

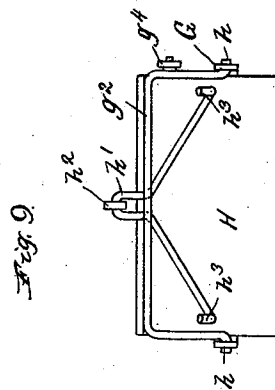
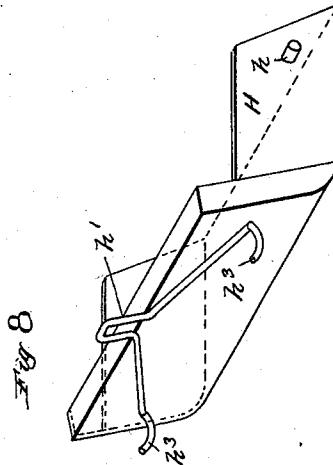
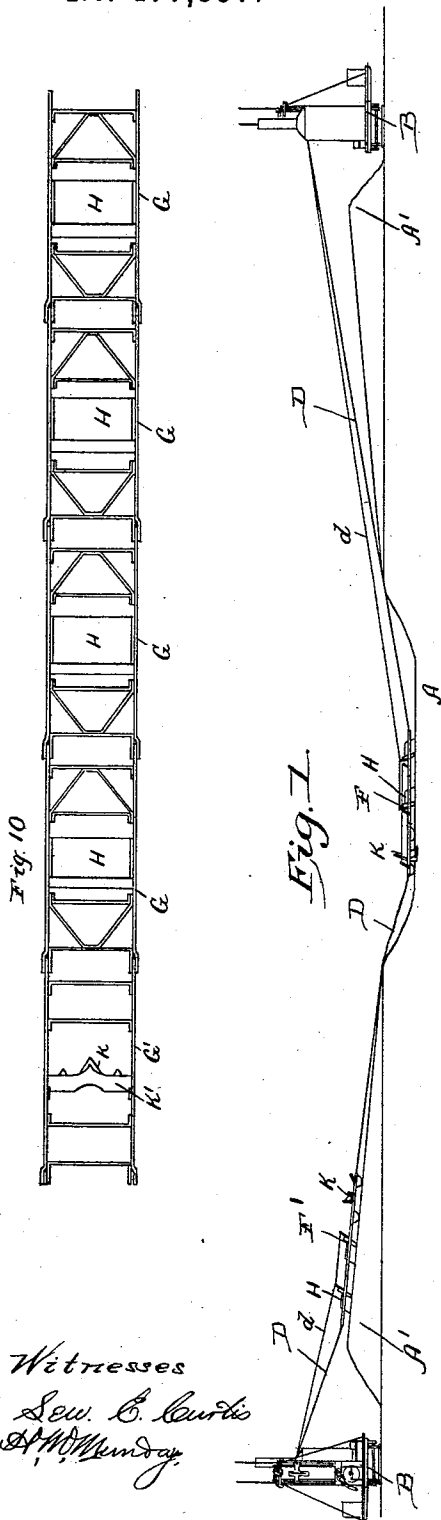
(No Model.)

5 Sheets—Sheet 1.

J. T. DOUGINE.
EXCAVATING APPARATUS.

No. 477,837.

Patented June 28, 1892.



Witnesses
Sew. C. Curtis
A. W. Munday

Inventor:
James T. Dougine
By Munday, Parts & Adeock,
His Attorneys

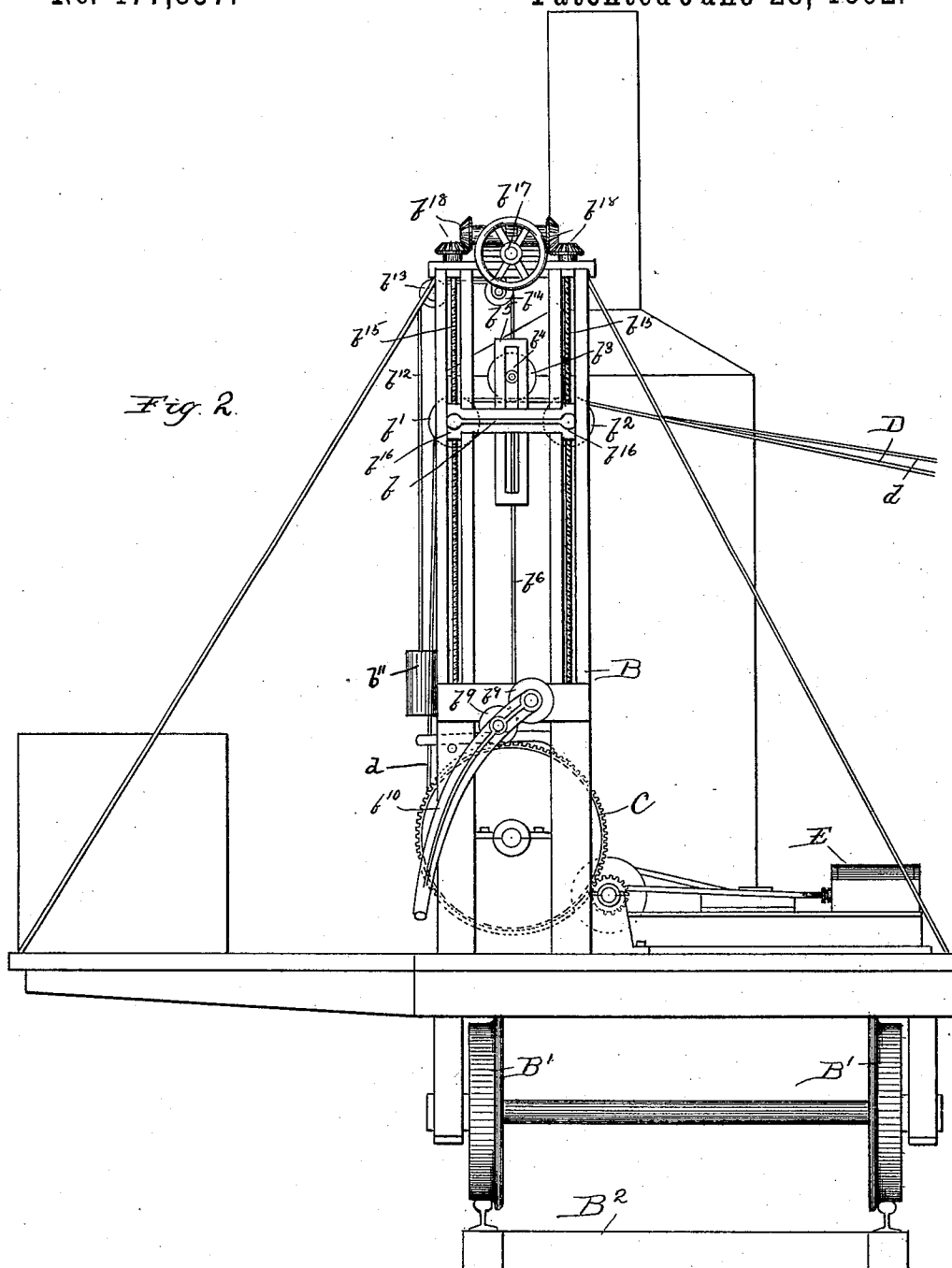
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5 Sheets—Sheet 2.

J. T. DOUGINE.
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Witnesses:

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(No Model.)

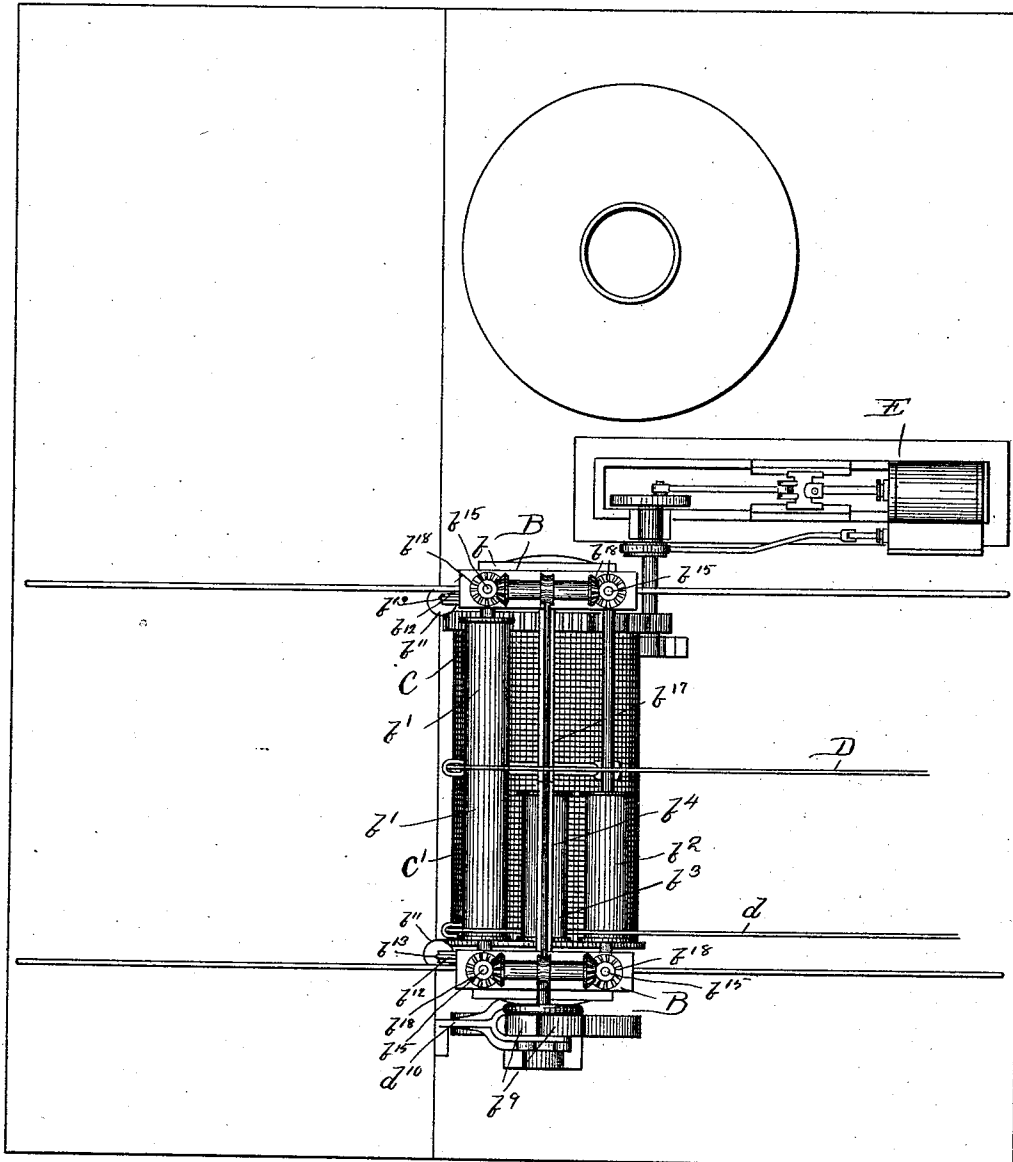
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Fig. 3.



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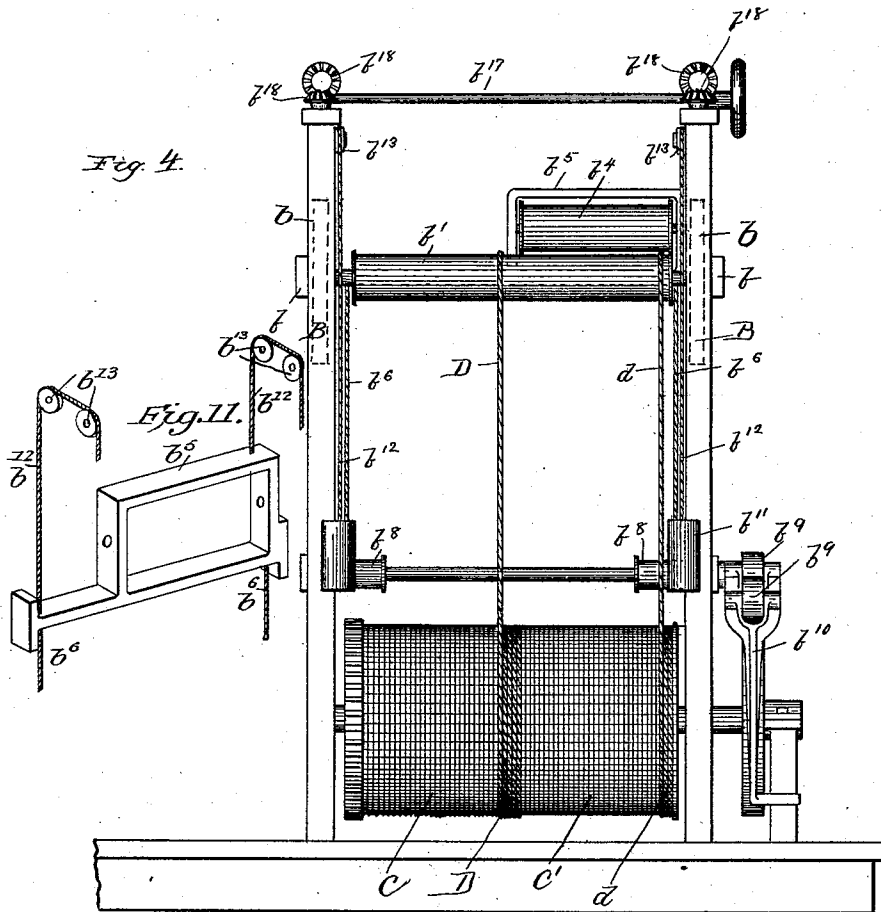
(No Model.)

5 Sheets—Sheet 4.

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(No Model.)

5 Sheets—Sheet 5.

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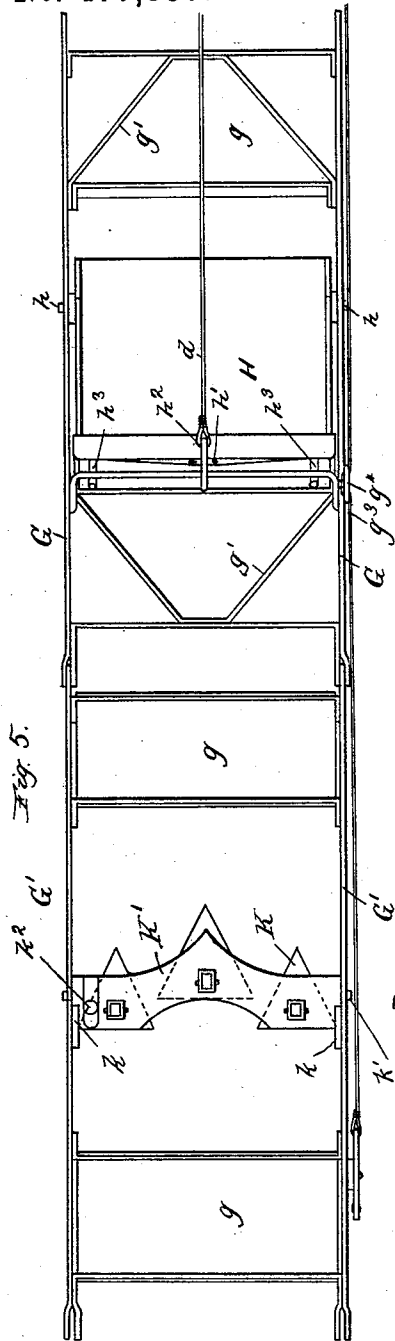


Fig. 5.

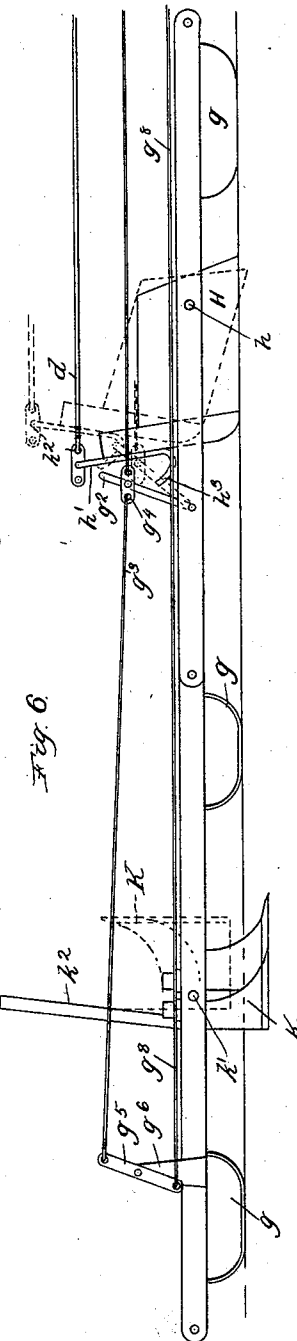


Fig. 6.

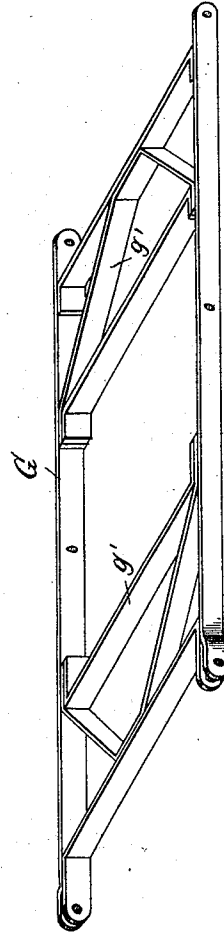


Fig. 7.

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UNITED STATES PATENT OFFICE.

JAMES T. DOUGINE, OF CHICAGO, ILLINOIS.

EXCAVATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 477,837, dated June 28, 1892.

Application filed June 13, 1891. Serial No. 396,072. (No model.)

To all whom it may concern:

Be it known that I, JAMES T. DOUGINE, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Excavating Apparatus, of which the following is a specification.

My invention relates to apparatus for removing earth, as in excavating or grading.

10 The object of my invention is to provide an apparatus of a simple, durable, and efficient construction by means of which the earth may be handled automatically without hand labor and much more cheaply and rapidly than by
15 any apparatus heretofore in use.

In the accompanying drawings, which form a part of this specification, I have for convenience shown my invention as applied to the work of digging or excavating a canal, the
20 earth excavated being deposited upon the banks of the canal. Those skilled in the art will, however, understand that my apparatus may also be used for grading and for a variety of other purposes.

25 By reference to the drawings it may readily be seen that my new apparatus comprises two gangs of scrapers and plows adapted to be drawn backward and forward across the work, one gang depositing its load at one side and
30 the other gang depositing its load at the opposite side and the two gangs working alternately, the one filling and carrying while the other is returning empty. The two gangs of scrapers and plows are drawn alternately
35 back and forth by a pair of windlasses or winding devices, one at each side or bank, operated by suitable motors, preferably by steam-engines. The plows and scrapers of
40 each gang are connected together tandem by a series of links or frames pivoted together, in which each scraper or plow is mounted. Each scraper is mounted pivotally in its pivoted frame or link, so that it may be properly
45 tilted to cause it to fill as well as to reverse or empty. The plow or earth-stirring device is likewise mounted pivotally in its supporting frame or link. Each supporting frame or link for the scrapers or plows is likewise furnished with a shoe or device for limiting the
50 depth of cut. The several scrapers of each gang are connected together or to a common operating-cable, so that they may be all tilted

simultaneously to cause them to fill and to empty or reverse. The operating-cable for simultaneously tilting the several scrapers of
55 each gang is wound up and paid out at the same speed as the main draft-cable, this being done, preferably, by winding it around a windlass of the same diameter as that employed for the main draft-cable. This oper-
60 ating-cable is taken up or let out, as required, to tilt the scrapers by means of a movable pulley adapted to deflect the cable out of its normal path. To change the line of draft, as
65 may be required, to accommodate for the varying height of the pile of earth deposited upon the bank, I provide the frame of each windlass or winding device with a vertically-
70 sliding frame, upon which guide-pulleys for the cable are mounted and by which the cables are deflected up or down, as required.

To move the apparatus along in the direction of the work to be done from time to time, as required, I mount the windlass-frames carrying the driving motors or engines upon
75 wheels, which travel upon a temporary track laid for the purpose.

My invention consists in the novel devices and novel combinations of parts and devices herein shown and described, and more par-
80 ticularly pointed out in the claims.

In the drawings, Figure 1 is side elevation of an apparatus or system embodying my invention. Fig. 2 is an enlarged detail elevation of one of the windlasses or winding de-
85 vices for the cables. Fig. 3 is a plan view of the same. Fig. 4 is a detail front or end view of the windlass-frame. Fig. 5 is a detail partial plan view of the gang of scrapers and plows and their frames, showing one scraper-
90 frame or link and one plow-frame. Fig. 6 is a side elevation of the same. Fig. 7 is a detail perspective view of one of the pivoted scraper frames or links. Fig. 8 is a detail perspective view of one of the scrapers. Fig. 95
9 is a rear view of one of the scrapers. Fig. 10 is a diagram or plan view of one of the gangs or series of scrapers and plows, showing five pivoted frames or links connected together in tandem. Fig. 11 is a detail per-
100 spective view of a part hereinafter described.

Similar letters of reference indicate like parts throughout all the figures of the drawings.

In the drawings, A may represent the excavation or other work to be done.

B B are the windlass-frames, one at each side of the work, and upon which the windlasses or winding-drums C are mounted, as well as the motors or engines E for driving the same. The windlass-frames B are furnished with wheels B' to adapt the windlasses to be pulled forward from time to time along the temporary track B².

D is the main draft-cable by which the two gangs F F' of scrapers and plows are connected together and by which they are drawn back and forth across the work by the winding-drums C, one end of the cable being wound around or attached to each drum.

Each gang of scrapers and plows or earth-stirrers comprises one or more, preferably four, scraper frames or links G, in which the scrapers or scoops H are mounted, and one plow frame or link G', in which the plow or plows K are mounted. The links or frames G G' are pivoted together at their ends, so that the scrapers and plows are connected tandem, the series of pivoted links constituting a flexible carriage for the scrapers and plows. Each link or pivotal frame G G' is provided with one or more devices *g*, preferably shoes, for limiting the depth of cut of the scrapers or plows, respectively. The scraper-carrying links G are furnished with braces *g'* to strengthen and stiffen them. The scraper-carrying links G are preferably furnished each with a shoe *g* at its front. The plow-carrying frame or link G' is preferably furnished with a shoe at each end. The scrapers H are pivoted to the side bars of the link or frame G by pivots or trunnions *h*, and each scraper is provided with an operating arm or projection *h'*, preferably having an eye *h²* for the operating-cable *d* to pass through or be attached to. Each scraper H is also furnished with one or more, preferably two, locking hooks or projections *h³*, which engage a pivoted bail or movable catch *g²* on the scraper-link or frame G. The pivoted bails *g²* for each scraper are all connected together, so that they may be operated simultaneously by a cable or line *g³*, which passes through suitable eyes *g⁴* on the bails *g²*, and which is connected at each end to levers *g⁵*, pivoted to standards *g⁶* on the extreme links G G' of each gang, so that the bails may all be operated from any position along the whole length of the gang of links. The lower ends of the two levers *g⁵* are connected together by another line or cable *g⁸*.

The operating-cable *d* for the gang of scrapers is wound around a drum C' of the same diameter of the drum C for the main draft-cable D, and preferably made integral with the drum C and secured to the same shaft, so as to better insure uniform winding and paying out of both cables D and *d*.

To deflect the line of draft up or down, as may be necessary to accommodate for the height of the pile of earth A' as it increases

from time to time, I provide the windlass-frame B with a vertically-sliding carriage or frame *b*, upon which is mounted a guide pulley or roller *b'* and over or around which the cables D *d* pass. By adjusting the slide or carriage *b* up or down the guide-pulley *b'* is raised or lowered, so as to deflect the line of draft up or down, as required, to enable the cable to properly clear the pile of earth A' between the windlass-carriage B and the work A. Any suitable mechanism may be employed for sliding or adjusting the carriage *b* up or down on the windlass-carriage B. The adjusting mechanism which I have shown in the drawings consists of four screws *b¹⁵* and nuts *b¹⁶*, the same being operated from the shaft *b¹⁷* through bevel-gears *b¹⁸*. The slide or carriage *b* is further provided with a pulley *b²*, over which the scraper-operating cable *d* passes, and with a movable or tightener pulley *b³* for the purpose of deflecting the operating-cable *d* out of its normal path, and thus operating or tilting the scrapers connected thereto, as may be required, to cause the same to fill or to empty, or reverse. The movable pulley *b³* is preferably journaled in a slide *b⁴*, which reciprocates in suitable guides *b⁵* on the frame *b*, and is operated by a cable or cord *b⁶*, passing around the winding-drums *b⁸*, which are driven by friction from the engine through the friction-wheels *b⁹* and treadle *b¹⁰* for operating the friction. The pulley *b³* and its slide are counterbalanced by a weight *b¹¹*, connected thereto by a cord *b¹²*, passing over the pulleys *b¹³* *b¹⁴*, the weight serving to return the pulley *b³* to its normal position, and thus slackening the operating-cable *d* as soon as the pressure is removed from the treadle.

The plows or stirring devices K are adjustably secured to their reversible or revoluble transverse beam K', which extends across the plow frame or link G' and is journaled thereon at *k'*. The plow or its beam is held in operative position by a pin or projection *k*, extending through the side bar of the frame G' and engaging the beam K' or a projecting arm thereon. To avoid danger of breakage from the plow encountering some heavy obstruction, the holding-pin *k* should be of wood or other material adapted to break when subjected to too great strain. The plow or its beam is provided with an operating-handle *k²*.

The operation is as follows: Preparatory to the forward pass of each gang of scrapers the bails or catches *g²* are pushed forward by the attendant in the cut, so that the hooks or projections on the scrapers will engage them. The operator or attendant at the engine then winds up the draft-cable, having first slightly tilted the scrapers forward by depressing the foot-treadle, and thus operating the take-up pulley *b³* to shorten or tighten the scraper-operating cable *d*. The extent to which the scrapers may be thus tilted forward to cause them to fill is of course limited by the locking-bails *g²*. As the gang is drawn forward

across the cut A, the scrapers are filled with earth and the plow at the rear of the gang loosens or stirs the earth for the next forward pass of the scrapers to a suitable depth below the cut of the scrapers—say six inches. As the gang is drawn forward out of the cut and after the scrapers have become filled, the attendant at the engine slackens the operating-cable *d* by raising his foot from the treadle, and the attendant in the cut at the same time throws back the locking-bail *g*², so that the scrapers may be dumped when desired. After the scrapers have been filled and as they are being drawn forward to the place of dump they settle back by their own gravity, so that the cutting-edge of the scraper does not engage the earth, as the pivot *h* of the scraper is placed forward of the center of gravity of the load. When the gang has been drawn forward to the place of dump by the cable D and windlass C, the operating-cable *d* being simultaneously and uniformly taken up by its windlass C', the attendant at the windlass, by again putting his foot upon the treadle *b*¹⁰, operates the take-up pulley *b*³, and thus pulls on the operating-cable *d* sufficiently to tilt all the scrapers of the gang and cause their cutting-edges to engage the earth and the scrapers to be reversed or dumped as they are continued to be drawn forward by the draft-cable D. When this has been done, the attendant at the windlass signals to the attendant at the opposite windlass, and the latter then repeats the same operation with the other gang F', the first-mentioned gang F being at the same time and by the same means drawn back into the cut ready for its next forward pass. As the first-mentioned gang F makes its backward or return pass its dumped or reversed scrapers are returned to their normal position, so that they ride back loosely without obstruction, and at the same time and by the same means the plow K is reversed or turned on its own swivel-beam, so as to be thrown out of engagement with the earth, as is clearly indicated in the drawings. The handle *k*² of the plow is used for turning the plow from its reversed into its operating position at the commencement of each forward pass of the gang.

The number of scrapers in each gang may of course be varied as required. The number most suitable to be employed will vary somewhat according to the width of the excavation to be made. In the drawings I have shown only one line of scrapers in each gang; but the number of lines of scrapers abreast may also be varied, according to the nature of the work and the power of the engine, &c. In the drawings I have also shown the scrapers as all of the same size; but this uniform size of the scrapers is not essential. In some kinds of earth it may not be necessary or desirable to employ any earth-stirring device or plow, in which cases the plow may be removed from the gang.

The earth or material may be distributed

or dumped at any point desired on either side of the cut, the distance to which it may be carried being limited only by the length of the cable, and the width and depth of the cut or excavation may also be greater or less, according to the length of the cable. Ordinarily a cable from one to two thousand feet in length will be sufficient for most purposes; but it may be greater or less, as required.

I claim—

1. An excavating or earth-moving apparatus comprising, in combination, two gangs of plow and scraper frames, said frames in each gang being connected together pivotally in tandem to form a flexible carriage, plows and scrapers mounted pivotally in said frames, devices or shoes on said frames to limit the depth of cut of the scrapers and plows, a pair of windlasses, and a draft-cable connecting said gangs of frames together and attached at its opposite ends to the windlasses, whereby said gangs may be drawn back and forth across the work or cut, substantially as specified.

2. An excavating or earth-moving apparatus comprising, in combination, two gangs of plow and scraper frames, said frames in each gang being connected together pivotally in tandem to form a flexible carriage, plows and scrapers mounted pivotally in said frames, devices or shoes on said frames to limit the depth of cut of the scrapers and plows, a pair of windlasses and a draft-cable connecting said gangs of frames together and attached at its opposite ends to the windlasses, whereby said gangs may be drawn back and forth across the work or cut, and operating-cables connected to each gang of scrapers, a winding-drum for said operating-cable traveling at uniform speed with the windlass of the draft-cable, and means for tightening and slackening said operating-cable to tilt the scrapers to cause them to fill or dump, substantially as specified.

3. An excavating or earth-moving apparatus comprising, in combination, two windlasses, a draft-cable connected at its opposite ends to said windlasses, and two gangs of scraper-frames connected to said cable, said frames of each gang being connected together pivotally in tandem to form a flexible carriage, scrapers mounted pivotally in said frames, the scrapers in the two gangs facing in opposite directions, so that the gangs fill and return alternately as they are drawn back and forth across the cut, substantially as specified.

4. An excavating or earth-moving apparatus comprising, in combination, two windlasses, a draft-cable connected at its opposite ends to said windlasses, and two gangs of scraper-frames connected to said cable, said frames of each gang being connected together pivotally in tandem to form a flexible carriage, scrapers mounted pivotally in said frames, the scrapers in the two gangs facing in opposite directions, so that the gangs fill and return alternately as they are drawn back

and forth across the cut, said gangs of pivoted frames being provided with devices for limiting the depth of cut, substantially as specified.

5 5. An excavating or earth-moving apparatus comprising, in combination, two windlasses, a draft-cable connected at its opposite ends to said windlasses, and two gangs of scraper-frames connected to said cable, said
10 frames of each gang being connected together pivotally in tandem to form a flexible carriage, scrapers mounted pivotally in said frames, the scrapers in the two gangs facing in opposite directions, so that the gangs fill
15 and return alternately as they are drawn back and forth across the cut, and operating-cables for tilting or reversing the scrapers, substantially as specified.

6. The combination, with a scraper-frame
20 G, furnished with a shoe or device for limiting the depth of the cut, of a scraper H, pivoted to said frame, a pair of winding-drums or windlasses, and a draft-cable connected to said scraper-frame with each of said wind-
25 lasses, whereby the scraper may be drawn back and forth across the work or cut, and an operating-cable for tilting the scraper to reverse or fill the same, substantially as specified.

30 7. The combination, with a scraper-frame G, furnished with a shoe or device for limiting the depth of the cut, of a scraper H, pivoted to said frame, a pair of winding-drums or windlasses, and a draft-cable connected to
35 said scraper-frame and with each of said windlasses, whereby the scraper may be drawn back and forth across the work or cut, and an operating-cable for tilting the scraper to reverse or fill the same, and a winding-
40 drum for said operating-cable, driven at the same speed as the windlass for said draft-cable, and a movable or take-up pulley for deflecting the path of said operating-cable to take up or slack the same, substantially as
45 specified.

8. The combination of scraper-frame G, furnished with a shoe or device for limiting the depth of cut, a scraper H, pivoted to said frame, a pair of winding-drums or windlasses,
50 and a draft-cable connected to said scraper-frame with each of said windlasses, whereby the scraper may be drawn back and forth across the work or cut, and an operating-cable for tilting the scraper to reverse or fill the same, and a winding-drum for said operating-
55 cable, driven at the same speed as the windlass for said draft-cable, and a movable or take-up pulley for deflecting the path of said operating-cable to take up or slack the same, said scraper being furnished with a locking
60 arm or projection and said scraper-frame having a holding bail or catch engaging said locking arm or projection on the scraper for holding the scraper in its filling position, substan-
65 tially as specified.

9. The combination of a gang of scraper-frames G, pivoted together in tandem, each

frame having a scraper H, mounted pivotally therein, furnished with a locking arm or pro-
jection h^3 , said scraper-frames having mov- 70
able bails or catches g^2 , having lines $g^3 g^8$, and levers $g^5 g^5$, connecting said bails, so that the same may all be operated simultaneously, a pair of winding-drums or windlasses, and a
draft-cable connecting said scraper-frames 75
with each of said windlasses, substantially as specified.

10. The combination of a gang of scraper-frames G, pivoted together in tandem, each
frame having a scraper H, mounted pivotally 80
therein, furnished with a locking arm or projection h^3 , said scraper-frames having movable bails or catches g^2 , lines $g^3 g^8$, and levers $g^5 g^5$, connecting said bails, so that the same may all be operated simultaneously, a pair of
85 winding-drums or windlasses, and a draft-cable connecting said scraper-frames with each of said windlasses, an operating-cable, a winding-drum for said operating-cable, driven at the same speed as the windlass for said draft-
90 cable, and a movable or take-up pulley for tightening or slackening said operating-cable, substantially as specified.

11. The combination of scraper-frame G, furnished with a shoe or device for limiting 95
the depth of cut, a scraper H, pivoted to said frame, a pair of winding-drums or windlasses, and a draft-cable connected to said scraper-frame with each of said windlasses, whereby the scraper may be drawn back and forth
100 across the work or cut, and an operating-cable for tilting the scraper to reverse or fill the same, and a winding-drum for said operating-cable, driven at the same speed as the windlass for said draft-cable, and a movable or
105 take-up pulley for deflecting the path of said operating-cable to take up or slack the same, a motor for driving said windlasses, and mechanism for communicating motion to said take-up pulley, substantially as specified. 110

12. An excavating or earth-moving apparatus comprising, in combination, two gangs
of plow and scraper frames, said frames being connected together pivotally in tandem
115 to form a flexible carriage, plows and scrapers mounted pivotally in said frames, devices or shoes on said frames to limit the depth of cut of the scrapers and plows, a pair of windlasses and a draft-cable connecting said gangs of frames together and attached at its opposite
120 ends to windlasses, whereby said gangs may be drawn back and forth across the work or cut, the frames for said windlasses being provided with a movable slide or frame b , carrying a guide-pulley for deflecting the line of
125 draft of the cable, substantially as specified.

13. An excavating or earth-moving apparatus comprising, in combination, two wind-
lasses, a draft-cable connected at its opposite
ends to said windlasses, and two gangs of 130
scraper-frames connected to said cable, said frames of each gang being connected together pivotally in tandem to form a flexible carriage, scrapers mounted pivotally in said

frames, the scrapers in the two gangs facing in opposite directions, so that the gangs fill and return alternately as they are drawn back and forth across the cut, the frames for said windlasses being each provided with a movable slide or frame *b*, carrying a guide-pulley for deflecting the line of draft of the cable, substantially as specified.

14. An excavating or earth-moving apparatus comprising, in combination, two windlasses, a draft-cable connected at its opposite ends to said windlasses, and two gangs of scraper-frames connected to said cable, said frames of each gang being connected together pivotally in tandem to form a flexible carriage, scrapers mounted pivotally in said frames, the scrapers in the two gangs facing in opposite directions, so that the gangs fill and return alternately as they are drawn back and forth across the cut, and operating-cables for tilting or reversing the scrapers, the frames for said windlasses being each provided with a movable slide or frame *b*, carrying a guide-pulley *b'* for deflecting the line of draft of said cables, a second guide-pulley *b²*, and a movable or take-up pulley *b³*, substantially as specified.

15. An excavating or earth-moving apparatus comprising, in combination, two windlasses, a draft-cable connected at its opposite ends to said windlasses, and two gangs of scraper-frames connected to said cable, said frames of each gang being connected together pivotally in tandem to form a flexible carriage, scrapers mounted pivotally in said frames, the scrapers in the two gangs facing in opposite directions, so that the gangs fill and return alternately as they are drawn back and forth across the cut, and operating-cables for tilting or reversing the scrapers, the frames for said windlasses being each provided with a movable slide or frame *b*, carrying a guide-pulley *b'* for deflecting the line of draft of said cables, a second guide-pulley *b²*, and a movable or take-up pulley *b³*, said pulley *b³* being mounted in a slide connected by a cord to a winding-drum, and friction mechanism for operating said last-mentioned winding-drum, substantially as specified.

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Witnesses:

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