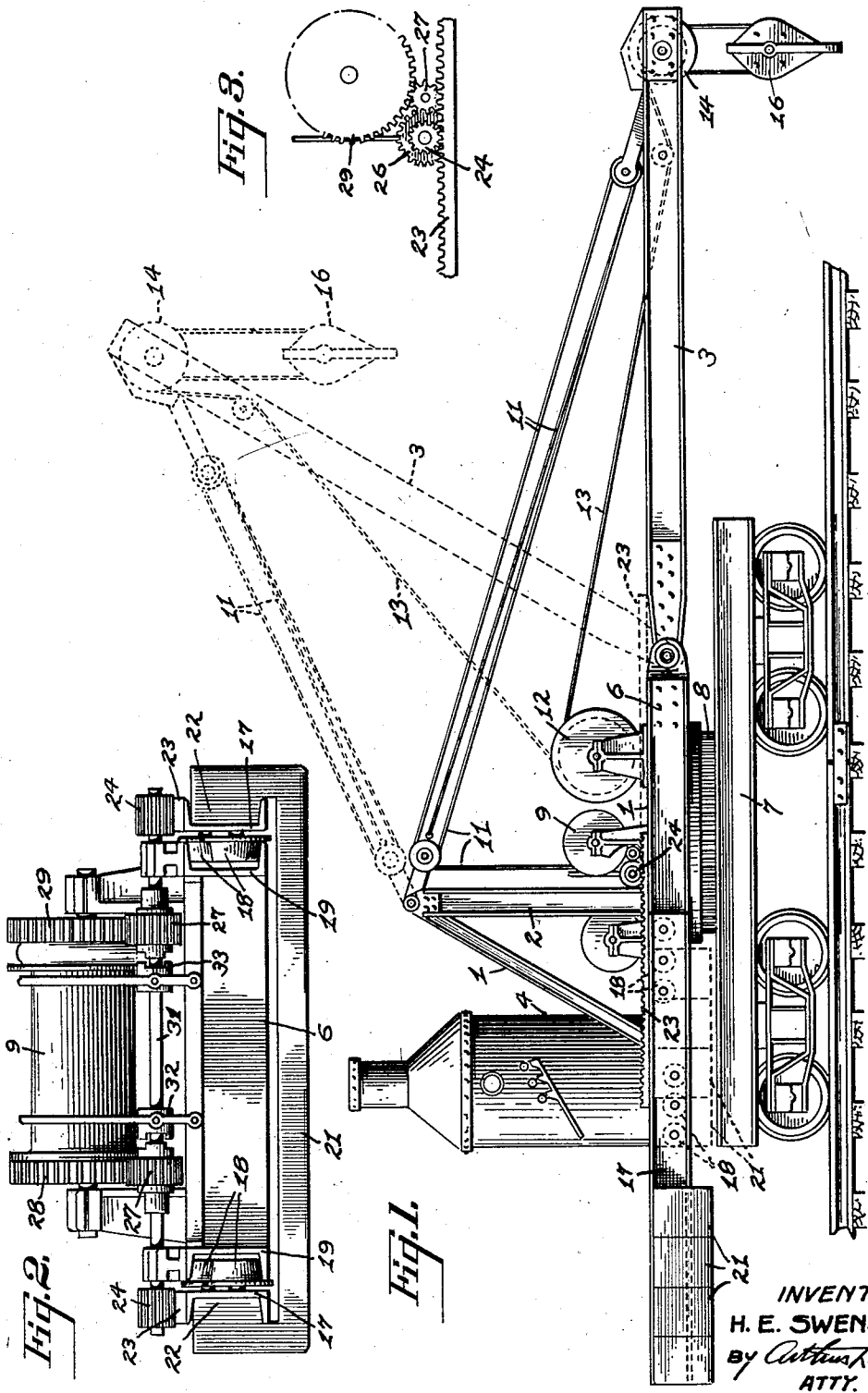


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H. E. SWENSON
COUNTERBALANCED CRANE

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COUNTERBALANCED CRANE

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My invention relates to improvements in cranes and particularly in cranes of the revolving deck type wherein a counterweight is slidably mounted in connection with the deck and arranged to be moved by the boom actuating mechanism of the crane for shifting the center of gravity of the crane relatively to a load.

The primary object of my invention is to provide an improved counter-balanced crane.

Another object is to provide an improved crane wherein counter-weights may be moved to shift the center of gravity of the crane to conform to the weight and position of the load.

Another object is to provide an improved counter-weight and shifting means which will operate simultaneously with the shifting of the boom to move the weights and thereby shift the center of gravity of the crane proportionally to the shifting of the load.

A further object is to provide an improved device of the character described wherein a counter-weight is normally carried in a position embraced within the normal dimensions of the crane and is arranged to be extended to outwardly extending counter-balancing position whereby the lifting capacity of a crane of stated size and capacity may be increased to care for a substantial overload by keeping the center of gravity within the base support of the crane when subjected to such overload.

Another object is to provide an improved mechanism whereby the counter-balance may be shifted by the boom actuating mechanism either independently or simultaneously and automatically with the boom.

A further object is to provide an improved device which may be installed upon cranes of standard construction without altering or interfering with the normal operation of such cranes and which will materially increase the efficiency of the crane.

A still further object is to provide an improved device of the character described which is simple in construction and positive and efficient in its operation.

I accomplish these and other objects by

means of the improved device disclosed in the drawings forming a part of the present application wherein like characters of reference are used to designate similar parts throughout the specification and drawings and in which—

Fig. 1 is a side elevation of my improved counter-balanced crane.

Fig. 2 is a rear elevation of the counter-balance mechanism as applied upon the deck of a revolving deck crane in connection with the actuating mechanism of the crane, the engine and hoisting mechanism, other than the boom actuating drum, being omitted; and

Fig. 3 is a broken side elevation of the counter-weight actuating gearing.

Referring to the drawings, the numeral 1 is used to designate in general a crane of the portable revolving deck type provided with the usual mast 2, boom 3, and power mechanism 4 mounted upon a deck 6 revolvably mounted upon a truck body 7. The deck 6 is arranged to be rotated relative to the supporting truck body 7 by means of a gear 8 in the ordinary manner. The power mechanism, designated in general by the numeral 4 includes the usual boom controlling drum 9 arranged to take in or pay out a cable 11 for raising and lowering the boom 3 which is pivotally mounted upon one end of the deck 6 in the well known manner. The boom 3 is also provided with the usual hoisting means including a hoisting drum 12 and cable 13 operating over the usual pulley blocks 14 and 16 for hoisting loads relative to the end of the boom in the usual manner.

In a crane of the type illustrated, the supporting base is necessarily limited, and when the boom is extended to its extreme reach and subjected to a heavy load the center of gravity of the load crane is shifted toward the side or end of the base from which the boom extends. The load which may be lifted by the boom must be limited to prevent the center of gravity from being shifted outside the base of the crane and the crane tipped over. This is particularly true when the boom is swung outwardly toward one side of the base, and as such cranes are commonly shifted from

place to place when in service, it is inconvenient to anchor the crane.

In my present invention I provide a counter-weight arranged to be moved to counter-balance the weight of the load and to shift the center of gravity of the crane proportionally to the shifting of a load, thereby keeping the center of gravity near the center of the crane base at all times. The counter-weight consists of a pair of frame members 17, preferably constructed from heavy structural channel iron, slidably mounted upon the sides of the deck 6. Anti-friction rollers 18 are mounted upon the inner sides of the frame members 17 and arranged to be engaged between the flanges of outwardly faced channel members 19 forming the sides of the deck 6. Counter-weight members 21 are mounted upon the outer ends of the frame members 17, said members preferably being cast in U shape with enlarged end portions 22 arranged to be slidably engaged between the outwardly faced flanges of the channel frame members 17. A plurality of the weight members 21 are provided to provide a desired weight which may be adjusted relatively to the frame members 17 and varied to suit a specific requirement. The weight members 21 span the space between the frame members 17 and join the ends of said members to form a yoke shaped counter-weight. The members 21 are arranged to extend between the members 17 immediately below the deck 6 and are arranged to be received within the space between said deck and the top of the supporting truck body 7.

The counter-weight is arranged to be moved by power from the boom controlling drum 9 and its actuating means preferably by means of racks 23 secured upon the frame members 17 and engaged by pinions 24 driven by gears 26 which in turn are driven by pinions 27 meshing with gears 28 and 29 mounted upon the driven and the driving portions respectively of the drum 9. The pinions 27 are rotatably mounted upon a shaft 31 extending transversely across the deck 6 and provided with suitable clutches 32 and 33 arranged to secure the adjacent pinion 27 to the shaft whereby the shaft 31 and the gears and pinions 24 and 26 may be driven by either the driven or driving portions of the drum 9. The gears 26 and pinions 24 are arranged to provide a suitable speed reduction between the drum 9 and the racks 23.

In operation, the frame members 17 are mounted upon the sides of the deck and the driving gears installed without altering the ordinary construction and operation of the crane. The weight members 21 are mounted upon the ends of the frame members so as to be positioned normally between the under side of the deck 6 and the top of the truck body 7 so that the length of the crane will not be increased and the deck may be rotated in the ordinary manner without interference by the weights.

When the boom is extended to lift a load the counter-weight is moved by the actuating gear connections to extend the frame members 17 and the weights 21 carried thereby longitudinally outward from the end of the deck 6 opposite the boom 3. This is accomplished by moving one of the clutches 32 or 33 to lock the adjacent pinion 27 to the driving shaft. When the clutch 32 is moved to lock the pinion 27 driven by the driven portion of the drum 9, the rotation of said drum in paying out the cable 11 to lower the boom 3 will cause the counter-weight frame to be moved outwardly to the position shown in full lines in Fig. 1 of the drawings, thereby counter-balancing the boom and shifting the center of gravity of the crane rearwardly to balance the weight of the boom and a load lifted thereby. As the boom is raised, the counter-weight will be moved inwardly proportionally to the inward movement of the boom as indicated in dotted lines and its load so that the center of gravity will be maintained at the approximate center of the crane as the boom is shifted, the counter-weight being moved outwardly and inwardly simultaneously with the lowering and raising of the boom to automatically compensate for the shifting of the load.

If it is desired to move the counter-weight to extended position and to maintain it in such extended position, the clutch 33 may be moved to connect the pinion 27 driven by the driving member 29 of the drum 9, thereby moving the counter-weight independently of the movement of the drum, or the counter-weight may be moved outwardly as the boom is lowered and the clutch 32 disengaged so as to leave the counter-weight so extended.

When the counter-weight is in extended position, the center of gravity of the crane is so shifted that a much greater load can be lifted by the boom without over balancing the crane, thus materially increasing the lifting capacity of the crane without altering the design thereof. When in normal position, the counter-weight is embraced within the natural area of the crane, thus permitting the crane to be transported with the usual facility.

While I have illustrated and described only the preferred form and construction of the device, the several elements are subject to modification in numerous ways without departing from the spirit of my invention. I therefore do not wish to restrict myself to the specific details and mode of operation illustrated and described, but desire to avail myself of all modifications which may fall within the scope of the appended claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a crane, the combination with a deck,
a movable boom mounted upon one end of the
deck, and boom actuating mechanism mount-
ed upon the deck, of a counter-weight mount-
ed upon the opposite end of the deck, said
5 counter-weight comprising a pair of frame
members slidably mounted along the sides
of the deck and a counter-weight body
mounted upon the outer ends of the frame
10 members and connecting the same; means
for moving the counter-weight to shift
the center of gravity of the crane relative
to a load; and anti-friction rollers mounted
upon the frame members and engaging the
15 sides of the deck to facilitate movement of
the counter-weight.

2. In a crane, the combination with a deck,
a movable boom mounted upon one end of the
deck, and boom actuating mechanism mount-
ed upon the deck, of a counter-weight mount-
20 ed upon the opposite end of the deck, said
counter-weight comprising a pair of frame
members slidably mounted upon the sides of
the deck and a counter-weight body connected
25 between the ends of the frame members and
joining the same in the form of a yoke, said
counter-weight body being movable from a
normal position extending under the deck to
an extended position extending outwardly
30 from the end of said deck; and means for
moving the counter-weight to shift the center
of gravity of the crane relatively to a load.

In witness whereof, I hereunto set my sig-
35 nature.

HAROLD E. SWENSON.

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