A. H. MITCHELL.

LUFFING CRANE.

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Fig. 1.

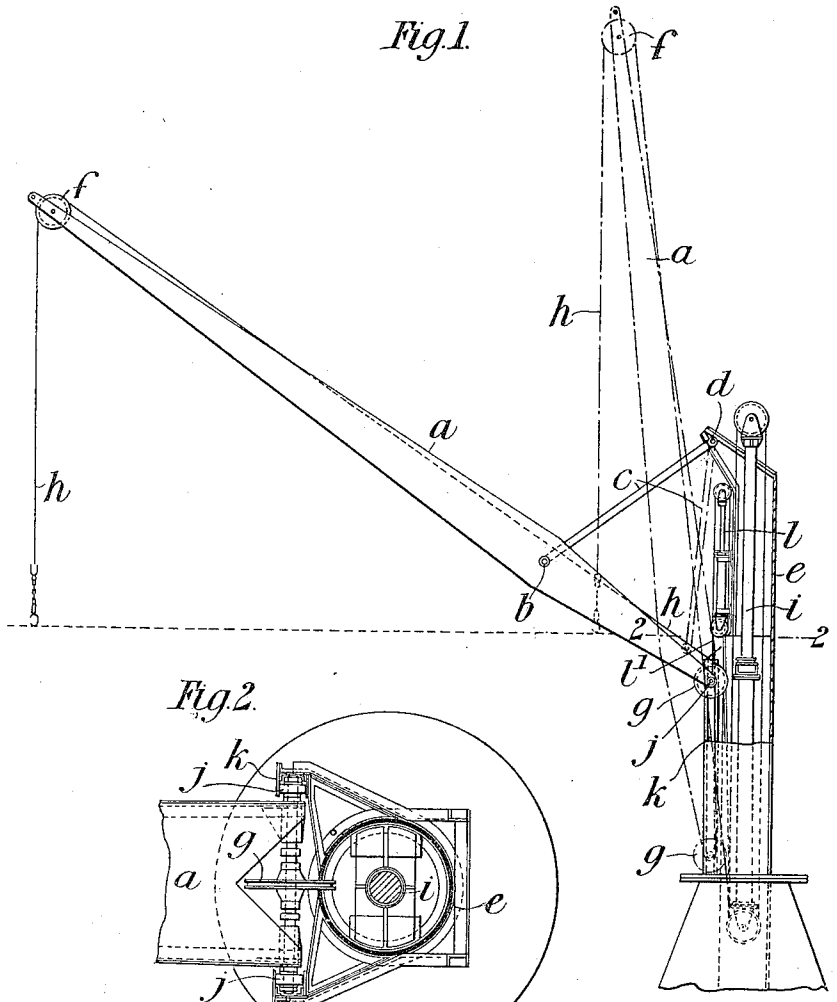
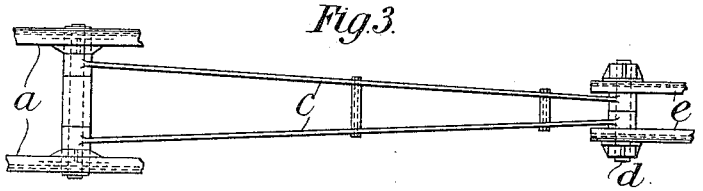


Fig. 2.

Fig. 3.



Witnesses.

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LUFFING-CRANE.

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To all whom it may concern:

Be it known that I, ALFRED HILLYARD MITCHELL, a subject of the King of Great Britain, residing at 25 Wrottesley road, Plumstead, Kent, England, have invented new and useful Improvements in Luffing-Cranes, of which the following is a specification.

My invention relates to improvements in cranes of the kind in which means are provided for maintaining the load at one level during luffing.

In cranes of this type as heretofore constructed the maintenance of the level of the load has been insured in various ways, as for instance by paying out or taking in the lifting rope, such an arrangement being shown, for example, in my prior British Patent No. 8607 of 1902 or by causing the jib head to move horizontally by mechanism on the principle of the well-known Scott-Russell straight line motion but in all cases the weight of the jib has to be lifted, whereby a considerable waste of power is occasioned, and in the latter case the length of the crane post is equal to that of the jib so that the former is unnecessarily long. Now, according to this invention I construct a crane in such a manner that, as the jib moves in luffing, its center of gravity moves in a horizontal line whereby the force of gravity on the jib has not to be counteracted in luffing and no balance weight has to be displaced.

In carrying out the invention I make use of a jib the center of gravity of which coincides approximately with its center of length and which is suspended by a link about one-quarter of the length of the jib and connected to the latter at a point a quarter of the length of the jib from the lower end thereof, which end moves vertically up and down the crane post in the known manner. The lifting rope is passed beneath a pulley at the bottom of the post, and over a pulley at the bottom of the jib, and thence over the usual pulley at the jib head. With this construction it will be seen that the center of the jib is always at one level whatever the position of the jib, and the distance measured from the ground to the jib head, added to the length of the jib and the distance of the jib end from the bottom of the vertical post will remain constant, notwithstanding the adjustment of the jib during the luffing operation and it will consequently be obvious that if the rope be fixed on the crane barrel the free end will always have a horizontal travel. Moreover, the jib being so constructed that its center of gravity is at the center of its length, as it moves in the process of luffing, the center of gravity moves in a horizontal line, thus reducing the power required to luff the jib to a minimum and dispensing with the separate balance weight.

To enable my invention to be fully understood, I will describe it by reference to the accompanying drawing, in which:—

Figure 1 is a sectional side elevation of a luffing crane constructed according to the invention. Figs. 2 and 3 are respectively a section on the line 2—2, Fig. 1, and a plan of a detail drawn to a larger scale.

a is the jib of the crane which is of the so-called cantaliver type, the said jib being suspended at the point *b* by means of a radius rod or link frame *c* to the point *d* at the head of the vertical post *e* of the crane. As above stated the position of the point *b* is a quarter, or practically a quarter of the length of the jib from the lower end thereof, and the radius rod or frame is of a length equal to the said distance of the said point from the jib end. A pulley *f* is mounted at the head of the jib *a* and a similar pulley *g* at the lower end thereof, the lifting rope *h* passing over the said pulleys *f* and *g* and thence to the bottom of the post *e* where it passes around the pulley tackle of the hydraulic ram *i* by means of which the said rope can be drawn in or paid out for the purpose of lifting or lowering the load in the well-known manner.

In the construction illustrated, the lower end of the jib *a* is made of considerable width as shown in Fig. 2 and is provided with rollers *j*, *j* which run in the channel guides *k*, *k*, provided at the lower part of the crane post *e*, the said guides being so constructed that the jib bottom cannot leave the post during the action of sluing. The luffing of the crane jib is effected by means of the hydraulic ram *l* and tackle l^1, the latter being connected to the lower end of the jib as shown. As above stated the length of the radius rod or link frame *c* is equal to the distance between the point *b* and the jib bottom, and the center of gravity of the jib *a* is at or about the center of its length.

The crane operates as follows:—Assuming that the lower end of the jib *a* be moved

downward along the runway *k* on the crane post *e*, then the said jib will assume a new position, such, for example, as that shown in broken lines in Fig. 1. The length of rope, however, from the winding tackle at the bottom of the crane post *e* over the pulley *g* along the jib *a* over the pulley *f* to the load will remain the same, this being true for every position of the jib between the maximum and minimum radius from which it will be obvious that any load suspended from the lifting rope *h* will travel in a truly horizontal line when the jib is luffed so that no work is required to be done on it, neither does it do any work or have any effect on the balance of the jib. It will also be obvious that when the jib is luffed so that the bottom drops vertically to a predetermined extent, the head of the jib will rise to an equal extent in the vertical direction, whereby it results that the center of the jib neither rises nor falls so that it travels in a horizontal line, and if the center of gravity of the jib be made to coincide with the center of length as above stated, the jib is balanced in all positions whether there be a load on the lifting rope or not.

In the preceding description I have stated the relative dimensions of the jib and its supporting link or links and it will be understood that these dimensions may be somewhat departed from in practice owing to the difference in the conditions brought about by the wrapping and unwrapping of the rope around the pulleys *f* and *g*. It will also be obvious that any desired area in the travel of the load may be obtained by suitably modifying the proportions, positions and inclinations of the various members of the crane gear. It will also be clear that any means other than those shown and described may be made use of for controlling the lifting and luffing ropes.

Claims.

1. In a crane of the class described, the combination with a crane post, of a jib, the inner end of which has a sliding connection with said post, a radius rod pivotally connected at one end to said post and at its other end to said jib at a point situated about a quarter the length of said jib from the inner end thereof, and said radius rod being about the same length as one quarter the length of the jib, and means for vertically moving the inner end of said jib.

2. In a crane of the class described, the combination with a crane post, of a jib, the inner end of which has a sliding connection with said post, a radius rod pivotally connected at one end to said post and at its other end to said jib at a point situated about a quarter the length of said jib from the inner end thereof, a pulley provided on the lower end of said jib and a further pulley provided on the outer end of said jib, a lifting rope passing over said pulleys, and means for vertically moving the inner end of said jib to increase or decrease the length of the rope between it and a fixed point.

3. In a crane, the combination with a crane post, of a jib, a radius rod or link pivotally connected at one end to said post and at the other end to said jib, means for moving the lower end of the jib in a vertical path, said jib and radius rod being so proportioned and connected that the downward vertical movement of the lower end of the jib is equal to the vertical rise of the top thereof, whereby the center of gravity of the jib will travel in a horizontal path.

4. In a crane, the combination with a crane post, of a jib, a radius rod pivotally connected at one end to said post and at the other end to said jib, pulleys provided at the outer and inner end of said jib, a rope passing over said pulleys and having its inner end secured to a fixed point, and means for vertically moving the inner end of said jib, said jib and radius rod being so proportioned and connected that the downward vertical movement of the inner end of the jib is equal to the vertical rise of the outer end thereof, whereby the load will travel in a horizontal path during the luffing and the center of gravity of the jib will move parallel thereto.

5. In a crane, the combination with a vertical support, of a cantaliver jib, a radius rod for suspending the jib to the upper part of the support, the said radius rod being of a length equal to a quarter of the length of the jib and being attached to the latter at a point situated a quarter of the length of the jib from the bottom end thereof and a runway upon or in connection with the lower part of the support in which the bottom end of the jib moves vertically, substantially as hereinbefore described.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."