

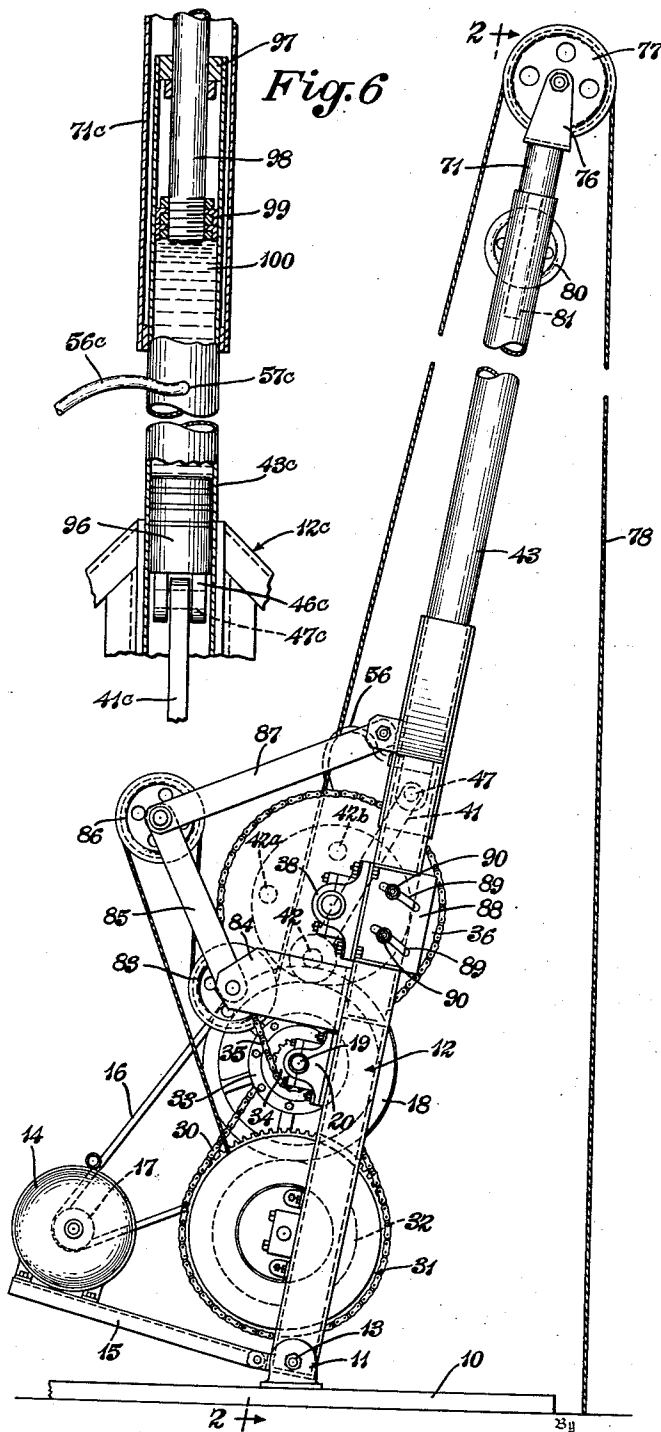
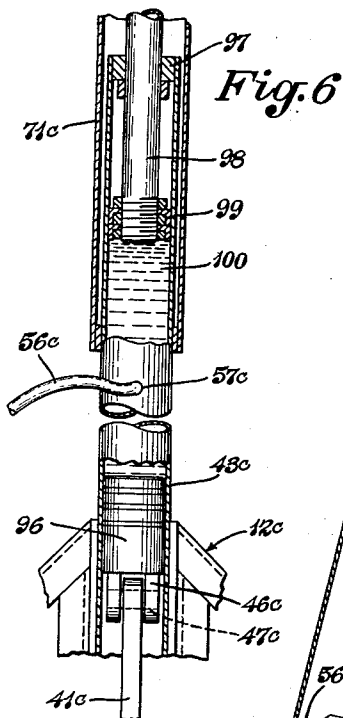
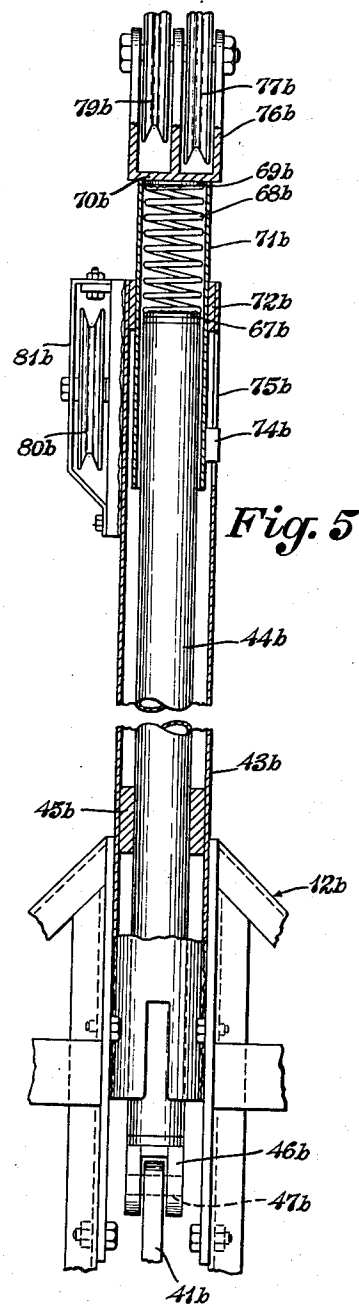
Jan. 26, 1954

W. N. MARTIN
DRILLING MACHINE

2,667,333

Filed Aug. 7, 1950

2 Sheets-Sheet 1



Inventor
Wilbur N. Martin

Frederic M. Bishop
Attorneys

Jan. 26, 1954

W. N. MARTIN
DRILLING MACHINE

2,667,333

Filed Aug. 7, 1950

2 Sheets-Sheet 2

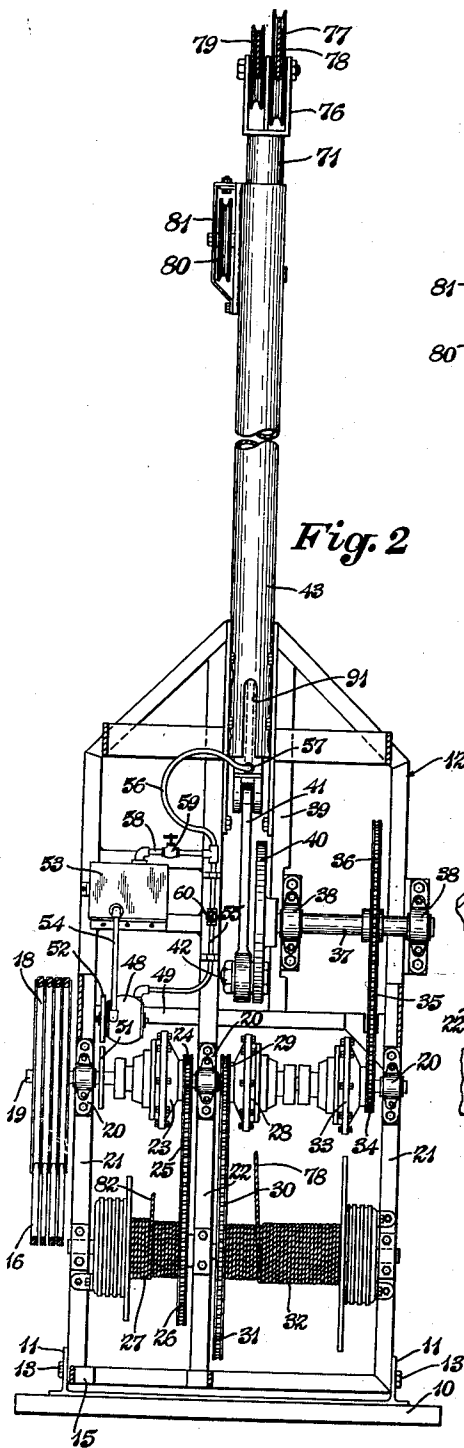


Fig. 2

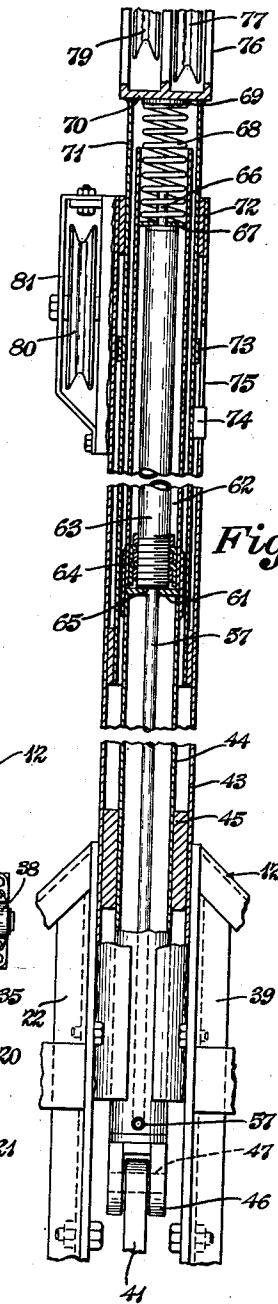
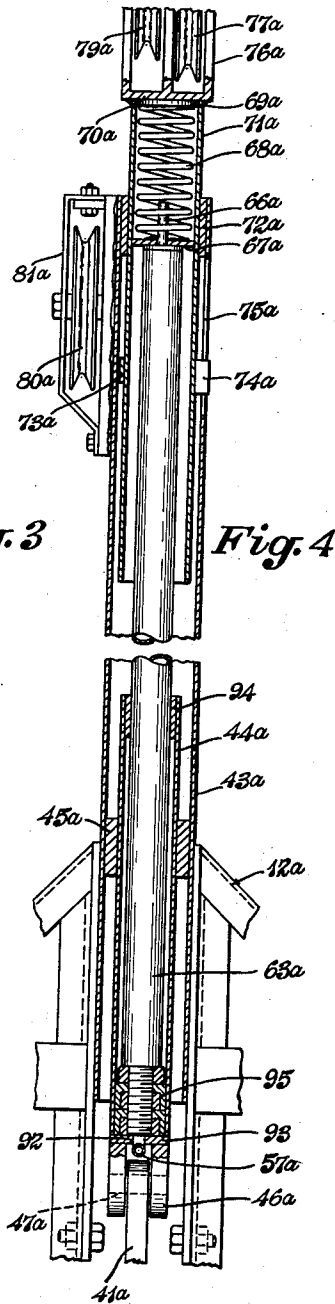


Fig. 3



UNITED STATES PATENT OFFICE

2,667,333

DRILLING MACHINE

Wilbur N. Martin, Canton, Ohio

Application August 7, 1950, Serial No. 178,069

4 Claims. (Cl. 255-10)

1

The invention relates to drilling machines of the type in which the drilling is performed by means of a tool suspended upon a cable from a mast and reciprocated by driving mechanism.

While the drilling machine to which the invention pertains is adapted for drilling wells, it is especially designed for drilling holes for the rams in hydraulically operated elevators, and for this purpose it is necessary that the machine be so designed that it can be operated in the pit at the bottom of the elevator shaft.

It is therefore an object of the invention that the drilling machine be so constructed that the driving mechanism is located in upright position within an inverted, substantially U-shaped frame, which supports the mast, and that the cable leading from the drum of the driving mechanism to the sheave at the top of the mast, be located close to the mast, whereby the drilling machine may be located in a small space such as the pit at the bottom of an elevator shaft.

Another object is to provide a drilling machine of this character in which the mast is mounted for reciprocation within an upright, tubular support and reciprocated by a pitman rod and pitman wheel, forming a part of the driving mechanism, the pitman wheel being so located with reference to the mast that upon the upstroke the pivotal connection of the pitman rod to the pitman wheel will pass through a line which is an extension of the axis of the mast, whereby the upstroke of the mast will be relatively slow and the downstroke relatively fast in order to increase the efficiency of the drilling operation.

A further object is to provide an adjustment for the bearings of the pitman wheel, whereby the relative timing of the upstroke and downstroke of the mast may be varied.

A still further object is to provide a drilling machine of the character referred to in which hydraulic means is provided for producing an additional raising of the mast, to facilitate the placing of a new casing section in the well or the removal or replacing of the drilling tool, or other function.

Another object of the invention is to provide a system of idler sheaves or pulleys over which the cable is passed between the drum and the sheave at the top of the mast in order to locate the cable close to the mast.

A further object is to provide means for reciprocating the mast by fluid power by a ram or piston connected to the pitman rod.

A still further object is to provide a spring cushion between the upper end of the mast and the sheave over which the cable operates.

2

The above and other objects apparent from the drawings and following description, may be attained, and the advantages and results obtained, by the apparatus, construction, arrangement and combinations, sub-combinations and parts which comprise the present invention, a preferred embodiment of which, illustrative of the best mode in which applicant has contemplated applying the principle, being set forth in detail in the following description and illustrated in the accompanying drawings, in which:

Figure 1 is a side elevation of a drilling machine embodying the invention;

Fig. 2 is a sectional elevation, taken as on the line 2-2, Fig. 1;

Fig. 3 an enlarged, longitudinal, sectional view of the mast and associated parts;

Fig. 4 a view similar to Fig. 3 of a modified form of the invention;

Fig. 5 is similar view of a further modification; and

Fig. 6 a similar view of still another modification.

The machine may be mounted upon any suitable or conventional platform or base, as indicated generally at 10, and for the purpose of adjusting the angle of the mast, as well as for lowering the mast to horizontal position for transportation of the machine, a spaced pair of ears 11 may be fixed upon said platform or base.

The inverted, substantially U-shaped frame, indicated generally at 12, is connected at the lower end to the ears 11 as by bolts 13. This upright frame 12 houses the driving mechanism in upright position, as distinguished from the conventional drilling machine in which the driving mechanism is located in horizontal position at one side of the mast.

For the purpose of operating the driving mechanism, a motor 14, or other prime mover, is mounted upon a bracket 15 supported by the frame 12, and a series of belts or the like, as indicated at 16, is located around the pulley 17 of the motor and around the drive pulley 18, which is mounted upon a drive shaft 19 journaled in bearings 20 mounted upon the side members 21 and intermediate member 22 of the frame 12.

A clutch 23 upon this shaft controls the sprocket wheel 24 which is connected by a chain 25 with the sprocket wheel 26 upon the sand-reel 27. A second clutch 28 controls the sprocket wheel 29 which is connected by a chain 30 with the sprocket wheel 31 upon the drum 32 of the machine.

A third clutch 33 controls the sprocket wheel 34 which is connected by a chain 35 with the sprocket wheel 36 fixed upon a shaft 37 journaled

in bearings 38 which may be adjustably mounted upon one outer member 21 and the intermediate member 39 of the frame 12.

The pitman wheel 40 is fixed upon the shaft 37 and the pitman rod 41 is pivotally connected thereto as indicated at 42. For the purpose of changing the length of the stroke of the mast the pitman wheel may be provided with a plurality of differentially located apertures, as indicated at 42a and 42b, for connection of the pivot pin 42.

In the construction shown in Figs. 1, 2 and 3, the mast comprises an upright tubular member 43, rigidly connected at its lower end to the frame 12 and having the tubular mast 44 mounted for longitudinal reciprocating movement therein, through the bushing 45.

A spaced pair of ears 46 is fixed to the lower end of the reciprocating mast 44 and the upper end of the pitman rod 41 is pivotally connected thereto as by the wrist pin 47.

An oil pump 48 is pivotally mounted within the frame 12, as upon the bracket 49, and adapted to be frictionally driven through the pulley 51 upon the shaft 19 and the pulley 52 of the pump. This pump communicates with an oil reservoir 53 through the pipe 54. The pipe 55 and hose 56 in this form of the invention lead from the oil pump to a pipe 57 located within the reciprocating mast 44.

A return pipe 58 connects the hose 56 with the reserve tank 53 and a valve 59 may be located in the pipe 58. A valve 60 may also be located in the pipe 55.

At a point spaced from the upper end of the reciprocating mast 44, a head 61 is fixed within the tubular mast 44 so that the upper portion 62 of said mast comprises a cylinder within which is reciprocally mounted an auxiliary mast 63 in the form of a piston having cups or leathers 64 or other suitable packing means, surrounding its lower end portion.

The pipe 57 extends upward through a suitable aperture 65, in the center of the head 61, so as to admit fluid pressure to the cylinder 62, beneath the ram or piston 63. The upper end of the auxiliary mast 63 has a central pin 66 fixed to its upper end and located through the disc 67 which is welded upon the lower end of the coil spring 68.

A disc 69 may be welded upon the upper end of the spring and bears against the closed top wall 70 of the tubular sleeve 71, which is slidably located through the bushing 72, fixed within the upper end of the tubular support 43 and surrounds the upper end of the mast.

A stop collar 73 is fixed around the exterior of the sleeve 71, at a point spaced from the upper end thereof, for contact with the bushing 72, to limit upward movement of the sleeve 71 and auxiliary mast 63.

A lug 74 is fixed upon one side of the sleeve 71 and adapted to reciprocate within the longitudinal slot 75 in the supporting tube 43 to prevent rotation of the sleeve 71 relative to the tube 43.

A bracket 76 is fixed upon the upper end of the sleeve 71 and has journaled therein the sheave 77 over which the cable 78 is located, and if desired, an auxiliary sheave 79 may also be journaled in said bracket.

A sand sheave 80 may be journaled in a bracket 81, located on one side of the supporting tube 43, to receive the cable 82 from the sand-reel 27. The outer end of the cable 78 is adapted

to be connected to any conventional drilling tool, in usual and well-known manner, while the other end thereof passes down from the sheave 77, substantially parallel to the mast, around an idler pulley 83, journaled in the plate 84 and arms 85, and then over another idler pulley 86, journaled in the arms 85 and 87, and thence to the drum 32.

For the purpose of varying the relation between the upstroke and downstroke of the mast, the bearings 38 may be adjustably mounted upon the frame 12. For this purpose, each bearing is carried upon a plate 88 having arcuate slots 89 therein, concentric with the sprocket wheel 34, for receiving clamping bolts 90 for locking the bearings in adjusted position.

As best shown in Fig. 2, the lower end of the tube 43 may be longitudinally slotted, as at 91, to accommodate the pitman rod 41 and the hose 56. With this construction it will be seen that the drilling machine is compact and occupies a minimum of floor space, so that it may be operated within a restricted space such as the pit at the bottom of an elevator shaft.

In the operation of the drilling machine, when the motor 14 is operated it will rotate the drive shaft 19, through the pulley 17, belt 16 and pulley 18. When the clutch 33 is thrown in, the pitman wheel 40 will be operated, through the sprocket wheel 34, chain 35 and sprocket wheel 36, and through the pitman rod 41 the mast 44 will be continually reciprocated, reciprocating the sheave 77 to raise and lower the cable 78 to operate the drilling tool carried thereby, in usual manner. The coil spring 68 acts as a cushion to absorb the shock of this operation.

When it is desired to raise the sheave 77 to a greater height, in order to insert a new casing or to remove or replace the drilling tool, the oil pump 48 is operated to pump oil, through the pipe 55, hose 56 and pipe 57, into the lower end of the cylinder 62, raising the auxiliary mast 63 to the desired height.

When it is desired to operate the drum 32, the clutch 28 is thrown in and through the sprocket wheel 29, chain 30 and sprocket wheel 31, the drum may be rotated to wind up the cable 78.

When it is desired to operate the sand-reel 27, the clutch 23 is thrown in and through the sprocket wheel 24, chain 25 and sprocket wheel 26 the sand-reel is operated.

In the form of the invention shown in Fig. 4, the frame indicated generally at 12a may be the same as the frame shown in Figs. 1 to 3 and all of the driving mechanism may be as shown in Figs. 1 and 2.

The tubular support 43a is rigidly connected at its lower end to the frame 12a, and the tubular mast 44a is mounted for vertical reciprocation therein through the bushing 45a. The tubular mast 44a is in the form of a fluid cylinder and the oil pipe 57a communicates with the central opening 92 in the head 93 at the bottom thereof.

The bifurcated bracket 46a is fixed to the lower end of the tubular mast 44a and the upper end of the pitman rod 41a is pivotally connected thereto, as indicated at 47a. The auxiliary mast 63a is mounted for longitudinal reciprocation within the tubular mast 44a, and through the bushing 94 in the upper end thereof, and it is in the form of a piston or ram having cups or leathers 95 or other suitable packing surrounding its lower end.

5

The upper end of the auxiliary mast 63a has a pin 66a centrally mounted thereon and located through a central opening in the disc 67a, welded to the lower end of the coil spring 68a. A disc 69a is welded to the upper end of the coil spring and seats against the upper, closed end 70a of the sleeve 71a, which is slidably located through the bushing 72a within the upper end of the tube 43a.

A stop collar 73a is fixed upon the sleeve 71a, for contact with the bushing 72a to limit the upward movement thereof, and a lug 74a is fixed upon one side of the sleeve 71a and slidably located within the longitudinal slot 75a in the tube 43a to prevent relative rotation.

A bracket 76a is fixed to the upper end of the sleeve 71a and carries the sheave 77a for the cable and an auxiliary sheave 79a, if desired. The sand-sheave 80a may be located in a bracket 81a, fixed to one side of the tubular support 43a near its upper end. The operation of this form of the invention will be the same as above described.

In the modification shown in Fig. 5, the frame indicated generally at 12b may be the same as the frame shown at 12 in Figs. 1 to 3 and all of the driving mechanism may be as shown in Figs. 1 and 2.

In this form of the invention the support tube 43b is rigidly connected at its lower end to the frame 12b and the reciprocating mast 44b is vertically, slidably mounted through the bushing 45b in the support tube.

A bifurcated bracket 46b is connected to the lower end of the reciprocating mast 44b and the upper end of the piston rod 41b is pivotally connected thereto as at 47b.

The sleeve 71b, with closed upper end 70b, is slidably mounted within the upper end of the support tube 43b, through the bushing 72b therein, and surrounds the upper end portion of the mast 44b.

A coil spring 68b is interposed between the upper end of the mast 44b and the closed end 70b of the sleeve 71b, and, if desired, discs 67b and 69b may be connected to the lower and upper ends respectively of the spring. A sheave 77b and auxiliary sheave 79b may be mounted in the bracket 76b connected to the closed upper end of the sleeve 71b.

A lug 74b may be fixed to one side of the sleeve 71b and is slidably operable within the longitudinal slot 75b in the support tube 43b to prevent rotation of the sleeve relative to the support tube. A sand pulley 80b may be mounted in a bracket 81b attached to one side of the support tube 43b near the upper end thereof.

The operation of the mast is the same as in the other forms described but no means is provided for raising the sheave 77b to an additional height as in the other forms of the invention.

Another modification is shown in Fig. 6 in which the frame, indicated generally at 12c, may be the same as the frame shown in Figs. 1 and 2 and the driving mechanism may be the same as shown in said figures.

The lower end portion of the support tube 43c is rigidly mounted in the frame. This support tube is in the form of a fluid cylinder and the piston 96 is mounted for reciprocation in the lower portion of this cylinder and the piston has the spaced ears 46c attached to its lower end, and by means of the wrist pin 47c is attached to the pitman rod 41c.

The upper end of the cylinder 43c is provided

6

with a head 97 through which is slidably mounted the mast 98 which is in the form of a fluid operated ram and provided with cups or leathers 99, or other suitable packing means, at its lower end.

The portion of the cylinder 43c between the piston 96 and the ram 98, as indicated at 100, is filled with oil or other fluid. A sleeve 71c may surround the upper end of the cylinder tube 43c and may be the same as the sleeve 71 in Figs. 1 to 3, having a coil spring interposed between the closed end of the sleeve and the upper end of the ram 98, and a bracket with sheave mounted upon the closed end of the sleeve, all as shown in detail in Fig. 3.

In the operation of this form of the invention, as the piston 96 is reciprocated by the pitman rod 41c the mast ram 98 will be reciprocated by the fluid in the cylinder 43c. If it is desired to raise the mast to an additional height, an additional amount of fluid is admitted to the cylinder at the point 57c through the hose 56c, from the pump, in the manner shown and described with reference to Figs. 1 to 4.

Although the upright location of the frame and driving mechanism, as shown in Figs. 1 and 2, is desirable where the drilling machine is to be used in a restricted space, such as the pit of an elevator shaft, it should be understood that the improved construction of mast and pitman wheel and pitman rod assembly, illustrated in the drawings and described above, are equally adapted for use with the conventional horizontally mounted driving mechanism.

I claim:

1. A drilling machine of the character described including a support frame, driving mechanism mounted in said frame and including a pitman wheel, an upright support tube mounted upon said frame, a mast mounted for reciprocation within the frame, a pitman rod operatively connecting the pitman wheel to the lower end of the mast, a sleeve having a closed top, said sleeve being slidably mounted within the upper end of the support tube and surrounding the upper end of the mast, a coil spring interposed between the upper end of the mast and the closed end of the sleeve, a sheave connected to the closed end of the sleeve and a cable extending over said sheave, an auxiliary mast section slidably mounted in the upper end of the mast and means for raising said auxiliary mast section relative to the mast.

2. A drilling machine of the character described including a support frame, driving mechanism mounted in said frame and including a pitman wheel, an upright support tube mounted upon said frame, a mast mounted for reciprocation within the frame, a pitman rod operatively connecting the pitman wheel to the lower end of the mast, a sleeve having a closed top, said sleeve being slidably mounted within the upper end of the support tube and surrounding the upper end of the mast, a coil spring interposed between the upper end of the mast and the closed end of the sleeve, a sheave connected to the closed end of the sleeve and a cable extending over said sheave, an auxiliary mast section slidably mounted in the upper end of the mast and fluid means for raising said auxiliary mast section relative to the mast.

3. A drilling machine of the character described comprising a support frame, an upright support tube mounted upon the frame, a mast mounted for reciprocation within the tube, driving mechanism mounted in said frame and in-

cluding a pitman wheel journalled at a point spaced from a prolongation of the axis of the mast, a pitman rod operatively connecting the pitman wheel to the lower end of the mast, a drive wheel operatively connected to the pitman wheel, the pitman wheel being so located with reference to the mast that on the upstroke the point of connection of the pitman rod to the pitman wheel will move upwardly and outwardly toward the prolongation of the axis of the mast and then upwardly and inwardly away therefrom, so as to produce a rapid upstroke of the mast, means for adjusting the position of the pitman wheel toward and from the prolongation of the axis of the mast in an arc concentric with the axis of the drive wheel so as to change the relative speeds of the upstroke and downstroke of the mast, a sheave carried by the upper end of the mast, and a cable extending over said sheave.

4. A drilling machine of the character described comprising a support frame, an upright support tube mounted upon the frame, a mast mounted for reciprocation within the tube, driving mechanism mounted in said frame and including a pitman wheel journalled at a point spaced from a prolongation of the axis of the mast, a pitman rod operatively connecting the pitman wheel to the lower end of the mast, a drive wheel operatively connected to the pitman wheel, the pitman wheel being so located with reference to the mast that on the upstroke the

point of connection of the pitman rod to the pitman wheel will move upwardly and outwardly toward the prolongation of the axis of the mast and then upwardly and inwardly away therefrom, so as to produce a rapid upstroke of the mast, means for adjusting the position of the pitman wheel toward and from the prolongation of the axis of the mast in an arc concentric with the axis of the drive wheel so as to change the relative speeds of the upstroke and downstroke of the mast, means for adjusting the connection of the pitman rod to the pitman wheel so as to change the length and further change the relative speeds of the upstroke and downstroke of the mast, a sheave carried by the upper end of the mast, and a cable extending over the sheave.

WILBUR N. MARTIN.

References Cited in the file of this patent
UNITED STATES PATENTS

Number	Name	Date
291,306	Daniell	Jan. 1, 1884
379,710	Manson	Mar. 20, 1888
506,204	Button	Oct. 10, 1893
1,006,794	Riggs	Oct. 24, 1911
1,143,324	Scholes	June 15, 1915
1,395,971	Okell	Nov. 1, 1921
1,898,684	Pearsall	Feb. 21, 1933
1,973,197	Baker	Sept. 11, 1934