A. PICK.

PORTABLE DERRICK.

APPLICATION FILED MAY 26, 1915.

1,198,656.

Patented Sept. 19, 1916.

4 SHEETS—SHEET 1.

Fig. 1.

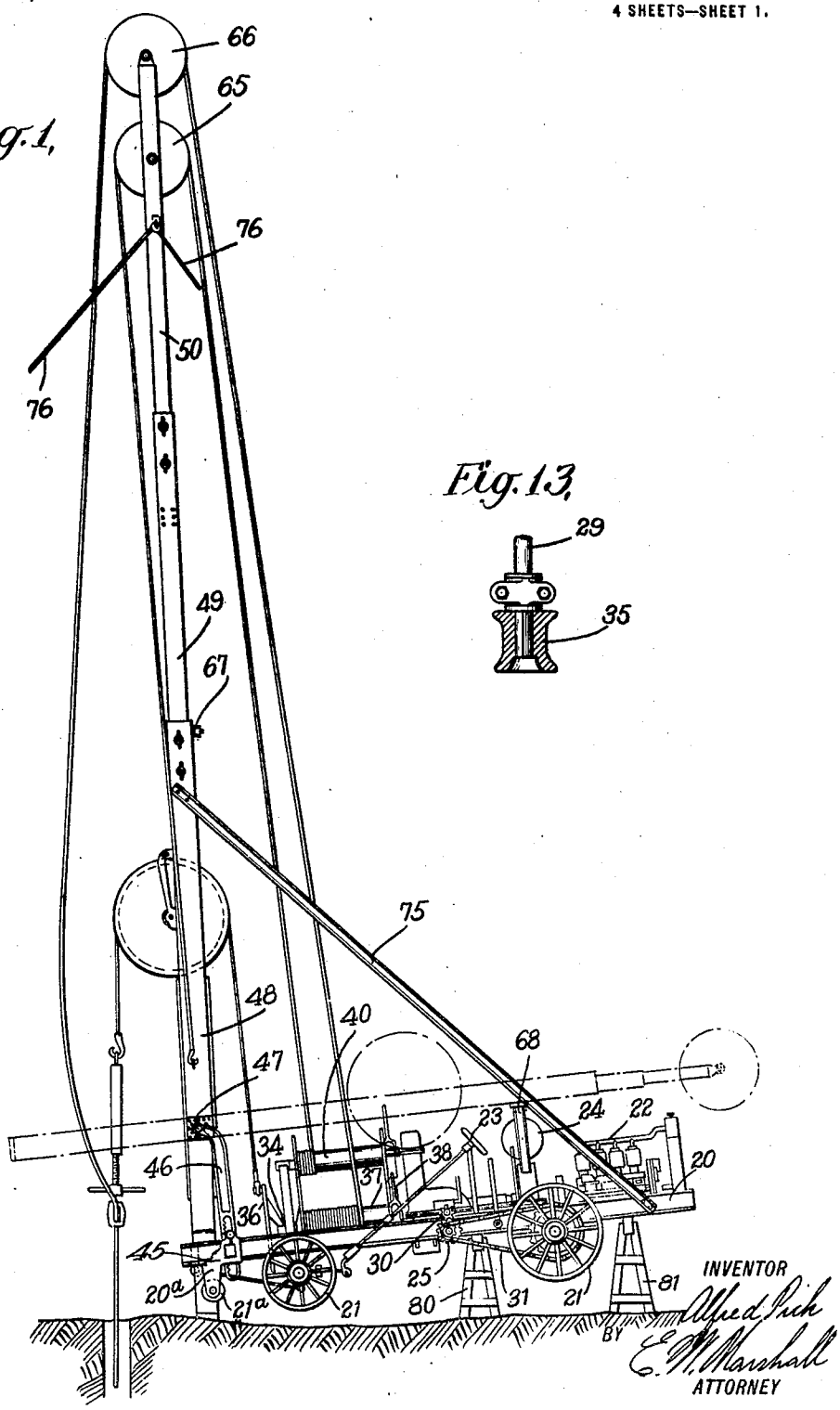


Fig. 13.

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4 SHEETS—SHEET 2.

Fig. 2.

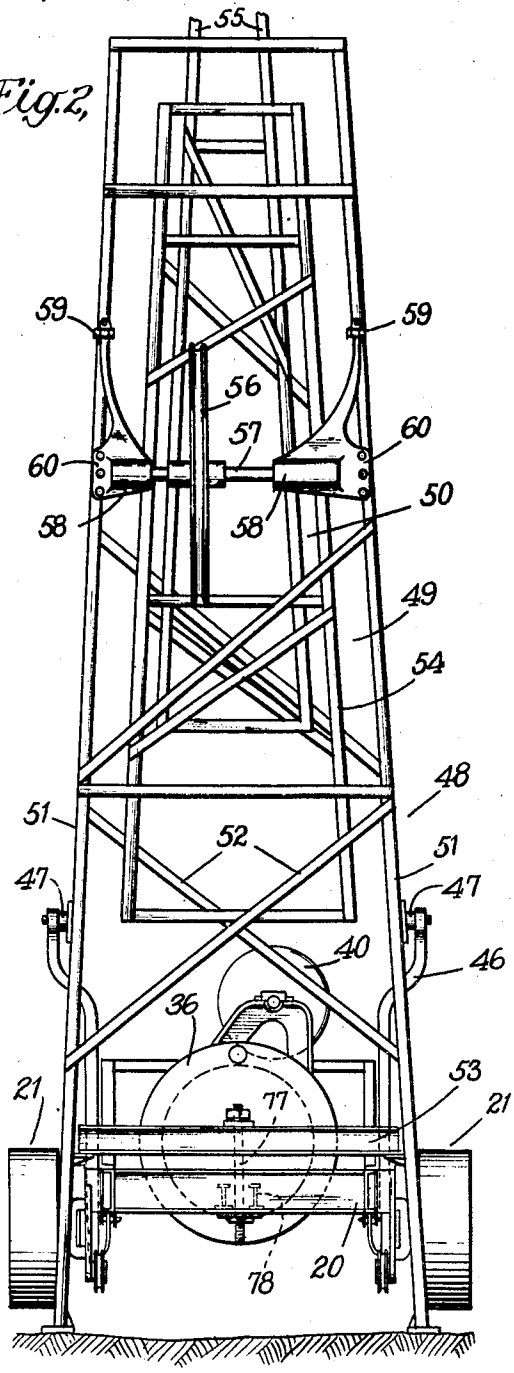
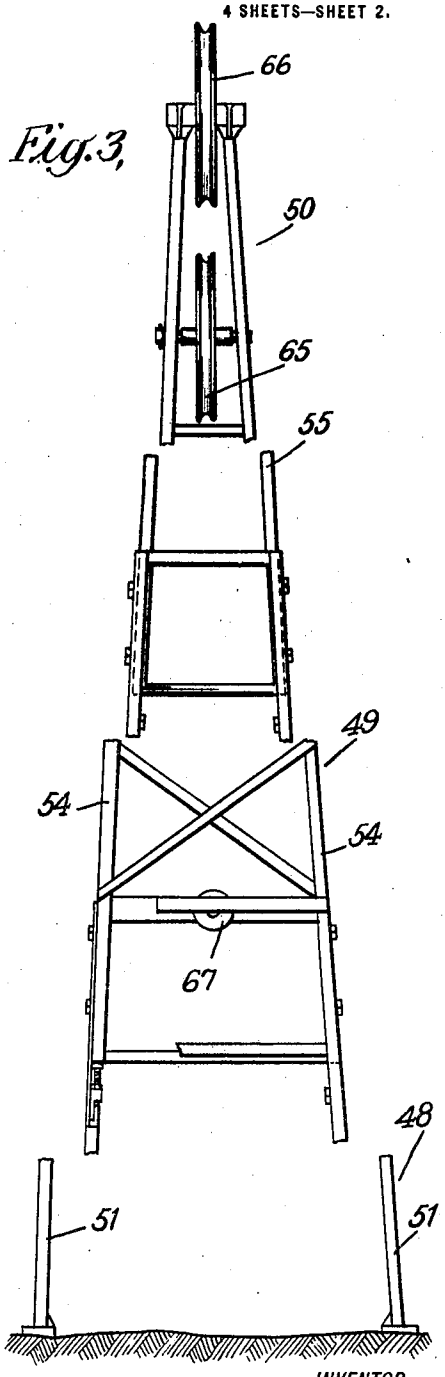


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4,

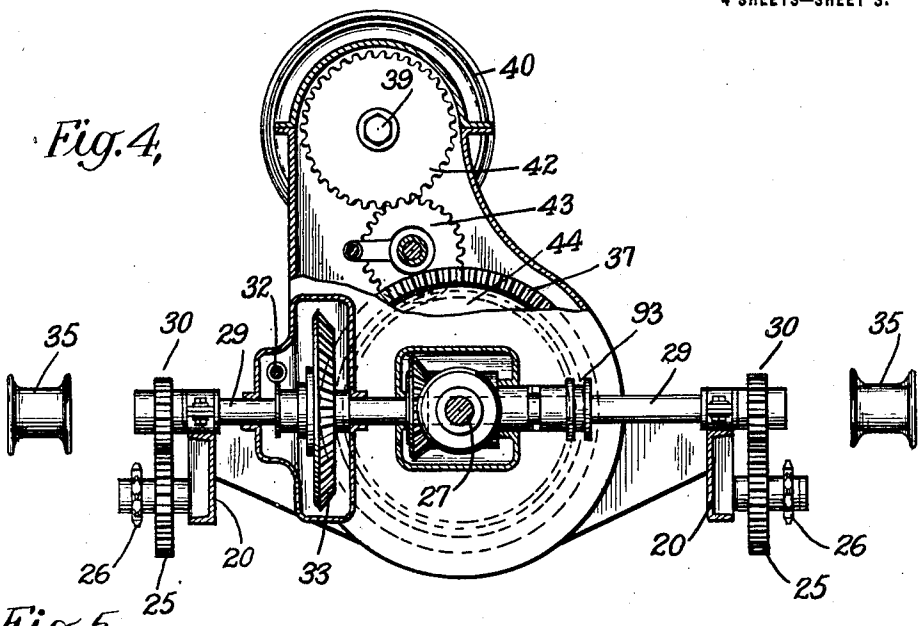


Fig. 5,

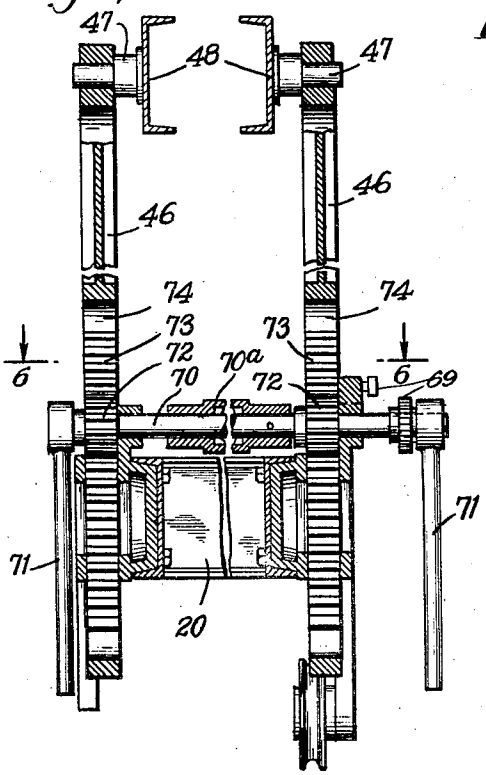


Fig. 6,

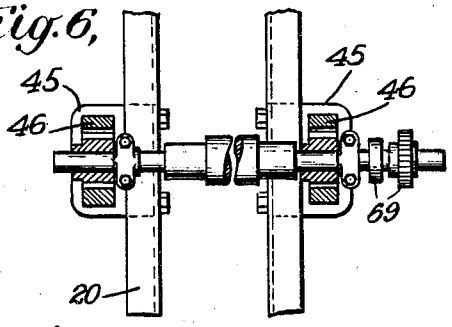
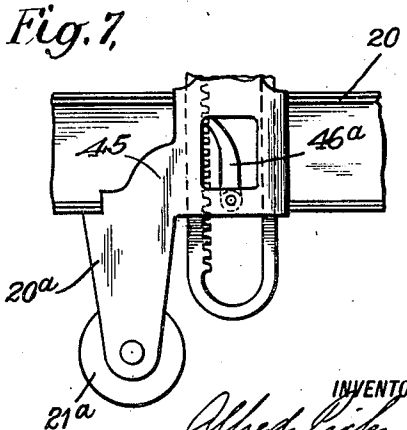


Fig. 7,



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4 SHEETS—SHEET 4.

Fig. 8.

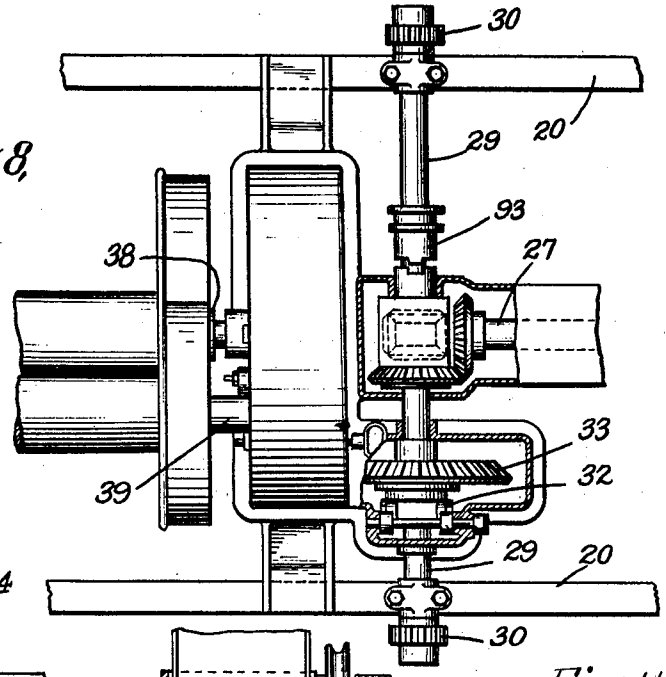


Fig. 9.

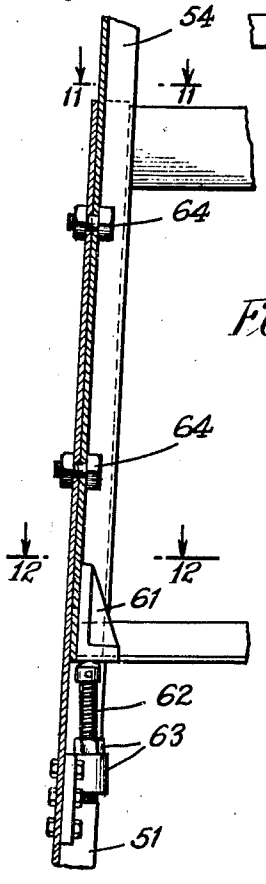


Fig. 10.

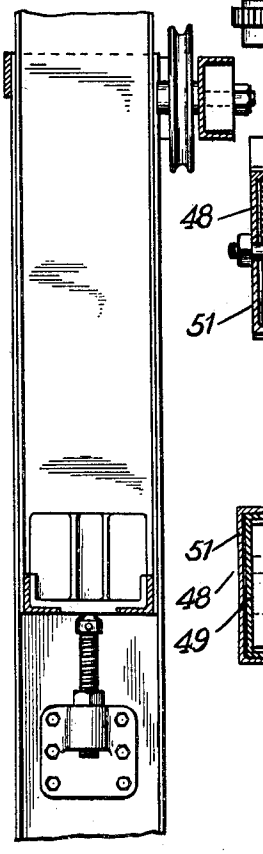


Fig. 11.

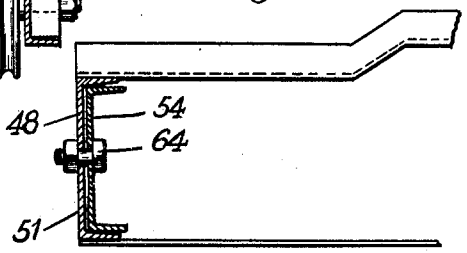
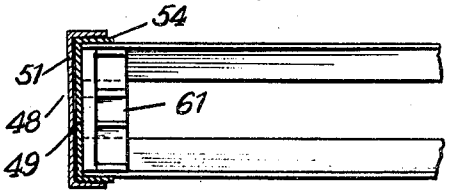


Fig. 12.



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UNITED STATES PATENT OFFICE.

ALFRED PICK, OF NEW YORK, N. Y.

PORTABLE DERRICK.

1,198,656. Specification of Letters Patent. Patented Sept. 19, 1916.

Original application filed November 10, 1914, Serial No. 871,220. Divided and this application filed May 26, 1915. Serial No. 30,496.

To all whom it may concern:

Be it known that I, ALFRED PICK, a subject of the Crown of Austria, residing at New York city, county and State of New York, United States of America, have invented certain new and useful Improvements in Portable Derricks, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

In my copending application Serial No. 871,220, filed November 10, 1914, of which this application is a division, I have set forth and described an earth drilling engine.

My present invention relates to portable derricks and has special reference to such earth drilling machines as are adapted to be used as a portable derrick.

One object of my invention is to provide a compact machine of the character above indicated that shall be arranged for self-propulsion so it may be conveyed from one field to another.

Another object is to provide a collapsible mast for a derrick of the aforesaid character.

Still another object is to provide for the ready manipulation of the mast and its equipment and for supporting the preferably telescopic collapsible mast upon the vehicle of which it constitutes a part.

Other objects and advantages of my invention will be set forth hereinafter, and in order that my invention may be thoroughly understood, I will now proceed to describe the same in the following specification, and then point out the novel features thereof in appended claims.

Referring to the drawings: Figure 1 is a side elevation of a drilling apparatus which may be utilized as a portable derrick and which is arranged and constructed in accordance with my invention. Fig. 2 is a front elevation of the machine with the mast partially collapsed, the mast alone being shown extended but broken away between joints in Fig. 3. Fig. 4 is a partially sectional transverse elevation through the intermediate portion of the vehicle showing the winding drums and the driving mechanism therefor. The method of connecting the mast to the vehicle and the hand winch details are shown in Fig. 5. Fig. 6 is a sectional plan view on the line 6—6 of Fig. 5, and Fig. 7 is a side elevation of the same parts. Fig. 8 is a partially sectional plan view of the winding drums and the driving mechanism. Details of the mast are shown on a larger scale in Figs. 9, 10, 11 and 12, Figs. 11 and 12 being sectional views taken on the lines 11—11 and 12—12 of Fig. 9. Fig. 13 is a sectional detail of one of the tower elevating drums.

The specific structure set forth in the drawings is intended merely to be illustrative of one embodiment of my invention and it is obvious that other structures may be produced within the spirit and scope of my invention, and I intend that only such limitations be imposed as are indicated in the appended claims.

While I have illustrated a drilling machine, it is obviously capable of use as a portable derrick and my present invention is principally concerned with the derrick apart from the drilling mechanism.

The structure illustrated comprises, in general, a motor truck having a longitudinal shaft, a transverse vehicle driving shaft suitably coupled thereto, an internal combustion engine arranged to drive the longitudinal shaft and located at the rear, suitable transmission gearing, winding drums, and a collapsible mast pivotally mounted on the vehicle frame. Suitable clutches are interposed between the winding drums and the longitudinal shaft and differential gearing is interposed between the engine and the driving shaft, means being provided for locking the differential at will.

The mast is composed of a plurality of sections and is pivotally mounted on a pair of arms which extend upwardly from the frame of the vehicle near the forward end. When in use the mast is extended and supports the forward end of the vehicle, the rear of the vehicle being elevated so that the cables from the drums may extend at right angles to their axes onto sheaves which are provided near the top of the mast.

The machine as shown in Fig. 1, is adapted for drilling. The vehicle frame is securely attached to the mast and the arrangement is such that when the machine is operating and drilling, the vehicle is maintained in a stationary position, one end

resting on the mast, the other on suitable supports, so that stability of the machine is insured. Furthermore, the weight of the vehicle assists materially in holding the mast securely to the ground and in position, it being also secured by suitable guy wires.

Like characters of reference designate corresponding parts in all the figures.

In the drawings, 20 designates a vehicle frame, 21 the wheels, 22 the motor and attachments which are at the rear of the vehicle, 23 a steering wheel and 24 a fuel tank. The motor is connected to a longitudinal shaft 27. This shaft is operatively connected to a two-section transverse shaft 29 having removable pinions 30 at its respective ends. When the vehicle is being propelled from one field to another these pinions are in mesh with gear wheels 25 having sprockets 26 which are coupled to the rear wheels 21 by chains 31.

When the apparatus is used for drilling and is set in position as shown in Fig. 1, the pinions 30 are removed (being replaced by small hoisting drums 35 as hereinafter set forth), and the shaft 29 is connected by a jaw clutch 32 and beveled gears 33 to a longitudinal shaft 34. 36 designates the drilling crank which is secured to the front end of the shaft 34, and 37 is a bull wheel which is rotatably mounted on the shaft 34 and may be operatively connected thereto by a clutch 38. Mounted above and a little to one side of the bull wheel is a shaft 39, on which a sand line reel 40 is rotatably mounted. The shaft is operatively connected to the shaft 34 by gears 42—43—44, the idler gear 43 being arranged to be thrown out of mesh with the gears 42—44.

The arrangement of connections and clutches is such that, when the main jaw clutch 32 is released and the pinions 30 are secured in position, the motor is adapted to drive the vehicle in the ordinary manner, the drilling apparatus being entirely disconnected. When it is desired to use the drilling apparatus, the pinions 30 are removed as above indicated and the clutch 32 set, thereby operatively connecting the motor to the forward longitudinal shaft section 34. The drilling crank is now operated and either of the reels 37 or 40 may be operated according as the clutch 38 or idler 43 are set. The operation of the drilling machine is governed just as the vehicle is governed in operation. Mounted in guide brackets 45 near the front end of the vehicle are a pair of uprights 46, which support at their upper ends trunnions 47 extending from opposite sides of the lower section 48 of the mast. In addition to the lower section 48 the mast comprises an intermediate section 49 and top section 50. The section 48 comprises a pair of side channels 51 having interconnecting cross-stays 52, and a pair of horizontal I beams 53 near its lower end. Cross-stays 52 are disposed so as not to interfere with the telescoping of the sections, the intermediate section 49 being constructed of side channels 54 which are slightly smaller than, and are adapted to nest with the channels 51, as clearly shown in Fig. 11. Since the sides of the mast taper (being relatively close together at the top) the sections are adapted to fit one into the other when the mast is fully extended but fall freely one within the other when the mast is collapsed. The top section 50 is similar in construction to the lower sections and has side channels 55 which are slightly smaller than the sections 54.

Mounted near the upper end of the lower section is a drilling sheave 56 which is adapted to be longitudinally adjusted and fixed in any suitable position on a shaft 57. The shaft is rotatably mounted in bearings 58 which are in the form of brackets and are pivotally suspended from stationary fixtures 59 respectively secured to the channels 51.

The bearings have flange projections 60 which are adapted to be bolted or otherwise detachably secured to the same channels, the arrangement being such that the flanges 60 may be detached and the sheave with its shaft swung out of the plane of the mast for the purpose of permitting the mast sections to be telescoped.

Secured to the lower corners of the intermediate section 49 are blocks 61; and elevating jack screws 62, which coöperate with blocks or nuts 63, and are removably secured to the channels 51 of the lower section, the arrangement being such that when the intermediate section is raised almost into its locking position with the lower section, the elevating jack screws may be placed in position and act against the blocks 61 in forcing the intermediate section firmly into place. When once the sections are in position they are secured by bolts 64.

The top section is provided with a sand line reel pulley 65 and a crown pulley 66. The bottom section of the mast is furthermore provided with a pulley or sheave 67 which is utilized in raising the mast after it has been swung to an upright position. The brackets 45, near the front corners of the frame 20 have downwardly extending projections 20^a which support pulleys 21^a. These pulleys act as guides for ropes or cables which are utilized for swinging the mast to an upright position and extend from the bottom ends of the mast channels, under the pulleys and onto the hoisting drums 35.

The arms 46 permit the mast when collapsed to be swung into a horizontal posi-

tion over the vehicle and rest on a brace 68 directly over the fuel tank 24 as shown in dotted lines in Fig. 1.

The vehicle frame is provided with a shaft 70 as shown in Figs. 5 and 6 which extends through slots 74 in the arms 46 and has a pair of pinions 72 near the respective ends. The pinions 72 mesh with racks 73 formed in the slots 74 and affixed to the shaft beyond each pinion is an actuating lever 71. The shaft is longitudinally adjustable, the arrangement of parts being such that by turning the shaft in the position shown with the gears in mesh, the mast may be lowered until it reaches the ground.

Pivotally mounted in the brackets 45 which are hollow, are pawls 46ª which are adapted to engage the teeth of the racks 73 and hold the arms 46 in any position to which they may be adjusted. Secured to the shaft 70 is a hand winch drum 70ª which is utilized for handling drilling bits as for example when a bit is removed and repointed or replaced by a sharp bit. To utilize this drum the shaft 70 is adjusted to throw the pinions 72 out of mesh with the racks 73 and in this position the parts of a ratchet and pawl 69 are in coöperative relation.

As clearly shown in Figs. 4 and 8 differential gearing having means to lock the differential is utilized. The lock shown at 93, when set, locks the differential so that it cannot act for its intended purpose. It may be adjusted at will and has a number of important advantages some of which may be illustrated as follows: When the vehicle is touring on the road the differential is operative for well known reasons, but if one wheel should slip in the mud the other will stall and render progress impossible unless the differential is locked. When the engine is driving the drilling mechanism, which is coupled to only one shaft section, the differential is locked, but on the other hand when the mast is being lowered or raised by the two hoisting drums 35, the differential action is desirable to equalize the pulls on the cables or ropes. The differential may be locked as desired to use one of the drums independently of the other.

The machine is utilized as follows: Assuming that the vehicle is in running condition with the wheels 21 on the roadway, the pinions 30 in position as shown in Fig. 4, the clutch 32 released to disconnect the drilling apparatus, and the tower collapsed as shown in Fig. 2, and swung into the position shown in dotted lines in Fig. 1,—the vehicle is mobile and may be operated as any motor truck to a new field where it is desired to drill. When the desired location is reached the pinions 30 are first removed to disconnect the shaft 29 from the traction wheels, then the small hoisting drums 35 are mounted in place of the pinions. Next the mast is elevated by being swung about the trunnions 47 as pivots into a substantially upright position, as shown in Fig. 2. The bottom ends of the mast channels are now a short distance above the ground and the levers 71 are used for lowering the mast step by step, the pawls 46ª holding the mast at each step until a new hold is secured on the shaft 70 by the levers 71 which act as ratchet wrenches. When the mast is set in position and the front end of the truck is raised thus resting on the mast, it is braced relative to the vehicle frame by means of braces 75 (see Fig. 1). The elevation of the mast is accomplished as hereinbefore set forth by attaching ropes or cables to the bottom ends of the side beams, passing them under the guide pulleys 21ª and winding them on the drums 35 which are operated by the engine. The differential gearing is active and serves under these conditions to equalize the pulls on the ropes. Ropes or cables from the drums 35 are next passed under the pulleys 21ª and over the sheave 67 and are hooked onto the lower end of the top section of the mast which is next raised by operating the engine until it is possible to place the elevating blocks 63 and jack screws 62 in position on the intermediate section, below the bottom end of the top section. By turning the screws 62 the top section is forced into place as already set forth and the two sections are then bolted together. The top and intermediate sections are now elevated together, the ropes being passed over the sheave 67 and hooked onto the lower end of the intermediate section. The extended mast is secured loosely by guy cables or wires 76. The front end of the vehicle is next raised off the ground by means of a screw 77, the crank shaft 70 being adjusted longitudinally to free the pinions 72 from the racks 73. The screw 77 is attached to the cross-beam 53 of the mast and extends between the cross-stays 78 forming parts of the vehicle frame. The rear of the vehicle is jacked up and is supported by blocks 80 and 81 in such position and at such angle that the common tangent of the crown pulley 66 and the drilling sheave 56 is vertical. The apparatus is now in the position shown in Fig. 1 and the guy cables or wires 76 may be tightened. When the shaft 70 is freed as above indicated the hand winch drum 70ª is available for use in handling the drill and for various other purposes, when the engine driven drums are not needed.

Attention is directed to the fact that the axis of the drilling crank is radial relative to the hole being drilled and in consequence the crank can be and is located close to the mast at the point where the frame of the machine is attached thereto, while the greater part of the weight of the machine is

at a distance from said point of attachment. This arrangement very materially reduces shaking and vibration of the machine since the crank which tends to vibrate the machine about the point of attachment to the mast has small leverage while the weight which opposes the vibration has a relatively great leverage.

Attention is further directed to the fact that the parts of the mast are firmly wedged together when the mast is extended, by reason of their tapered form and consequently the mast is particularly rigid.

The motor is operated and the clutches 26 and 32 set, thereby driving the drilling crank by the engine. The speed of the drilling crank may be governed just as the vehicle speed is ordinarily controlled.

What I claim is:

1. A collapsible drilling mast comprising a bottom section having a drilling sheave, and means for adjustably supporting the drilling sheave to permit it to be swung outwardly, and a top section having a sand line pulley and a crown pulley and adapted to telescope within the bottom section.

2. A collapsible drilling mast comprising inclined side beams, a transverse shaft and brackets therefor pivotally connected to the mast and a drilling sheave secured to the shaft and adapted to be swung outwardly with its shaft to permit the tower to collapse.

3. The combination with a substantially horizontal frame, having a pair of vertically adjustable uprights near one end of a drilling mast pivotally supported near the upper ends of the uprights and adapted to be swung into a substantially vertical position when in use.

4. The combination with a substantially horizontal frame having a pair of guide brackets near one end, and uprights vertically adjustable in said guide brackets, of a drilling mast pivotally supported near the upper ends of the uprights, the mast being adapted to be swung into a substantially vertical position and set on the ground when in use.

5. The combination with a substantially horizontal frame having a pair of guide brackets near one end, a pair of arms adjustably mounted in said brackets and having a vertical rack, a transverse shaft rotatably mounted in said brackets and having pinions adapted to mesh with the teeth of the racks, and means for turning the shaft to adjust the positions of the uprights, of a drilling mast pivotally supported near the upper ends of the arms and adapted to be swung in a substantially vertical position with one end on the ground when in use, said frame being adapted to be raised off the ground and supported on the mast.

6. The combination with a vehicle having a substantially horizontal frame, a pair of brackets near one end of the frame and uprights adjustably mounted in the brackets, of a drilling mast pivotally supported near the upper ends of the uprights, and means for swinging the mast into a substantially vertical position and setting it on the ground.

7. The combination with a vehicle having a substantially horizontal frame, a pair of brackets near one end of the frame and uprights adjustably mounted in the brackets, of a drilling mast pivotally supported near the upper ends of the uprights, and means for swinging the mast into a substantially vertical position and setting it on the ground, and means for adjusting the frame relative to the mast to transfer the weight from the ground to the mast.

8. The combination with a vehicle having a propelling motor, a transverse driving shaft, and a driving gear removably mounted thereon, of a drilling mast pivotally supported near one end of the vehicle frame, a sheave on said mast, and a hoisting drum adapted to replace said removable gear and to coöperate with the sheave on said mast for hoisting purposes.

9. In a drilling machine, a vehicle frame, a mast pivotally supported thereon, an engine, a transverse driving shaft, means for coupling the driving shaft to the vehicle wheels, a pair of hoisting drums adapted to be mounted on the driving shaft at its respective ends and differential gearing for the driving shaft adapted to equalize the power transmitted at the respective ends of the driving shaft, and means for locking the differential gearing whereby either of the hoisting drums may be utilized independently.

10. A telescopic mast for a drilling machine comprising a pair of inclined channel beams secured together in the form of a tapering box beam and constituting a bottom section and other sections of similar construction but of smaller size nested one within the other and within the bottom section whereby the parts of the mast, when extended, are wedged together.

11. A telescopic mast for a drilling machine comprising a pair of inclined channel beams secured together in the form of a tapering box beam and constituting a bottom section and other sections of similar construction but of smaller size nested one within the other and within the bottom section, and removable means for forcing the sections into final position in which they are wedged together when the mast is extended.

12. A telescopic mast for a drilling machine comprising a pair of inclined channel beams secured together in the form of a tapering box beam and constituting a bottom section and other sections of similar construction but of smaller size nested one within the other and within the bottom section,

brackets pivotally supported near the top of the bottom section, and a drilling sheave rotatably mounted in said brackets and adapted to be either secured in position with its axis near the mast or swung outwardly on the pivotal bracket to permit the telescoping of the mast.

13. A telescopic mast for a drilling machine comprising a pair of inclined channel beams secured together in the form of a tapering box beam and constituting a bottom section and other sections of similar construction but of smaller size nested one within the other and within the bottom section, a crown pulley mounted at the top of the mast and a drilling sheave mounted near the top of the bottom section and means for permitting the adjustment of the drilling sheave into and out of the plane of the mast.

14. A telescopic mast for a drilling machine comprising a pair of inclined channel beams secured together in the form of a tapering box beam and constituting a bottom section and other sections of similar construction but of smaller size nested one within the other and within the bottom section and removable means for forcing the sections into final position when the mast is extended, and brackets pivotally supported near the top of the bottom section and a drilling sheave rotatably mounted in said brackets and adapted to be either secured in position with its axis near the mast or swung outwardly on the pivotal bracket to permit the telescoping of the mast.

15. A telescopic mast for a drilling machine comprising a pair of inclined channel beams secured together in the form of a tapering box beam and constituting a bottom section and other sections of similar construction but of smaller size nested one within the other and within the bottom section and removable means for forcing the sections into final position when the mast is extended, a crown pulley mounted at the top of the mast and a drilling sheave mounted near the top of the bottom section and means for permitting the adjustment of the drilling sheave into and out of the plane of the mast.

16. The combination with a vehicle having a propelling motor, a transverse driving shaft, and driving gears removably mounted thereon, of a drilling mast pivotally supported near one end of the vehicle frame, rope guiding means on said mast, and a pair of hoisting drums adapted to replace said removable gear and to coöperate with the rope guiding means on said mast for hoisting purposes.

In witness whereof, I have hereunto set my hand this 20th day of May, 1915.

ALFRED PICK.