Oct. 28, 1924. 1,513,387

E. E. GREVE

ROTARY HOIST

Filed May 3, 1922 2 Sheets-Sheet 1

Fig. 1

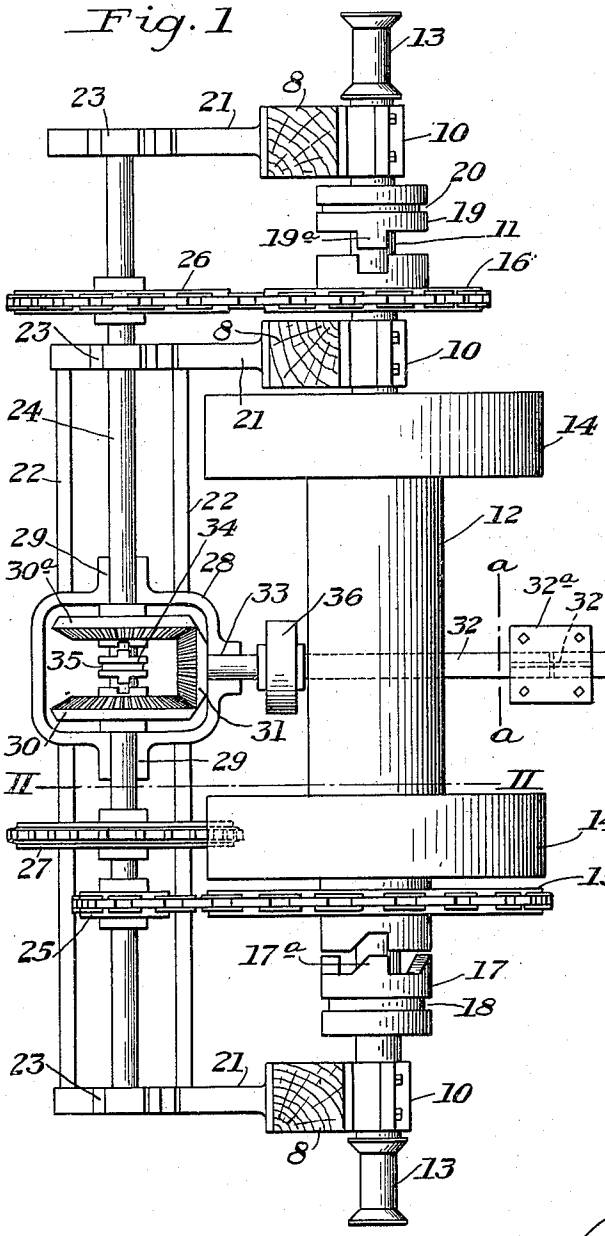
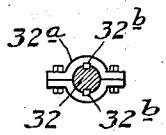


Fig. 1a



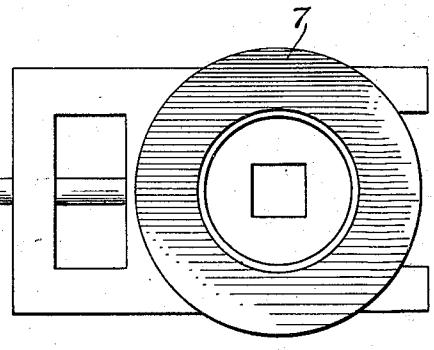
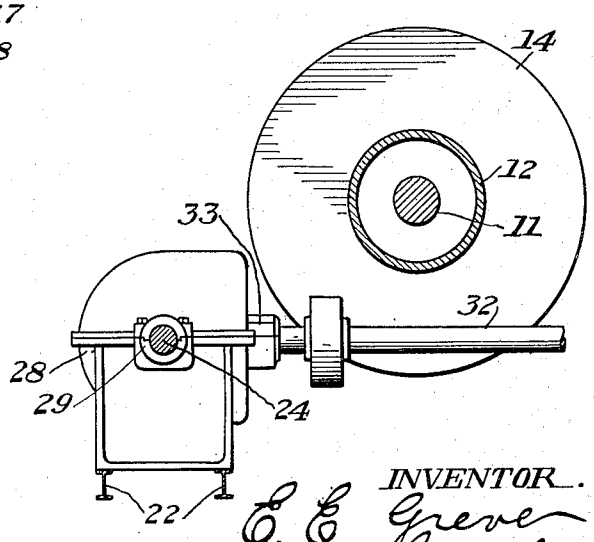


Fig. 2



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ROTARY HOIST

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Fig. 3

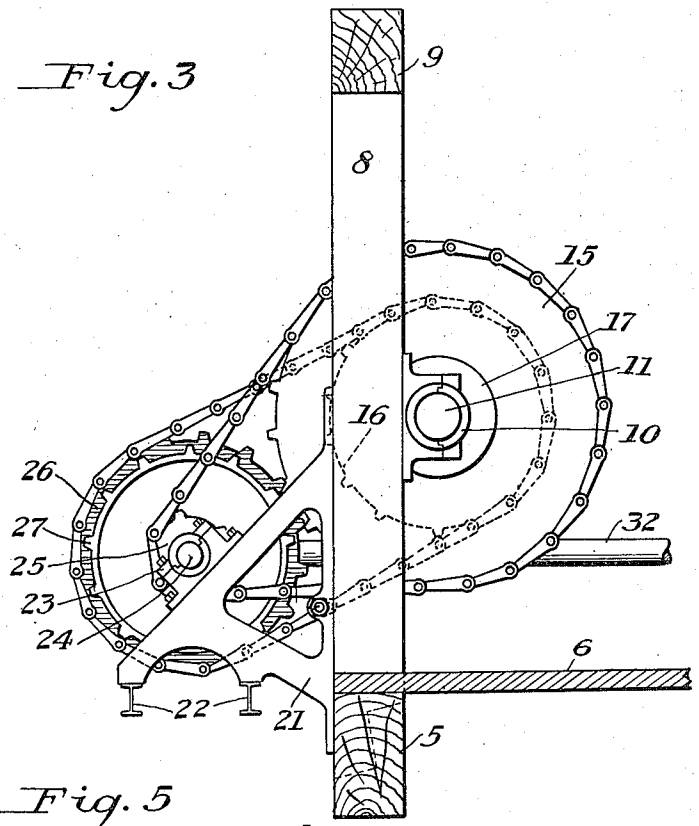


Fig. 5

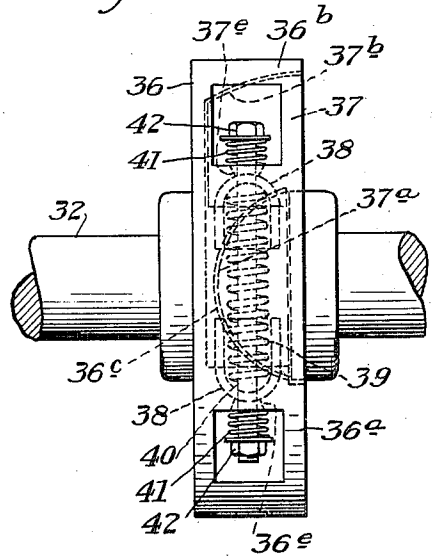
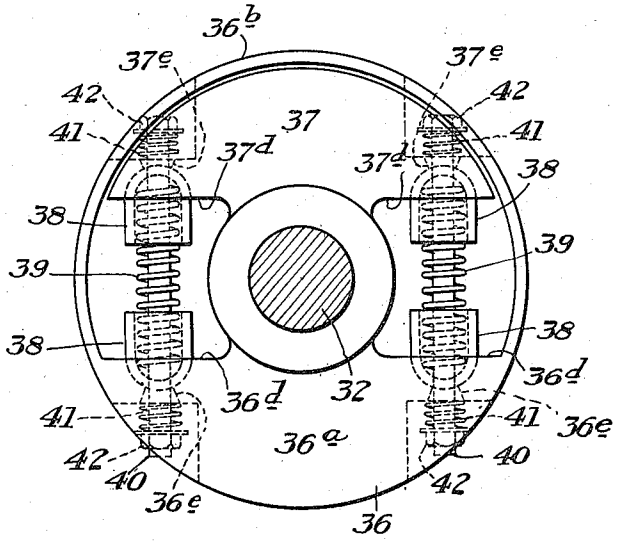


Fig. 4



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Patented Oct. 28, 1924. 1,513,387

UNITED STATES PATENT OFFICE.

EDGAR E. GREVE, OF BELLEVUE, PENNSYLVANIA.

ROTARY HOIST.

Application filed May 3, 1922. Serial No. 558,194.

To all whom it may concern:

Be it known that I, EDGAR E. GREVE, a citizen of the United States, residing at Bellevue, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Rotary Hoists, of which the following is a specification.

This invention is for a hoist for use in connection with earth drilling rigs, and relates particularly to a combined hoisting mechanism and driving means for a rotary, the invention being intended for use with rotary drilling machinery.

In rotary drilling operations, a hoist is used in connection with the rotary for spooling and unspooling the cable necessary to carry the traveling block and drill pipe or casing as the drilling progresses, and for other hoisting purposes.

It is desirable that the hoist, which is almost essential, be driven from the same source of power as the rotary. A great many different hoists have been used to considerable success, but, so far as I am aware, all of them have used a line shaft of considerable length from which both the rotary and hoist are driven, and this line shaft, which extends across two posts of the rigging, continually springs out of shape.

Furthermore, it has been the practice to elevate these line shafts above the drum and to drive the rotary from a chain passing over a sprocket wheel on this elevated line shaft, and to drive the shaft and hoist from similar chains. These elevated chains are dangerous to the operator in the event that any one of them breaks. The height of the line shaft above the floor also requires that the posts for supporting the shaft be sufficiently long to permit of such construction. The longer the posts are, the more susceptible they are, of course, to bending movements.

The objects of the present invention are to provide a hoist of sturdy construction in which the line shaft is located below the drum shaft, the height of the post being limited and the line shaft supported against springing. Another object is the means of driving the rotary in either direction.

A further important object is to provide a semi-rigid driving connection in the form of a flexibly coupled shaft between the line shaft and rotary in place of the chain normally employed. Rotaries have heretofore been driven by a shaft in many instances where a driller preferred a rigid driving connection, but many operators prefer a chain because they can tell by the manner in which the chain is running whether or not they are liable to injure the drill shaft or stem. My invention gives the advantages of a rigid drive and yet provides for greater flexibility than obtains in a chain drive, so that the advantages of the chain drive are retained in a more marked degree than in the chain drive itself, and the driller may judge, therefore, how much strain is on the drill stem.

My invention may be readily understood by reference to the accompanying drawings, in which:

Fig. 1 is a plan view of the hoist and rotary;

Fig. 1ª is a detail sectional view on line *a*—*a* of Fig. 1;

Fig. 2 is a section on line II—II of Fig. 1;

Fig. 3 is a side elevation of the hoist;

Fig. 4 is a front view of one form of flexible coupling which I may use; and

Fig. 5 is a side elevation of the coupling.

In the drawings, 5 indicates a cross beam near the bottom of the derrick structure, and 6 is the derrick floor. Suitably positioned on the floor is a rotary 7 of any usual or preferred construction.

Secured to the cross beam 5 are vertical posts 8 on which the hoist and line shaft, hereinafter described, are carried. The posts are connected at their upper ends to a cross beam 9.

Secured to the posts 8, as near to the floor as permissible, are bearings 10 which support the drum shaft 11, on which is carried the drum 12. Catheads 13 may be provided on the projecting ends of the shaft. The drum is provided with brake wheels 14 at each end thereof. At each side of the drum, and loose on the shaft, are sprocket gear wheels, indicated as 15 and 16. Sprocket wheel 15, which is larger in diameter than sprocket wheel 16, may be operatively connected with the shaft 11 through a slidable clutch 17 splined to the shaft and operable through a suitable feather, such as 18. The clutch has teeth 17ª which have abrupt faces on one side and sloping or inclined faces on the other side, which fit into correspondingly shaped recesses in the hub of the

sprocket wheel. This provides an automatic release for the clutch if the shaft should be rotated faster than the sprocket wheel.

A slidable clutch 19 having projections 19[a] is splined to shaft 11 to transmit motion from sprocket wheel 16 to the drum shaft, the hub of the sprocket wheel having recesses for the reception of projections 19[a]. A feather 20 may be provided for operating this clutch.

On the opposite side of each post 8 from the bearings 10, are brackets 21. Connecting the brackets on the two posts are structural metal beams 22. On each bracket 21 is a bearing 23 disposed below the center of the drum shaft 11. These bearings support the line shaft 24. This line shaft carries a small sprocket wheel 25 around which a chain may pass to drive sprocket 15 on the drum shaft. It also carries a larger sprocket wheel 26, from which power may be transmitted to sprocket wheel 16. It will be apparent that sprocket wheels 16 and 26 drive shaft 11 through clutch 19 at a greater speed than sprockets 15 and 25, and hence the advantage of having clutch 17 self-releasing when the drum shaft is driven faster than the sprocket 15.

Keyed to the shaft 24 is a third sprocket wheel 27, through which power may be transmitted from a source of power through a chain (not shown) to the line shaft.

Fixed to the supporting beams 22, about midway between the posts, is a retaining structure 28 having bearings 29 therein for the line shaft 24. In this retainer and loose on the shaft, are opposed bevel gear wheels 30[a] and 30. Both of these gear wheels mesh with a pinion 31 on a rotary driving shaft 32, which is journaled in the retainer at 33. A clutch 34 splined to the line shaft 24 and operated through a suitable feather 35 serves to transmit motion from the line shaft to either one of the bevel gears, said clutch having a neutral position in which neither of the gears is driven. By shifting the clutch as desired, the direction of rotation of shaft 32 may be reversed.

The shaft 32 extends from the line shaft to the rotary, as shown in Fig. 1, passing under the drum 12 and as close to the floor as possible. In order to provide a certain amount of flexibility between the line shaft and rotary, so as to enable drillers to determine, to some extent, whether they are likely to injure the drill stem or any part of the machinery by the relative movement of sections of the pipe, one or more flexible couplings are placed in the drive shaft, which shaft is made in sections for this purpose.

In order to allow for certain limited longitudinal movements in the shaft 32, I may divide the shaft and connect adjacent ends by a coupling 32[a]. This coupling may be of any preferred or desired construction, so long as it allows for a limited extension in the length of the shaft, or for longitudinal movement of the separate sections of the shaft. The coupling 32[a], shown in the drawings, comprises two plates bolted together and having keyways in their shaft engaging faces which hold keys 32[b], said keys slidably engaging in suitable key-ways or channels in the shaft sections.

Each flexible coupling is comprised of two main sections 36 and 37. Section 36 has a partly solid interior 36[a] and a partly hollow interior, the hollow portion being enclosed by a peripheral flange 36[b]. The hub of member 36 has a rounded recess 36[c] therein. Member 37 has a rounded projecting hub 37[a] fitting into the recess 36[c]. It is also provided with a projection portion 37[b] adapted to fit into the hollow portion of member 36. The solid portions of the two sections are spaced apart and the faces 36[d] and 37[d] of each are normally parallel. In the faces 36[d] and 37[d] at each side of the shaft, are cups or spring holders 38 having a spherical seat in the faces. Seated in these cups are spiral springs 39. Rods 40 pass through the members 36 and 37, passing also through the springs 39 and holders 38. Clearance for the rods is provided at 36[e] and 37[e]. The outer ends of the rods are surrounded by springs 41 held in compression by nuts 42. These smaller springs serve to counter balance springs 39.

As the drill stem offers resistance to the rotary, one of the springs 39 will be compressed as the parts 36 and 37 tend to move relatively to each other. The action of the couplings may, therefore, serve to indicate to the operator dangerous conditions.

From the foregoing, it is believed that many of the important advantages attained by my invention are apparent. The line shaft is supported below the drum shaft so that the necessity for elevated power transmission chains is eliminated. The posts 8 can be made of minimum height. The chain for driving the rotary is eliminated, while the advantages of the chain are retained. Obviously, it would not be desirable to have a power transmitting shaft elevated above the hoisting drum. The present invention enables the drive shaft to be close to the floor. The line shaft is supported against springing, and the retaining means for the reversing gearing gives rigidity to the construction. The brackets for the line shaft enable the line shaft to be sufficiently low and provide for lateral clearance of the various parts.

Various changes and modifications may be made within the contemplation of my invention, and within the scope of the appended claims.

What I claim is:

1. A hoist for rotary drilling operations comprising a drum, a shaft therefor, posts

on one side of which the shaft is supported, brackets on opposite side of said posts projecting outwardly from the posts having bearings therein spaced outwardly from the posts and below the drum shaft, a line shaft in said bearings, said line shaft thereby being disposed to one side of the drum shaft and below it, and means for driving the drum shaft from the line shaft.

2. A hoist for rotary drilling operations comprising a drum, a shaft therefor, posts on which the shaft is supported, brackets on the posts having bearings therein disposed to one side of and below the drum shaft, a line shaft in said bearings, means on the line shaft through which the drum may be driven, gearing thereon through which a rotary may be driven, bearing means for the line shaft adjacent said gears for driving a rotary, and a rigid cross member connecting said brackets to which said bearing means is secured.

3. A hoist for rotary drilling operations comprising a drum, a shaft therefor, posts on one side of which the drum shaft is supported, brackets on the opposite side of said posts, a line shaft in said brackets spaced outwardly from the posts and at one side of and below the drum shaft, means on said line shaft through which the drum shaft may be driven, gears on said line shaft which are clear of the drum through which a rotary may be driven, rotary driving means driven by said gears and extending under the drum, a retainer for said gears providing bearings for the line shaft, and rigid supporting means for the retainer.

4. A hoist for rotary drilling operations comprising a drum, a shaft therefor, posts on one side of which the drum shaft is supported, brackets on either side of said posts, transverse supporting means connecting the brackets, a line shaft in said brackets spaced outwardly from the posts at one side of and below the drum shaft, means on said line shaft through which the drum shaft may be driven, a shaft extending under the drum for driving a rotary, gears on said line shaft for rotating said rotary driving shaft, said gears being arranged to provide a reversing mechanism for the rotary driving shaft, and a retainer carried by said transverse supporting means for said gears.

5. A rotary driving means comprising a line shaft, a rotary driving shaft at right angles thereto, gearing for transmitting motion from the line shaft to the rotary driving shaft, and a resilient coupling in the rotary driving shaft.

6. A rotary driving means comprising a line shaft, a rotary driving shaft driven from said line shaft, a resilient coupling in the rotary driving shaft, and means in said rotary driving shaft for allowing said shaft to be extended or contracted longitudinally.

In testimony whereof I affix my signature.

EDGAR E. GREVE.