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EXCAVATING MACHINE

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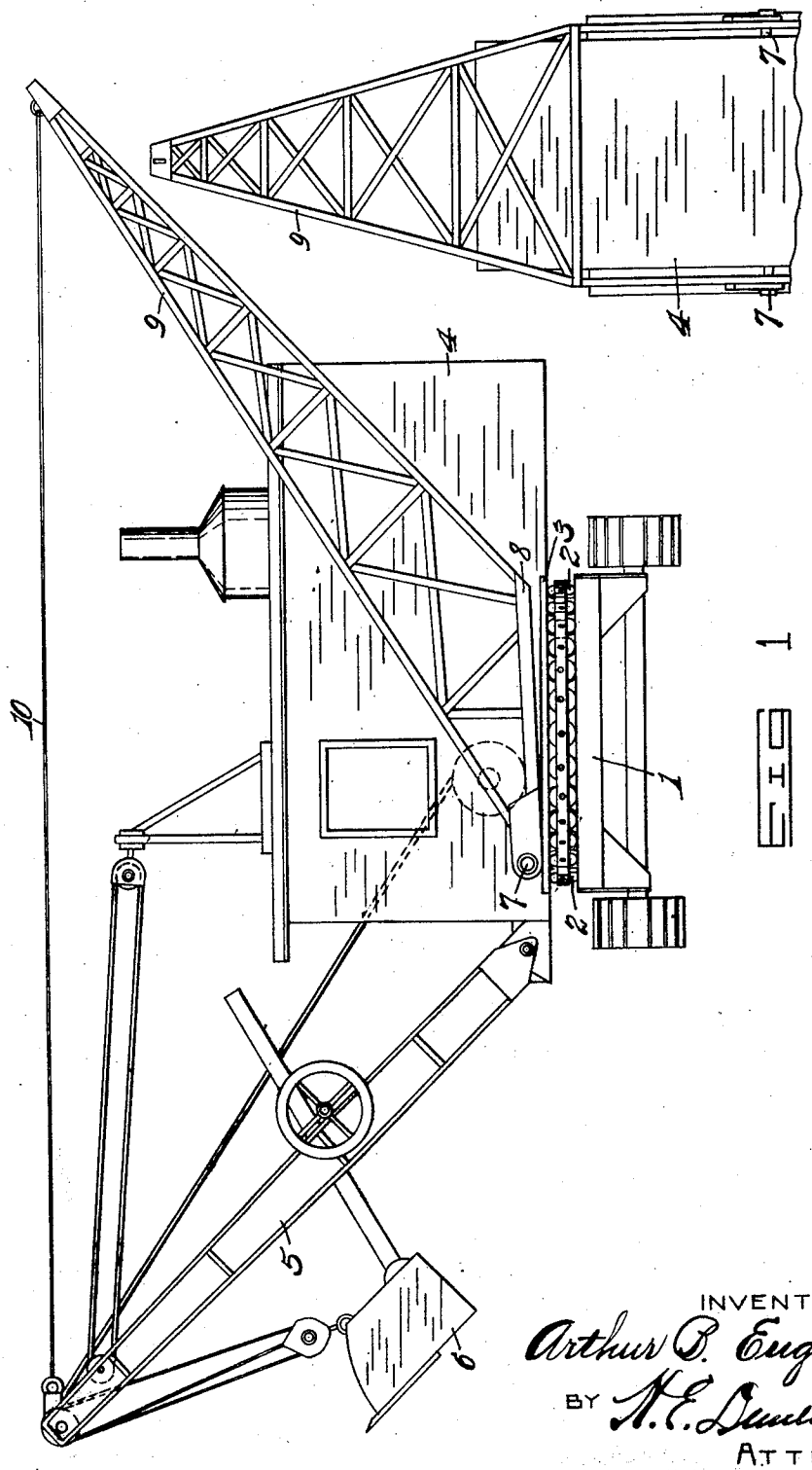


FIG 2

FIG 1

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EXCAVATING MACHINE

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This invention relates broadly to excavating machines, and more specifically to boom-balancing means for such machines.

The primary object of the invention is to provide, in a power shovel or similar excavating machine, pivoted means whereby the unbalanced weight of the hoisting boom is supported and balanced, and also whereby may be balanced at least a material part of the load imposed upon said boom from time to time in operation, thereby to greatly increase the lifting capacity of the machine without tendency to upset the latter and without enlarging the capacity of the hoisting engine or motor employed.

A further object is to provide an excavating machine having a counterbalance structure pivotally mounted on the upper rotary deck thereof and connected with the hoisting boom, whereby said machine is relieved of the constant gravity strain which is imposed thereon through said boom and which tends to unbalance said deck.

A still further object is to provide, in a rotary excavating machine, a counterbalance structure of the character mentioned which is so mounted relative to the rotary deck that its weight is at all times imposed on the latter at a point located adjacent or inwardly with respect to the circular path of travel of the deck-supporting rollers or turntable, thereby to a large extent, if not wholly, eliminating the necessity for the employment of the usual ballast required on such machines and providing a more effective counterbalance.

With these and other objects in view, the invention resides in the features of construction, arrangement of parts and combinations of elements which will hereinafter be fully described, references being had to the accompanying drawings, in which—

Figure 1 is a side elevation of an excavating machine embodying my invention; and—

Figure 2 is a top plan view of the rear end of the upper deck and the balancing boom, shown on a slightly reduced scale.

Referring to said drawings, 1 designates the bed or roller-carrying understructure of an excavating machine of a common type, 2 the rollers, and 3 the bed-plate of the superstructure which constitutes the upper deck, said bed-plate constituting part of a turntable which includes said rollers 2 and which carries the cab 4. Pivotally mounted upon the forward end of the superstructure is the lower end of the usual hoisting boom 5 which carries a dipper or shovel 6 and any usual or appropriate arrangement of sheaves and power driven cables.

Pivotally mounted on the superstructure at opposite sides of the cab 4, as on suitably carried pins 7, are the forward ends of the bottom members 8, hereinafter termed seating members, of a tower-like framework 9 which has its lower end disposed in straddling relation to said cab and which has a rearward inclination, as shown. Said framework 9, hereinafter termed a counterbalance boom, is made of any appropriate length, having its upper end elevated to a suitable height above the top of the cab and connected by a rod or cable 10 to the upper end of said hoisting boom. Said boom 9 may be constructed to possess the great weight required to render it serviceable as a means whereby the unbalanced weight of the hoisting boom 5 and, additionally, any desired portion of the load imposed, in operation, upon said hoisting boom is balanced.

The pivot pins 7 upon which the counterbalance boom is mounted may be located in any appropriate position, preferably forward of the axis of rotation of the superstructure of the machine and inwardly relative to the circular path of travel of the deck-carrying rollers 2, thereby so to position the fulcrum that forces exerted through the latter are at all times imposed more or

less adjacent to the desired position of the center of gravity of the superstructure with its superimposed load.

Any tendency of the machine, or the superstructure of the latter, to become overbalanced by ordinary, or even abnormally great, loads imposed on the hoisting boom is obviously overcome through the use of the counterbalance boom described. By reason thereof, the capacity of the dipper may be very greatly increased and necessity for the use of ballast in the usual manner is obviated. Moreover, because no part of the motive power is required for the support of the hoisting boom, the entire motive power may be utilized for operating the dipper. Thus, the dipper may have greatly increased capacity without increase of the capacity of the motor; or, the capacity of the dipper remaining the same, a smaller motor may be employed.

When the machine is in operation, the counterbalance boom is at practically all times elevated somewhat from the position in which its seating members 8 occupy seated relation to the bed-plate 3 or other adjacent or equivalent form of seat provided on the superstructure, it being apparent that said boom will follow the elevating and lowering movements of the hoisting boom. When the hoisting boom is elevated from its normal position wherein it occupies substantially a 45° angle, as by the upwardly directed force exerted when the dipper is forcibly thrust into a bed of material to be excavated at a point closely adjacent to the machine, the counterbalance boom is permitted to lower to a self-supporting position wherein its seating members 8 rest upon the bed-plate 3 or equivalent support, whereupon and in which case the unbalanced weight of the hoisting boom is utilized to facilitate entrance of the dipper into the bed of material.

Manifestly, the counterbalance boom might be mounted upon the side walls or the top of the cab, but since such would necessitate the provision of an unusually heavy and rigid cab structure, it is preferred that it be carried in the positioned hereinbefore indicated.

The counterbalance boom possesses such weight that it at least counterbalances the unsupported or unbalanced weight of the hoisting boom when the latter occupies its normal working position wherein it is disposed at an approximate angle of 45°. The rod or cable 10 is fixed at its opposite ends to the upper ends of the lifting boom and the counterbalance boom. Lowering of the hoisting boom below such 45° or other normal angle for which it is set is positively prevented by the cable which connects it to the Gantry frame mounted on the top of the cab. However, as hereinbefore indicated, elevation of the hoisting boom is permitted under the upwardly directed force exerted through the dipper stick when the dipper is crowded downwardly in a substantially vertical direction into entering relation to a bed of material located close to the machine, in which case the weight of said hoisting boom is utilized for forcing entrance of the dipper in such bed. At the same time, the then seated counterbalance boom remains effective as a counterbalance for preventing overturn of the machine.

What is claimed is—

1. In an excavating machine embodying an understructure and a superstructure, the latter including a cab and being supported for rotary movements with respect to the former by means of a turntable including rollers arranged for travel in a circular path, the combination with a hoisting boom pivotally mounted on the front end of the superstructure, of a heavy tower-like framework pivotally mounted on a suitable part of said superstructure adjacent to said circular path and extending thence upwardly in a rearwardly inclined direction, the lower end of said framework being disposed in straddling relation to the cab, and an element directly connecting the upper end of said framework to the upper end of the hoisting boom whereby the force of gravity acting upon said framework is utilized to counterbalance the weight of said hoisting boom.

2. In an excavating machine, upper and lower decks, the former being supported for rotary movements relative to the latter by means of a turntable including rollers arranged for travel in a circular path, a hoisting boom pivotally mounted on an end of the upper deck, a second boom pivotally mounted on said upper deck forward of the axis of rotation of the latter and having an upward and rearward inclination, supporting means limiting the extent of downward swinging movement of said second boom on its pivotal mounting, and means connecting the upper ends of said booms whereby increase of the distance between said ends is prevented, said second boom, through said connecting means, tending to counterbalance the force of gravity acting upon said hoisting boom.

3. In an excavating machine, a rotary superstructure having a hoisting boom pivoted thereon, a counterbalance boom pivoted on said superstructure, and means fixedly secured at one end to the counterbalance boom and at its opposite end to the hoisting boom so as to effect upward and downward swinging movement of the counterbalance boom about its pivot upon downward and upward movement respectively of the hoisting boom and vice versa.

4. In an excavating machine, a rotary superstructure having a hoisting boom

pivoted thereon, a counterbalance boom pivoted on said superstructure, and means connecting the booms for preventing increase of the distance therebetween and to effect upward and downward swinging movement of the counterbalance boom about its pivot upon downward and upward movement of the hoisting boom and vice versa.

5. In combination with a pivoted hoisting boom, pivoted counterbalance means, and means connecting said boom and counterbalance means to maintain a predetermined relation between the boom and counterbalancing means in all movements thereof and whereby upon raising of the boom the counterbalance means is swung about its pivot and lowered and vice versa.

6. In an excavating machine, a rotary superstructure having a hoisting boom mounted on an end thereof, a second boom pivotally mounted on said superstructure adjacent to the axis of rotation of the latter and inclined in a direction away from said hoisting boom, said second boom having its upper end connected to the upper end of said hoisting boom and maintained against movements relative to the latter, said second boom constituting means whereby the unbalanced weight of said hoisting boom is at least partially counterbalanced.

7. In an excavating machine comprising a hoisting boom, a dipper movably supported on said boom, and hoisting mechanism for actuating said dipper; a second boom, means connecting said booms and preventing increase of distance therebetween, the second boom acting through said connecting means to counterbalance a part or all of the weight of said hoisting boom and said dipper for permitting utilization of the full power of the hoisting mechanism for lifting the load imposed on the dipper.

8. In an excavating machine, a deck, a hoisting boom supported in an inclined position at the front end of said deck, a dipper mounted on said boom, hoisting mechanism operatively connected to said dipper, a counterbalance boom pivotally mounted upon said deck and inclined upwardly and rearwardly therefrom, and means connecting the upper end of said counterbalance boom to the upper end of said hoisting boom, said counterbalance boom acting through said connecting means to counterbalance a part or all of the unbalanced weight of said hoisting boom and said dipper, said means preventing increase of the distance between said boom ends, and supporting means limiting the extent of downward movement of said counterbalance boom on its mounting.

9. In combination with the rotary superstructure of an excavating machine having a hoisting boom and a cab thereon, a counterbalance boom having a bifurcated lower end receiving the sides of the cab therebetween and pivoted to the superstructure, said lower end being formed to engage said superstructure thereby to restrict downward movement of the counterbalance boom, and means connecting the booms so as to effect upward and downward swinging movement of the counterbalance boom about its pivot upon downward and upward movement of the hoisting boom and vice versa.

In testimony whereof I affix my signature.

ARTHUR B. EUGA.