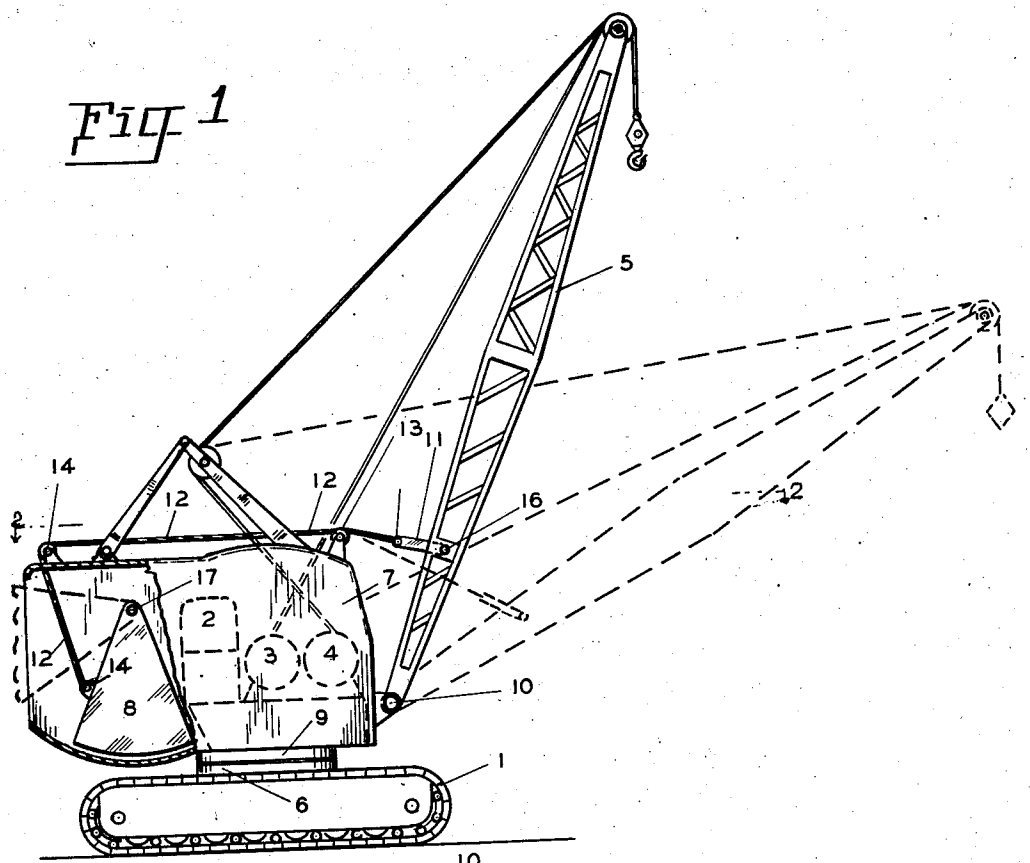
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AUTOMATIC COUNTERBALANCE FOR BOOM DERRICKS

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Fig. 1



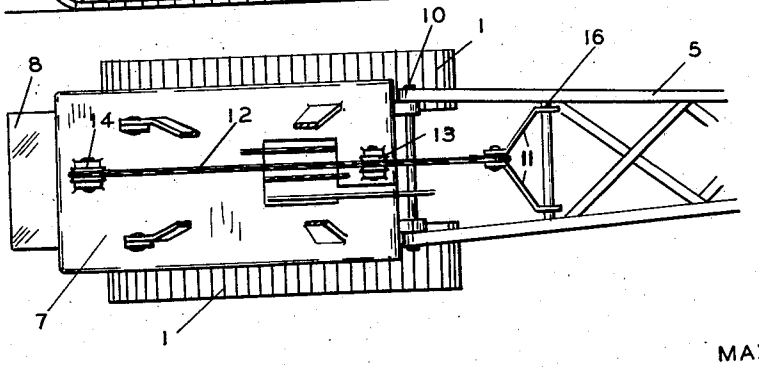


Fig. 2

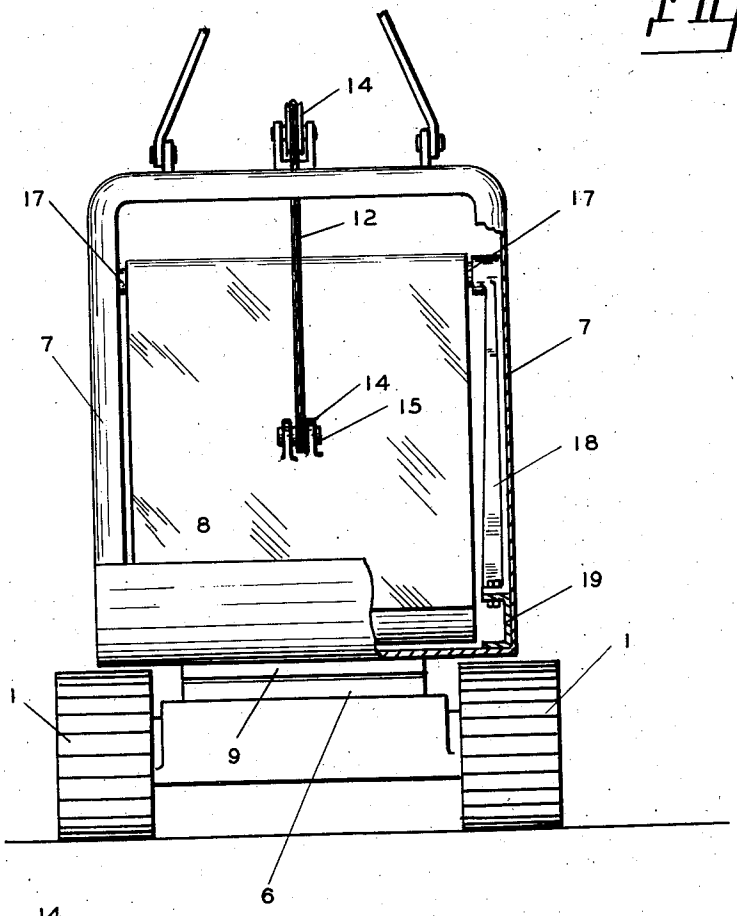
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AUTOMATIC COUNTERBALANCE FOR BOOM DERRICKS

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Fig 3



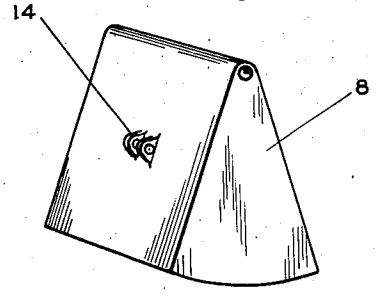


Fig 4

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AUTOMATIC COUNTERBALANCE FOR BOOM DERRICKS

Maxwell A. West, Portland, Oreg.

Application September 13, 1944, Serial No. 553,942

5 Claims. (Cl. 212—49)

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This invention relates to an automatic means for variably counterweighting a derrick boom, the counterweighting effect being greatest when the boom is horizontal and vanishing almost or quite completely when the boom reaches or nears the maximum altitude possible when it is lifting a load. This altitude will of course be affected by the bulk of the load to some extent.

The foregoing statement may also be read as one of the principal objects of the invention.

While the invention may be used in connection with relatively fixed derricks of the pillar-crane type, the mast and gaff type and others, it finds its most useful field in what is broadly defined as the locomotive crane in general and the crawler type locomotive crane in particular; and with these, the principal object is to provide a way for increasing the lifting capacity of the crane without increasing the overhang of the cab or house within which the lifting and propelling machinery is contained and without producing a condition of unbalance due to an excessive counterweight effect when the boom approaches a vertical aspect.

The next object is to arrange a pendulum mounted and pivoted counterweight so connected to the boom that when the boom is lowered the pendulum counterweight will automatically swing outward and upward with respect to a turntable upon which both the counterweight and the boom are operatively pivotally mounted, so that the counterbalancing of the boom is proportionate to boom position, without requiring that the cab of the crane be much if any larger than would otherwise be required; in other language, the boom is mounted as an inverted pendulum, with the connection 12 between itself and the pendulum weight 8 so positioned that the overhead or long end of the boom 5 will at all times be equally counterbalanced, whatever the boom's relative position between vertical and horizontal.

Drawings accompany and form a part of this specification in which as will be seen I have chosen to illustrate and describe the invention as used with a crawler type crane, that being its most useful application.

Fig. 1 of the drawings shows a crawler type crane with a boom and automatic counterweight according to the invention, the crane being of the full revolving type. The boom in this figure is about at its greatest vertical aspect. Parts of the structure are broken away for clarity.

Fig. 2 is a top or plan view of Fig. 1 viewed from the plane 2—2, showing the boom lowered,

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which has concurrently raised the counterweight to exert its maximum counterbalancing effect as will be explained.

Fig. 3 is a rear view of Fig. 1 showing the counterweight and the double pedestal, one part of which is built into each opposite side wall of the cab to support the pivot mounting of the counterweight.

Fig. 4 is a perspective view of the pendulum counterweight detached from the rest of the mechanism. This is diagrammatic as it indicates a solid casting or the like, when as a matter of utility it will be better if made of steel plates with a separate compartment at the large end filled with, say punchings of steel or other cheap material to concentrate the weight in the heavy lower end better than a cylindrical segment would do.

Further describing the drawings, 1 represents the well known crawler apparatus and 2 indicates a powerful internal combustion motor selectively engageable with the crawler apparatus indicated by 1 or the hoisting drums 3 or 4, 3 being employed for raising the boom 5 or manipulating it in the well known manner, no part of which is a part of the claimed invention.

A platform 6 supports a cab 7, the latter containing the prime mover and the drums mentioned and the pivotally mounted pendulum counterbalance 8. The platform 6 is mounted between and supported by the two treads of the crawler indicated by numeral 1. The cab 7 rests on a turntable 9 interposed between the platform 6 and the cab 7 in the well known manner and also well known is a drive by which the cab 7 with its supported boom, power plant and counterweight may be revolved in either direction at will by power of the motor 2 selectively applied.

The bottom part of the cab 7 is strongly constructed, not only to support the parts described but to withstand the stresses of using the derrick. It will be noted that the bottom part of the cab 7 is really an upper member of the turntable 9 and it will be so referred to hereinafter. The boom 5 is pivotally connected to the turntable 9 near one outer boundary by the pivot pin 10 and can be raised or lowered by using that pivot pin as a turning point.

When power (or gravity) lowers the boom, the clevis 11 (Fig. 2) moves with it and hauls the connected cable 12 over the well supported rollers 13 and 14 and moves the pendulum counterbalance outwardly and upwardly with respect to the opposite boundary of the turntable 9, with re-

spect to the point where the boom 5 is pivotally connected, since the end of the cable 12 opposite the clevis connection is connected to the pendulum 8 by the lugs 14 and the bolt 15 and it will be at once seen that the amount of movement of the pendulum counterweight is proportional as predetermined by the respective distances between the pivot 16 for the clevis 11 and the centerline of the pivot pin 10 as compared with the distance between the pivot rod 17 which supports the pendulum weight 8 and the bolt 15 to which the cable 12 is connected. The law of the lever applies throughout this construction.

Since the boom cannot usefully be raised to vertical nor usefully lowered to horizontal and the pendulum weight 8 can (oppositely) occupy both of these extreme conditions, the line 12 is attached to the weight at about three quarters the spacing from pivot point 17, as compared with the spacing of pivot point 10 and the place where 12 is attached at 17. This applies the "law of the lever" in that less weight is required in 8 to overcome the longer leverage of the boom 5. It is not the purpose herein to balance more than the boom.

The connections between the weight and the boom, including the cable 12, the rollers upon which the cable bears and the elements 11, 13 and 16, will for brevity be hereinafter called transmissions.

The pivot rod 17 is supported by brackets 18 at each end, one of which is shown in Fig. 3 resting on the channel 19 which forms a part of the turntable 9.

Numerous conventional parts, well known, such as lifting cables both for boom and load, are shown merely to give the relative arrangement of the claimed invention and since they are well understood by anyone familiar with lifting derrick apparatus, they have not been indicated by numerals or described, but it is thought that a clear description of the claimed invention is to be found herein and that those familiar with the art can find all the necessary disclosure to make use of the invention.

What I claim as new and desire to secure by Letters Patent, is:

1. In revoluble derrick machines, a pivoted boom member, means for raising and lowering the boom, a pendulum boom counterbalance weight swingably mounted behind the boom pivot, cable and roller transmissions between said boom and said pendulum weight, said cable operatively connected to the boom near its lower pivoted end so that as the boom lowers and its effective weight

increases, the pendulum weight raises and its applied counterbalance effect also increases to substantially counterbalance said boom.

2. In rotary crane machines, a turntable, a boom pivotally connected to the turntable for raising and lowering, a pendulum weight independently pivotally mounted above the turntable rearwardly of the boom, a cable pivotally in tension between the weight and boom, the said cable connected to the boom, said boom end of the connection means attached to the boom near its lower end to permit greater travel of the boom than is required of the said pendulum weight to move from one extreme position to the other.

3. In a movable boom type hoisting machine, a turntable, a boom pivotally mounted by one end thereof near one outer boundary of the turntable, a pendulum counterweight member pivotally mounted to swing outward and upward with respect to the opposite boundary of said turntable, and cable connecting means between said boom and said counterweight, said boom end of the connecting means pivotally attached to the boom near the lower end of the latter with the weight of the boom above the said connection substantially equal to the effective weight of the counterweight upon opposite movement thereof.

4. In a boom type hoisting machine, a turntable, a boom pivotally mounted by one end thereof near one outer boundary of the turntable, a pendulum counterweight member pivotally mounted to swing outward and upward with respect to the opposite boundary of said turntable, and cable connecting means between said boom and said counterweight, said cable connected to the boom near to the pivoted turntable end and to said counterweight, to move the counterweight equally and oppositely with respect to the point on the boom where the cable is connected, and tending to balance the boom in any of its positions.

5. A derrick including a revoluble turntable, a boom pivoted near one edge of said turntable, a pendulum weight pivotally mounted above the turntable rearwardly of said boom, said pendulum weight swingable to place its effective weight above and near the edge of the turntable opposite the boom mounting to counterbalance the boom, and connections between the boom and the pendulum weight so proportioned and connected to both the weight and the boom that the pendulum weight and its leverage against the boom substantially equals and counterbalances the weight of the boom.

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