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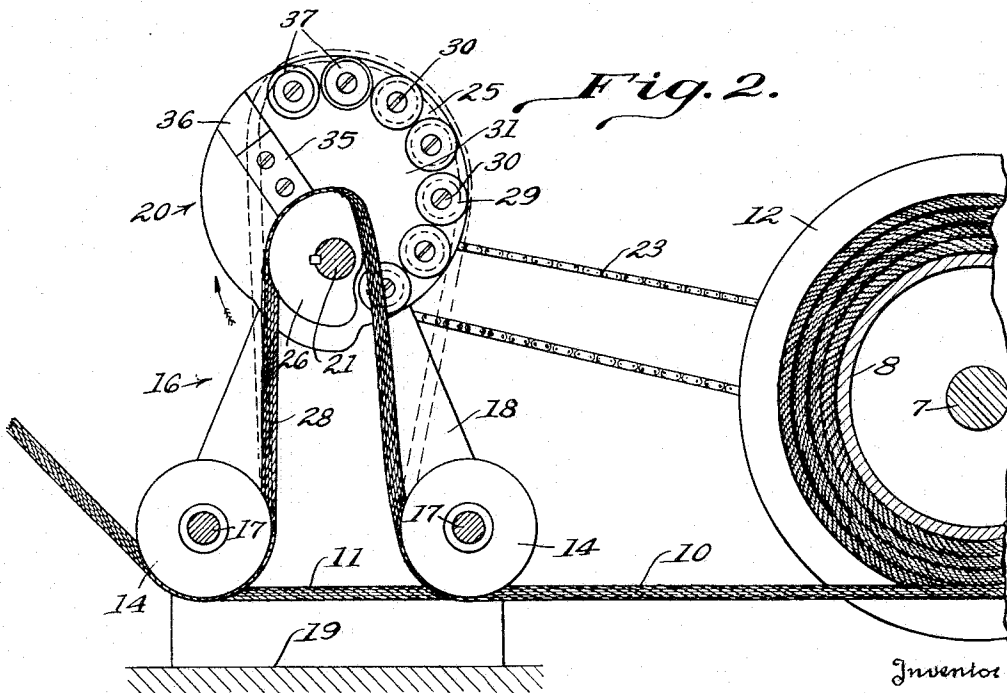
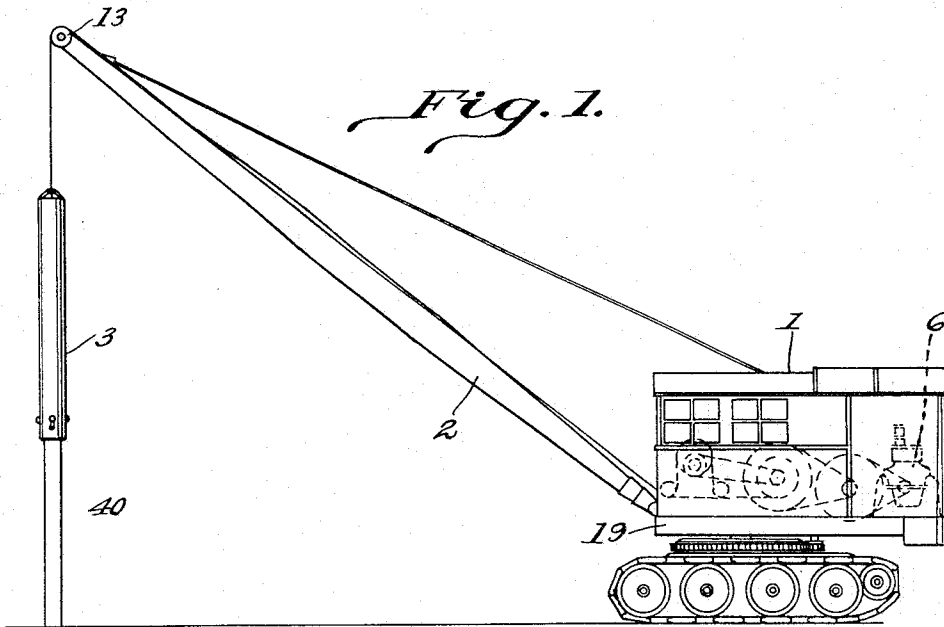
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1,938,459

MECHANICALLY OPERATED HAMMER

Filed July 11, 1932

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

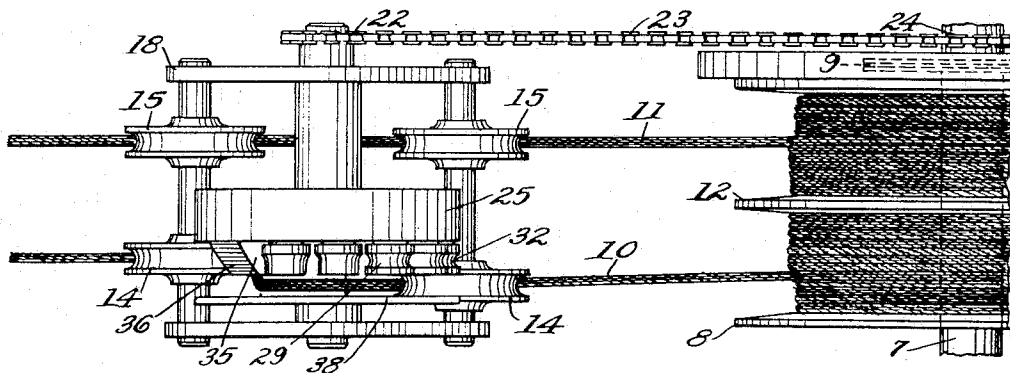


Fig. 3.

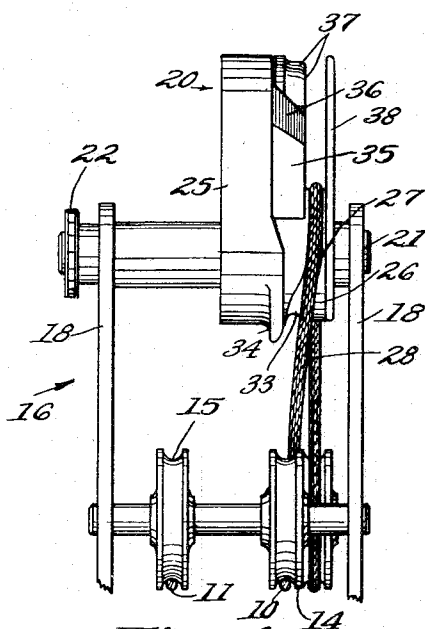


Fig. 4.

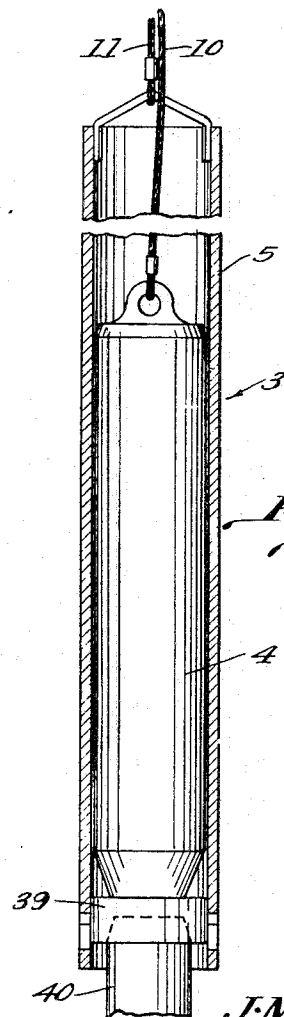


Fig. 5.

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MECHANICALLY OPERATED HAMMER

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6 Claims. (Cl. 61—74)

This invention relates to improvements in means for operating reciprocating cable tools such as hammers used in connection with pile driving machinery, drop hammers in forge shops, oil or water well drilling tools and other apparatus of like nature.

section, showing more particularly the hammer reciprocating mechanism;

Fig. 3 is a top plan thereof;

Fig. 4 is an end elevation thereof;

Fig. 5 is a vertical longitudinal sectional view taken through the hammer mechanism.

Referring more particularly to the drawings, the numeral 1 designates a power driven crane, which for the purpose of illustration only, has been selected to show one use of the present invention. The crane 1 includes the usual boom 2 from which is suspended, in this instance, by cables, the hammer mechanism 3 comprising the vertically reciprocating hammer 4 and a guide 5 therefor. Carried by the crane is also the engine 6 which may be of any known variety and is connected by suitable gear mechanism, to drive a shaft 7 having mounted thereon a cable drum 8. A clutch and brake mechanism 9 is provided between the shaft 7 and the drum by which the latter may be made to rotate with the shaft or held stationary relative thereto. Instead of providing separately rotating drums for the individual cables 10 and 11, to which the hammer 4 and the guide 5 is connected, the drum 8 has both of the cables wrapped thereunto with a separating flange 12 therebetween to keep the cables from becoming entangled with one another. The purpose of the single drum will be described later.

The cables 10 and 11 which are arranged substantially parallel to one another from the drum 8 to the sheaves or pulleys 13 carried by the outer end of the boom 2 are each trained over spaced sets of pulleys 14 and 15 forming a part of the hammer reciprocating mechanism, indicated generally by the numeral 16. The pulleys 14 and 15 are free to rotate independently of one another upon shafts 17 connecting a pair of spaced bracket members 18 mounted upon the engine supporting base 19 of the crane structure 1. Arranged above the pulleys 14 and 15 and disposed in substantially vertical registration with the former is a tool reciprocating member 20 attached for rotation with a shaft 21 journaled within bearings formed in the upper ends of the bracket members 18. To effect the rotation of the member 20, one end of the shaft 21 is equipped with a sprocket 22 over which is trained a sprocket chain 23 leading to a second sprocket 24, mounted upon the cable drum shaft 7. It will be understood that instead of the sprockets and chain, other motion transmitting means may be employed with equal facility.

The tool reciprocating member 20 comprises a main body 25 which is mounted eccentrically upon

An object of the invention is to provide novel and simplified means for effecting the reciprocation of the aforesaid tools and wherein said means consists of a rotatable and eccentrically shaped member arranged at a point of the cable between the tool and the cable drum, which member has a portion of its periphery formed with a cable guide in which the cable is received to form a lifting loop in the action of raising the tool, means being also provided in connection with said member for dislodging the cable from the guide, after the tool has been lifted to its maximum height, thus permitting the tool to drop.

Another object of the invention is to form the tool reciprocating member such that a comparatively large size lifting loop on the cable may be formed thereby with respect to the size of said member.

A still further object is to provide antifric-tion means in connection with the cable guide of the tool reciprocating member in order to minimize the wear upon the cable at the point of lifting.

In certain types of hammers such as those used in connection with pile drivers, a cable suspended hammer and a guide or tubular hammer receiving casing is employed carrying an anvil block at its lower end. It is of the utmost importance that the proper relation between the hammer and the guide thereof is maintained in order that the apparatus will function to the best advantage. It is also therefore an object of the present invention to arrange the hammer and hammer guide carrying cables in such manner relative to one another that the proper correlation therebetween will be automatically maintained at all times regardless of the vertical position of the hammer and guide.

With these and other objects in view, which will appear as the description proceeds, the invention consists in the novel features of construction, combinations of elements and arrangements of parts hereinafter to be more fully described and pointed out in the subjoined claims.

In the accompanying drawings:

Fig. 1 is a side elevation of a power driven crane when used as a pile driver and embodying the present invention;

Fig. 2 is an enlarged detail view partly in

the shaft 21 and keyed for rotation therewith. Arranged to one side of a vertical face of said body and located at a point around the shaft 21 is a cam 26 having a guide groove 27 formed therein in which is received the upper portion of a loop 28 formed in the cable between the pulleys 14. Also carried by the body 25 and arranged at a point near the outer periphery thereof are a plurality of guide rollers 29 mounted adjacent one another for rotation upon pins or the like 30, rigidly carried by the face 31 of the member 25. The rollers 29 are each formed with a cable receiving groove 32 which are aligned with one another and the guide groove 27 to form a continuous guideway for the reception of the loop portion 28 of the cable. It will be noted from Fig. 4 of the drawings that the guide groove 27 formed in the cam 26 is angularly or spirally arranged, as indicated at 33, so that the cable will be guided into direct alignment with the roller grooves upon the rotation of the member 20. It will also be noted that the pulleys 14 are positioned slightly offset with respect to one another of which one thereof is in alignment with the grooves 32 formed in the rollers and the other of said pulleys in alignment or registration with the outermost portion of the groove 27. To prevent the cable from overrunning the angular groove portion 33, a guide flange 34 is provided which will also aid in directing the cable into proper registration with the roller grooves.

From the structure so far described, it will be seen that as the member 20 is rotated in a clockwise direction indicated by the arrow in Fig. 2, the cable portion 28, which is initially positioned within the guide groove 27 of the cam member 26, will be slidably guided into the portion 33 of the groove and upon further rotation of the member 20, will seat itself within the grooves of the rollers 29 until the member 20 has made substantially one complete revolution. This will raise the cable to a position indicated by dotted lines in Fig. 2 and as the cable 10 is attached to the stationary drum 8, the free end thereof, carrying the tool or hammer mechanism 4, will thus be moved so as to effect the raising of the tool as will be readily understood. With the cable loop in this raised position, the tool will be elevated to its maximum height and ready to be dropped to perform its function, at which time the loop 28 will take the position shown by full lines in the just mentioned figure.

To effect the dropping of the loop, each time the member 20 has made a revolution, the face 31 of the body 25 is provided with a wedge block 35 which is beveled at its upper end as at 36 from a point even with the face 31 to the outer face of the block which projects outwardly to a point substantially even with the forward end of the guide groove 27. By the provision of this wedge block and the beveled surface thereof, the cable will be made to slide outwardly so as to dislodge itself from its contact with the rollers. To facilitate the initial dropping movement of the cable loop, the rollers 37 have their grooves diminished or formed somewhat slanting towards the outer ends of the rollers so that the cable will readily slip off and fall to its lowered position. This raising and dropping of the loop will be continued as long as the member 20 is in its rotative operation.

If desired, a guide plate 38 may be provided which is spaced from the ends of the rollers 29 and the outer face of the wedge block 35 a sufficient distance therefrom to allow the cable to

drop therebetween. The plate will prevent the cable from falling off the end of the cam 26 and aid in positioning the cable correctly within the groove at the beginning of each lifting operation. The cable to which the tool is attached should be so adjusted as to provide a slight slack therein at the point of the loop each time the tool is dropped, in order to permit the tool to function effectively and to prevent snapping of the cable.

When the apparatus is used in connection with pile driving machinery, employing a drop hammer and a vertically adjustable guide casing therefor, as illustrated in Fig. 5 of the drawing, it is highly essential that the relation between the hammer and the guide casing will be properly maintained at all times during the driving of the pile. This is automatically accomplished by winding the separate hammer and casing suspending cables 10 and 11 around the single drum 8, so that whenever the hammer is progressively lowered to follow the driven pile, the guide casing therefor will also be simultaneously lowered correspondingly in correct proportion. The relative relation between the hammer and the guide casing should be such that the anvil block 39, carried by the lower end of the casing 5, together with the latter, will rest with their weight upon the upper end of the pile 40 with the hammer striking the block. The block 39 which is mounted for limited vertical movement within the casing 5 is free to follow with the pile at each blow of the hammer, which amount of movement is governed and automatically maintained by the simultaneous lowering of the casing and hammer, effected by the unwinding adjustment of the cable drum 8.

From the foregoing description, taken in connection with the accompanying drawings, it will be apparent that the present invention provides for a novel tool reciprocating mechanism which is particularly suitable for use in connection with pile driving machinery.

The rotatable tool reciprocating member of the mechanism is extremely simple in construction, involving novel means in the form of an eccentrically shaped cable guide for raising the cable and its attached tool to a desired height, said means being also formed as to effect the release of the cable permitting the tool to drop, each time the member has made a revolution, to perform its function.

The invention also provides for a novel arrangement between a cable suspended hammer and guide casing therefor whereby the two may be simultaneously adjusted and kept in their true relative relation or coordination with respect to one another regardless of their vertical position.

Although I have shown and described what I consider to be the preferred form of the invention, nevertheless it will be understood that various slight changes may be made in the operating parts and the arrangement thereof without departing from the spirit and scope of the invention.

What is claimed is:

1. In apparatus of the class described, comprising in combination a cable drum, a reciprocating tool and a cable for effecting the suspension thereof, and means for effecting the reciprocation of said tool, said means including a pair of spaced cable receiving pulleys, an eccentrically shaped tool lifting member rotatably mounted above said pulleys between which the cable forms a loop, said member being provided with a cable receiving guide groove, which is disposed around

a portion of the periphery of said member, said guide groove serving to effect the raising of said loop and consequently the lifting of the tool as the member is rotated, and means on said member for dislodging the cable from said groove when said member has rotated to a point raising the cable loop to a maximum height.

2. In pile driving machinery, a cable suspended hammer, a cable suspended guide casing therefor, a single cable drum around which the ineffective lengths of said cables are wound, means co-acting with the hammer cable for effecting the reciprocation of said hammer, and means connecting with the first named means for controlling the movement of said drum in the operation of lowering said hammer and casing, the arrangement of the cables and the drum therefor permitting a true relative relation to be maintained between said hammer and casing during the raising and lowering thereof.

3. In apparatus of the class described, the combination with a cable suspended reciprocating tool and a winding drum for receiving the inactive length of said cable, of a tool lifting mechanism at a point on the cable intermediate the tool and drum, said mechanism comprising a pair of spaced cable guides between which the cable forms a loop, and a rotatable member spaced above said cable guides and disposed within said loop and having means formed near its periphery for raising said loop to a high point and effect its release, thereby dropping the tool and returning said loop to a low point.

4. In apparatus of the class described, the combination with a cable suspended reciprocating tool and a drum for the reception of the inactive length of said cable, of a tool lifting mechanism at a point on the cable intermediate the tool and drum, said mechanism comprising a pair of spaced cable guides between which the cable forms a loop, and a rotatable member spaced from said

cable guides disposed within said loop and having means formed near its periphery for enlarging said loop to raise the tool and for effecting the release of said loop from said member to allow said tool to drop by gravity and to thereby take up the slack in said cable formed by the enlargement of said loop.

5. In apparatus of the class described, the combination with a cable suspended reciprocating tool and a drum for receiving the inactive length of said cable, of a tool lifting mechanism at a point on the cable intermediate the tool and drum, said mechanism comprising a pair of spaced cable guides between which the cable forms a loop, and a rotatable member spaced from said cable guides and disposed within said loop having a plurality of guide rollers adjacent the periphery engaging said loop for the lengthening and enlargement thereof to raise said tool, and means for disengaging the loop when the tool has been raised to its maximum height.

6. In apparatus of the class described, the combination with a cable suspended reciprocating tool and a winding drum for receiving the inactive length of said cable, of a tool lifting mechanism at a point on the cable intermediate the tool and drum, said mechanism comprising a pair of spaced cable guides between which the cable forms a loop, a rotatable member spaced from said cable guides and disposed within said loop and having a cable guide near its periphery by which the loop is lengthened to raise said tool, means to dislodge the cable therefrom when the tool has been raised to its maximum height and to thereby permit the same to drop by gravity including anti-friction means formed in connection with said cable guide for permitting said cable to be shifted longitudinally to lower the tool when said member is in operation.

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