(No Model.) 4 Sheets—Sheet 1.

M. G. BUNNELL.

GRADING AND DITCHING MACHINE.

No. 584,323. Patented June 15, 1897.

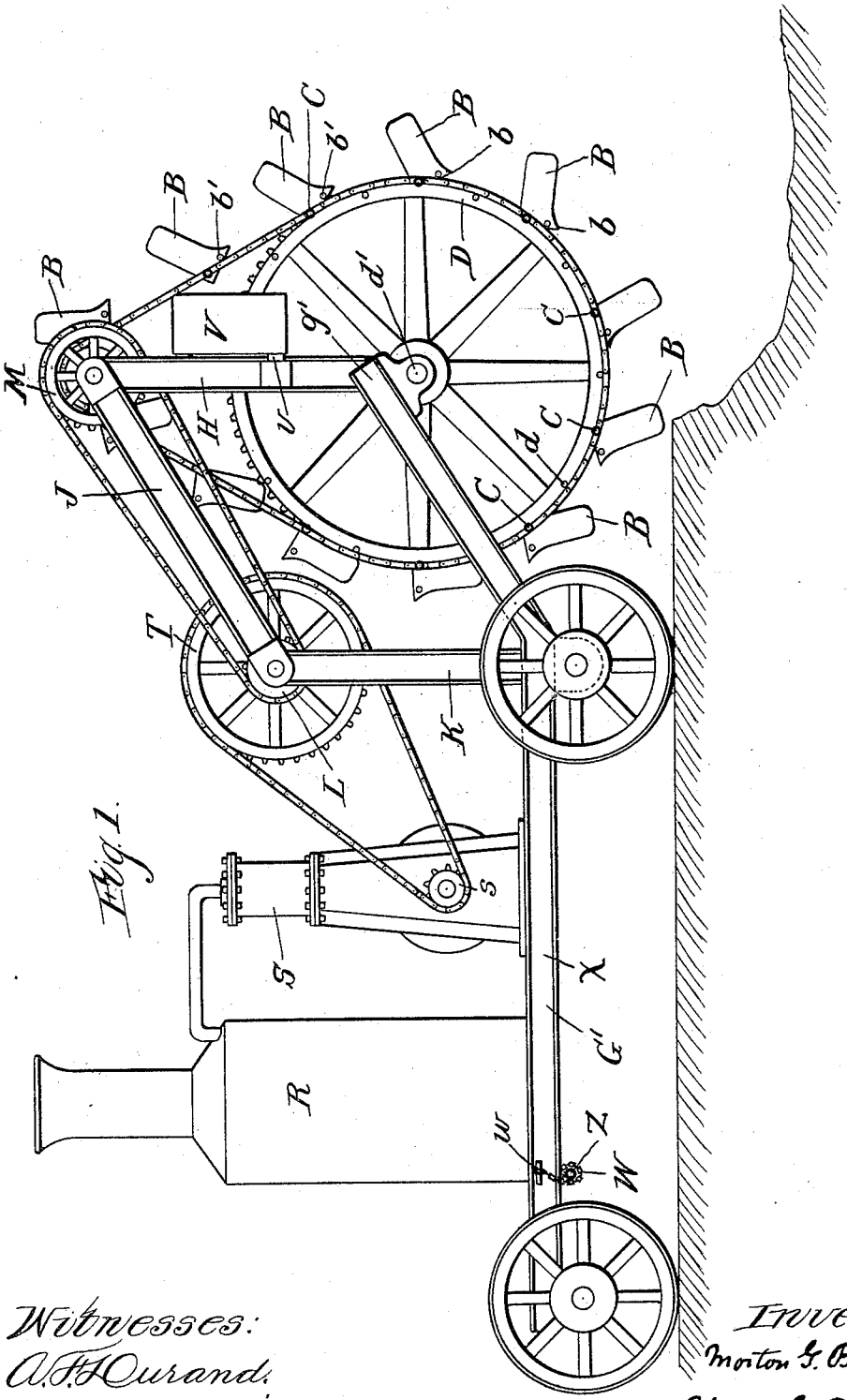


Fig. 1.

Witnesses:
A. F. Durand.
A. M. Belfield

Inventor:
Morton G. Bunnell.
By Chas. G. Page Atty

(No Model.) 4 Sheets—Sheet 2.

M. G. BUNNELL.

GRADING AND DITCHING MACHINE.

No. 584,323. Patented June 15, 1897.

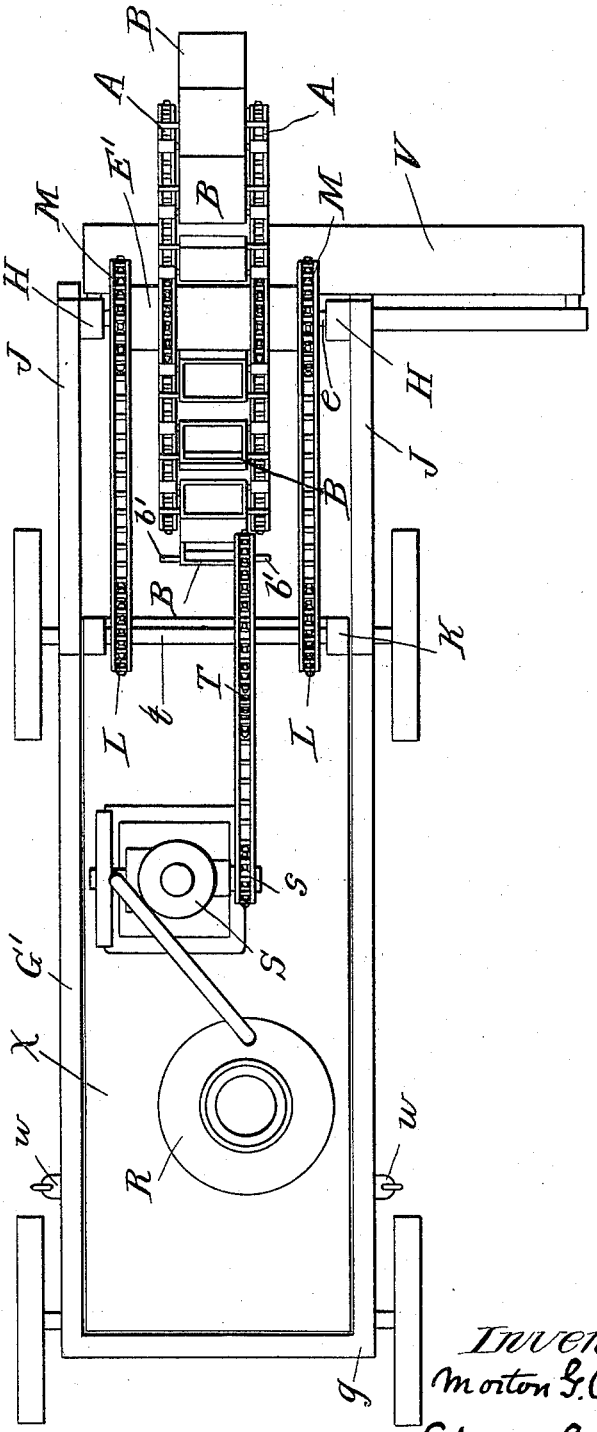


Fig. 2.

Witnesses:
A. F. Durand.
A. M. Belfield

Inventor:
Morton G. Bunnell.
By Chas. G. Page Atty

(No Model.) 4 Sheets—Sheet 3.

M. G. BUNNELL.

GRADING AND DITCHING MACHINE.

No. 584,323. Patented June 15, 1897.

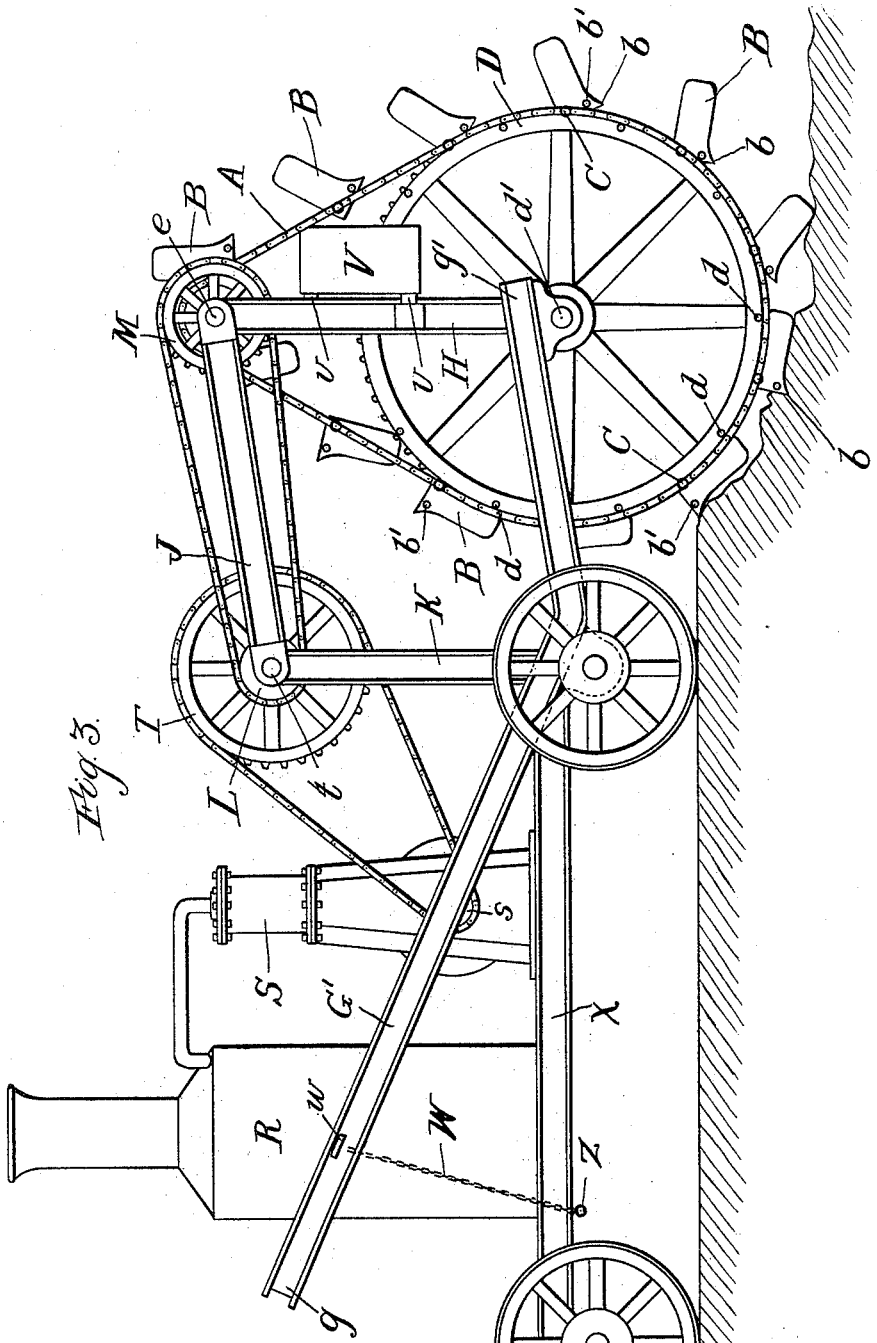


Fig. 3.

Witnesses:
A. F. Durand.
A. M. Belfield

Inventor:
Morton G. Bunnell.
By Chas. G. Page. Atty

(No Model.)

4 Sheets—Sheet 4.

M. G. BUNNELL.

GRADING AND DITCHING MACHINE.

No. 584,323. Patented June 15, 1897.

Fig. 4.

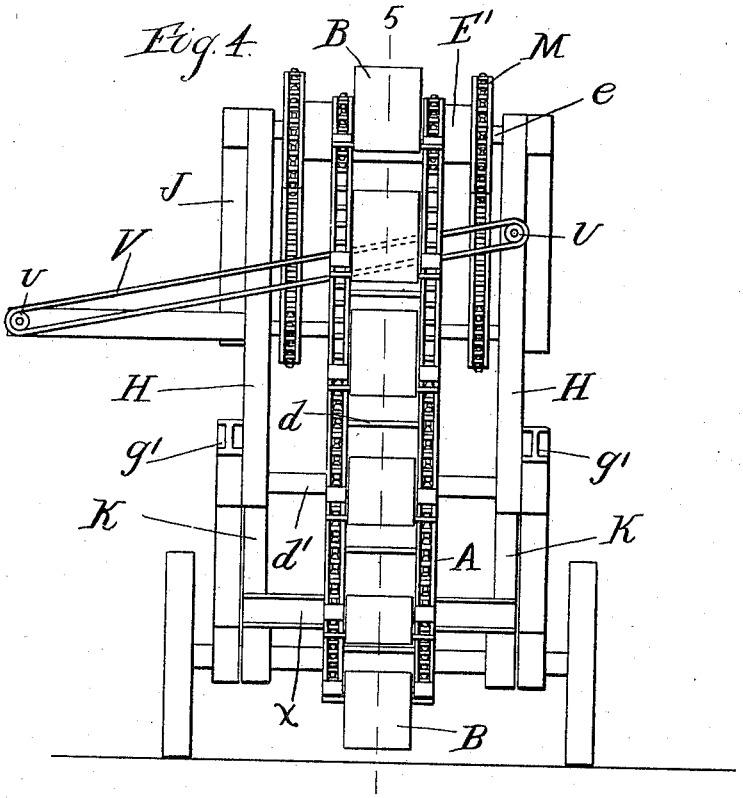
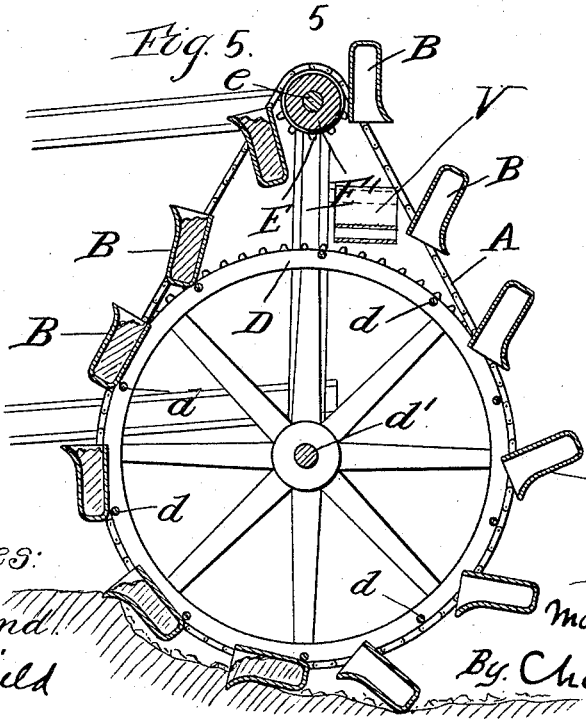


Fig. 5.



Witnesses:
A. F. Durand.
A. M. Belfield

Inventor
Morton G. Bunnell.
By Chas. G. Page Atty.

UNITED STATES PATENT OFFICE.

MORTON G. BUNNELL, OF CHICAGO, ILLINOIS, ASSIGNOR TO FREDERICK C. AUSTIN, OF SAME PLACE.

GRADING AND DITCHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 584,323, dated June 15, 1897.

Application filed March 11, 1896. Serial No. 582,741. (No model.)

To all whom it may concern:

Be it known that I, MORTON G. BUNNELL, a citizen of the United States, residing in the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grading and Ditching Machines, of which the following is a specification.

My invention relates to a construction of excavating-machine having a traveling excavator which is adapted to collect and remove the soil and is arranged for adjustment in such a manner as to be capable of taking soil from different depths.

Prominent objects of my invention are the production of a cheap and light machine particularly adapted to carry the traveling excavator, the provision of a simple and efficient construction of traveling excavator and the arrangement of the same in connection with operating means, the production of an effective and readily-operative mechanism by which the traveling excavator may be bodily raised and lowered at will while in operation, and the provision of simple, efficient, and quick-acting means for causing such movement on the part of the excavator.

In the machine more particularly described hereinafter, the traveling excavator is arranged upon a suitable support supplied with means for permitting its advancement in such a manner as to collect the soil, and this support is attached to the body-frame of the machine by means of a couple of connectors which are pivotally secured to the support at two points in its length and to the body-frame at points which are fixed or stationary with reference to one another. By such arrangement the traveling excavator can be bodily raised and lowered while in operation by reason of the hinged or jointed connection which its support has with the body-frame of the machine. The pivotally-attached connectors which form this hinged or jointed connection serve to guide the support for the excavator in a direction dependent upon the relative lengths of such connectors and upon the relative position of their points of attachment with the support and with the body-frame of the machine. As a preferred arrangement the connectors are constructed substantially equal in length, and the distances between the points of attachment thereof on the support and on the body-frame are also made substantially equal, whereby the excavator in its various adjustments occupies positions practically parallel to one another. As a matter of further improvement and as a means for effecting such adjustment on the part of the traveling excavator one of the connectors is provided with an extension or attachment which is arranged forward of the point of attachment of such connector with the body-frame, whereby the connector and its extension act as a lever having its fulcrum at such point of connection for raising and lowering the traveling excavator.

In the accompanying drawings, Figure 1 is a side elevation of a grading and ditching machine embodying my invention. Fig. 2 is a top plan of the same. Fig. 3 is a side elevation of the same while in operation. Fig. 4 is an end elevation of the machine when in the position illustrated in Fig. 1. Fig. 5 is a vertical section of the same, taken on line 5 5 in Fig. 4.

The body-frame of the machine comprises the platform X, which is mounted on suitable front and rear wheels and serves as a support for the boiler R and engine S.

At the rear of the machine is arranged the traveling excavator and its operating mechanism. The support H for the traveling excavator is formed by a couple of parallel beams connected at their ends by the shafts d' and e, the excavator being suspended upon the pulleys D and E, mounted on these shafts and arranged for movement between the beams forming such support H. This support H is attached to the body-frame, as aforesaid, by means of connectors having pivotal or jointed connections with both the support and the body-frame. These connectors could be of any suitable construction and each could consist of a single member, but inasmuch as the support H is composed of a couple of parallel beams each of said connectors is formed by a couple of members arranged parallel to one another and on either side of the support H and attached at corre-

sponding points on the support and body-frame, it being observed that the two members thus arranged will act as a single connector.

In the construction illustrated the upper connector is formed by the members J J and the lower one by the members G G, the former being pivotally attached to the support H by means of the shaft *e* and the latter by the shaft *d'*. These connectors could be unequal in length and the distance between their points of attachment to the body-frame could be greater or less than the distance between their points of attachment to the support H—that is to say, between the centers of the shafts *e* and *d'*. As a preferred construction, however, the connectors are substantially equal in length and the distances between their points of attachment to the support H and to the body-frame of the machine are also substantially equal. By such arrangement the inclination of the support H, when adjusted to different positions, is not varied.

As a simple and convenient construction for supplying relatively fixed or stationary points for the connection of these connectors to the body-frame of the machine the posts or uprights K K are secured to the platform X above the rear axle, and the shaft *t* is mounted transversely to these posts or uprights near their upper ends. The members J J are then fitted upon the ends of the shaft *t* and the members G G are pivotally secured to said axle between the wheels by bearings, which can be of any well-known or suitable construction.

As a simple and effective means for adjusting the support H in accordance with the depth of the ditch or grade to be dug the members G G are provided with extensions or attachments G' G', which are arranged forward of the points of attachment of such members with the body-frame.

The forward ends *g* of the extensions G' G' are joined by a suitable cross-piece, the whole thus forming a frame which fits about the platform X, Fig. 2, and acts as a lever, having its fulcrum at the points of attachment of the members G G with the body-frame—*i. e.*, at the rear axle. These extensions G' G' could be arranged substantially in alinement with the members G G, but as a matter of further improvement they are constructed at an angle therewith, thus forming a bell-crank lever having its pivotal point at the rear axle, which is substantially at the bend or curve formed by such members and their extensions, the obliquity of the angle thus formed being desirably such as to cause the excavator to be lifted clear of the ground when the extensions G' G' are situated alongside the platform X, as shown in Fig. 1. In this construction it is obvious that the excavator carried by the support H will normally tend to descend. Hence suitable means for locking it in adjustment and for raising it are provided, the arrangement shown consisting in the roller or drum Z and the chains W W, which are coiled about the drum Z and connected with the extensions G' G' at *w w*.

The traveling excavator, which is arranged upon the support H, could be of any suitable construction, but as a preferred arrangement it comprises a couple of belts or chains A A, and a number of buckets B B attached at intervals to the belts or chains A A.

The belts or chains A A are arranged to travel over the long pulley E, which is carried by shaft *e* at the upper end of the support H, and over the pulleys D D, which are carried by the shaft *d'* at the lower end of such support and are connected by means of the rods or bars *d*.

The upper pulley E is desirably comparatively small in diameter and the lower pulleys D D are comparatively large, whereby the buckets B are inverted quickly in turning the upper pulley E, and hence empty their contents without objectionable scattering, and also whereby the buckets B are drawn along the bottom of the ditch for a comparatively long period of time while following the peripheries of the wheels D D, and hence are completely filled before rising.

The buckets B could be of any suitable construction, but as a matter of further improvement they are constructed with an elongated body part which fits between the wheels D D, and are provided with ears or projections *b'*, which engage the chains A A after the buckets have been inverted, so as to prevent their wabbling while descending. The buckets B are connected with the chains or belts A A at their upper ends and at such intervals that their lower portions engage the connecting bars or rods *d*, whereby the buckets are prevented from swinging while being filled.

Power is transmitted from the engine S to the excavator by means of suitable power-transmitting connection, the arrangement shown comprising the pulleys T and L L, mounted on the shaft *t*, the pulleys M M, mounted on shaft *e*, and belting connecting the pulley T with the wheel *s* of the engine and the pulleys L L with the pulleys M M. By such arrangement no inconvenience is experienced in adjusting the traveling excavator by reason of the fact that the pulleys L L and M M are supported on shafts which are always equally distant from one another.

A movable carrier is desirably provided in connection with the traveling excavator and arranged to remove the soil discharged from the buckets of the latter.

In the construction shown the movable carrier comprises the belt or band V, arranged on suitable rollers *v v*, which latter are attached to the support H in such a manner as to bring the belt V in an inclined position below the point where the buckets B are inverted, Figs. 3 and 4, whereby the contents of the latter are received by the belt V and serve as a means of causing its advancement.

The outer end of this carrier may be situated so as to dump the soil received from the traveling excavator at any suitable point.

What I claim is—

1. In a grading and ditching machine, the combination of a support movable longitudinally of itself and provided at longitudinal intervals with pulleys or the like; an endless traveling conveyer arranged upon said pulleys; and a couple of connectors pivotally attached to said support at longitudinally-removed points, and to the body-frame of the machine at points which are relatively stationary, substantially as set forth.

2. In a grading and ditching machine, the combination with a suitable support for the traveling excavator, of a couple of connectors which are pivotally attached to the support at points situated suitably distant from one another in its length, and to the body-frame of the machine at points which are relatively stationary, one of said connectors being provided with an extension which is arranged forward of the point of attachment of such connector and the body-frame, whereby the connector and its extension act as a lever having its fulcrum at such point of attachment, for raising and lowering the excavator, substantially as set forth.

3. In a grading and ditching machine, the combination with a suitable support for the traveling excavator, of a couple of connectors which are pivotally attached to the support at points situated suitably distant from one another in its length, and to the body-frame of the machine at points which are relatively stationary, one of said connectors being provided with an extension which is arranged forward of the point of attachment of such connector and the body-frame, and is constructed at an oblique angle with the connector, whereby the latter and its extension act as a bell-crank lever having its center at the bend or curve formed at the juncture of its coöperating portions, for raising and lowering the excavator, substantially as set forth.

4. In a grading and ditching machine, the combination of a support movable longitudinally of itself and provided at longitudinal intervals with suitable pulley-bearing shafts; an endless traveling conveyer arranged upon the pulleys of said shafts; and a couple of connectors pivotally connected to said support by means of said pulley-shafts, and also to the body-frame of the machine at points which are relatively stationary, substantially as set forth.

5. In a grading and ditching machine, the combination with the support for the traveling excavator, of a couple of connectors which are substantially equal in length, and are pivotally connected to the support at points situated suitably distant from one another in its length, and to the body-frame of the machine at relatively-fixed points removed from one another a distance substantially equal to the distance between the corresponding points of attachment on the support, one of said connectors being provided with an extension which is arranged forward of its point of attachment with the body-frame, whereby the connector and its extension act as a lever having its fulcrum at such point of attachment for raising and lowering the excavator, substantially as set forth.

6. In a grading and ditching machine, the combination with the support for the traveling excavator, of a couple of connectors which are substantially equal in length and which are pivotally connected to the support at points situated suitably distant from one another in its length, and to the body-frame at relatively-fixed points removed from one another a distance substantially equal to the distance between the corresponding points of attachment on the support, one of said connectors being provided with an extension which is arranged forward of its point of attachment with the body-frame, and which is constructed at an oblique angle with the connector, whereby the latter and its extension act as a bell-crank lever having its center at the bend or curve formed at the juncture of its coöperating portions for raising and lowering the excavator, substantially as set forth.

7. In a grading and ditching machine constructed with forward and rear axles, the combination of a support comprising a couple of substantially parallel beams provided at longitudinal intervals with pulleys or the like which are situated between said beams; an endless traveling conveyer arranged upon said pulleys; a couple of connectors each of which is composed of two members; and uprights secured to the body-frame of the machine above the rear axle, the members forming the connectors being pivotally connected to the support at longitudinally-removed points, and to the body-frame of the machine at the tops of said uprights, and at the rear axle, substantially as described.

8. In a grading and ditching machine, the combination of a support consisting of a couple of parallel beams between which the excavator is to be arranged; a couple of connectors each composed of two members; and uprights secured to the body-frame of the machine above the rear axle, the members forming the connectors being pivotally connected to the ends of the support by means of the shafts for the excavator-pulleys, and to the body-frame of the machine at the tops of the uprights and at the rear axle, and the members forming the lower connector being provided with extensions which are arranged forward of the rear axle and at an oblique angle with such members, and such extensions being connected together so as to form a frame adapted to fit about the body-frame of the machine, substantially as described.

9. In a grading and ditching machine, the combination of a suitably-supported traveling conveyer comprising a couple of belts or chains, and a series of buckets pivotally con-

nected with and suspended from the belts or chains, at intervals, in the length of the latter and constructed with swinging end portions; and a pulley or the like constructed with a couple of peripheral portions which are adapted to receive the chains or belts, and constructed also with an intervening peripheral portion provided with transversely-extending shoulders which are separated from one another by distances substantially equal to the intervals intervening between the points of attachment of the buckets to the belts or chains, and are adapted to form abutments in opposition to the inward thrust of the swinging end portions of the buckets, as set forth.

10. In a grading and ditching machine, the combination with an adjustable support for the traveling excavator, of a bell-crank lever for raising and lowering the same, said lever being pivotally secured to the body-frame and having sufficient angularity between its inclined portions to cause the excavator to be lifted clear of the ground when the free portion of the lever is substantially parallel to the floor of the body-frame, substantially as set forth.

MORTON G. BUNNELL.

Witnesses:
GEO. W. HARWOOD,
CHAS. B. JOHNSON.