C. L. HOPKINS.

EXCAVATING APPARATUS.

APPLICATION FILED JAN. 27, 1909.

963,561.

Patented July 5, 1910.

4 SHEETS—SHEET 1.

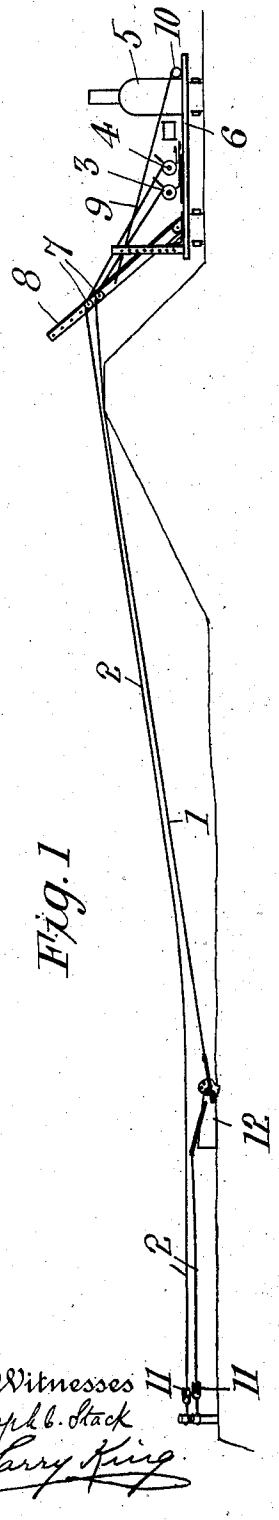

Fig. 1

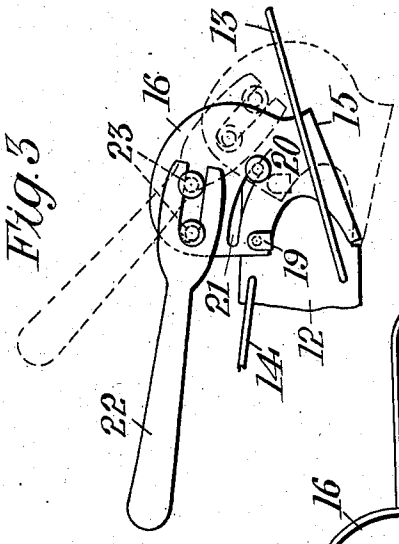

Fig. 3

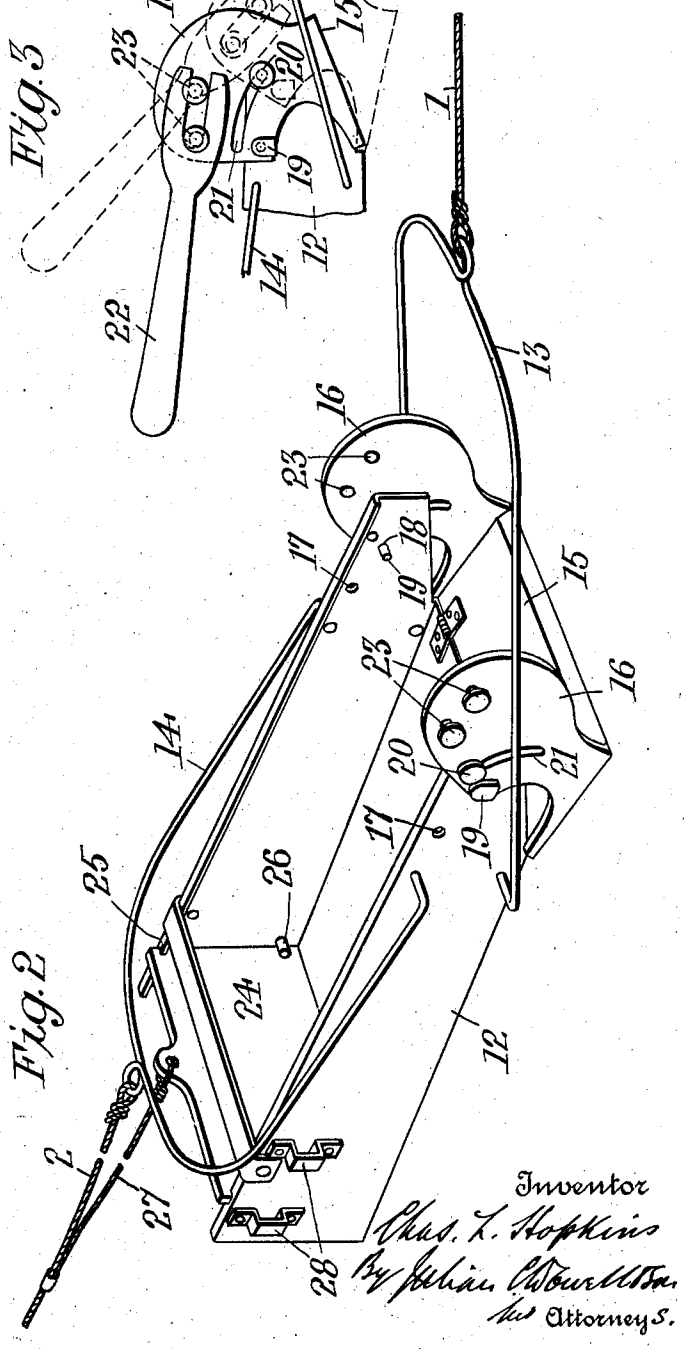

Fig. 2

Witnesses

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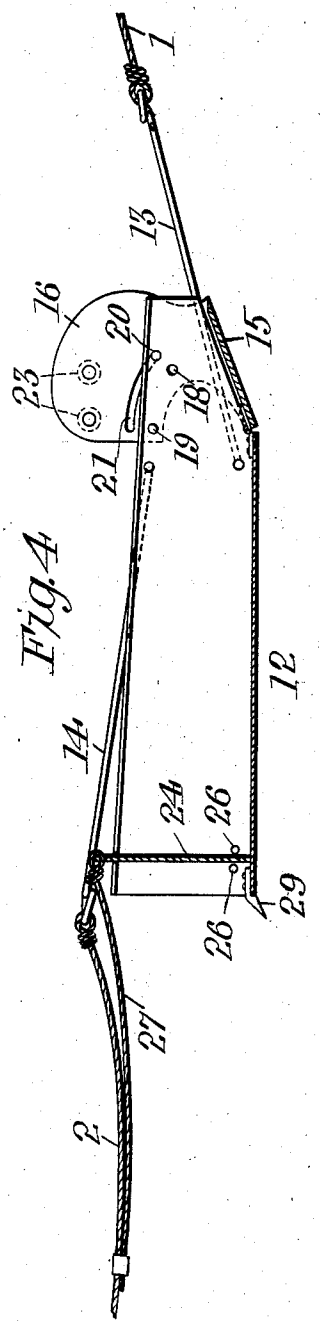

Fig. 4

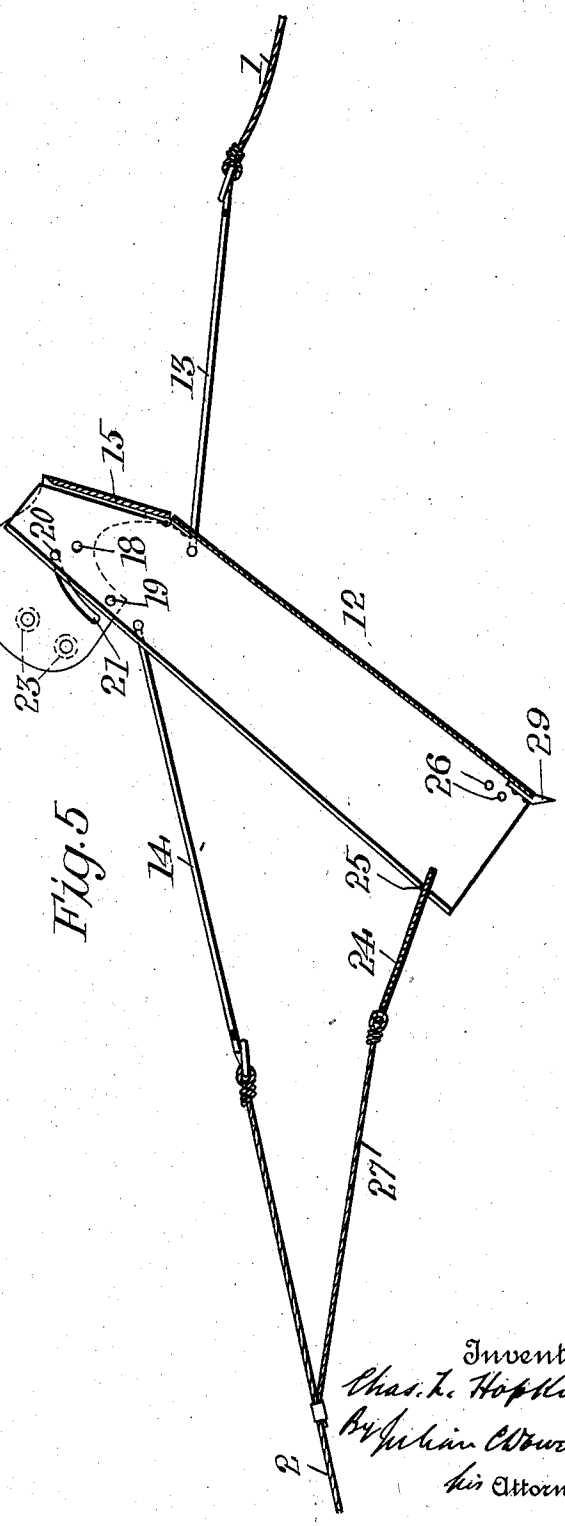

Fig. 5

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4 SHEETS—SHEET 3.

Fig. 6

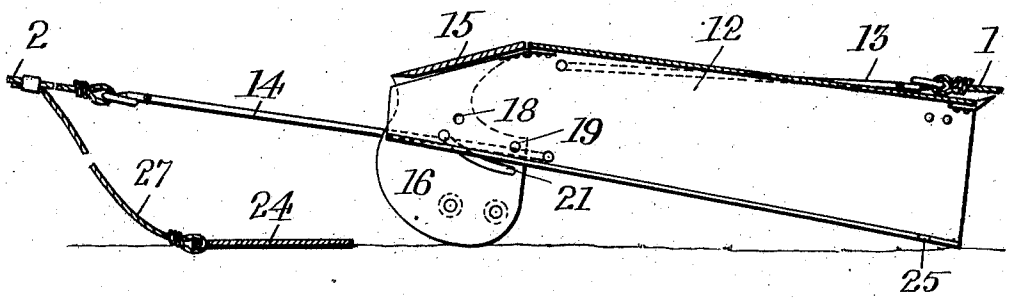


Fig. 7

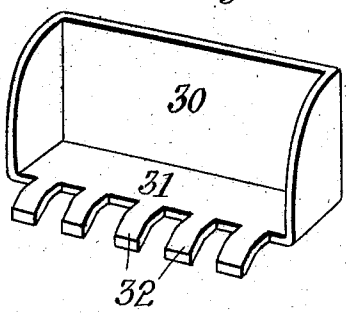


Fig. 8

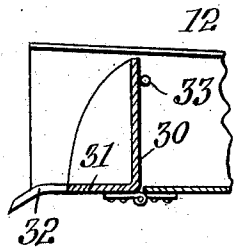


Fig. 9

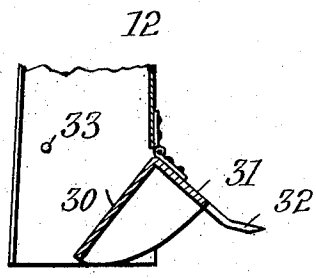
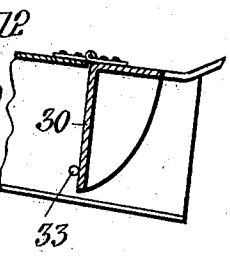


Fig. 10



Witnesses

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4 SHEETS—SHEET 4.

Fig. 11

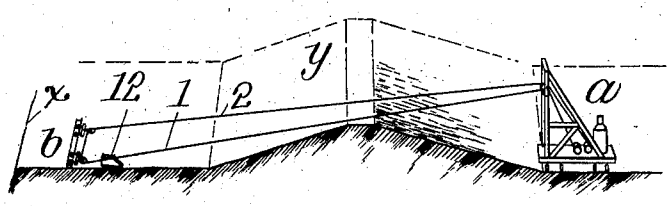


Fig. 12

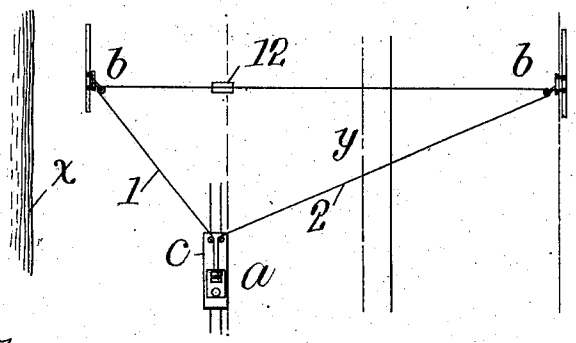


Fig. 13

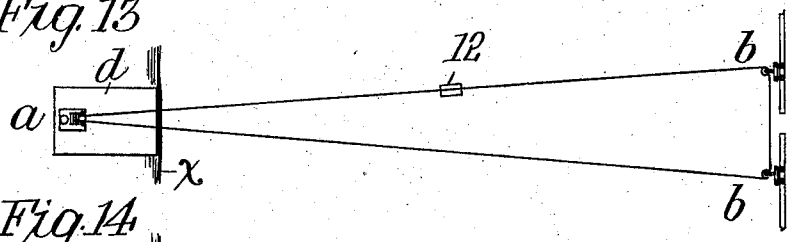


Fig. 14

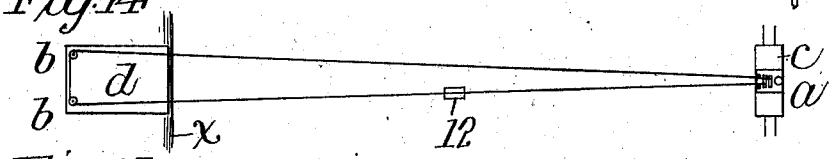


Fig. 15

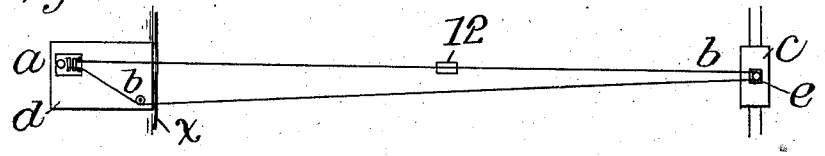
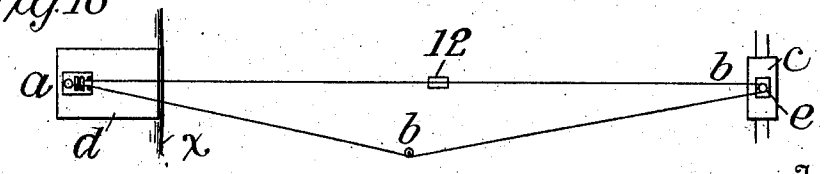


Fig. 16



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UNITED STATES PATENT OFFICE.

CHARLES L. HOPKINS, OF NEW ORLEANS, LOUISIANA.

EXCAVATING APPARATUS.

963,561. Specification of Letters Patent. Patented July 5, 1910.

Application filed January 27, 1909. Serial No. 474,534.

To all whom it may concern:

Be it known that I, CHARLES L. HOPKINS, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Excavating Apparatus; and I 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 appertains to make and use the same.

This invention relates to apparatus for excavating and transporting earth and other materials by a scoop or scraper operated by power through cables; and the invention is particularly adapted for use in the construction of earth embankments such as levees, dikes, dams or similar structures.

One object of the invention is to provide a practicable system including a scoop or scraper in connection with oppositely-operated cables whereby the scraper can be filled and transported by pulling it in one direction and unloaded or dumped and returned for another load by pulling it in the reverse direction.

Another object is to provide an improved scoop or scraper, or what may be termed an excavating and transporting receptacle, particularly adapted for the carrying out of the foregoing functions.

Earth embankments of the levee type have in general been heretofore constructed by using wheel-barrows, or scrapers drawn by mules or horses, or excavating machines of the long arm steam shovel or orange-peel dipper types. The first two named methods are recognized as being obsolete; while the steam shovel and orange-peel excavators do not meet the essential requirements because these machines of necessity dig close to the base of a levee and make it impossible to construct an embankment of fair height with a berm at its base. With the apparatus of my present invention, earth to construct a levee can be taken as far from its base as may be expedient or desirable, and therefore leave as wide a berm as required. The said apparatus, as installed for work on levees or embankments, includes, in connection with the self-loading scoop or scraper, forward and backward draft cables which in practice may be independent cables operated by separate winding drums, or different runs of the same cable medially wound around a single drum, whereby one cable is pulled and taken up while the other is simultaneously let out; and said drum or drums and the motor therefor are or may be mounted adjacent to the embankment site, preferably at the opposite side of the embankment from the scoop or scraper, and the rearward-draft cable runs from the drum to an out-station at a distance behind the scoop where it passes around a suitably planted guide-pulley or sheave; or according to other arrangements of the system either or both cables may run to suitably disposed out-stations.

The cables are so connected to the scoop that by pull of the forward-draft cable the scraper is caused to scoop up the soil and load itself, and by continued pull of the same cable is transported to the embankment site; then on reversing the motion the backward pull by the rearward-draft cable dumps the scoop, and continued backward pull returns the scoop in an inverted or overturned position to the starting point; whereupon the motion being again reversed the forward pull of the forward-draft cable brings the scoop to working position and repeats the performance of loading and transporting.

The invention will be hereinafter described with reference to the accompanying drawings, which form a part of this specification, and then more particularly pointed out in the claims at the end of this description.

Figure 1 is a view showing diagrammatically the use of the invention in constructing a levee. Fig. 2 is a perspective view of the scoop or scraper, showing its adjustable front or cutting end in lowered or scooping position. Fig. 3 is a detail view in side elevation of said adjustable cutting end and its adjusting-means the same being shown in elevated position while its lowered position is indicated by dotted lines. Fig. 4 is a longitudinal sectional view of the scoop when it is being drawn forward to the dumping place by pull of the forward-draft cable. Fig. 5 is a similar view showing the scoop in the act of dumping under pull of the rearward-draft cable, the tail-gate of the scoop being withdrawn by the same cable. Fig. 6 is a similar view showing the scoop being drawn rearward in an upside down condition. Fig. 7 is a detail perspective view of another form of tail-gate. Fig. 8 is a detail longitudinal section of the rear portion of

the scoop or scraper when equipped with the tail-gate of Fig. 7. Fig. 9 is a similar view showing the scoop, of Fig. 8, in the act of dumping. Fig. 10 is a similar view showing said scoop in its overturned position as when being drawn rearward. Figs. 11 to 16 inclusive are diagrammatic views showing various arrangements of the cable system, Fig. 11 being in perspective and the remaining views being in plan.

Referring to Fig. 1, it will be observed that a car carrying the engine and drums for controlling the cables is shown disposed at one side of the embankment site, while the scoop or scraper with its cutting end facing the embankment is disposed at the opposite side; and the sheave or pulley upon which the rearward-draft cable reverses its direction is located behind the scoop, or on the river side when the embankment under construction is a levee.

The numerals 1 and 2 indicate respectively the forward-draft and rearward-draft cables, wound upon and controlled by the power-operated drums 3 and 4, which drums may be of any suitable type and may be provided with the usual friction-brakes, and foot-brakes. The drums together with their operating motor or engine 5 are shown mounted upon a car 6. The said cables pass from the drums over guide-pulleys 7 on a boom 8 carried by the car, so as to permit adjustment of the cables according to the varying height of the embankment; suitable means being provided for raising and lowering the boom, as the wire rope or cable 9 wound upon a controlling drum or windlass 10. Passing over the embankment, the forward-draft cable 1 leads directly to the scoop or scraper 12, while the rearward-draft cable 2 runs beyond to a suitably anchored sheave or pulley, 11, from whence it passes in a reverse direction to the scoop.

Both cables are connected to the scoop or scraper by means of bails, 13 and 14, and at such points that the rearward-draft cable 2 will obviate any tendency of the scoop to overturn forward, but can be operated to overturn the scoop backward and draw it rearward in an upside down position. The relative locations of the bail-connections are illustrated as being both forward of the center of the scoop or at or near its front; the bail 13 being pivoted near the bottom and the bail 14 near the top.

The scoop or scraper 12 is an open-topped receptacle having a removable or displaceable tail-gate and an adjustable front cutting end. Said cutting end is formed by what may be considered a hinged or pivoted extension 15 of the scoop-bottom, having preferably a front knife-edge and provided with upstanding side extensions or flanks 16 which embrace and are adjustably connected to the sides of the scoop. The cutting end can thereby be held either in a lowered or depressed position as in Fig. 2 so as to enter the ground for filling the scoop, or in an elevated position as shown in Fig. 4 to enable the scoop to ride freely over the ground. To accomplish these results the side of the scoop is provided with holes or apertures 17 and 18 either of which is adapted to receive a removable pin 19 which is passed through a hole in the adjacent flank 16. The said pin and holes are shown duplicated at the opposite sides of the scoop, but it would be sufficient to provide them at one side only. By inserting the pin 19 through the forward hole 18 the cutting end is fixed in its depressed position; by inserting the pin in the rear hole 17 the cutting end is secured in its raised position. Other adjusting means and other means of securing the cutting end in position are of course within the scope of the invention. The flanks 16 of the cutting end or hinged front extension 15 are guided and limited in their pivotal movements, and the strain upon the pins 19 and upon the hinges or pivots of said front extension are relieved, by headed pins or studs 20 projecting from the sides of the scoop and engaging in segmental slots 21 in the flanks. A lever 22, separate from the machine, is provided for easy and convenient adjustment of the cutting end. Said lever is adapted for quick attachment to or detachment from said cutting end, for which purpose it is shown having a forked end adapted to engage a brace of headed studs or pins 23 on either of the flanks 16. The lever when affixed thus provides a detachable handle for rocking the cutting end up and down. (See Fig. 3.)

The scoop in Figs. 2 to 6 inclusive has a removable tail-gate 24 adapted to be withdrawn by the pull of the rearward-draft cable in the act of dumping the scoop. Suitable means is provided for holding said tail-gate in position during the forward travel of the scoop; as, for example, the guide-stop or notches 25 in the upper flanges of the sides of the scoop and guide-pins 26 in the bottom. The tail-gate is connected by a rope 27 to the rearward-draft cable 2. The scoop may be rearwardly provided with lateral sockets 28 adapted to receive removable handles.

The operation of the apparatus as hereinbefore described is as follows: In starting the scoop, its cutting end is depressed and secured in that position, as shown in Fig. 2. The drum 3 now being actuated to wind the cable 1, and the cable 2 being simultaneously unwound, the scoop is pulled forward or toward the embankment, its cutting end entering the ground, and the earth is thereby gathered into the scoop. When the scoop is full, its cutting end is raised and locked by means of the pins 19, or one

of them, and thereby the further progress or transportation of the scoop to the dumping place is unimpeded by removal of its cutting end from possible engagement with the ground; it being observed that the inclination of the cutting end in its raised position will cause the scoop as readily to ride over obstructions as to be carried forward over soft soil to the dumping place. When the scoop reaches the dumping place, the motions of the drums are reversed, and the pull of the rearward-draft cable 2 tilts up the scoop on its rear end as a fulcrum, and at the same time withdraws the tail-gate 24 as shown in Fig. 5, whereby the load is either partially or entirely dumped; and the scoop being finally overturned by continued pull of the rearward-draft cable, thus fully discharging its load, is drawn back in its inverted condition to the starting place. The backward tilting and overturning of the scoop is facilitated by teeth 29 projecting from its rear end. At the place of loading, a reversal of motion of the cables is again utilized for overturning the scoop forward to bring it to its proper position. It will be observed that the backward overturning of the scoop is effected by the connection of the rearward-draft bail 14 to the front part of the scoop; and that owing to the relative arrangement of the pivotal connections of the two bails the scoop when being filled and drawn forward can be prevented from tilting or overturning forward by the restraining effect of the rearward-draft cable. It will also be observed that by virtue of the relative arrangement of the bails they do not interfere with one another during the various evolutions of the scoop, but readily make the transitions from the position shown in Figs. 2 and 4 to that shown in Fig. 6 and vice versa. If the ground being excavated is of such hardness as to require it, handles may be temporarily inserted in the sockets 28, whereby the desired inclination of the scoop to the ground can be readily maintained. In this event the handles would be removed subsequent to the filling of the scoop and preparatory to its run to the embankment site.

The other form of tail-gate 30 shown in Figs. 7 to 10 is hinged to the rear of the scoop bottom, which ends short of its sides, the gate being located in the space thus formed. The tail-gate has a rearwardly extending bottom-plate 31, which may terminate in teeth or fingers 32 as shown, and which, by contacting with the ground, holds the tail-gate in its upright position, or restrains its backward movement and retains the load in the scoop when the latter is traveling forward; while the forward swinging of the tail-gate is restrained by suitable stops such as the pins 33 in the sides of the scoop. The tail-gate proper and its bottom-plate 31 are shown connected by side flanges. The operation of this hinged tail-gate is as follows: During the forward run of the scoop the tail-gate as heretofore explained is held in the position shown in Fig. 8. When the rearward-draft cable is pulled to dump the scoop, the teeth 32 form a fulcrum on which the scoop tilts up backward, until it is brought to an approximately upright position whereupon the tail-gate swings down on its hinges and drops the scoop into the position shown in Fig. 9 and thus releases the load. When by continued pull of the rearward-draft cable the scoop is overturned the tail-gate drops down to the position shown in Fig. 10. The sudden dropping of the scoop into the position shown in Fig. 9, as the weight of the scoop and load in tilting backward passes behind the fulcrum of the tail-gate, produces a jar and loosens any material adhering to the surfaces of the scoop.

It will be noted that neither form of tail-gate impedes the return of the inverted scoop to the dumping place, since the removable tail-gate 24 will trail on the ground, and the hinged tail-gate in the position shown in Fig. 10 will yield and pass over the soil or any obstacle it might encounter as the scoop is hauled backward.

It may be stated in conclusion that the arrangement of the cable-system, its main power-station and out-stations for guiding the cables, may be various. Diagrams of several plans are shown in Figs. 11 to 16, illustrating the universality of application of the system. In these diagrammatic views x indicates the shore line of the river, and y the top of a levee under course of erection. a denotes the main power-station with engine and cable-operating drums, and b out-stations with sheaves for guiding the cables, the latter being designated by the numerals 1 and 2 and the scoop or bucket by the symbol 12 as in the preceding views. From Figs. 11 and 12 it will be observed how the power-station a can be placed at either side of the levee. Fig. 11 shows the cables running across the embankment from the engine on the land side to sheaves on the river side, which arrangement could of course be reversed and in either case the scoop could be operated at either side of the levee. Fig. 12 shows the engine on the river side and the cables running to two out-stations or around sheaves at opposite sides of the levee. This triangular arrangement would also allow the scoop to work on the land side or the power-station to be transported to that side. In these Figs. 11 and 12 the engine and drums are or may be carried by a car running on rails longitudinally of the levee; the guide-sheaves may also be adjustably secured to longitudinal rails or

beams, and thus the entire system can be transported along the river bank as the work progresses. Trestles may be used to elevate the cables as the levee goes up, said trestles in most instances being placed under the ropes on the side of the levee from the sheaves. Figs. 13 to 16 illustrate different plans of loading soil on and off a barge *d*. On the rear of the barge or on another boat is placed the engine and the cables are run to two sheaves on the bank as in Fig. 13; or the engine can be on shore and the sheaves on the rear of the barge as in Fig. 14, this more particularly for loading the barge; while a plan better adapted for unloading is to put engine on barge, one sheave on a tower *e* on the car *c*, and the other sheave on a front corner of the boat or on shore as illustrated in Figs. 15 and 16. It is thus possible to build a levee on shore taking the earth from a boat. In any of these arrangements, while the barge can be towed along the shore, the car on land carrying engine or tower, as the case may be, or the sheaves adjustably anchored to a rail as in Fig. 13, can be moved with the barge longitudinally thus allowing for shift of the system as the work progresses. The foregoing plans may of course be otherwise modified or extended.

While the invention has been described particularly in relation to excavation and the construction of earth embankments, it will be understood that it may be applied to other purposes. I desire also that it should be understood that instead of limiting myself to any specific embodiment I reserve the right to such modifications in detail and arrangement as may be within the spirit and scope of my invention, as set forth in the following claims:

I claim and desire to secure by Letters Patent:

1. In an apparatus of the character described, the combination with a scoop, of a forward-draft cable and a rearward-draft cable, each cable having attachment with the opposite sides of the scoop near its forward end, and means for winding and unwinding the cables, the rearward-draft cable being adapted to dump the scoop by overturning it backward.

2. In an apparatus of the character described, the combination with a scoop, of a forward-draft cable and a rearward-draft cable, each cable having attachment with the opposite sides of the scoop near its forward end, and means for winding and unwinding the cables, the forward-draft cable being adapted to carry the loaded scoop to a dumping place, and the rearward-draft cable being adapted to dump the scoop by overturning it backward and to return it to the loading place.

3. In an apparatus of the character described, the combination with a scoop, of oppositely operated cables running fore and aft and connected thereto for hauling the scoop in opposite directions, the cables being adapted to oppositely overturn the scoop, overturning in one direction dumping the scoop and overturning in the opposite direction returning the scoop to its normal position.

4. In an apparatus of the character described, the combination with a scoop, of bails pivoted to the scoop near one end, a forward-draft cable secured to one of the bails, a rearward draft cable secured to the other bail, and means for drawing either cable, the rearward-draft cable being adapted to dump the scoop by overturning it.

5. In excavating apparatus, the combination with a scoop or scraper of oppositely-operated cables arranged for hauling the scoop alternately in opposite directions and so connected thereto that the scoop is overturned backward for dumping by the rearward pull and returned to working position by the forward pull.

6. In an apparatus of the character described, the combination with a scoop, of a forward-draft cable and a rearward-draft cable connected to the scoop, power-controlled mechanism for operating the cables, and means variable in height to control the elevation of the scoop at the dumping place.

7. The combination with a tilting-dump receptacle, of a forward-draft cable and a dumping cable both connected to the receptacle, a tail-gate movably mounted in the receptacle, and means connecting the tail-gate to the dumping cable, the latter in dumping the receptacle removing the tail-gate from the path of the discharging load.

8. The combination with a scoop, of a cable for hauling it forward and a cable for hauling it backward, a tail-gate mounted in the scoop to be removable therefrom, and means connecting the tail-gate to the rearward-hauling cable, the latter being adapted to dump the scoop and remove the tail-gate therefrom and to return the scoop to its starting place.

9. The combination with a scoop, of a forward-draft cable and a rearward-draft cable, each connected to the scoop, the rearward-draft cable being adapted to overturn the scoop backward and to haul it rearward while in upside down position.

10. A scoop or scraper in combination with forward and rearward draft cables and attachments thereof to the sides of the forward portion of the scoop so arranged that by pull of the first cable the scoop is hauled forward while the restraining effect of the second cable prevents the scoop from tilting or overturning forward, and by pull of the

latter cable the scoop is overturned backward.

11. A scoop or scraper provided with independent forward and rearward-draft attachments both connected to the sides of the forward portion of the scoop and so arranged that by pull of the first attachment the scoop is hauled forward and by pull of the second attachment the scoop is dumped by tilting backward.

12. A scoop or scraper having a forward-draft bail and a rearward-draft bail, both pivotally-connected to the sides of the scoop forward of its center of gravity.

13. A scoop or scraper provided with a forward-draft bail and a rearward-draft bail each pivotally-connected independently to the scoop forward of its center of gravity and at opposite sides of a medial horizontal plane.

14. A scoop or scraper adapted to be overturned backward and provided with a forward-draft bail and a rearward-draft bail, each straddling the scoop and pivotally-connected to the forward portion of the sides of the scoop, the forward-draft bail being connected to the scoop near its bottom and the rearward-draft bail being connected thereto near its top, the front of the scoop when the latter is turned backward passing through the rearward-draft bail.

15. A scoop or scraper provided with a pair of independent draft-bails one connected thereto for drawing the scoop forward and the other connected thereto for dumping the scoop by tilting it backward.

16. A scoop or scraper adapted to be overturned backward and provided with a forward-draft bail and a rearward-draft bail each straddling the scoop and pivotally-connected to the sides of the forward portion thereof, the arrangement being such that as the scoop is overturned the bails will pass to inverse positions without interference.

17. A scoop or scraper adapted to dump by tilting backward and having projections to engage the ground and establish a fulcrum for the scoop in its tilting movement.

18. A scoop or scraper adapted to dump by tilting or being pulled backward and having a movable tail-gate adapted to retreat out of the path of the discharging load.

19. The combination with a scoop movable to and from a dumping place and adapted to be dumped by being overturned backward, of a tail-gate therefor adapted in the overturned position of the scoop to be non-rigid against pressure opposed to the return movement of the receptacle.

20. A scoop or scraper having a cutting plate hinged or pivoted to the bottom and adapted to be adjusted to an inclination above or below the plane of said bottom, the said plate having a side-extension or flank and means for securing the flank to the side of the scoop.

21. A scoop or scraper having a hinged bottom section forming a cutting end for the scoop, said cutting end having a side extension, means carried by the side extension and adapted to be temporarily engaged by a removable lever for the purpose of adjusting the cutting end, and means for holding the cutting end in its adjusted position.

22. A scoop or scraper having an adjustable front provided with a flank beside a side of the scoop, there being a pin and segmental slot connection between said side and flank.

23. A scoop or scraper having an adjustable cutting end provided with flanks embracing the sides of the scoop, there being pin and segmental slot connections between sides and flanks.

24. The combination with a scoop having a section pivoted to the bottom and forming a cutting end for the scoop, said pivoted end having side extensions or flanks, a plurality of lugs carried by a flank and forming a fulcrum and a power-applying point for a lever to be used in adjusting the cutting end, a pin-and-slot connection between the scoop and a flank, and means for holding the cutting end in an adjusted position.

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

CHARLES L. HOPKINS.

Witnesses:

AL. C. KAMMER,

S. E. GALIBER.