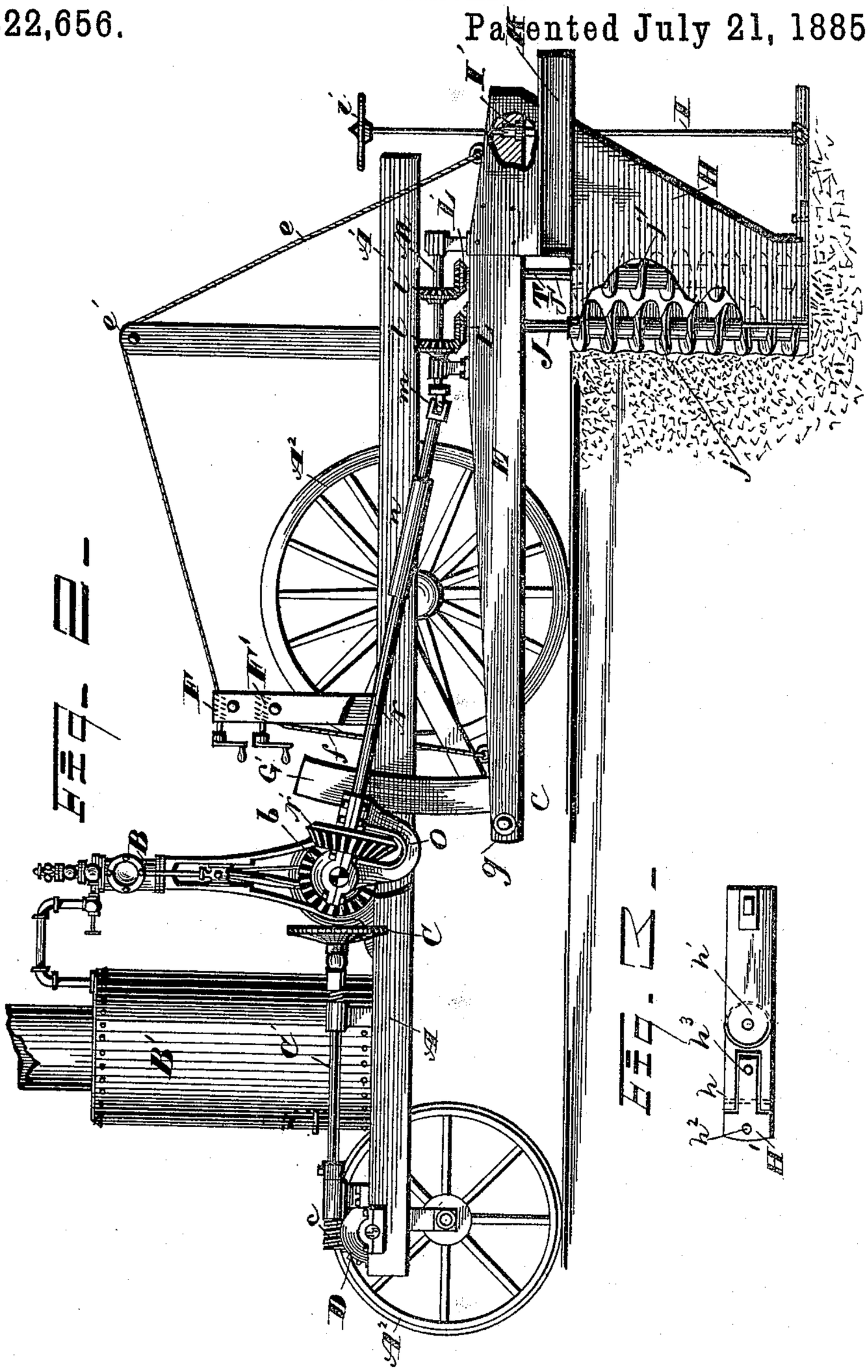

FIG. 2.

FIG. 3.

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UNITED STATES PATENT OFFICE.

JOHN C. TITUS, JOHN MORRAL, AND SAMUEL E. MORRAL, OF MARION, OHIO, ASSIGNORS OF ONE-HALF TO SAID J. C. TITUS, AND ONE-FOURTH EACH TO SAID J. MORRAL AND S. E. MORRAL.

DITCHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 322,656, dated July 21, 1885.

Application filed January 30, 1885. (No model.)

To all whom it may concern:

Be it known that we, JOHN C. TITUS, JOHN MORRAL, and SAMUEL E. MORRAL, of Marion, in the county of Marion and State of Ohio, have invented certain new and useful Improvements in Ditching-Machines; and we 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 pertains to make and use the same.

Our invention relates to improvements in ditching-machines designed more especially for laying draining-tiles having for its object the arrangement of upright spiral revolving cutters or augers with outwardly and upwardly projecting lips that act as excavators, and the inclined or spiral blades that, with the said lips, are arranged to form a continuous surface from bottom to top of the auger, and act as elevators and carry the dirt above the ground and discharge it on either side of the ditch.

Our invention consists in the details of construction illustrated in the accompanying drawings and pointed out in the claims.

Figure 1 is a plan view of a ditching-machine embodying our invention, with the top frame and windlasses removed. Fig. 2 is a side elevation, with portions broken away to show the mechanism more clearly. Fig. 3 is a detached view of a portion of the shoe. Fig. 4 is a detached view in elevation of the excavating mechanism, showing the mold-boards in open adjustment, and Fig. 5 is a view in section through a portion of one of the excavators.

A and A′ are beams, suitably connected by cross-pieces, forming a supporting-frame, and mounted on the wheel A^2. On this frame is mounted the engine B and the boiler B′.

On the engine-shaft B^2 is mounted the gear *b* and the friction-disk *b′*. This disk has a spline and the shaft an engaging groove arranged in the usual manner, and a lever, b^2, for sliding the disk along the shaft. The periphery of the disk engages the face of the disk C, that is mounted on the shaft C′, the forward end of which is provided with a worm, *c*, engaging the worm-gear D on the drum *d*, on which winds the cable *d′* that advances the machine, the other end of the cable being attached to an anchor or other stationary object. By adjusting the disk *b′* to engage the disk C nearer to or farther from the center of the latter the speed with which the machine is advanced is regulated as required.

E is a beam, to which the excavating apparatus is attached, and has attached at the rear the cable *e*, leading over the pulley *e′* to the windlass F. To the forward part of the beam is attached the cable *f*, that leads direct to the windlass F′. By means of these cables and windlasses the beam E and its attachments may be raised, lowered, or tilted longitudinally, as required. The forward end of the beam is provided with a spindle that extends laterally on either side of the beam, and on these projecting parts of the spindle are mounted, respectively, the rollers *g*. These rollers engage the front faces of the draft-posts G′, the forward faces of which are slightly curved longitudinally, so that while the beam is tilted by raising or lowering the forward end the beam will be approximately at right angles to the surface of these posts, where the rollers for the time being engage the posts. These posts are firmly attached to the parts A′, and are suitably braced, and by their engagement with the rollers *g* propel the excavating apparatus, and as they embrace the beam E form guides for this end of the beam.

To the rear portion of the beam E are firmly secured the plates H, usually of boiler-iron. These plates, at the bottom and near the forward edge, are secured to a shoe, H′, that slides along on the bottom of the ditch. This shoe at *h* (being at the rear of where the plates H are secured) has a hinge, by means of which the rear portion of the shoe may be raised or depressed, and a screw-rod, I, is pivoted to the shoe and passed through a nut, I′, that is secured between the plates H, and has a hand-wheel, *i*, for regulating the pitch or inclination of this rear portion of the shoe. The shoe is provided also, at *h′*, with a joint or hinge that may be turned a limited distance laterally, but is rigid vertically. By means of this latter

hinge the shoe, that is of considerable length, may adjust itself laterally in making curves in the ditch.

A preferable means of securing the rod I to the shoe is the well-known ball-and-socket attachment, and the nut I is not held rigidly, so that the rod I can accommodate itself to any lateral movement of the shoe.

When the apparatus has been properly adjusted and is in operation, the excavating apparatus rides upon the shoe H′ without support from the cables, that are only used in raising, lowering, and adjusting the device, and, as aforesaid, the inclination of the shoe with the beam E and augers is regulated by the rod I, and by this means the depth of the ditch is regulated.

On the forward part of the shoe, that, as aforesaid, is rigidly attached to the plates, are the steppings that support, respectively, the upright shafts J and J′, on which are respectively arranged the augers *j* and *j′*. These augers are usually of cast metal and made in sections, but of course can each be made of a single piece, if preferred. The forward auger, *j*, on the periphery, has a lip, j^2, (see Fig. 5,) projecting upward and outward on an angle of about forty-five degrees (more or less) from a horizontal line. These ribs serve as cutters or excavators proper, and should be made hard, to withstand the wear. If the augers are of cast metal, the ribs should be "chilled" in casting; or, if the augers are of steel, the ribs should be "highly tempered." The rear auger, that only serves as an elevator, need not have these ribs, although they would do no harm. Something more than half of the auger *j* is in advance of the casing or plates H. The casing is about as wide as will follow freely in the ditch made by the auger, and the ends of the plates are brought as near the periphery of the auger as is practicable. The two augers are located about as near each other as they will revolve without contact, and a semi-cylindrical plate, H^2, secured to the plates H, forms a casing for the rear of the auger *j′*. The excavating capacity of the auger *j* is so great and the loose dirt to be elevated is so bulky that the auger will sometimes clog unless the machine is advanced more slowly than would otherwise be necessary. To avoid such clogging, we have provided the rear auger, *j′*, to assist in elevating the dirt, and with the two augers thus arranged no difficulty is had in running the machine to its full capacity. The rear auger need not extend to the shoe, as the forward auger will elevate the dirt some little distance without any assistance. As shown in Fig. 2, the plates H opposite the tops of the augers are cut away to allow the dirt to discharge on either side. Two mold-boards, K, of considerable length are hinged, respectively, to the plates H, or to the rods depending from the frame A, if preferred, and extending rearward, and arranged to drag along the ground on either side of the ditch. If the tiles are to be laid as the machine advances, the mold-boards are left to drag along close to the ditch, (see Fig. 1,) and prevent the dirt from falling into the ditch while the tiles are being laid; but at the rear end of the mold-boards much of the dirt will fall into the ditch and the remainder will be in close proximity to the ditch. If the ditch is to be left open, the mold-boards are distended, as shown in Fig. 4, and scrape the dirt back from the ditch. The shafts J and J′ are provided, respectively, with the gears L and L′, that engage the gears *l l′*, that are mounted on the shaft M. This shaft is jouraled in suitable boxes that are secured to the beam E, and the front end of the shaft is connected by a universal joint, *m*, with the shaft N. The shaft N has an extension or slip-joint consisting of the sleeve *n*, secured to one part of the shaft, and provided with a spline that engages a groove in the other part of the shaft in the usual manner. The forward end of the shaft N is journaled in suitable boxes attached to the yoke O, that in turn is journaled at the front end on the engine-shaft. The shaft N has attached the gear N, that engages the gear *b*. By this arrangement of parts the shaft N when in motion or at rest can accommodate itself both in length and in position in a vertical plane to the movements of the excavating apparatus.

What we claim is—

1. In a ditching-machine, the combination, with an excavator and elevating auger as described, of a second auger at the rear and in open relation with the first auger and arranged to assist in elevating the dirt, substantially as set forth.

2. In a ditching-machine, the combination, with one or more augers as described, of a shoe the forward part of which is provided with steppings to support such augers, and the shoe provided with two hinges or joints, the one operating laterally and the other vertically, substantially as set forth.

3. In a ditching-machine, the combination, with one or more upright augers for excavating and elevating the dirt, of a jointed shoe, and a casing for supporting said auger, a tilting beam with the casings attached, and cables and windlasses or equivalent devices for operating the beam, substantially as set forth.

4. In a ditching-machine, the combination, with a tilting beam, a casing, and shoe supporting upright augers, of laterally-projecting spindles and rollers mounted thereon, and upright draft-posts secured to the machine for engaging said rollers and propelling the excavating apparatus, substantially as set forth.

5. In a ditching-machine, the combination, with a tilting beam arranged to support one or more excavating and elevating augers, and the shaft M, intergeared with the spindles of said auger and supported from said beam, of a tumbling-rod provided with an extension or slip-joint and connected to the shaft M by a universal joint, and journaled in boxes at-

tached to the yoke that in turn is journaled on the engine-shaft or other shaft from which motion is transmitted to the ditching apparatus, substantially as set forth.

6. In a ditching-machine, the combination, with a movable beam, a vertical auger journaled therein, and devices for imparting rotary motion to said auger, of mold-boards adjustably secured to the machine, and adapted to operate substantially as described.

7. In a ditching-machine, the combination, with a wheeled frame, a tilting beam suspended therefrom, and devices for tilting said beam, of a casing secured to the tilting beam, and two augers located within the casing and journaled to the beam, substantially as set forth.

8. In an excavating-machine, the combination, with a tilting beam and depending casing supported from the beam, of two upright augers, the rear auger for elevating and the forward auger for excavating and elevating the earth, substantially as set forth.

In testimony whereof we sign this specification, in the presence of two witnesses, this 15th day of January, 1885.

JOHN C. TITUS.
JOHN MORRAL.
SAMUEL E. MORRAL.

Witnesses:
J. E. DAVIDS,
JOHN GAIRY.