J. L. POTTER.

EXCAVATING AND CONVEYING APPARATUS.

APPLICATION FILED OCT. 25, 1909.

970,750.

Patented Sept. 20, 1910.

5 SHEETS—SHEET 1.

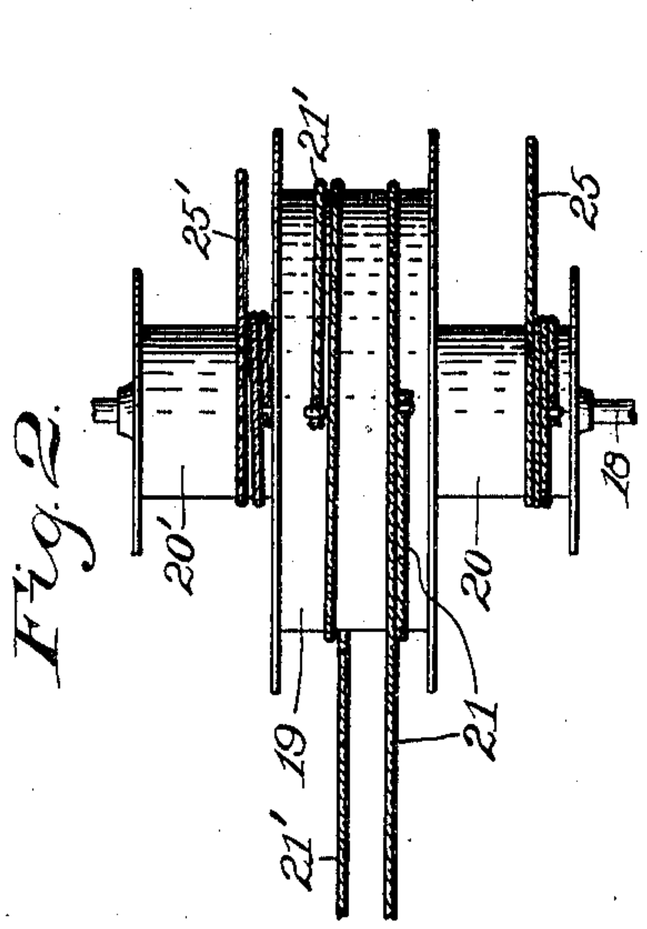


Fig. 2.

Fig. 1.

Fig. 3.

WITNESSES:

J. H. Gardner.

K. R. Woddell.

INVENTOR:

Joseph L. Potter,

BY

E. T. Silvius.

ATTORNEY.

J. L. POTTER.

EXCAVATING AND CONVEYING APPARATUS.

APPLICATION FILED OCT. 25, 1909.

970,750. Patented Sept. 20, 1910.

5 SHEETS—SHEET 2.

Fig. 4.

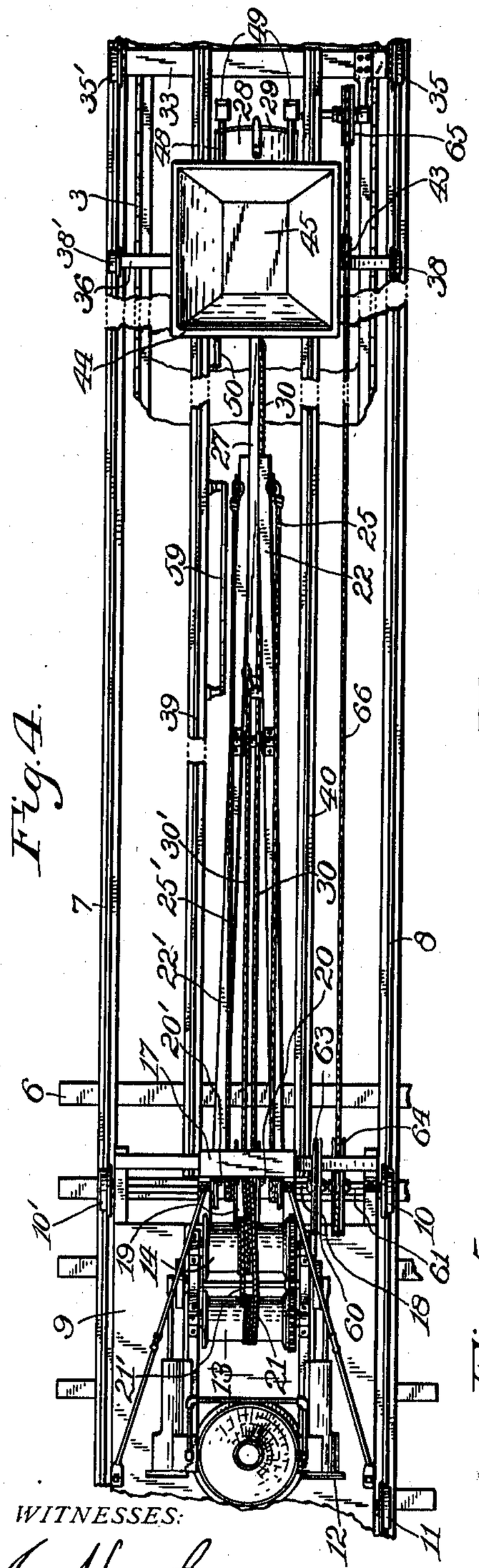


Fig. 7.

Fig. 8.

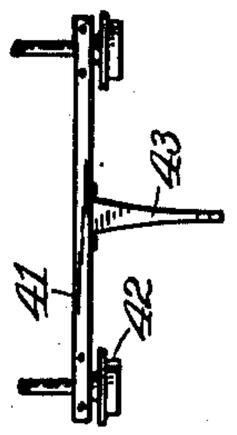


Fig. 6.

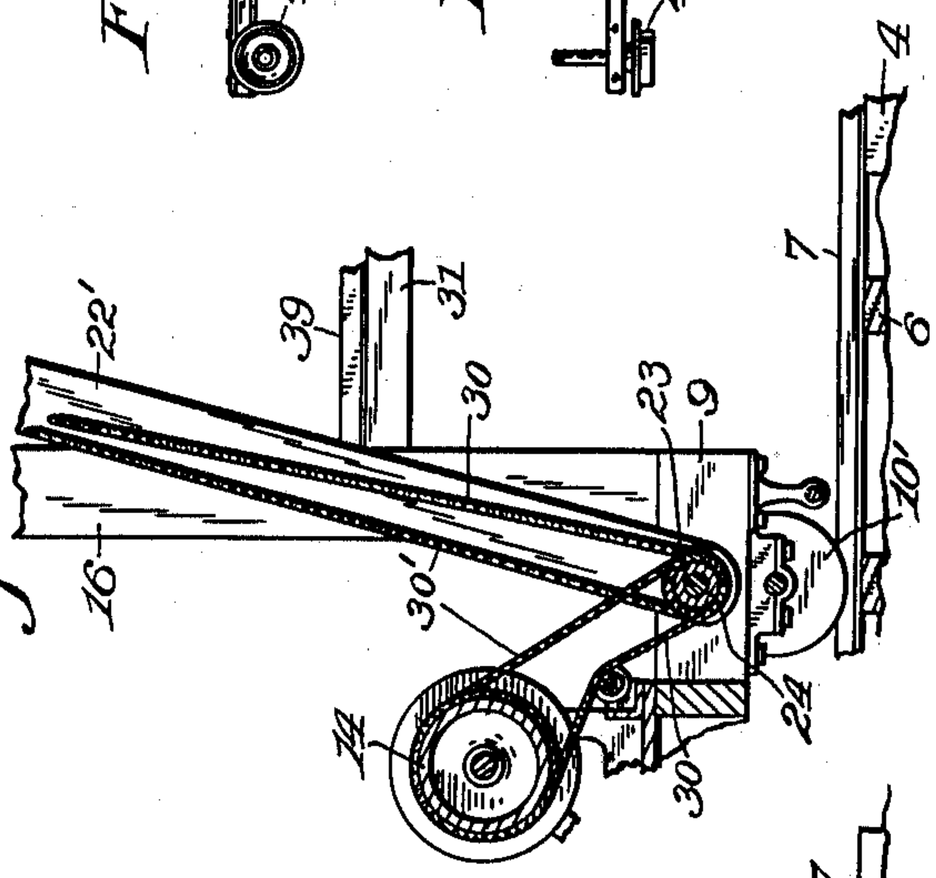
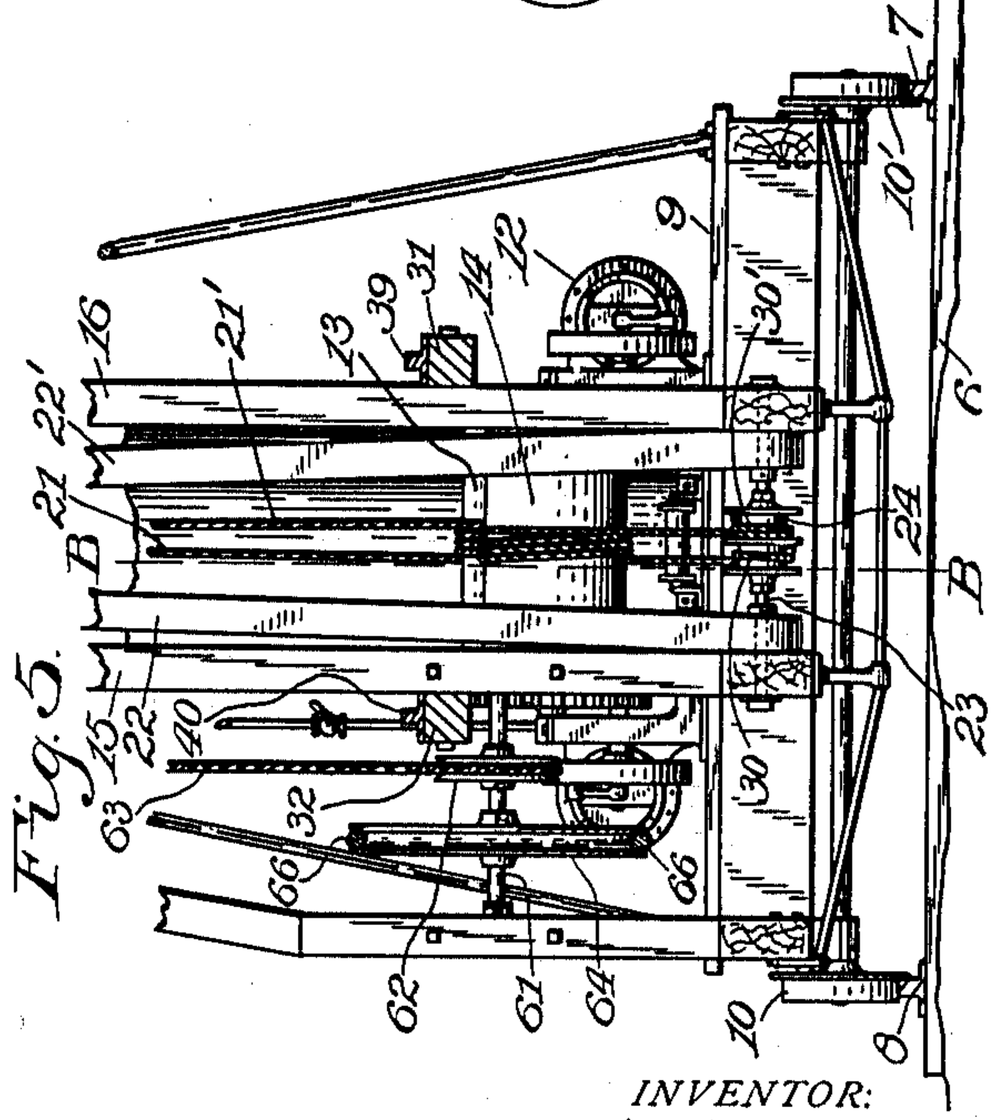


Fig. 5.



WITNESSES:

J. H. Gardner.

K. B. Woddell.

INVENTOR:

Joseph L. Potter,

BY

E. T. Silvius,

ATTORNEY.

J. L. POTTER.

EXCAVATING AND CONVEYING APPARATUS.

APPLICATION FILED OCT. 25, 1909.

970,750.

Patented Sept. 20, 1910.

5 SHEETS—SHEET 3.

Fig. 12.

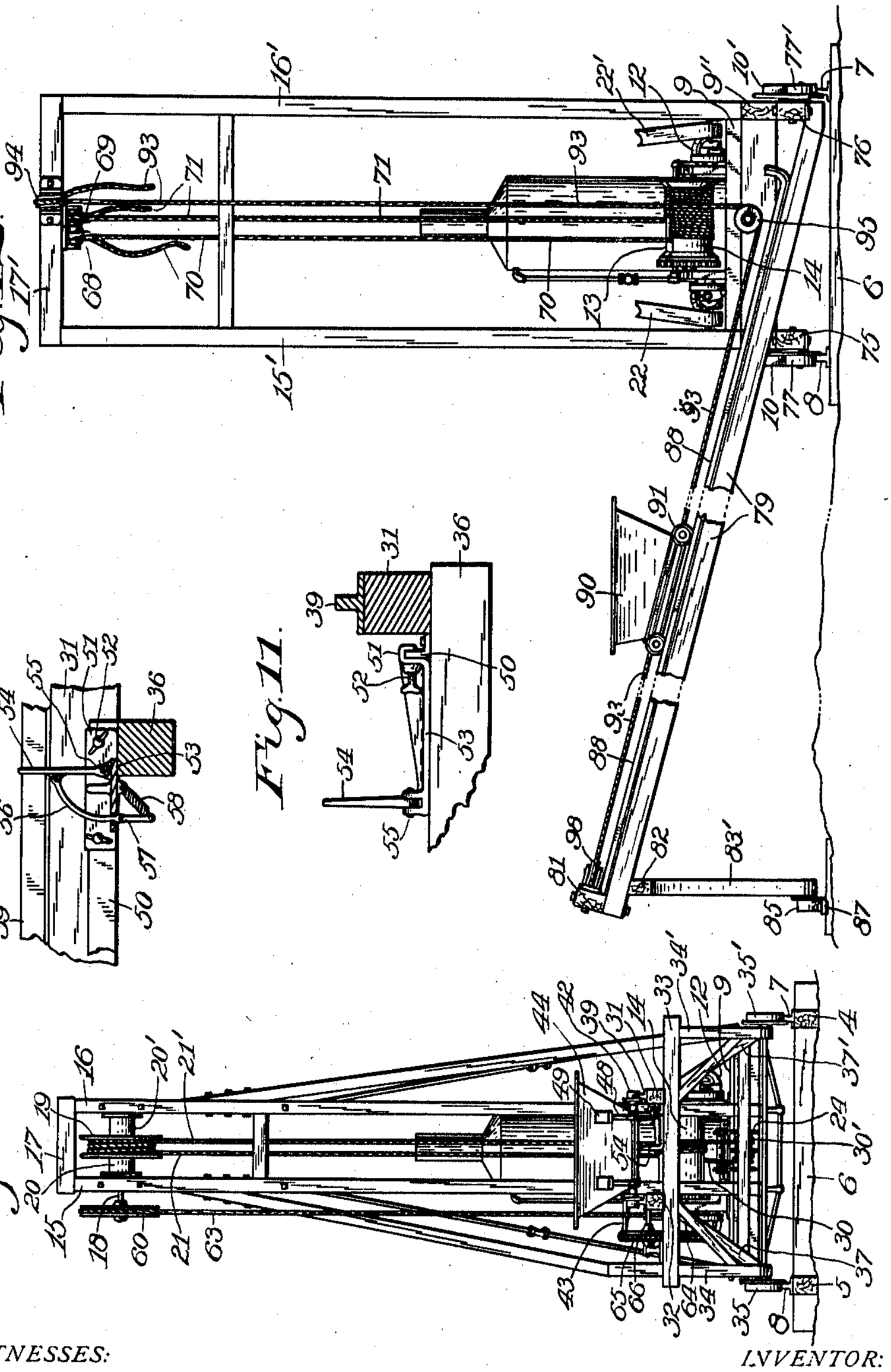


Fig. 10.

Fig. 11.

Fig. 9.

WITNESSES:

J. A. Gardner.

K. R. Woddell.

INVENTOR:

Joseph L. Potter,

BY

E. T. Silvius,

ATTORNEY.

J. L. POTTER.

EXCAVATING AND CONVEYING APPARATUS.

APPLICATION FILED OCT. 25, 1909.

970,750.

Patented Sept. 20, 1910.

5 SHEETS—SHEET 4.

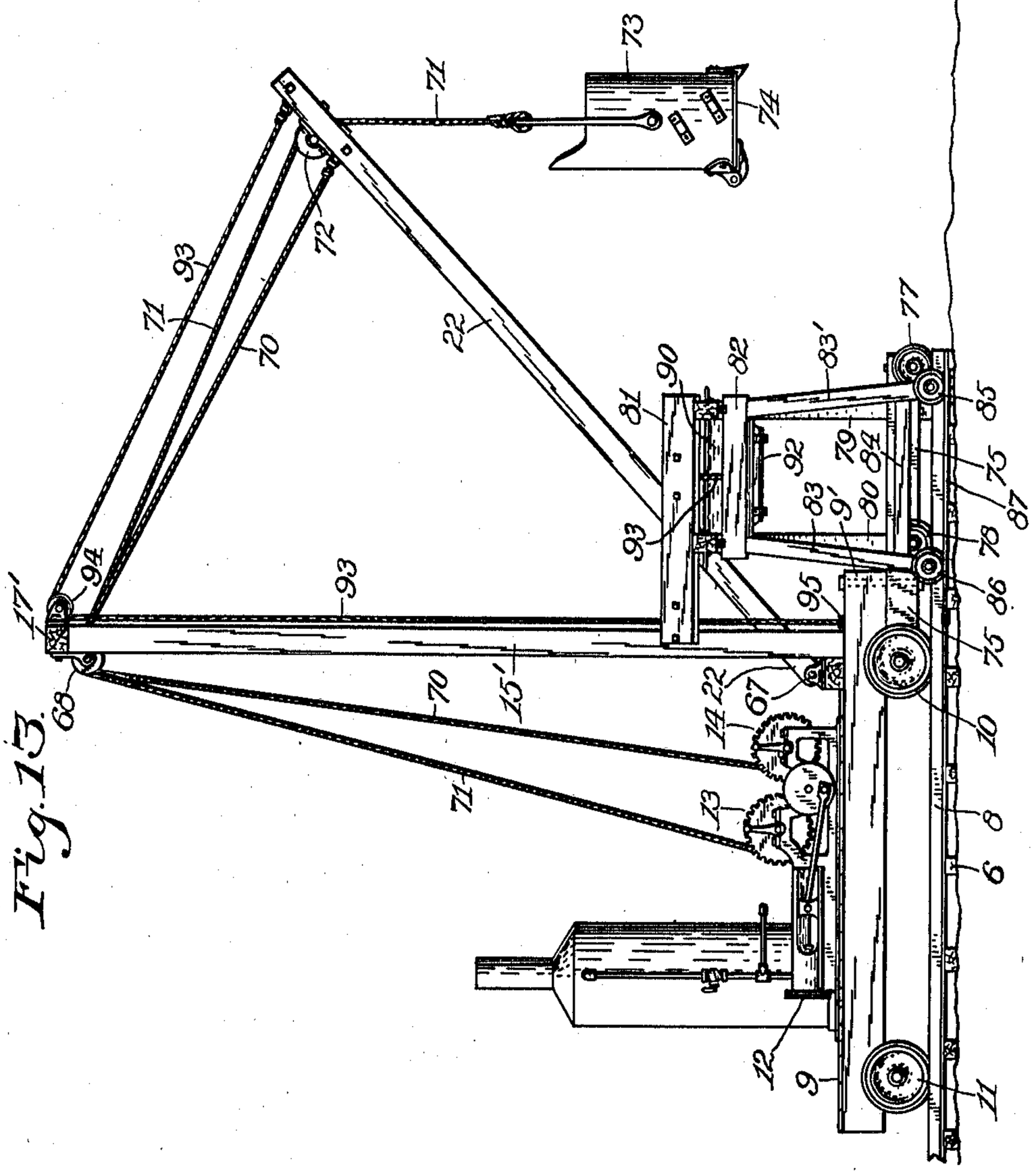


Fig. 13.

WITNESSES:

J. H. Gardner.

K. R. Woddell.

INVENTOR:

Joseph L. Potter,

BY

E. T. Silvius.

ATTORNEY.

J. L. POTTER.

EXCAVATING AND CONVEYING APPARATUS.

APPLICATION FILED OCT. 25, 1909.

970,750.

Patented Sept. 20, 1910.

5 SHEETS—SHEET 5.

Fig. 15.

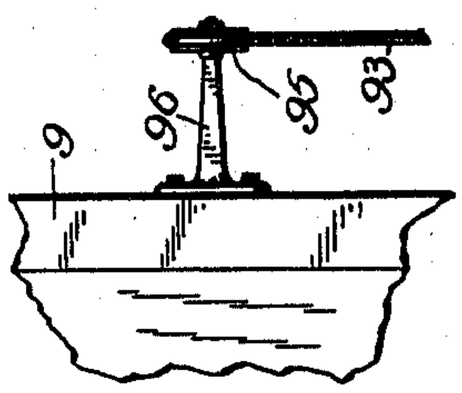


Fig. 16.

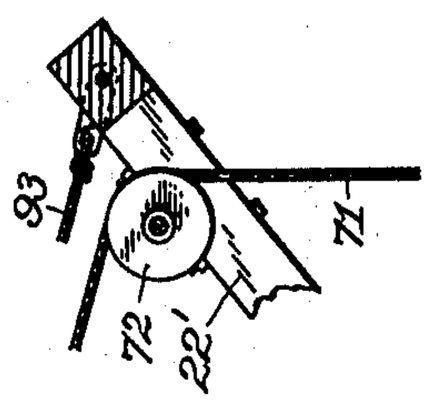
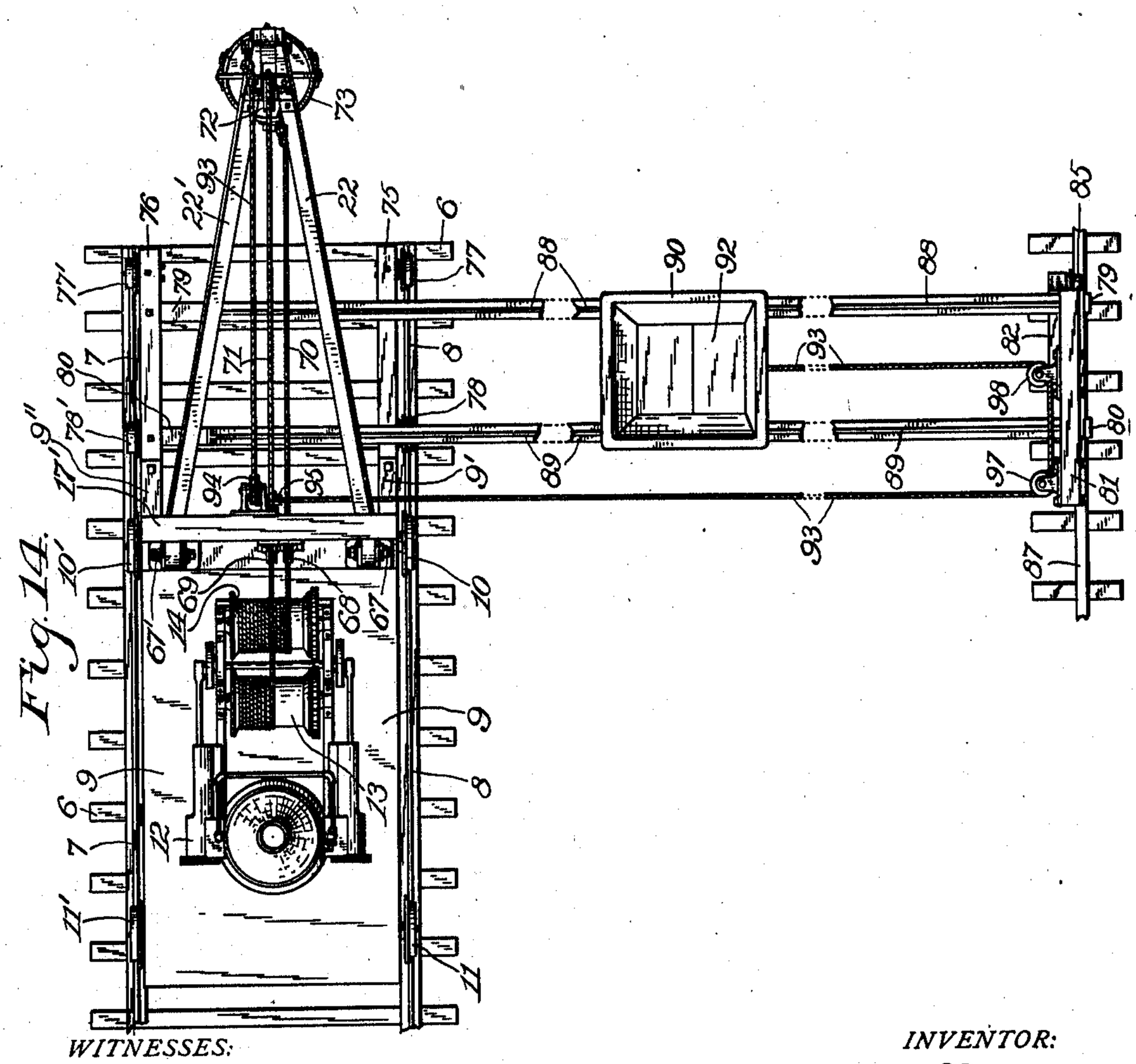


Fig. 14.



WITNESSES:

J. H. Gardner.

K. R. Woddell.

INVENTOR:

Joseph L. Potter,

BY

E. T. Silvius.

ATTORNEY.

UNITED STATES PATENT OFFICE.

JOSEPH L. POTTER, OF INDIANAPOLIS, INDIANA.

EXCAVATING AND CONVEYING APPARATUS.

970,750. Specification of Letters Patent. Patented Sept. 20, 1910.

Application filed October 25, 1909. Serial No. 524,459.

To all whom it may concern:

Be it known that I, JOSEPH L. POTTER, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Excavating and Conveying Apparatus; and I do declare the following to be a full, clear, and exact description of the invention, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to portable apparatus for excavating or for hoisting and for conveying that which may be hoisted away from the hoisting apparatus, the invention having reference more particularly to apparatus for digging trenches and conveying the earth removed in excavating either back into the trenches or elsewhere.

The object of the invention is to provide simple and compact apparatus for hoisting and conveying that will be capable of being operated by the least number of attendants possible in order to reduce the cost of operation to the minimum, another object being to provide improved hoisting and conveying apparatus that will be adapted to be variously modified in detail to suit different requirements in excavating along predetermined lines, as for trenches or the like.

The invention consists in movable hoisting apparatus comprising a car on which is mounted a derrick-crane and also an engine, a movable trestle, a conveying car mounted on the trestle and connections between the derrick-crane and the conveying-car for automatically controlling the movements of the conveying-car in harmony during operation with the hoisting apparatus, whereby the hoisted material may be automatically conveyed away and the conveying-car returned to be reloaded; and the invention consists further in the novel parts and combinations and arrangements of parts, as hereinafter particularly described and then defined in the appended claims.

Referring to the drawings, Figure 1 is a side elevation of the apparatus modified for sewer excavations, portions of the trestle being broken away; Fig. 2, a top plan of a speed-reducing drum preferably employed on the derrick-crane; Fig. 3, a fragmentary vertical longitudinal section of the trestle and conveying car showing apparatus for automatically dumping the load out of the car; Fig. 4, a top plan of the apparatus as shown in Fig. 1; Fig. 5, a fragmentary vertical section on the line A A in Fig. 1; Fig. 6, a fragmentary vertical section on the line B B in Fig. 5; Fig. 7, a side elevation of the frame of the conveying-car; Fig. 8, a fragmentary top plan of the frame of the conveying-car; Fig. 9, a front elevation of the apparatus as shown in Fig. 1 omitting parts of the hoisting apparatus; Figs. 10 and 11, fragmentary sectional details of the apparatus for automatically dumping the loads from the conveying-car; Fig. 12, a front elevation of the apparatus modified for conveying elsewhere than back to the excavation, as when digging trenches that are intended to remain open, parts of the hoisting apparatus being omitted; Fig. 13, a side elevation of the apparatus adapted to convey the hoisted material or earth to one side of the line of excavation; Fig. 14, a top plan of the apparatus as shown in the preceding figure; Fig. 15, a fragmentary plan showing a portion of the forward end of the engine car and a guide sheave mounted thereon; and Fig. 16, a fragmentary detail of the boom shown in Figs. 13 and 14.

In the different figures of the drawings corresponding reference characters indicate corresponding elements or features of construction herein referred to.

Referring specifically to the drawings, the numeral 1 indicates a section of the earth in which is a trench 2 having sheathing 3 as usual when relatively narrow excavations are made, there being stringers 4 and 5 on the surface of the earth adjacent to the excavation, and cross-ties 6 more remote from the excavation and supporting track-rails 7 and 8 on which the hoisting and conveying apparatus may be moved as the excavating operations proceed.

A car 9 having wheels 10 and 10′, 11, 11′, is provided and mounted on the rails, a suitable hoisting engine 12 being mounted on the car, the engine including two suitable hoisting drums 13 and 14. A derrick-crane is mounted also on the car and comprises two upright posts 15 and 16 on which is a tie-beam 17, the posts being suitably braced to constitute an upright frame and serve as a mast on the upper portion of which a shaft 18 is rotatably mounted. A speed-reducing drum is secured to the shaft and comprises a relatively large drum part 19 and two

drum parts 20 and 20′ that are relatively smaller in diameter, as preferably constructed, and in some cases one of the smaller drum parts may be dispensed with. Motion is given to the drum in one direction by means of a cable 21 that is partly wound about the drum part 19 and secured thereto and likewise connected to the drum 13, the speed-reducing drum being rotated in the opposite direction by means of a cable 21′ that is partially wound about the drum part 19 in the opposite direction, and likewise connected to the drum 13, and it will hereinafter become apparent that in some cases the cable 21′ may be dispensed with. It should be understood that a single cable wound a few times about the drum 13 and having its ends attached to the drum part 19 may serve the purpose of the two cables 21 and 21′, the use of the term "cables" being relative, and any equivalent thereof may be employed if desired for rotatively moving the speed-reducing drum positively or without slippage. The derrick-crane comprises also a boom which preferably consists of two spars 22 and 22′ suitably connected together and pivotally mounted on a shaft 23 which is supported in a suitable manner on the car 9 adjacent to the lower portion of the upright frame, a guide roller 24 being rotatably mounted also on the shaft, the shaft being horizontal and extending transversely of the car, so that the boom may move pivotally up or down in the plane in which the trench is to be made. Two cables 25 and 25′ are connected to the free end of the boom and are secured to the smaller drum parts 20 and 20′ to be wound thereon for raising the boom, one of the cables, however, permissibly being omitted if desired. The end portion of the boom supports a pivot rod 26 on which a bam 27 is mounted between its ends and between the two spars of the boom, one end of the beam having a suitable lifting device mounted thereon which preferably is a scoop or shovel 28 that preferably has a drop bottom 29, the arrangement being such that when the boom is lowered a scoop may be caused to drag against the earth and be filled on moving the boom upward. The beam 27 may be controlled by means of two cables 30 and 30′ that are connected to the beam at opposite sides of its pivot and extend about the guide roller 24 to the drum 14 to which they are suitably connected, or the two cables may be a single cable or rope wound a few times around the drum 14 to prevent slippage, the ends of the cables or rope being connected to the beam, as will be apparent, any suitable guides desired or required being provided for guiding the cable or cables, the arrangement being such that the position of the beam relatively to the boom may be controlled by the drum 14.

A movable trestle is provided that may be modified to suit requirements or conditions, and when the earth from the excavation is to be used to fill in the trench after building a sewer wall therein, the trestle extends longitudinally substantially from the derrick-crane along the line of the trench, the trestle being preferably connected to the engine-car and comprising stringers 31 and 32 supported on a transverse beam 33 which is provided with legs 34 and 34′ mounted on wheels 35 and 35′ respectively, the stringers having a suitable number of intermediate supports comprising each a beam 36 and legs 37 and 37′ mounted on wheels 38 and 38′, the wheels of the trestle being mounted on the track rails 7 and 8. A pair of track rails 39 and 40 are secured on the tops of the stringers 31 and 32 for guiding a conveying car which preferably comprises a frame 41 having wheels 42 that are mounted on the rails 39 and 40, the car frame being provided with a suitable lug 43. The car includes a body 44 provided with a drop bottom 45 which is supported on a hinge rod 46 and normally held in closed position by a spring-catch 47 with which the car body is provided. The hinged end of the door has an arm or arms 48 secured thereto, each arm having a weight 49 thereon for balancing the hinged bottom or closing the bottom after having been dropped by a load. In order to automatically release the spring-catch to permit the bottom 45 to drop, a guide bar 50 is fixedly supported on the trestle and adjustably supports a clamp 51 provided with binding screws 52, the clamp supporting a plate 53 on which a finger 54 is mounted by means of a hinge 55, the finger having a rod 56 thereon that is provided with a stop device adapted to engage the under side of the plate 53 to prevent movement of the finger away from upright position in one direction, the finger being movable in the opposite direction or toward the engine car, and a spring 58 is connected to the rod 56 and also to the plate 53 for normally holding the finger 54 in upright position in the path of the spring-catch 47, so that when the conveying car moves outward from the engine car to the desired position for delivering its load into the trench, the spring-catch will engage the finger 54 and be forced to release the drop bottom 45 which will swing down at a suitable angle to discharge the load. The spring-catch, of course, will slide over the finger 54 if the car advances sufficiently, and on return of the car the spring-catch will push the finger 54 out of its way and then the finger will be returned to its normal position by the spring 58. If from any cause the bottom is not swung up entirely to closed position by the counter weights, the door may be forced to close when brought into contact

with an inclined bar 59 that is suitably supported on the trestle, and it will be apparent that if desired such inclined bar may be placed in the desired position to effect the closing of the bottom, in which case the counter weights may be dispensed with.

While it is apparent that the trestle need not of necessity be horizontal it is preferably so constructed, and as will be seen the portion of the trestle adjacent to the derrick crane is open, so as to permit the boom and its lifting devices to operate between the two track rails of the trestle. In order to move the conveying car a relatively long distance, speed-increasing gearing is provided therefor comprising preferably a pulley 60 which is secured to the shaft 18, a shaft 61 being suitably mounted on the car 9, and a pulley 62 which is smaller in diameter than the pulley 60 is secured to the shaft 61 and connected by a belt 63 with the pulley 60. Another pulley 64 that is relatively larger in diameter than the pulley 62 is secured also to the shaft 61 or so mounted that it may be driven by the pulley 62. A guide pulley 65 is mounted on the end portion of the trestle and a cable 66 extends about the pulley 64 and the pulley 65 and is secured to the lug 43 of the conveying car, so that the car will be moved when the boom is moved, and the relative extent of movement of the conveying car may be predetermined by calculation to ascertain the required relative diameters of the pulleys 60, 62 and 64, which as will be seen increase the speed of the conveying car with respect to the speed at which the boom moves.

When it is desired to dig a trench that is to remain open the apparatus is slightly modified, preferably as illustrated in Figs. 12 to 16 inclusive in which the posts 15′ and 16′ are mounted on the engine car substantially as above described and have a cap beam 17′ secured to the upper parts thereof. The boom is mounted on the engine car by means of hinge rods 67 and 67′. A pair of guide-sheaves 68 and 69 are mounted on the beam 17′ and a cable 70 is connected to the end portion of the boom and runs over the sheave 68 to the drum 14 to which the cable is connected for raising or lowering the boom, and a cable 71 is connected to the drum 13 and runs over the sheave 69 and also over a sheave 72 that is mounted on the end portion of the boom, the cable 71 having a suitable lifting device on its end, such as a shovel bucket 73 having a drop bottom 74. The movable trestle comprises two sills 75 and 76 which are supported on the track rails 7 and 8 by means of wheels 77, 77′, 78, 78′, and two stringers or beams 79 and 80 are secured to the sills in inclined position in order to elevate the loads received from the hoisting device. The sills 75 and 76 are preferably connected to ends 9′ and 9″ of the sills of the engine car. The stringers or beams 79 and 80 have an end rail 81 mounted thereon and are supported at their outer ends by a beam 82 provided with supporting legs 83 and 83′ that are connected together by a rail 84 and supported on wheels 85 and 86 that rest on a temporary rail 87 on which the wheels may roll. A pair of track rails 88 and 89 are secured on the stringers 79 and 80 and support and guide a conveying car 90 provided with wheels 91 that run on the rails, the car having a suitable drop bottom 92. A cable 93 is connected to the outer end portion of the boom and runs over a guide sheave 94 that is mounted on the beam 17′, the cable extending thence downward and under a guide sheave 95 that is rotatable on a bracket 96 (Fig. 15) mounted on the engine car 9, the cable extending thence about two guide sheaves 97 and 98 that are mounted on the rail 81 and thence backward to the car 90 to which the cable is connected, so that when the boom moves downward the conveying car will be drawn outward by the connecting cable 93, and when the boom rises so as to slacken the cable it is evident that the conveying car will return down the sloping trestle by the force of gravity, and therefore the conveying car is automatically controlled in its movements by the moving hoisting apparatus.

It will be apparent from the foregoing that automatic dumping of the car 90 may be accomplished by various means such as above described, without requiring a repetition of the description of such appliances. It should be explained also that the movable trestle may be modified, so as to guide the conveying car in any desired direction other than those illustrated. And it will be apparent also that either specific form of trestle may be employed with either one of the specific forms of hoisting apparatus, and that various modifications in detail may be made within the scope of the accompanying claims.

In practical use the derrick-crane may be variously employed for loading the conveying car or for hoisting loads from the car, as will be apparent, and when employed in excavating operations the apparatus is moved along the track rails as the work proceeds, and it will be understood that the shoveling or scooping devices are designed to be drawn along the ground or in the trenches toward the engine car for filling them and then lifted by means of the engine drums and the derrick-crane to the required position above the trestle on which the conveying car will stand at the predetermined loading station to which the conveying car will advance during the upward movement of the boom; the load being then dumped into the conveying car.

after which the boom when released will descend by gravity force and draw the conveying car outward along the trestle to its discharging station or position, and it will be understood that when in some cases there may not be sufficient weight on the boom to enable it to move the conveying car outward with its load, the hoisting engine may cooperate to assist in moving the conveying car outward, suitable provision being made for this purpose as illustrated particularly in Figs. 1, 4, 5, and 9. In some cases the gravity force may be augmented by swinging the beam 27 toward or to horizontal position after dumping the load, so as to change the center of gravity of the boom by moving the weight represented by the scoop 28 away from the upright frame when the boom is nearly vertical, in order to overcome the friction of the gearing for increasing the relative travel of the conveying car when arranged to move a relatively long distance over the trench, so as to fill the trench with but one handling of the earth taken therefrom.

Having thus described the invention, what is claimed as new, is—

1. Hoisting and conveying apparatus including an engine-car, a hoisting-engine on the engine-car, an upright frame on the engine-car, a trestle extending from the engine-car, a horizontal pivot with a stationary axis on the engine-car in proximity to the adjacent end of the trestle, a boom mounted on the engine-car with its end movable upward above the adjacent end of the trestle, a rotative guide on the upper portion of the frame, a cable connected with the hoisting-engine and coöperating with the guide to move the boom, a conveying-car movable on the trestle, a guide-pulley on the engine-car in proximity to the pivot, a guide-pulley on the remote end portion of the trestle, a cable connected to the conveying car and extending about the guide-pulleys to the rotative guide, the cable being operatively connected with the hoisting engine and actuated thereby simultaneously with the movement of the boom, and a lifting device movably connected with the boom and guided thereby first toward and thence above the adjacent end of the trestle.

2. Excavating and conveying apparatus including an engine-car, a hoisting-engine on the engine car, an upright frame on the engine-car, a trestle extending from the engine-car, a boom pivotally supported on the engine-car in proximity to the trestle and the bottom of the frame with its free end movable upward above the adjacent end of the trestle in a vertical plane, a conveying-car movable on the trestle, a rotative guide on the upper portion of the frame, hoisting means connected operatively with the hoisting-engine and the boom and coöperating with the guide for moving the boom, a draft-cable connected to the conveying-car, and an excavating device connected movably with the boom and guided thereby toward and above the adjacent end of the trestle, with compound gearing mounted on the engine-car and having operative connection with the hoisting-engine and the boom and the draft-cable.

3. Excavating and conveying apparatus including an engine-car, a winding-drum and an upright frame on the engine-car, a trestle extending from the engine-car, a boom pivotally supported on the engine-car in proximity to the trestle and the bottom of the frame with its free end movable upward above the adjacent end of the trestle, a shaft mounted on the upper portion of the upright frame, a large drum mounted on the shaft, a cable connected with the winding-drum and the large drum for operating the drum, a relatively smaller drum on the shaft driven by the large drum, a cable connected to the smaller drum and also to the boom, a conveying car movable on the trestle, a gear pulley on the shaft and driven by the large drum, a rotative guide mounted on the engine-car in proximity to the bottom of the upright frame, a guide sheave on the remote portion of the trestle, power-transmission means having operative connection with the rotative guide and the sheave and connecting the conveying car with the gear pulley, and an excavating device guided by the boom.

4. Excavating and conveying apparatus including an engine-car, a winding-drum and an upright frame on the engine-car, a trestle extending from the engine-car, a boom pivotally supported on the engine-car, an excavating device guided by the boom, a shaft mounted rotatively on the upper portion of the upright frame, a hoisting cable operatively connected with the winding-drum and the boom, a cable-drum secured to the shaft and engaged by the cable for rotating the shaft, a gear wheel secured to the shaft, a countershaft mounted on the engine-car in proximity to the lower portion of the upright frame, a speed-increasing pulley on the countershaft, a sheave on the remote portion of the trestle, a conveying car movable on the trestle, a draft cable in contact with the sheave and connected with the conveying car and the speed-increasing pulley, and driving gearing connecting the gear wheel with the speed-increasing pulley for driving the draft cable faster than the hoisting cable.

5. In excavating and conveying apparatus, the combination of an engine-car, a winding-drum on the engine-car, a boom pivoted on the engine-car to move vertically, a trestle, and a conveying-car movable on

the trestle, with speed-reducing gearing mounted on the engine-car and connected with the winding-drum and the boom to move the boom, and speed-increasing gearing mounted on the engine-car and connected with the conveying-car and also operatively with the winding-drum and the boom, for moving the conveying-car relatively farther than the boom simultaneously with the movement of the winding-drum.

6. In excavating and conveying apparatus, the combination of an engine-car, a winding-drum on the engine-car, an upright frame on the engine-car, a boom pivotally supported on the engine-car, a hoisting cable operatively connected with the boom and the winding-drum, a trestle, a conveying car movable on the trestle, a speed-increasing pulley mounted rotatively on the engine-car at the lower portion of the upright frame, a relatively small wheel connected to the pulley, a sheave mounted on the trestle, a cable guided on the sheave and connected to the conveying car and with the pulley, and power-transmitting means operatively connecting the small wheel with the hoisting-cable.

7. In excavating and conveying apparatus, the combination of an engine-car, an upright frame and a winding-drum on the engine-car, a boom pivoted on the engine-car, a trestle, a sheave mounted on the trestle, a conveying car movable on the trestle, a drum-shaft mounted rotatively on the upper portion of the upright frame, a large drum and a relatively smaller drum and also a gear pulley secured to the drum-shaft, a cable connected with the winding-drum and the large drum, a cable connected with the boom and the small drum, a countershaft mounted on the lower portion of the upright frame, a large pulley and a relatively small pulley on the countershaft and connected together, a transmission belt connecting the small pulley with the gear pulley, and a cable in contact with the sheave and connected with the large pulley and the conveying car.

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

JOSEPH L. POTTER.

Witnesses:

HARRY D. PIERSON,

E. T. SILVIUS.