Dec. 3, 1935. H. A. CHRISTIAN 2,022,844

INDICATOR

Filed Nov. 3, 1934 2 Sheets-Sheet 1

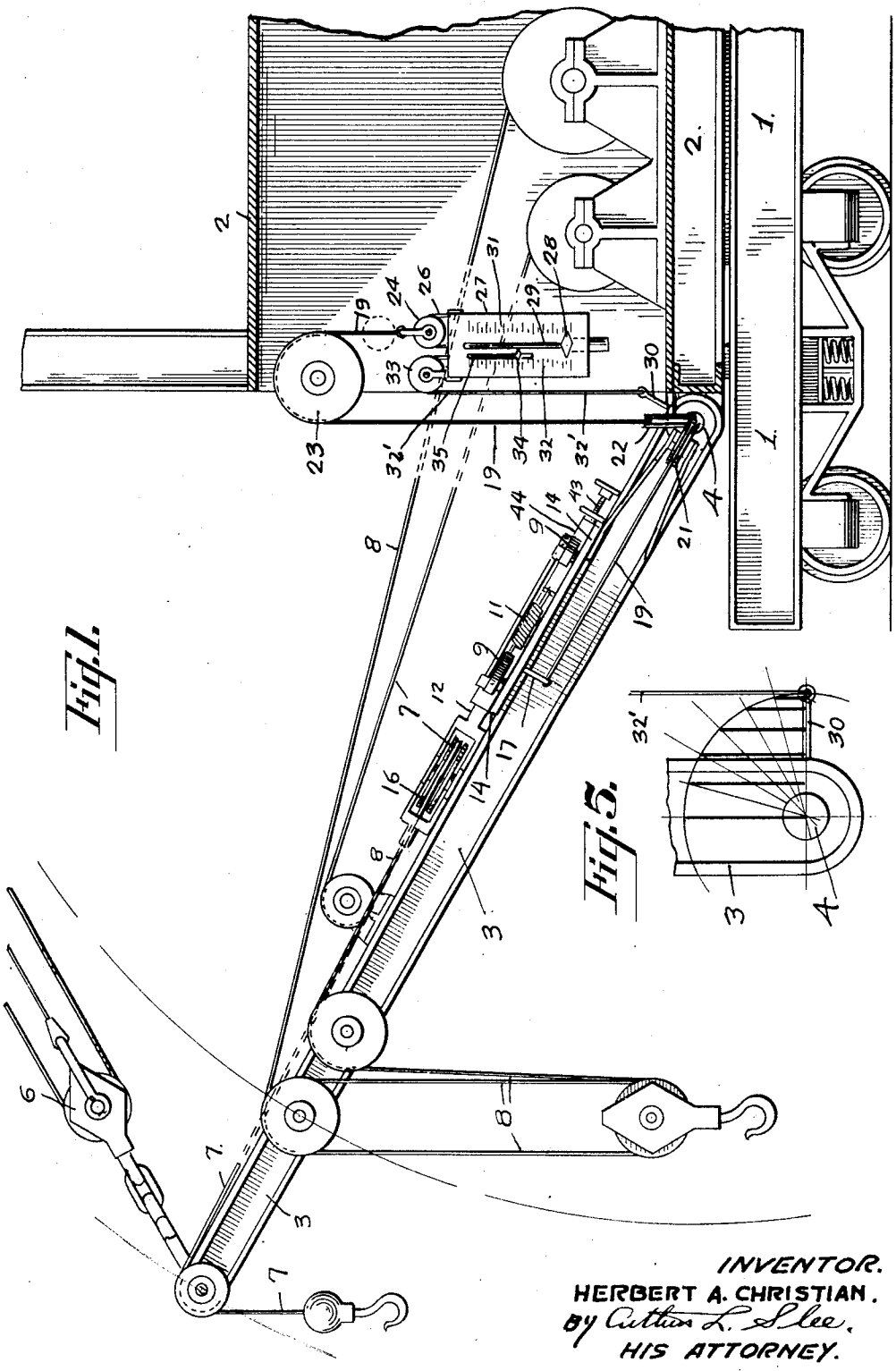


Fig. 1.

Fig. 5.

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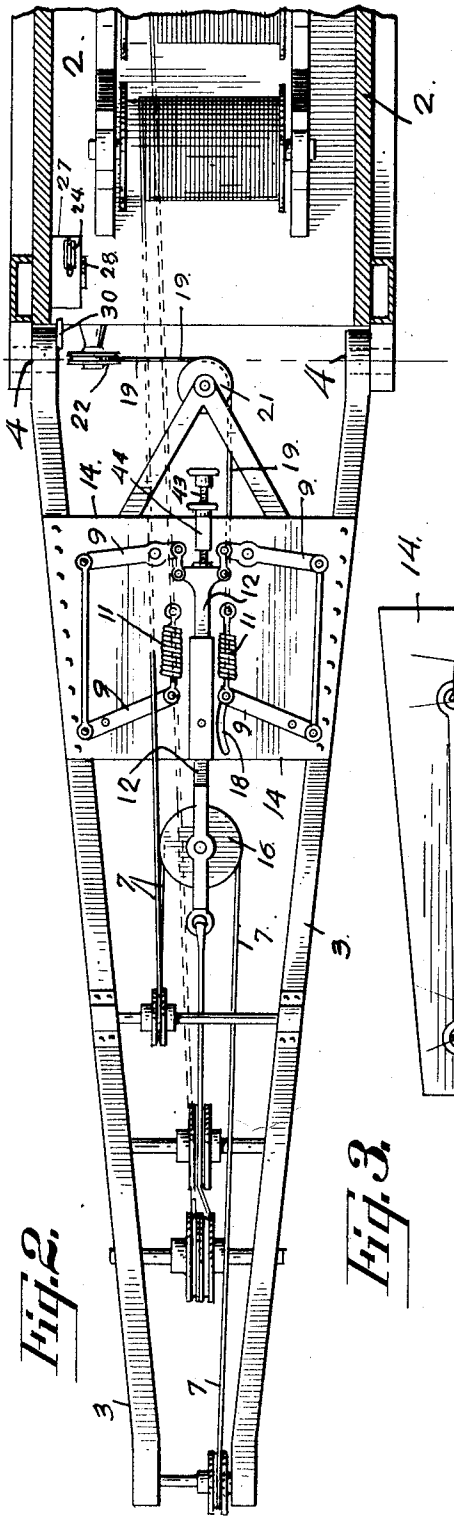


Fig. 2.

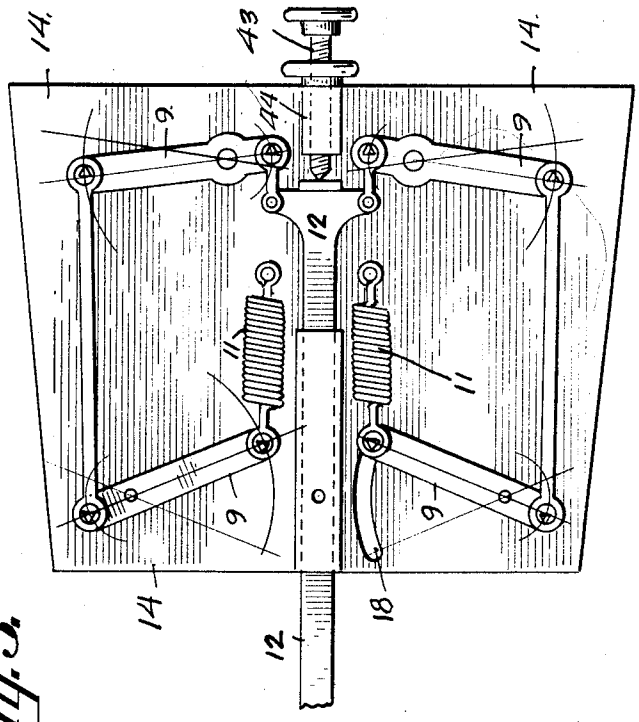


Fig. 3.

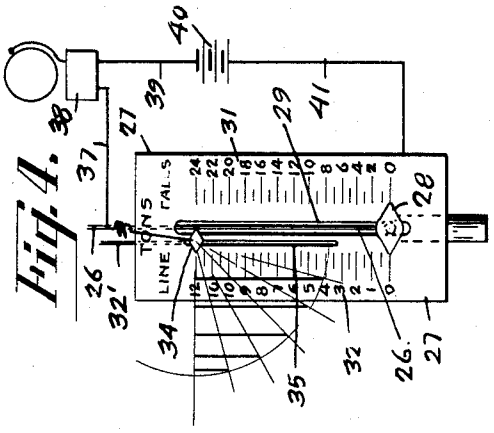


Fig. 4.

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UNITED STATES PATENT OFFICE

2,022,844

INDICATOR

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Application November 3, 1934, Serial No. 751,349

1 Claim. (Cl. 265—52)

My invention relates to improvements in indicators for indicating when the safe maximum load being lifted by the pivotal jib of a portable crane has been reached for the angle of the jib at which said load is being lifted, and wherein a weighing device actuated by the tension of the lifting tackle operates in conjunction with an indicator automatically actuated by the angular elevation of a pivotally mounted jib for indicating when the maximum load has been reached or is being lifted by said tackle and jib.

The primary object of the present invention is to provide a new and improved indicator for indicating the safe maximum loads to be lifted by a portable crane.

Another object of the invention is to provide a new and improved device of the character set forth having improved means for indicating the safe maximum load to be lifted for any angular elevation of a movable jib upon a portable crane to prevent said crane from being tilted.

A further object is to provide a new and improved indicator for sounding an audible alarm when the tension of the cables of a lifting tackle on a portable crane has reached the safe maximum load.

A still further object of the invention is to provide a new and improved connection between a weighing means upon a movable jib of a portable crane and a weight indicating means upon the body of said crane for indicating a safe maximum load to be lifted by said jib.

A still further object is to provide new and improved means for indicating the weight of a load or loads being lifted by either or all of a plurality of independent lifting tackles upon a portable crane having one or more of such lifting tackle.

A still further object is to provide new and improved means for indicating the maximum safe loads which may be lifted at different angular elevations of a movable jib upon a portable crane.

I accomplish these and other objects by means of the preferred form of the device disclosed in the accompanying drawings forming a part of the present application, in which—

Fig. 1 is a broken side elevation of the front portion and movable jib of a portable crane, partly in section, and with the near stringer of the jib removed;

Fig. 2 is a broken plan view of Fig. 1, with the jib laid flat;

Fig. 3 is an enlarged detailed view of the weighing means;

Fig. 4 is an enlarged detailed view of the indicating means; and

Fig. 5 is an enlarged broken view, partly diagrammatic, disclosing the means for actuating the maximum safe load indicating means.

Referring to the drawings:

The numeral 1 is used to designate a suitable truck upon which is rotatably mounted the body 2 of a portable crane having the usual movable jib 3 pivotally mounted thereon as at 4.

The jib 3 is provided with the usual jib-raising tackle 6 which serves as a back-leg for raising and lowering said jib 3. The jib 3 is further provided with a single-line load tackle 7 and a block and falls load tackle 8, as disclosed in Fig. 1 of the drawings.

Mounted preferably upon the jib 3 and adjacent the base thereof is a weighing mechanism comprising two pairs of connected compounding levers 9 normally held in one extreme or non-weighing position by means of suitable springs 11 connected to one set of ends thereof. A shank 12 is slidably mounted for longitudinal movement within a plate 14 mounted upon the jib 3 and upon which the levers 9 are also pivotally mounted, said shank 12 having one end connected to the opposite ends of the compounding levers 9 and the other end extending beyond said plate 14 and provided with a sheave 16 which engages a bight within the single line 7 while the end of the block and falls tackle 8 is connected to the end of said shank 12, the purpose of which will hereinafter be more fully set forth.

That end of one lever 9 capable of the greatest compounded movement has a pin 17 extending through an arcuate slot 18 within the plate 14 and a line 19 extends from said pin 17 to a grooved pulley 21 arranged tangentially to the axis of the pivotal point 4 of the jib 3 and thence to a second grooved pulley 22 rotatably mounted upon the body 2 and also arranged tangentially to said axis or pivotal point 4 so that one portion of the line 19 will always be aligned or coincide with said axis and therefore remain undisturbed by any movement of the jib 3 about its axis or pivotal point 4, the purpose of which will hereinafter more fully appear.

The line 19 extends from the grooved pulley 22 to a similar pulley 23 and after passing thereover has a pulley 24 secured to the end thereof. A second line 26 has one end attached to a housing 27 and after passing over said pulley 24 extends downwardly through said housing 27 to an indicator 28 extending through a slot 29 in the housing 27 to indicate certain indicia 31, and 32 upon the face of the housing 27.

An arm 30 extends at right angles to the jib

3 and radially from the pivotal point or axis 4 thereof. A line 32' has one end fastened to the end of said arm 30 and after passing upward and over a grooved pulley 33 passes downwardly and into the housing 27 and has an indicator 34 insulated from said housing 27 and extending through a second slot 25 therein and arranged in parallel spaced relation to the first slot 29, as disclosed in Figs. 1 and 4 of the drawings.

The indicia 31 and 32 upon the face of the housing 27 is provided to indicate the weights of loads being lifted by the single line 7 and block and falls tackle 8 respectively.

As the sheave 16 of the shank 12 engages a bight in the single line 7 it is obvious that the longitudinal movement of said shank 12 will be one-half of the movement of said single line 7 whereas the block and falls tackle 8 having, in the present instance, four lines it is equally obvious that the movement of the shank 12 will be only one-quarter of the movement of the line leading to said tackle. Consequently, it will require twice the weight or load on the tackle 8 to move the shank 12 the same distance that it would be moved by a weight or load being lifted by the single line or tackle 7.

For this reason the two corresponding sets of indicia 31 and 32 are provided upon the face of the indicator housing 27 so that the operator of the crane may read the weight of a load or loads being lifted by either or both tackles.

In operation

Assuming the jib 3 to be substantially vertical and a load is being lifted by either tackle, the tension of said tackle will move the shank 12 longitudinally a distance directly proportional to the weight of said load and will also move the levers 9, against the tension of the springs 11, a corresponding distance. Assuming that the load being lifted is the maximum load that can be lifted by the crane, the shank 12, levers 9, lines 19 and 26 will raise the indicator 28 to indicate the index 24, if the load is being lifted by the falls 8, or 12 if said load is being raised by the single line or tackle 7. If an electrical connection 37 is made from the second indicator 34 to a bell or alarm 38, in turn having a connection 39 to a source of electrical energy 40 and a connection 41 thence to the housing 27, an audible alarm will be automatically sounded when the indicator 28 contacts the insulated indicator 34, thereby indicating that the safe maximum load has been reached, the arm or lever 30 being horizontal and the insulated indicator being in its uppermost position when the jib 3 is substantially vertical.

When the jib 3 is changed or lowered to a new angular elevation, such, for instance, as that elevation disclosed in Fig. 1 of the drawings, such movement will elevate the end of the arm 30 and consequently lower the insulated indicator 34 within its slot 35, the several positions and distances lowered being indicated by the corresponding heavy black lines in Figs. 4 and 5 of the drawings.

When the elevation of the jib 3 is lowered it is obvious that greater leverage is imparted to the said jib 3 so that the maximum safe load for a vertical jib would, by its increased leverage, when said jib is horizontal, tend to tip or tilt the crane. In order to prevent such tilting by indicating to the operator that the safe maximum load has been reached, the end of the arm 30, when the jib 3 is lowered, will be raised a corresponding amount and consequently lower the second or insulated indicator 34 to a position indicating the safe maximum load to be lifted for that angular elevation of the said jib 3 and for either or both tackles 7 or 8.

Assuming that the jib is horizontal, the indicator 34 will be lowered to the index indicating the safe load for that position or elevation of the said jib 3, and the rising indicator 28, when a load is being lifted, will encounter and contact the insulated indicator 34 when said indicator 28 arrives at the indicia indicating the safe maximum load for that elevation of the jib, thus automatically sounding the alarm 38.

The weighing mechanism represented by the levers 9 and spring 11 may be readily adjusted by lifting an object whose correct weight is known, then turning the threaded rod 43, screw threaded to a nut 44 in the plate 14 to release or move the said shank 12 until the indicator 28 points to the correct figure or index upon the face of the housing 27.

The same device may be utilized, if desired, to move the indicator 28 to indicate a weight slightly greater than the actual weight of load being lifted so that a greater safety factor may be obtained in lifting loads and thereby prevent the crane from being tilted.

The provision of aligning a portion of the actuating line 19 with the axis of the pivotal point 4 of the jib 3 prevents change of angular position of said jib 3 from moving said line 19 and therefore a correct indication of the weight of the load being lifted may be had without interference by said jib movement and at any and all angular elevations of the same.

It is also obvious that change in angular elevation of the jib 3 will automatically position the insulated indicator 34 to a point where it will be contacted by the indicator 28 and an audible alarm automatically sounded when the weight of the load being lifted equals the safe maximum load for that elevation of said jib.

Having thus described my invention I claim—

In a weight indicator for indicating the weight of safe maximum loads to be lifted by a crane, the combination with a crane, movable jib and lifting tackle thereof, of a housing mounted upon the crane and provided with graduated scales thereon; an indicator movably mounted upon said housing to indicate upon said scales the weight being lifted; compounding levers pivotally mounted upon the jib; springs connected to the compounded ends of said levers to resist movement thereof; a sheave connected to the opposite ends of said levers and engaging the tackle and actuated by the tension of said lifting tackle to move said levers; means for connecting the indicator on the housing with the compounded ends of said levers whereby said indicator may be moved to indicate upon the graduated scales the weight being lifted by said tackle; a second indicator mounted upon the housing and connected to the movable jib and actuated by a change in elevation of said jib to indicate on said scales the safe load to be lifted by said change of elevation.

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