W. F. BRINTON.

MEANS FOR EXCAVATING AND TRANSPORTING MATERIAL IN GRADING.

APPLICATION FILED OCT. 12, 1916.

1,231,121.

Patented June 26, 1917.

3 SHEETS—SHEET 1.

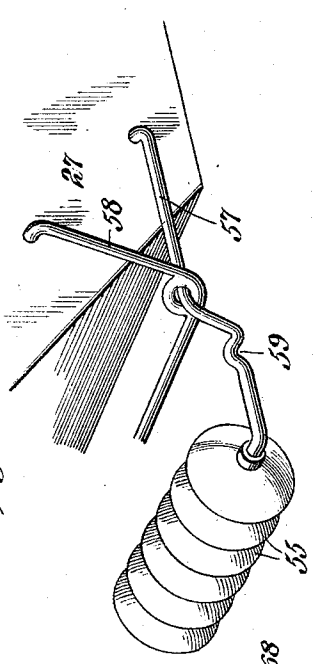

Fig. 10.

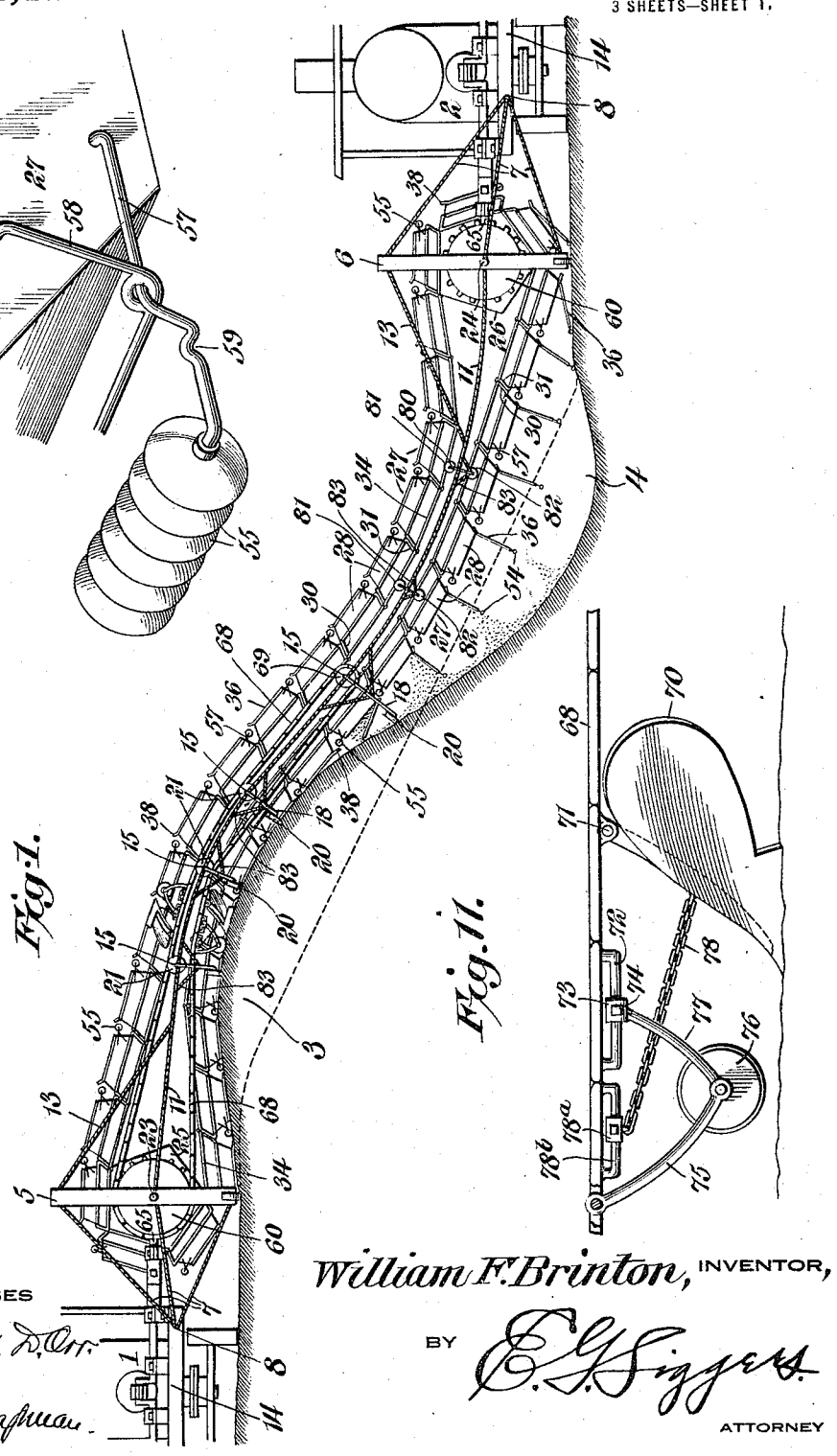

Fig. 1.

Fig. 11.

WITNESSES

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3 SHEETS—SHEET 2.

Fig. 2.

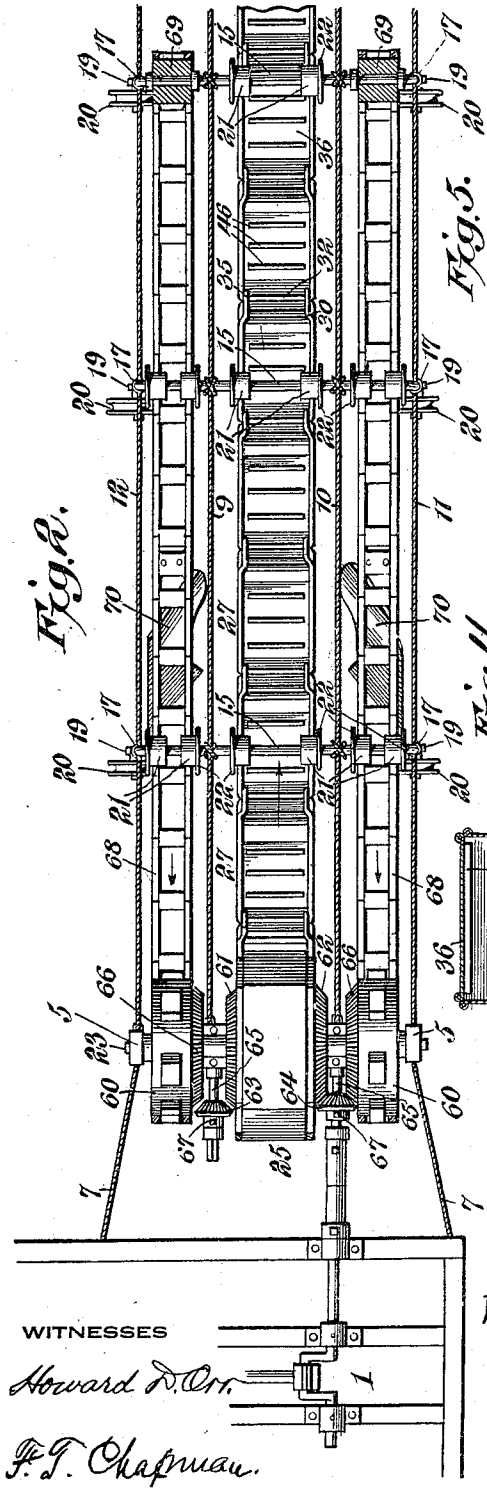


Fig. 5.

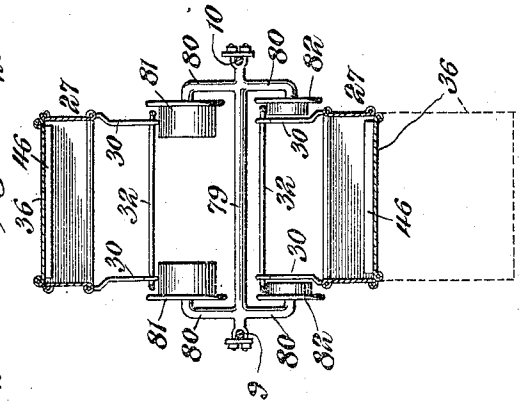
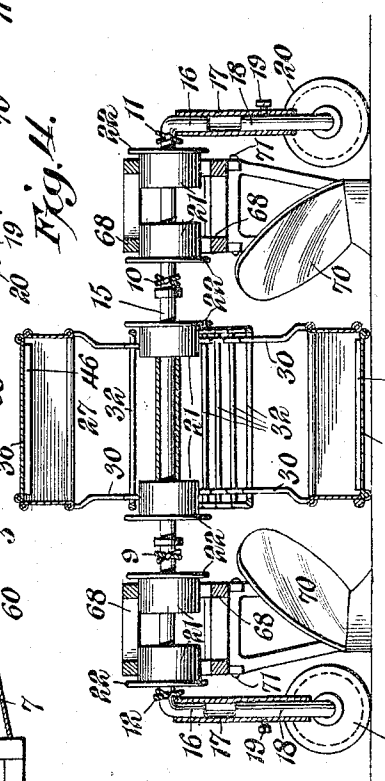


Fig. 4.



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3 SHEETS—SHEET 3.

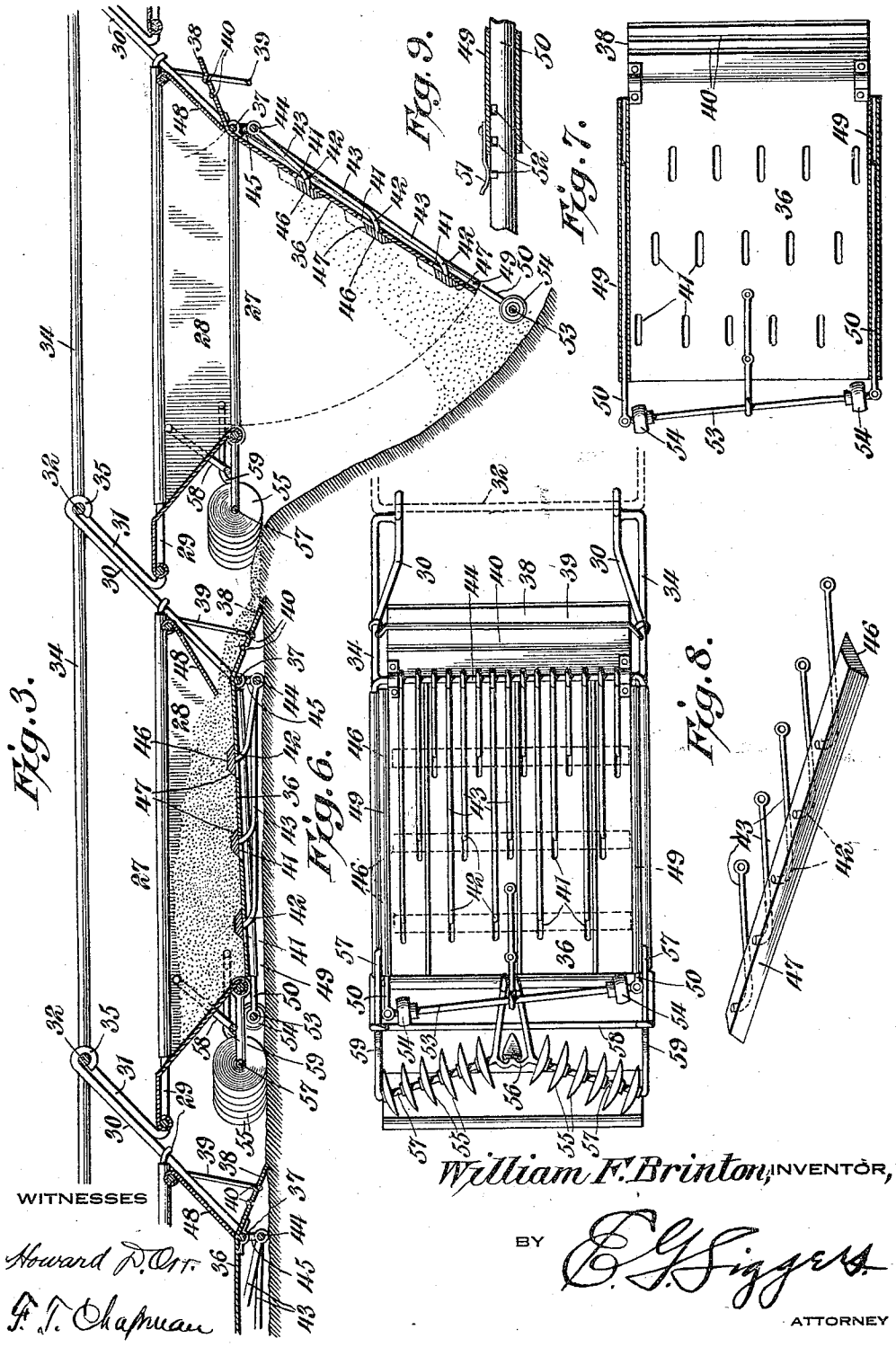

Fig. 3.

Fig. 6.

Fig. 9.

Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

WILLIAM F. BRINTON, OF WASHINGTON, IOWA.

MEANS FOR EXCAVATING AND TRANSPORTING MATERIAL IN GRADING.

1,231,121. Specification of Letters Patent. Patented June 26, 1917.

Application filed October 12, 1916. Serial No. 125,266.

To all whom it may concern:

Be it known that I, WILLIAM F. BRINTON, a citizen of the United States, residing at Washington, in the county of Washington and State of Iowa, have invented a new and useful Means for Excavating and Transporting Material in Grading, of which the following is a specification.

This invention has reference to means for excavating and transporting material in grading, and its object is to provide a means whereby grades may be leveled or improved by cutting down elevations and filling in depressions with the work performed on a large scale and capable of substantially continuous operation except for the necessity of shifting the structure from time to time.

In accordance with the present invention there is provided an endless series of scoops or buckets designed primarily to receive and transport excavated material, such as dirt, but capable to a limited extent of excavating, and in conjunction with such series of buckets there are provided plows for loosening the dirt and directing it into the buckets, the plows proceeding in one direction and the buckets in the opposite direction. Moreover, the series of buckets is flanked on opposite sides by the plows, so that the plows may be made to act upon either side of the traveling buckets without the necessity of shifting the plows with relation to the buckets.

Provision is made for sustaining the traveling buckets and plows without the necessity of anchorages, except at the extremities of the system, and the structure is so arranged that traction engines may be employed to furnish the motive power for driving both the buckets and the plows.

By means of the invention the crown portion of a hill may be cut off and the dirt so removed may be deposited in an adjacent valley whereby the surface is correspondingly graded and steep grades are thus obliterated. This is particularly advantageous in road building, but may be of advantage in other grading, as, for instance, in bringing the surface of the ground more nearly to a level for building and other purposes.

The invention will be best understood from a consideration of the following detailed description, taken in connection with the accompanying drawings forming part of this specification, with the further understanding that while the drawings show a practical form of the invention, the latter is not confined to any strict conformity with the showing of the drawings, but may be changed and modified so long as such changes and modifications come within the scope of the appended claims.

In the drawings:—

Figure 1 is a side elevation of an apparatus constructed in accordance with the present invention, but with the showing greatly condensed in length.

Fig. 2 is a sectional plan view of one end of the structure shown in Fig. 1, omitting the upper runs of the series of buckets and plows.

Fig. 3 is a longitudinal section through two adjacent buckets or scoops arranged to illustrate the operation of the structure.

Fig. 4 is a cross-section of the structure at a point about intermediate of two scoops.

Fig. 5 is a detail section through one of the plow carriers.

Fig. 6 is a bottom plan view of one of the scoops.

Fig. 7 is a similar view of one of the scoops but with some parts omitted.

Fig. 8 is a detail perspective view of one of the dirt loosening devices.

Fig. 9 is a detail view of an adjusting device employed on the scoops.

Fig. 10 is a detail perspective view of one corner of one of the scoops.

Fig. 11 is a side elevation of one of the plows and adjacent parts.

Referring to the drawings there are shown two engines 1, 2, which may be traction engines of any suitable type, and, of course, of suitable power. One of these engines is located upon an elevation or hill 3 and the other engine is located on the side of a valley or depression 4 remote from the hill. In Fig. 1, and also in Fig. 3 the length and steepness of the slopes of the hill and valley are greatly disproportionate to conditions which may actually occur, in order that the whole device may be properly illustrated in the drawings. It is quite possible that the device may work even under the conditions illustrated, but usually the grading is less violent than the drawings would indicate.

Each engine is suitably anchored, but the anchorages are not shown in the drawing, since they are common expedients.

Adjacent the engines are posts 5, 6, respectively, rising from the surface of the ground and connected by ropes 7 to the engines at 8 to hold the posts upright against strains to which they are subjected.

Connecting the posts 5 and 6 are cables 9, 10, 11, 12, which, when installed, are drawn as tight as may be, whereby the cables are able to sustain certain structures to be described. The ropes or cables 9 to 12 are further supported by guys 13, as may be found necessary. Each engine 1 and 2 carries framework 14 which in turn supports mechanism to be described.

Extending across and connected to the respective cables 9 to 12 are rods 15 disposed at such intervals as may be found necessary in the installed apparatus, and these rods have ends 16 bent at an angle to the length of the rods and each carrying a sleeve 17 in which telescopes another rod 18 held thereto by a set screw 19, or in any other suitable way. In the installed position the rods 18 and sleeves 17 are upright, and the rods 18 carry wheels or rollers 20 at their lower ends, such wheels or rollers being designed to rest upon the ground so as to sustain the cables 9 to 12 at a suitable height and at such intervals as to prevent any material sagging.

Mounted upon each rod 15 are pairs of guiding drums or rollers 21 each having a flange 22. The drums are arranged in pairs to support certain structures to be described.

Journaled between the posts 5, of which there is a pair, and also journaled between the posts 6, of which there is a pair, are shafts 23, 24, respectively. The shaft 23 carries a polygonal drum 25 and the shaft 24 carries a similar polygonal drum 26. These drums serve as supporting, direction-changing, and driving means for an endless series of scoops or buckets 27. Each bucket may be of generally rectangular form with a body portion 28 of sheet iron or other suitable material and having what may be termed the front and rear ends sloping toward the bottom. The buckets have their edge portions in the form of rods or bars 29 with front and rear hangers 30, 31 in slanting relation to the remainder of the bucket. The hangers 31 are connected together crosswise of the bucket by a bar 32, and the hangers 30 and 31 are connected together by longitudinal bars 34. The hangers 30 are each provided at one end with a hook 35 engaging over the rear cross bar 32 of the next forward bucket in order. In this way the buckets are connected together with the bars 32, and 34 constituting a sprocket chain adapted to the drums 25 and 26, whereby the drums on rotating drive the series of buckets after the manner of a sprocket chain. The lower run of the series of buckets travels along the ground while the upper run is sustained by certain of the drums 21 over which the series of buckets travels.

Each bucket 27 has a bottom 36 mounted at what constitutes its forward end upon a pivot rod 37. The bottom 36 has a forward continuation 38 at an angle to the bottom, so that when the latter is closed the continuation 38 has a downward slant considering the bottom as approximately level. The forward continuation 38 is in the nature of a cutter or lip for the scoop designed to enter the dirt to a small depth as the scoop moves along to direct the dirt into the interior of the bucket. To support this lip a bail 39 is hung from the bucket in underriding relation to the lip which may have spaced notches 40 to seat the bail and therefore permit some adjustment of the latter to provide for varying depth of cut.

The bottom 36 has longitudinal slots 41 therethrough, and extending through these slots are curved ends 42 of rods 43, which rods are pivotally connected to a cross bar 44 at what constitutes the forward end of the bottom of the bucket, this rod being fixedly connected to the pivot rod 37 by strips 45 constituting cranks, so that when the bottom is opened and closed the curved ends 42 of the rods 43 move lengthwise of the slots 41. The curved ends 42 of the rods 43 where they project through the slots 41 are connected above the bottom 36 to slide bars 46 having beveled long edges 47 so as to slide along the top surface of the bottom of the bucket and thereby loosen dirt which may cling thereto. The forward end member of the bucket is in the form of a swinging gate 48 normally gravitating to the closed position, but permitting dirt gathered by the blade 38 to enter the bucket.

At the edges the bottom 36 has tubular guides 49 in which slide rods 50 held in adjusted positions by latches 51 entering any one of a series of notches 52 in the rods. The two rods 50, one on each side of the bottom 36, are pivotally connected by another rod 53 in which are mounted rollers 54 close to the sides of the bottom of the bucket, these rollers serving as guiding rollers traveling on the ground being excavated. By shifting the rod 53 so as to have an angular relation to the line of travel, the bucket has imparted to it a tendency to move to one side or the other for a purpose which will hereinafter appear.

Carried by each bucket 27 in trailing relation thereto are series of disk cutters 55 tending to loosen up the surface of the ground in advance of the next bucket in order, these cutters having their axes in angular relation to the line of travel, so that each bucket serves to loosen the surface of the ground, and such loosened ground will readily enter the succeeding bucket being directed thereinto by the blade 38. A small plow 56 between the adjacent ends of the series of disk cutters 55 takes care of the dirt not acted upon by these cutters. It is desirable to vary the depth of cut of the

disks 55, wherefore the series of disks are mounted upon arms 57 pivoted in corresponding sides of the bucket 27, and a swinging bail 58 pivoted in the bucket serves to hold the cutters 55 in different elevated positions, the arms 57 having bent portions 59 to hold the bail 58 and arms 57 together.

The shaft 23 carries sprocket wheels 60 on opposite sides of the drum 25. Fast to the drums 25 and 26 on opposite sides thereof are bevel gear wheels 61, 62, respectively, with which mesh bevel pinions 63, 64, respectively. The bevel pinions are mounted on shafts 65 connected to the respective engines 1 and 2. The bevel pinions 63 are capable of movement lengthwise of the shafts so as to be brought into and out of mesh with the gear wheels 61 on opposite sides of the drum 25. On the sprocket wheels 60 are bevel gears 66 with which the bevel pinions 63 may be made to mesh. The bevel pinions 63 may be held in or out of mesh with the respective gear wheels by set screws 67 or by other means. The arrangement is such that either of the sprocket wheels 60 on opposite sides of the drum 25 may be made to turn with the drum, but in a direction opposite to the direction of rotation of the drum.

Extending about each sprocket wheel 60 is an endless sprocket chain 68 continued for a distance from said sprocket wheel to another sprocket wheel 69 carried by an appropriate one of the rods 15. Each sprocket chain 68 has plows 70 pendently hung therefrom by means of a pivot connection 71. In front of each plow, that is, in advance thereof in the direction of travel of the plow, one of the links of the chain 68 carries an elongated support 72 on which is mounted a slidable block 73 capable of being secured to the support 72 by a set screw 74 or otherwise. At a point still further in advance of the plow on the chain 68 is a pivotally mounted pendent arm 75 carrying at its lower end a guide wheel 76 and the arm 75 is connected to the block 73 by another arm 77. In this manner the wheel 76 may be set at different distances below the chain 68 and in different relations to the ground, so that the cut of the plow 70 may be correspondingly regulated. In order to hold the plow there is provided a chain 78 connected at one end to the plow and at the other end to a block 78^a adjustably fixed to an elongated support 78^b on a link of the chain 68. The flexibility of the chain 78 admits of the turning of the plow with the chain 68 about the sprocket wheels supporting the sprocket chain.

Wherever the endless series of buckets or the endless sprocket chains are sufficiently close to the ground the buckets and plows travel along the ground and hence the lower runs of the respective chains require no other support, but the upper runs must be supported. The series of buckets, as has already been stated, has the upper run carried by the corresponding drums 21, while the upper runs of the chains 68 are carried by the remaining drums 21, which are arranged in pairs in suitable spaced relation for the purpose.

Where the buckets and sprocket chains 68 travel over a valley or depression the rollers 20 would not reach the ground, and hence, if present, would be unsupported. Therefore, where the structure overrides a valley the cables 9 and 10 carry rods 79 with branched arms 80 supporting drums 81, 82, respectively, in position to support the respective runs of the endless series of buckets. No provision is made for similarly supporting the plows, because they are not extended far enough to override the depression or valley to any extent. The rods 79, and also the rods 15, are prevented from rocking on the cables carrying them by divergent brace arms 83.

When the excavating devices are all properly installed and the engines are set in motion, the buckets move over the ground to be excavated, say, the crown portion of the hill 3, and loosen and gather the surface dirt. In the meantime the plows 70 at one side of the line of buckets are propelled therealong in close side relation thereto and turn furrows from the surface of the ground to a sufficient depth, the dirt being directed by the moldboards of the plows, so as to turn over into the respective buckets as the plows pass the buckets toward the top of the hill and the buckets travel toward the bottom of the hill. Usually there need be only two plows for each chain 68 and only one of the chains is active at any one time, since the other chain remains idle because the respective bevel gear wheel or pinion 63 is out of mesh with the corresponding gear wheel 66. The buckets fill as they travel along toward the valley and ultimately when the depression of the valley is sufficient to permit it, the bottoms 36 of the buckets drop open, thus permitting the dirt in the buckets to flow therefrom into the valley. Sometimes the dirt gathered into the buckets is of such nature as to stick therein, and in such event the bars 46 have a range of movement on the upper surface of the bottom 36, because of the difference of pivot support of the bucket bottom and of the rods 43, and any dirt which may stick to the bottom of the bucket is disturbed and gravitates therefrom. All dirt loosened by the disks 55 and small plows 56 or dirt otherwise loosened and in the path of the buckets is gathered into the buckets by the blades 38.

After a hill has been cut down by the travel of the buckets and plows to a desired depth and the earth has been deposited in

the valley to fill up the valley, the whole device is shifted laterally, this being permitted by the arrangement of the rollers 20, the axes of which are in the direction of travel of the buckets and plows and hence the whole structure may be readily moved in the said lateral direction to adjust it for the next cut. In order to cause the buckets to closely hug the active plows and to tend to move these plows toward the dirt being excavated, the rollers 54 are suitably adjusted so their axes are in more or less angular relation to the line of travel.

After the parts have been readjusted a new cut is made and the dirt is removed as before.

In operation the buckets or scoops may dig into the dirt, say, to an extent of six inches, and the plows to one side of the traveling scoops may be cut into the dirt a like amount, thus producing sufficient clearance at the sides of the traveling scoops to provide for the sidewise adjustment of the series of scoops and plows.

After the buckets and plow carriers or chains pass over the driving drums and sprockets they are separated laterally of their direction of travel enough to clear the driving mechanism, but when they are at work the rollers at one end of each scoop crowd the scoop over toward the plows, so that the clearance is taken up and the plows deposit the dirt directly into the scoops.

Under some circumstances it may be advisable to operate both series of plows at the same time and such operation is quite feasible with the structure of the present invention.

Usually but two plows are needed for each sprocket chain 68.

This invention is an improvement upon the distance power excavating machine shown and described in Letters Patent No. 1,191,942, granted to me July 25, 1916.

The scoop herein shown is claimed in my application Serial No. 124,797, filed October 10, 1916.

What is claimed is:—

1. Means for excavating and transporting material in grading, comprising an endless series of buckets or scoops, and plows movable alongside of the series of buckets or scoops in position to direct excavated dirt thereinto, and means for driving the series of buckets or scoops in one direction and the plows in the opposite direction, the plows being arranged on opposite sides of the series of buckets or scoops.

2. Means for excavating and transporting material in grading, comprising an endless series of buckets or scoops, and plows movable alongside of the series of buckets or scoops in position to direct excavated dirt thereinto, and means for driving the series of buckets or scoops in one direction and the plows in the opposite direction, the plows being arranged on opposite sides of the series of buckets or scoops, and the driving means for the plows having means for coupling up either series of plows to the exclusion of the other series of plows.

3. Means for excavating and transporting material in grading, comprising an endless series of buckets or scoops, power means at each end of the series for causing the series of scoops to move progressively in the direction of the length of the series, and a series of plows adjacent to the series of scoops and provided with driving connections for propelling the plows oppositely to the direction of movement of the buckets or scoops.

4. Means for excavating and transporting material in grading, comprising an endless series of buckets or scoops of a length to extend from an elevated area over a depressed area, means for propelling the series of scoops, and a series of plows arranged at one side of the series of scoops in position to direct material into said scoops and of a length to override the elevated portion and stopping short of the depressed portion of the area to be graded.

5. Means for excavating and transporting material in grading, comprising an endless series of buckets or scoops of a length to extend from an elevated area over a depressed area, means for propelling the series of scoops, and a series of plows arranged at one side of the series of scoops and of a length to override the elevated portion and stopping short of the depressed portion of the area to be graded, the grading means including power means with connections to the series of buckets and plows to propel the series of buckets in one direction and the series of plows in the opposite direction.

6. Means for excavating and transporting material in grading, comprising a series of elevated strands constituting an aerial support and of a length to override an elevated area to be cut down and to override an adjacent depression to be filled up, an endless series of buckets or scoops of a length to override both areas and suspended by the aerial strands, supports on the strands for the return run of the series of scoops, an endless series of plows mounted on the supporting strands adjacent to the series of scoops, power means, and connections between the power means and the endless series of scoops and plows to cause the scoops and plows to travel in opposite directions.

7. Means for excavating and transporting material in grading, comprising an endless series of buckets or scoops with means for gathering and directing excavated earth thereinto, an endless series of plows adjacent to the scoops for excavating dirt and directing it into the scoops, and means for

driving the series of scoops and the series of plows in opposite directions.

8. Means for excavating and transporting material in grading, comprising an endless series of buckets or scoops each having means at one end for directing dirt thereinto and means at the other end for loosening dirt on the surface to be graded, an endless series of plows movable along the first-named series in position to direct dirt into the scoops or buckets, and means for driving the series of buckets and the series of plows simultaneously in opposite directions.

9. Means for excavating and transporting material in grading, comprising an endless series of buckets or scoops each having means at one end for directing dirt thereinto and means at the other end for loosening dirt on the surface to be graded, an endless series of plows movable along the first-named series in position to direct dirt into the scoops or buckets, and means for driving the series of buckets and the series of plows simultaneously in opposite directions, the buckets or scoops each having means for constraining the buckets toward the plows in the course of and by the travel of the buckets.

10. Means for excavating and transporting material in grading, comprising an endless series of buckets, an aerial support therefor, means at the ends of the aerial support for holding the latter in a taut condition, power means at the ends of the aerial support, an endless carrier on the aerial support, plows mounted on the endless carrier to travel in close side relation to the buckets, and connections from the power means to the series of buckets and the endless support for the plows for driving the buckets in one direction and the plows in the opposite direction.

11. Means for excavating and transporting material in grading, comprising an elongated aerial support in the form of cables, means at the ends of the support for holding the cables taut, power means at the ends of the support, an endless series of buckets carried by the endless support, endless carriers on the support and located on opposite sides of the series of buckets, plows on the endless carriers, and connections between the power means and the series of buckets and also the carriers for the plows for driving the buckets in one direction and the plows in the opposite direction.

12. Means for excavating and transporting material in grading, comprising an elongated aerial support in the form of cables, means at the ends of the support for holding the cables taut, power means at the ends of the support, an endless series of buckets carried by the endless support, endless carriers on the support and located on opposite sides of the series of buckets, plows on the endless carriers, and connections between the power means and the series of buckets and also the carriers for the plows for driving the buckets in one direction and the plows in the opposite direction, the aerial support being provided with spaced supporting means provided with rollers mounted on axes longitudinal of the aerial support for permitting movement of the support as a whole in a direction laterally of its length.

13. Means for excavating and transporting material in grading, comprising aerial cables extended over an area to be graded, supporting means for the cables at the ends and at intermediate points with the supports at the intermediate points having rollers upon which the supports may be moved in a direction laterally of the length of the cables, rollers carried by the supports on the cables, an endless series of buckets carried by the rollers, endless carriers on the rollers on opposite sides of the series of buckets, plows on the endless carriers, and connections between the power means and the endless carriers and also the endless series of buckets for driving the buckets in one direction and the plows in the opposite direction.

14. Means for excavating and transporting material in grading, comprising aerial cables extended over an area to be graded, supporting means for the cables at the ends and at intermediate points with the supports at the intermediate points having rollers upon which the supports may be moved in a direction laterally to the length of the cables, rollers carried by the supports on the cables, an endless series of buckets carried by the rollers, endless carriers on the rollers on opposite sides of the series of buckets, plows on the endless carriers, and connections between the power means and the endless carriers and also the endless series of buckets for driving the buckets in one direction and the plows in the opposite direction, the connections between the power means and the carriers for the plows being arranged for disconnecting one series of plows while the other series of plows is in operation.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

W. F. BRINTON.

Witnesses:
JOHN H. SIGGERS,
ANNIE MYERS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."