

(No Model.)

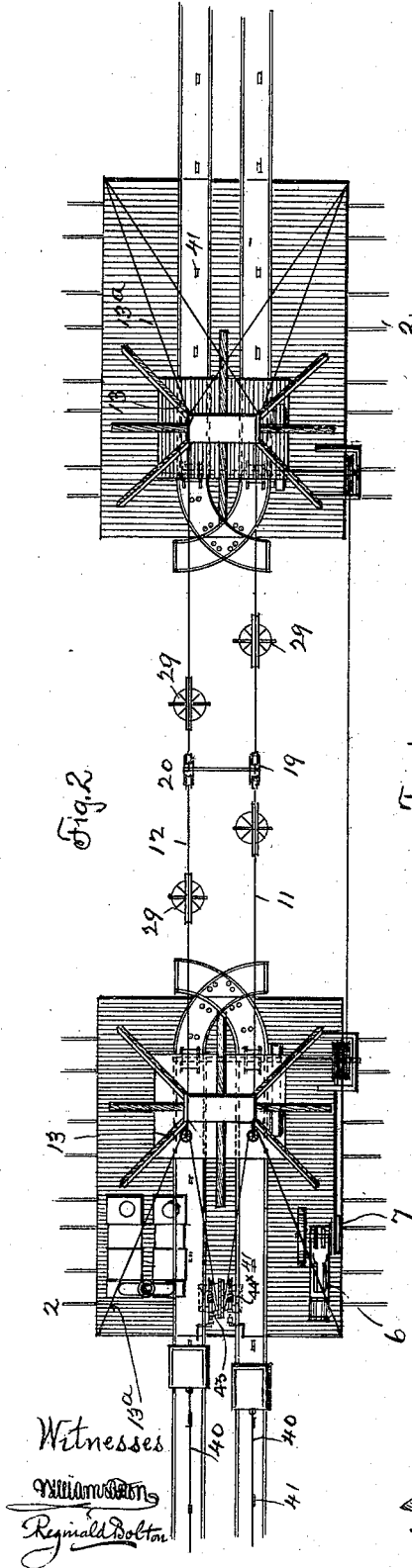
4 Sheets—Sheet 1.

J. H. LANCASTER.

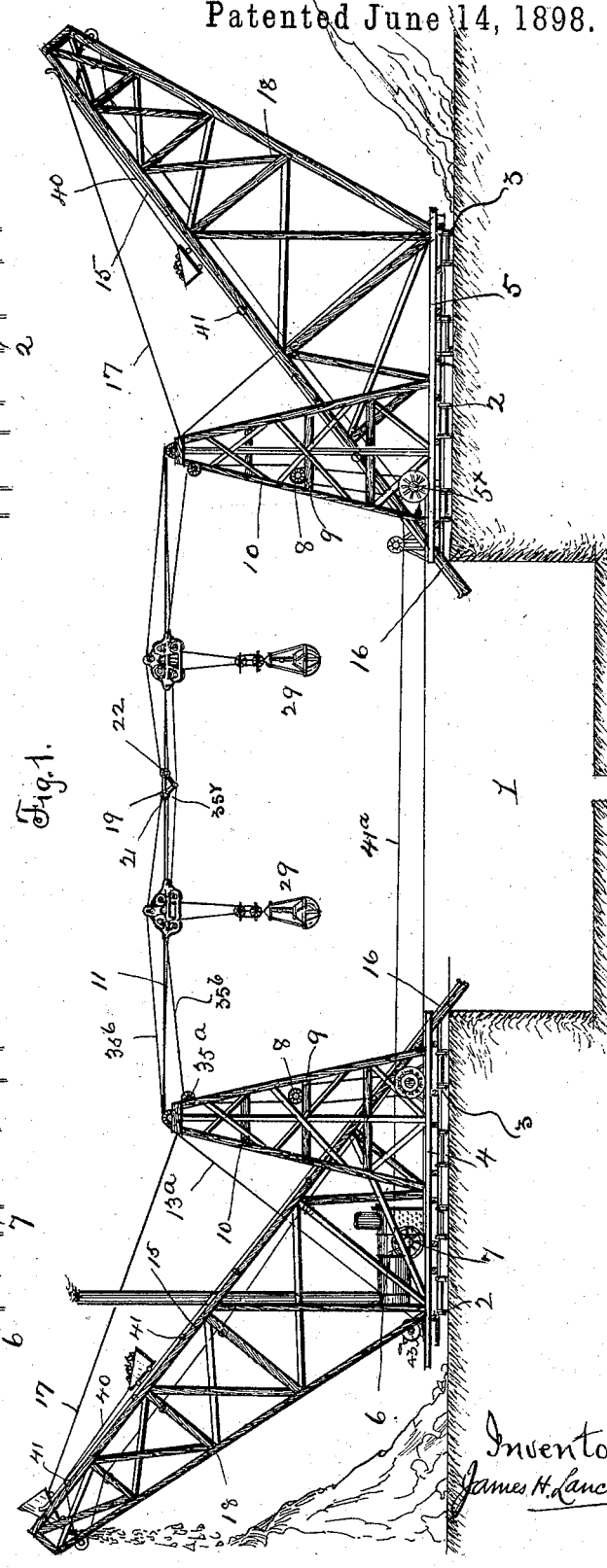
CABLEWAY SYSTEM AND APPARATUS FOR EXCAVATING AND CONVEYING.

No. 605,488.

Patented June 14, 1898.



Witnesses  
 William [Signature]  
 Reynold [Signature]



Inventor:  
 James H. Lancaster

(No Model.)

4 Sheets—Sheet 2.

J. H. LANCASTER.

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Fig 6.

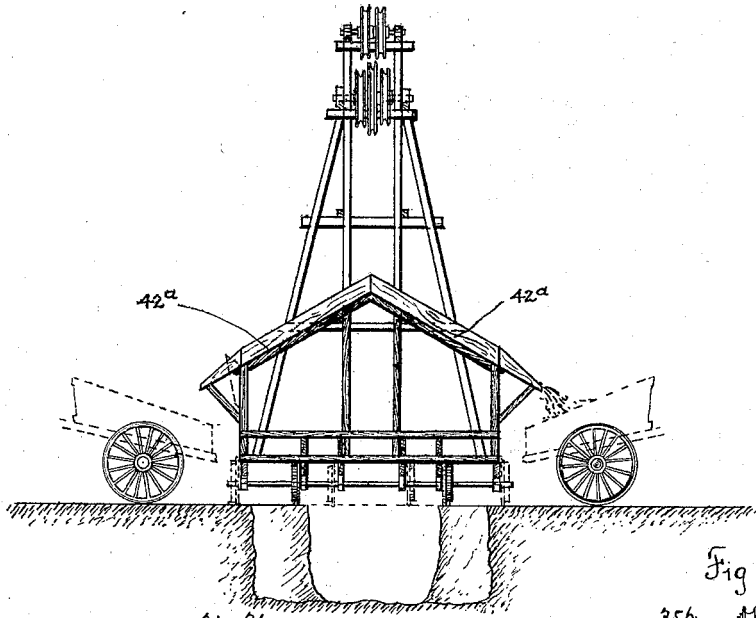


Fig 4.

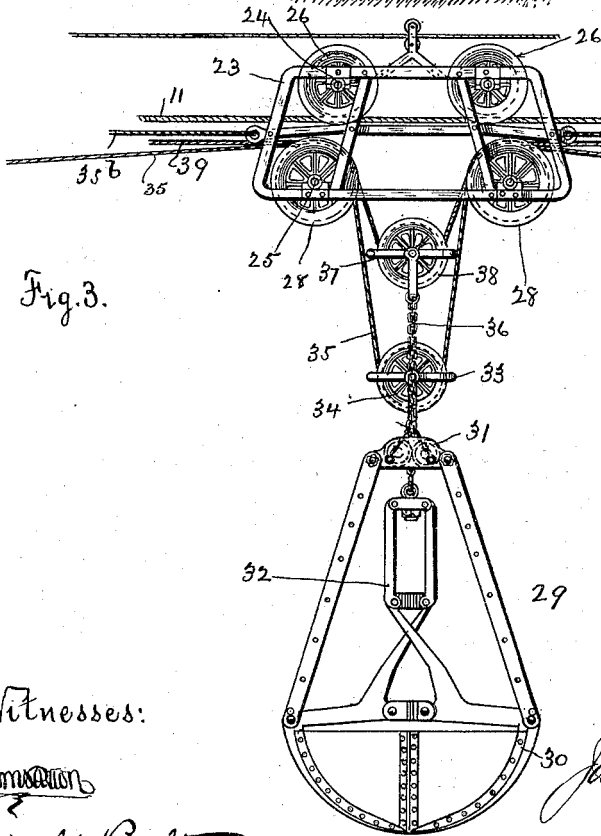
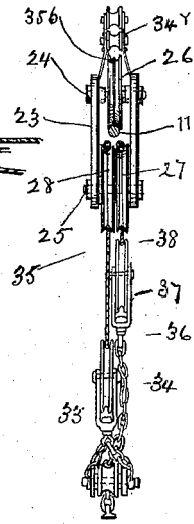


Fig. 3.

Witnesses:

*Williamson*  
*Reginald Bolton*

Inventor:

*James H. Lancaster.*

(No Model.)

4 Sheets—Sheet 3.

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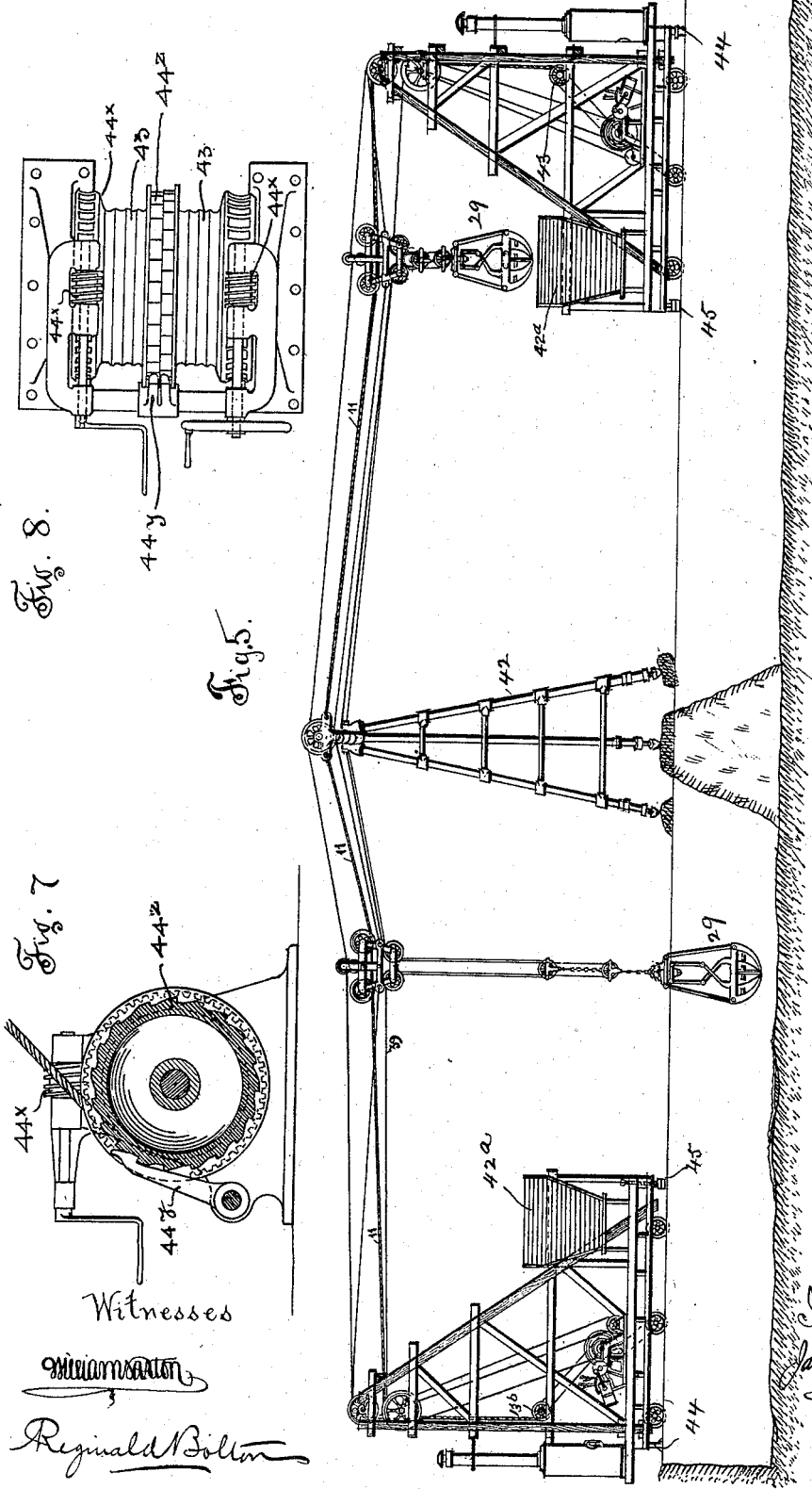


Fig. 8.

Fig. 5.

Fig. 7.

Witnesses  
*Reginald Bolton*

Inventor.  
*James H. Lancaster*

(No Model.)

4 Sheets—Sheet 4.

J. H. LANCASTER.

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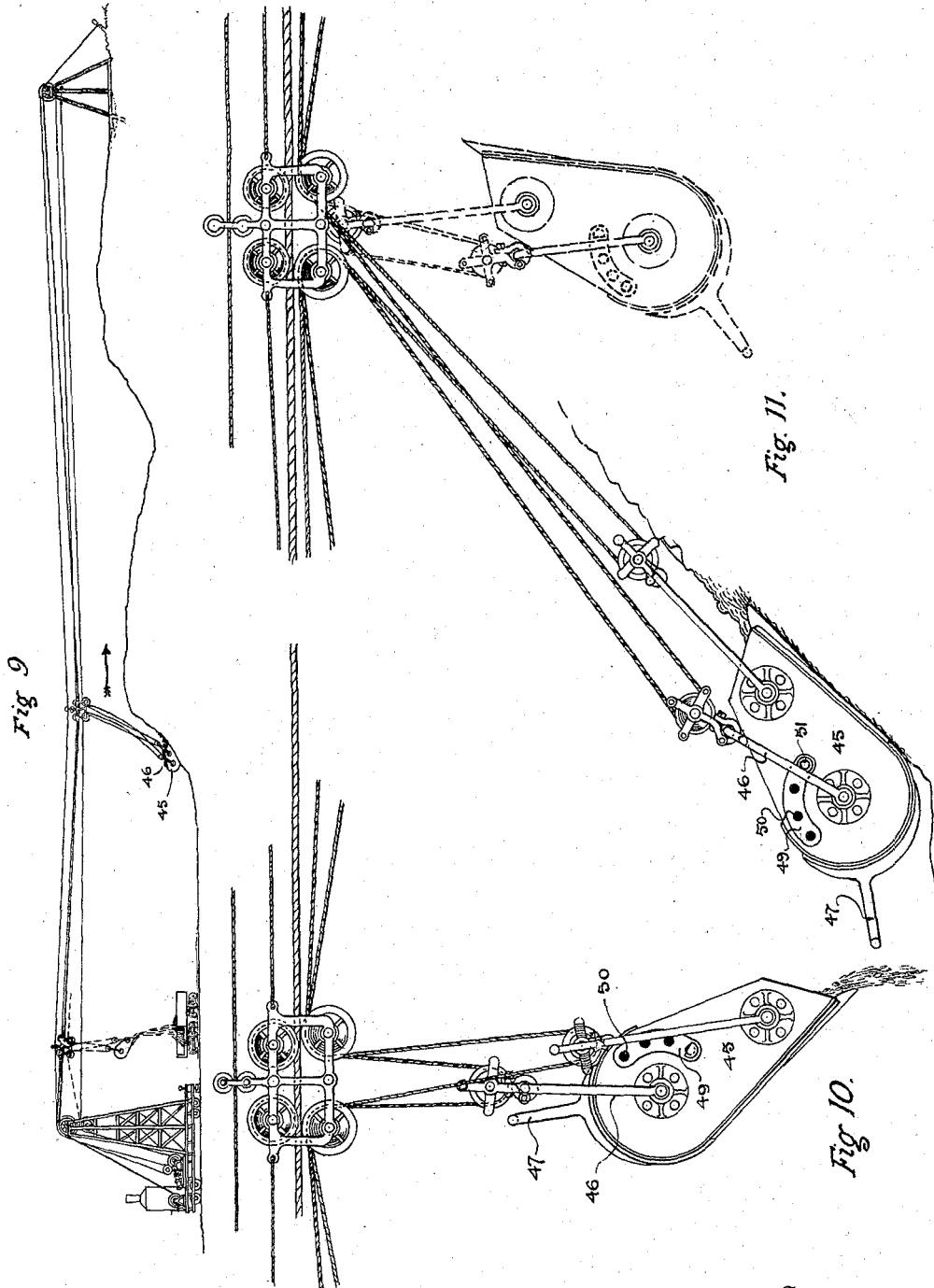


Fig. 9

Fig. 11.

Fig. 10.

Witnesses

*William ...*  
*Reginald Bolton*

Inventor

*James H. Lancaster*

# UNITED STATES PATENT OFFICE.

JAMES H. LANCASTER, OF NEW YORK, N. Y.

CABLEWAY SYSTEM AND APPARATUS FOR EXCAVATING AND CONVEYING.

SPECIFICATION forming part of Letters Patent No. 605,488, dated June 14, 1898.

Application filed February 14, 1895. Serial No. 538,461. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES H. LANCASTER, a citizen of the United States, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Cableway Systems and Apparatus for Excavating and Conveying, of which the following is a specification.

The present invention has reference to suspended cableways whereby either dredgers, diggers, grapples, shovels, or scoops and skips or tubs may be operated, and has for its principal objects the handling of minerals, products, and materials of all kinds and also to provide a novel, portable, and highly-efficient cableway system for controlling and operating one or more of the devices mentioned.

From the following detailed description it will be noted that I also provide means for operating a plurality of said devices under varying conditions, so that the work is not only continuously prosecuted, but the maximum degree of service can be obtained from a definite quantity of power expended.

In the drawings accompanying this specification, Figure 1 is a side view showing one form of my improved cableway system for operating a series of grapples, dredgers, and diggers. Fig. 2 is a plan view of the parts shown in Fig. 1. Figs. 3 and 4 are an enlarged side and end view, respectively, of one of the traveling carriers and its grapple. Figs. 5 and 6 show in side and end elevation an arrangement whereby the system can be employed in working longitudinally in digging a sewer or trench. Figs. 7 and 8 are a vertical sectional elevation and plan view, respectively, of the drum mechanism and worm-gear for tightening and holding the cables. Fig. 9 is a side elevation showing the adaptation of my improved system in connection with a shovel or scoop; and Figs. 10 and 11, enlarged side views of the shovel or scoop and its immediate connections, the shovel or scoop being represented in different working positions.

While I have in the drawings illustrated my improvements in connection with a system particularly adapted for use in connection with a plurality of grapples, dredgers, or diggers worked from both sides of or along the excavation or trench, it will be under-

stood that the generic improvements can be utilized with a single cableway and carrier, grapple, or similar device.

On opposite sides of the canal or trench 1 that is to be dug or from which the loosened material is to be removed I dispose parallel with the sides of the same a series of track-rails 2, upon which bear the supporting-wheels 3 of one of a pair of platform-trucks 4 5.

As has been stated, the system disclosed in several figures of the drawings is intended for the operation of grapples from each side of the canal or trench, and it is therefore necessary to provide each truck structure with power to control and operate the grapples worked from the same. The desired power can be in the form of a distinct motor on each truck; but the arrangement illustrated will generally answer all purposes and give highly satisfactory results. Thus on the platform of the truck 4 is mounted an engine 6, from the band-wheel 7 of which is transmitted by suitable belt-gearing the power necessary to drive a friction hoisting apparatus 8, located on an elevated platform 9. This latter platform, as shown, is sustained by a vertical framework composed in part by upwardly-converging timbers 10, at the top of which bear a pair of cableways 11 12, the terminal portions of which are provided with loops or eyes 13, engaged by downwardly-inclined guys or stays 13<sup>a</sup>, anchored to the platform or other fixed part of the general truck structure. By reference to Fig. 2 it will be seen that the guys or stays on the structure of the truck 5 are so arranged that they cross each other to connect with the eyes of both cableways, and thus impart added strength and rigidity to the same in their adjusted positions. Drums may, however, be used for receiving one of the ends of the cable-guys or the cables themselves for lengthening and shortening the span, as shown, on the structure of the truck 4, Fig. 2 and in detail Figs. 7 and 8. Each truck structure 4 5, Figs. 1 and 2, is further provided with an upwardly and outwardly inclined way 15, the lower extremity 16 of which terminates at that side of the truck-platform contiguous to the side of the canal or trench, the other projecting part of said way 15 being extended considerably beyond and above said truck structure and sus-

tained and braced relative to the same by means of guy-ropes 17, attached to the top of said structure, and also by an under truss-frame 18. The cableways 11 12, as shown most clearly in Fig. 1, extend transversely across the canal or trench to be dug, and each is preferably in two sections connected together by means of a central clamp frame or frames 19 20, pulleys 21 22 operating in connection with the two oppositely-working grapples of each cableway-span.

As the arrangement of carriage and grapple is the same in each instance, it will only be necessary to describe one in order to understand all. At this point it may be stated that I employ what is known as a "double-chain" grapple, a type which I have improved to a considerable extent and which may generally be explained as an arrangement in which one chain is employed to cause the opening or closing of the blade or digging sections of the grapple, while a second chain effects the elevation, suspension, or lowering of said grapple, a third cable being operated to cause the grapple to travel back and forth with the carriage on the cableway.

The construction and arrangement of the carrier, grapple, and operating-chains or wire ropes is more clearly disclosed in Figs. 3 and 4, from an inspection of which it will be observed that each carrier comprises a pair of castings 23, constituting side frames and having provision for upper and lower bearings, in which are mounted pins 24 25, upon the upper of which loosely turn traveling wheels 26, while each lower pin carries pulleys 27 and 28.

The grapple 29 is so constructed that its pivoted blade or digging sections 30 are resuspended from a circular head 31, said sections through the medium of a lever system 32 being designed to be closed or opened by moving relative to said head and suspending means.

As the detailed construction of said grapple forms the subject-matter of a separate application for Letters Patent, Serial No. 515,200, filed June 20, 1894, it will not be necessary to herein describe the same at length. It is sufficient, however, to state that the head 31 is connected to the saddle or frame 33, suspending the sheave 34, engaged by the hoisting or lowering chain 35, which passes around the lower pulleys 27 at one side of the carriage, and is thence led, respectively, to the central frame or block 19 20, to which it is positively connected, and around one of a series of pulleys 35<sup>a</sup>, suspended on the upper part of the truck-frame, from which it descends to one of the drums of the friction hoisting mechanism.

The general features of the hoisting-machine are also disclosed in a separate application for Letters Patent, Serial No. 541,348, filed March 11, 1895, in which latter case it is described prominently as comprising a pair of loosely-mounted drums taking the closing and

elevating chains, respectively, and so mechanically operated that the drum controlling the closing-chain will be first thrown into engagement with the driving parts, and thereafter the drum actuating the elevating-chain correspondingly affected. The hoisting mechanism in the present case is, however, equipped with a third or conveying drum, which is under the complete management of the attendant and is adapted to be thrown into and out of operation with the power means, so as to control a third chain or cable 35<sup>b</sup>, which makes several turns around the third drum or bull-wheel and has one of its portions led over one of the bearing-pulleys at the top of the structure and secured to its carriage-frame, while the other part is similarly guided from said structure, and it then passes through a pulley-bracket 34<sup>v</sup> in the top of the carrier and thence around one of the pulleys 21 of the central clamp-frame 19 and is returned and finally connected to its carriage-frame.

To understand the operation of the two chains employed for closing the grapple and for elevating it while so closed, the lever system 32 of the grapple is connected by a short length 36 of chain with an upper saddle 37, carrying a sheave 38, around which passes the chain or cable 39, designed to first close the jaws or blades of the grapple and thereafter, in conjunction with the chain or cable 35, lift said grapple, the chain or cable 39 being guided over the other side pair of lower carriage-pulleys and connected with the central clamp-frame and with the drum provided therefor. Therefore in the present arrangement, after the closing of the grapple and its elevation to the carriage, the third drum revolves to pull on one part of the cable 35<sup>b</sup> and pay out the other portion, thus effecting a compensation of the same and causing the carriage to travel back and forth on the cableway. Of course at such point of the operation the closing and elevating chains have become practically rigid, so that the carriage merely moves along the same.

The result of what has been described is that in the arrangement illustrated a dual system of carriers, chains, and grapples is provided in which the grapples are adapted to work from the center of the canal-trench back to the truck structures and discharge into suitable receiving and conveying cars which travel upward on track-rails of the inclined way and dump their contents when they reach the top of the same.

The motive means for moving the cars is provided in the form of cables 40, each of which passes centrally along one of the inclined ways, around suitable rollers 41, and at the point where the cars are dumped is deflected so as to engage one of the driving portions of the prime motor. The cars descend by gravity.

The reversal of the hoisting driving means occasions the reversal of the rotation of the drums, so that the carrier is first retracted to

a position suitable for the descent of the grapple, after which the elevating and closing chains are paid out and the grapple permitted to descend to repeat the operation.

5 The triple-drum hoisting mechanism will be duplicated on each truck structure, the necessary power to actuate the same being transmitted from the engine on the truck 4 to a large power-sheave 5<sup>x</sup> on the truck 5 by means of a belt-cable 41<sup>a</sup>, which extends transversely across the canal or trench. Thus while a separate operator can be employed for the triple-drum hoisting mechanism on each truck structure it will not be necessary to provide an engine for each. Each cableway therefore has a pair of carriages and grapples, each of which travels to and from its truck under the independent control of its attendant. It will thus be understood that while the triple-drum hoisting mechanism on both truck structures can, if desired, be driven by the same prime motor either can operate independent of the other, or they can be manually controlled to cause the simultaneous movement of one grapple into position as the other moves out.

While I have described a duplex system of cableways, it will be obvious that many advantages will be attendant upon an arrangement employing but a single cableway, carriage, and grapple, or additional cables and grapples may be used, in which event the carriage-operating cable will pass around a pulley secured to a standard or other stationary part.

As it is extremely important to employ the duplex system in connection with canal work or deep trenching, it is necessary that the operators controlling the respective mechanisms should be located or be in a position to see and follow the grapples throughout their entire movements. This each operator is readily enabled to do by virtue of his elevated position, which permits him to readily witness the movements and working of the grapples and also while they travel toward and from his side of the excavation. The operation of the carriers and their grapples can thus be continuously conducted, and all conditions considered it will be very easy to extend the period of work by the aid of electric lights.

In Figs. 5 and 6 I have shown the system embodying my improvements as being portably arranged to enable the carriers and grapples to work longitudinally in digging the sewer or trench. This portable construction includes means for tightening or loosening the cable-span and a central support or tripod 42 to intermediately sustain the same.

60 While in Fig. 5 I have shown two carriers and grapples working to and from the central supports, it will be obvious that the truck structure and operating means at one end of the cable-span can be omitted and the cable can be simply suitably supported at one end, so as to permit the grapple-carrier to work back and forth throughout the length of the same

under the power exerted by the single operating apparatus at one end of the cable-span.

In the construction illustrated in the last two figures the material raised is disposed of by being discharged into diverging chutes 42<sup>a</sup>, so that said material can be received by carts at either side of the sewer.

75 Instead of anchoring the cable way or ways to the truck structure, as shown in Fig. 5, each after passing over the top bearing-roller may connect with a drum 43, actuated through the medium of worm-gear 44<sup>x</sup>, (see Figs. 7 and 8,) preferably operated by hand, although it may be actuated from the engine. Such an arrangement provides for cableways of any desired length or span or of any desired degree of tension or rigidity. The drum (or drums 43 if two cables are used) can be locked to hold the cable in the adjusted position by a pawl 44<sup>y</sup>, designed to engage a ratchet-wheel 44<sup>z</sup>, carried by the drum.

To secure the truck structures against the inward pulling power or strain exerted by the cableways and weight carried thereby, the said structures are clamped at their outer sides, as indicated at 44, while the inner portions of the same are braced or blocked by lower jacks 45. Each truck structure is preferably provided with a double bottom, by which it can be adjustably balanced or additionally weighted by pig-iron or other suitable ballast.

Where the street or thoroughfare is too narrow to admit of the side delivery to carts, a structure, together with its operating means, straddles the trench or sewer and is centrally located, so as to work in connection with oppositely-extending cable-spans and their supporting-trestles, from the extremities of which the material is dumped into longitudinally-disposed chutes carried by adjustably-projecting structures and sheave-frames.

In Figs. 9, 10, and 11 I have shown my improved cableway system as adapted for use in connection with a shovel or scoop 45, which may be shaped as represented or otherwise, as may be deemed desirable, and be provided at its rear portion with a pivoted bail 46, to which one of the sheave-saddles is attached. The other saddle is connected by a bail 46<sup>a</sup> to the shovel at a point that will enable it to hold the same either horizontal with its forward portion uppermost or inverted. When the shovel is to be filled, the cables passing around the sheaves of the saddles are so adjusted as to hold the shovel horizontally in a position to penetrate the material. The drum of the operating mechanism moving the carriage back and forth on the cableway is then rotated to cause said carriage to move in the direction indicated by the arrow, Fig. 9, to an extent sufficient to drag the shovel into the material and cause it to become filled therewith, the attendant guiding and steadying the shovel by means of handle 47. The drum controlling the saddle connected with the forward part of the shovel is next actu-

ated to upwardly swing the shovel on the pivot presented by its bail connection 46, so as to retain its load for conveyance to the desired point of discharge along the cableway-span. Both drums rotate in unison to elevate the shovel to the required height while in such load-retaining position, after which the carriage-cable is operated to effect the travel of the carriage with the suspended shovel to the point of discharge, at which time the drum controlling the saddle attached to the forward part of the shovel is reversed to pay out its cable, thereby permitting said shovel to tilt on its bail-pivot to the position shown in Fig. 10, so as to discharge its contents to the ground or into trucks 48. The carrier, with the suspended shovel, is then moved back to a point above the material to be conveyed and the motion of the drums regulated to permit the descent of the shovel in a horizontal position. Opposite arc-shaped plates 49 are secured on the side of the shovel or scoop and are each provided with a series of perforations 50, registering with corresponding perforations in the other plate. In the corresponding perforations on the opposite plates pins 51 are inserted to form stops for the bail 46 to control and regulate the horizontal position of the shovel or scoop. The plurality of perforations admits of the adjustability of the stops. It will therefore be seen that I can operate a tilting shovel or scoop in connection with my cableway system as readily and in the same manner as grapples, dredgers, diggers, &c. The interchangeability of excavating or digging appliances in connection with my improved system will be obvious.

It is manifest that the general arrangement of suspended cableway, carrier, and operating means can be utilized in removing and transporting material from one point and delivering it at another.

The axles of the wheels supporting the trucks are capable of extension or contraction, so as to adapt the trucks for tracks of different gages, and also to permit the straddling of the excavations or trenches over which the truck travels.

In sewer or trench work one or more of the earth-removing means can be utilized to replace the earth while others are digging the same.

I claim—

1. The combination with a carriage or frame on a cableway, of an attached cable 35<sup>b</sup>, operated by a driving wheel or drum to cause the carriage to travel back and forth, together with a second cable suspending a grapple or equivalent and guided through the carriage, said second cable being positively held at one end of the cableway-span, extending to the other end thereof and connected with operating means, substantially as set forth.

2. The carriage or frame on a cableway and adapted to travel back and forth thereon under the action of the driven cable 35<sup>b</sup>, in com-

bination with a pair of cables in operative relation with a grapple or equivalent for respectively closing and elevating the same, said pair of cables being positively held at one end of the span, and winding mechanism for either independently or conjointly operating the cables of said pair, substantially as set forth.

3. The combination with a suspended cableway, of a carriage or frame adapted to travel thereon, means for positively moving said carriage or frame back and forth, a grapple having sheaves connected with its head and blade-sections, and closing and elevating chains or cables passing around the respective sheaves and guided through the carriage, and positively held at one end, substantially as set forth.

4. A carriage or carrier comprising side frames, upper rollers and lower pairs of pulleys, a cableway upon which the upper rollers bear and travel, in combination with a double-chain digging or excavating device having the sheaves as described, and the closing and raising cables of which, are guided through the longitudinal pairs of lower pulleys and positively secured at one end, together with means for operating said closing and raising cables, and the carriage-operating cable, substantially as set forth.

5. The combination with a cableway, of a carrier or frame adapted to travel thereon, a cable for moving the same and connected at one end thereto, passing around a fixed bearing-pulley, then through a top guide of said carriage, next around a suitable operating-drum and finally again connected to the carriage; together with a second cable positively held beyond the carriage at one side thereof, passing through guides in said carriage and suspending and operating a grapple, substantially as set forth.

6. In operating apparatus for grapples, grabs, dredges and the like, the combination with an elevated cableway, of a carrier having rollers and pulleys as described, the former bearing on the cableway, a grapple or dredge having closing and raising sheaves and chains, closing and raising cables, and a cable 35<sup>b</sup>, for positively moving the carrier back and forth on the cableway, substantially as set forth.

7. In a system for operating a grapple upon a suspended cableway, the combination with the carrier having the pulleys, of the closing and elevating cables positively held at one end and guided through said pulleys and engaging the closing and elevating sheaves, the frames of which are connected by chains to the grapple, substantially as set forth.

8. In an excavating, hoisting and conveying apparatus, the combination of two movable truck structures 4 and 5, cableway 11, load-carriage thereon, and a grapple, together with means controlled from one of the truck structures for shifting the load-carriage to, and closing or opening and cables or chains posi-



tively held at one end for elevating or lowering the grapple, at any point of the cableway, substantially as set forth.

9. In an excavating, hoisting and conveying apparatus, the combination of two movable truck structures 4, and 5, cableway 11, load-carriage thereon and its propelling-cable 35<sup>b</sup>, means for actuating said cable, together with a grapple having closing and opening and elevating and lowering chains or cables positively held at one end to permit the charging and discharging and vertical movements of the grapple at any point along the cableway, said operating-cables being guided through the load-carriage to actuating mechanism on one of the truck structures, substantially as set forth.

10. In an excavating, hoisting and conveying apparatus, the combination of two movable structures 4 and 5, cableway 11, load-carriage thereon and having upper rollers and lower pairs of pulleys, propelling-cable 35<sup>b</sup>, means for actuating the same, together with a grapple or dredge having closing and raising sheaves and chains, and closing and opening and elevating and lowering chains or cables positively held at one end and passing around the respective sheaves, guided by the lower pairs of the carriage-pulleys, and led to one of the truck structures whereby the several movements of the grapples may be controlled from said structure to work the grapple at any point along the cableway, substantially as set forth.

11. In a system for operating a grapple upon a suspended cableway, the combination with the carrier having the supporting-rollers and lower pairs of guide-pulleys, of the cable for positively moving the carrier back and forth on the cableway, together with a grapple and cables for respectively closing and elevating the same, each of said cables passing over a front and rear guide-pulley and led oppositely along the cableway-span, substantially as set forth.

12. The combination with the carriage or frame on a cableway, of an attached cable 35<sup>b</sup>, passing around a pulley secured to the cableway, and operated by a driving wheel or drum to cause the carriage to travel back and forth, together with a second cable suspending a grapple or equivalent and guided through the carriage, said second cable being positively held beyond and at one side of the carriage

and extending to the other side thereof and connected with operating means, substantially as set forth.

13. In a system for operating grapples, upon a suspended cableway-span, the combination with a pair of carriers mounted on the same, a pair of pulleys secured intermediately thereof, a grapple suspended from each carrier by operating chains or cables positively held contiguous to said intermediate pulleys and guided in each carrier, and distinct carrier-moving cables connected to their respective carriers and passing around said pulleys, substantially as set forth.

14. In a system for operating grapples upon a suspended cableway-span, the combination with a pair of grapple-carriers and grapples, and their suspending and operating chains or cables positively held at one end and guided through their carriers, of carrier-operating cables and actuating mechanism adapted to move one carrier into, as the other is passed out of position, substantially as set forth.

15. In a suspended cableway system for operating grapples, the combination with a pair of truck structures between which the cableway is extended; of primary grapple-operating mechanism located on a truck structure and geared by a belt or cable transmission to similar mechanism on the second truck structure, together with a plurality of carriers on said cableway and from which the grapples are suspended, substantially as set forth.

16. The combination with a carrier on the suspended cableway, of a grapple, and a truck structure having a conveying way or chute for the material discharged from the grapple, and provided with carrier and grapple operating mechanism controlling cables adapted to raise and hold the grapple in relation to the carrier irrespective of the movement or position of the latter, and operate the grapple at any point of the cableway-span, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 29th day of December, 1894.

JAMES H. LANCASTER.

Witnesses:

WILLIAM PAXTON,  
REGINALD BOLTON.