March 24, 1936. G. VOSS 2,035,107

CABLE CRANE

Filed Sept. 28, 1931

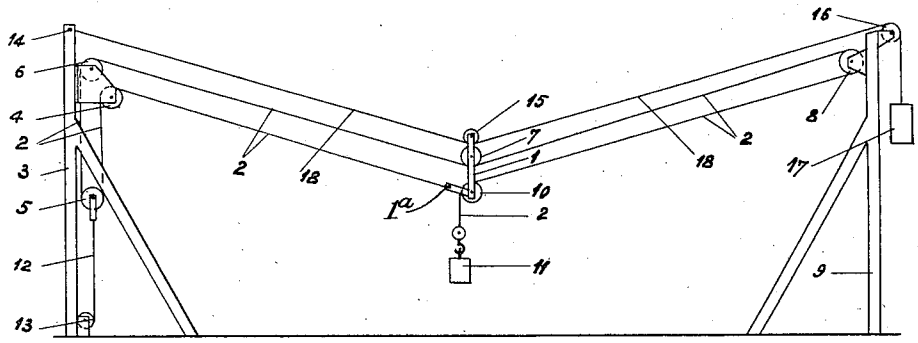


Fig. 1

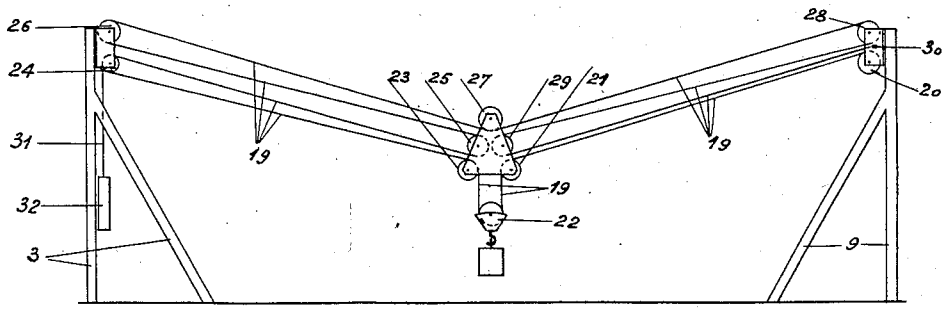


Fig. 2

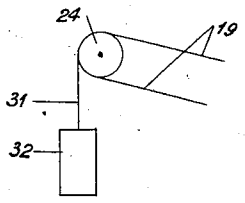


Fig. 3

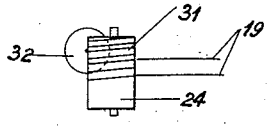


Fig. 4

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CABLE CRANE

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5 Claims. (Cl. 212—87)

The present invention relates to a rope or cable crane, the object of the invention being to provide an improved apparatus of this kind in which the load carrying rope also serves as lifting ropes and in which the weight of the pulley block is taken up by means of a special rope which is suspended between the pulleys mounted on the supporting pillars or brackets, said rope stretched at a constant tension, or the carrying rope has an additional pull or tension imparted to it by means of a counterweight which is designed to neutralize the weight of the pulley block.

With the above and other objects in view, the invention consists in the construction, combination and arrangement of devices hereinafter described and claimed.

In the accompanying drawing

Figure 1 is a diagrammatic elevation of a cable crane constructed and arranged in accordance with my invention.

Figure 2 is a similar view of a modified form of the cable crane.

Figure 3 is a detail diagrammatic elevation of the supporting revoluble drum 24 and a portion of the cable and of the counterweight and the ropes sustaining said counterweight from said drum.

Figure 4 is a detail plan of the same.

Fig. 1 in the appended drawing shows an embodiment of the present invention. The carrying rope or travelling cable 2 which is fixed to the block 1 at one of its extremities as at 1^a is carried over the driving pulley 4 mounted on the support 3, then extends downwardly and passes over the loose pulley 5, then upwardly and over the pulley 6 of the support 3, and over the guide pulley 7 of the block 1 and is then carried over the rope pulley 8 of the support 9 and back over to the pulley 10 of the block 1. The depending end of the carrying rope carries the load 11. The rope 12 is carried from the loose roller or pulley 5 to the rope drum 13 of the winch. If the driving pulley 4 is prevented from rotating, then assuming the proper frictional adhesion between the load carrying rope and the driving pulley 4 to exist the length of the load carrying rope between the said driving pulley 4 and the block 1 remains stationary, the latter can therefore not move in a horizontal direction.

If however the loose roller 5 is pulled downwardly by means of the haulage drum 13, the load 11 is pulled upwardly over the rollers or pulleys 10, 8, 7, 6, and 5 by means of the portion of the carrying rope running over said rollers; and if the loose pulley is raised the load is lowered. If the level of the loose pulley 5 is fixed by means of locking the haulage drum, then the block 1 is pulled when the driving pulley 4 rotates left-handedly by the length of the carrying rope between pulley 4 and the pulley block to the left and when the pulley 4 rotates right-handedly the pulley block moves to the right.

The weight of the rope block 1 is taken up by the relieving rope 18 which is fixed at 14 to the support 3 and runs under the pulley 15 of the block 1 and over the pulley 16 mounted at the upper end of the lateral support 9. Said rope 18 is kept at a constant tension by means of the counterweight 17 to which its free depending end is attached.

To illustrate the operation of the invention, the following is in point: If the weight of the load is designated with P, the pull in the supporting cable 2 equals also P. As the rolls 10, 8, and 7 are freely rotatable in each of the four supporting cable strands, arranged laterally on the crane trolley, also the pull P must be present, if the crane trolley is in the center between both the lateral supports. When a designates the angle of the supporting cable strands, extending laterally from the trolley against the horizontal, the equilibrium condition at the crane trolley reads, when the deadweight thereof is balanced by the cable 18: $P=4P$: sin a; from this results: sin $a=\frac{1}{4}$. This equation shows that the angle a and therewith also the sag of the supporting cable is independent of the position of height of the load. Hence the sag of the supporting cable is constant during the lifting of the load.

Fig. 2 shows another embodiment. Figs. 3 and 4 show the devices adopted to produce a constant and additional pull or tension on the carrying rope, for the purpose of neutralizing the weight of the pulley block, on an enlarged scale both in elevation and plan view. In this case the load carrying rope 19 consists of two ropes hanging down from the rope pulley block which together take up the loads, the load carrying rope consisting in the horizontal direction of four ropes. Said load carrying rope is carried from the lifting drum 20 fixed to the lateral support 9, over the rope pulleys 21 to 23 forming a depending bight therebetween and passes then on to the tension drum 24, being coiled several times around it, so as to create the required frictional adhesion. From said drum the rope runs over the rope pulleys 25 to 27 to the driving pulley 28 and from there over the rope pulley 29 of the pulley block to the point 30 where it is fixed to the lateral support 9. It is possible to divide

the carrying rope on the drum **24** and the two rope extremities produced by this division can be fixed to the drum. There is further another rope **31**, fixed to this drum, which is subjected to a constant tension by reason of the counterweight **32**.

By means of this rope the three top strands of the load carrying rope **19** have an additional pull imparted to them which is utilized to neutralize the weight of the pulley block.

By reason of this arrangement the rather awkwardly long rope **18** of the first embodiment is eliminated, moreover the sagging of the upper ropes or rope strands when the crane is not loaded is very considerably reduced so that the dead or idle lift is also considerably reduced.

If the driving pulley **28** is locked and prevented from rotating, then the lengths of the carrying rope between the rope pulley **29** and the driving pulley **28** and the fixing point **30** remain stationary, i. e., the pulley block can not be displaced laterally; the load is then raised or lowered in the manner known per se by rotating the lifting drum **20**. If the latter, however, is locked then the lengths of the carrying rope between the rope pulley **29** and the driving pulley **28** or the point of fixation **30** are, by reason of rotating said driving pulley **28**, lengthened or shortened, so that the pulley block and the load moves to the right or left according to the direction of rotation of the driving pulley.

I claim:

1. A cable crane comprising supporting elements arranged at spaced points, a cable having bights slidably engaging said supports so that the cable is suspended by and between said supports, a pulley block carried by and also movable on and by the cable, load attaching means on a portion of the cable extending downwardly from said pulley block, means for balancing the weight of the pulley block and the cable, means to apply tension to the cable for shortening the effective length of the same and thereby raise the load attaching means while maintaining constant the sag of the cable, and a driving drum around which the cable passes for causing the load attaching means to be hauled by the cable.

2. A cable crane comprising supporting elements arranged at spaced points, a cable supported by, movable on and suspended in depending bights between said supporting elements and constituting in itself both a lifting cable and a carrying cable, a pulley block carried by and also movable on and by said cable, load attaching means on a portion of the cable extending downwardly from said pulley block, means for balancing the weight of said pulley block and the cable, means for shortening the effective length of the cable to raise the load attaching means while maintaining constant the sag of the cable, and a driving drum around which the cable passes for causing the pulley block and therewith the load attaching means to be conveyed toward either one of said supporting elements.

3. A cable crane comprising supporting elements arranged at spaced points, a cable supported by, movable on and suspended in depending bights between said supporting elements and constituting in itself both a lifting cable and a carrying cable, a pulley block carried by and also movable on and by said cable, load attaching means on a portion of the cable extending downwardly from said pulley block, means for balancing the weight of said pulley block and the cable, means for shortening the effective length of cable to raise the load attaching means while maintaining constant the sag of the cable, said means comprising a lifting drum to which one end of said cable is secured and adapted to be wound thereon, the other end of said cable being anchored to a stationary element, and a driving drum around which the cable passes for causing the pulley block and therewith the load attaching means to be conveyed toward either one of said supporting elements.

4. A cable crane comprising supporting elements arranged at spaced points, a cable supported by, movable on and suspended in depending bights between said supporting elements and constituting in itself both a lifting cable and a carrying cable, a pulley block carried by and also movable on and by said cable, load attaching means on a portion of the cable extending downwardly from said pulley block, means for balancing the weight of said pulley block and the cable, means for shortening the effective length of cable to raise the load attaching means while maintaining constant the sag of the cable, said means comprising a vertically movable pulley arranged in a downwardly extending bight of said cable and adapted to vary the length of said bight, and a driving drum around which the cable passes for causing the pulley block and therewith the load attaching means to be conveyed toward either one of said supporting elements.

5. A cable crane comprising supporting elements arranged at spaced points, a cable supported by, movable on and suspended in depending bights between said supporting elements and constituting in itself both a lifting cable and a carrying cable, a pulley block carried by and also movable on and by said cable, load attaching means on a portion of the cable extending downwardly from said pulley block, means for balancing the weight of said pulley block and the cable, said balancing means comprising a rope which is secured with one of its ends to one of said supporting elements, passes slidably through said pulley block and is slidably supported by said other supporting element, and a counter weight attached to the other end of said rope; means for shortening the effective length of cable to raise the load attaching means while maintaining constant the sag of the cable, and a driving drum around which the cable passes for causing the pulley block and therewith the load attaching means to be conveyed toward either one of said supporting elements.

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