

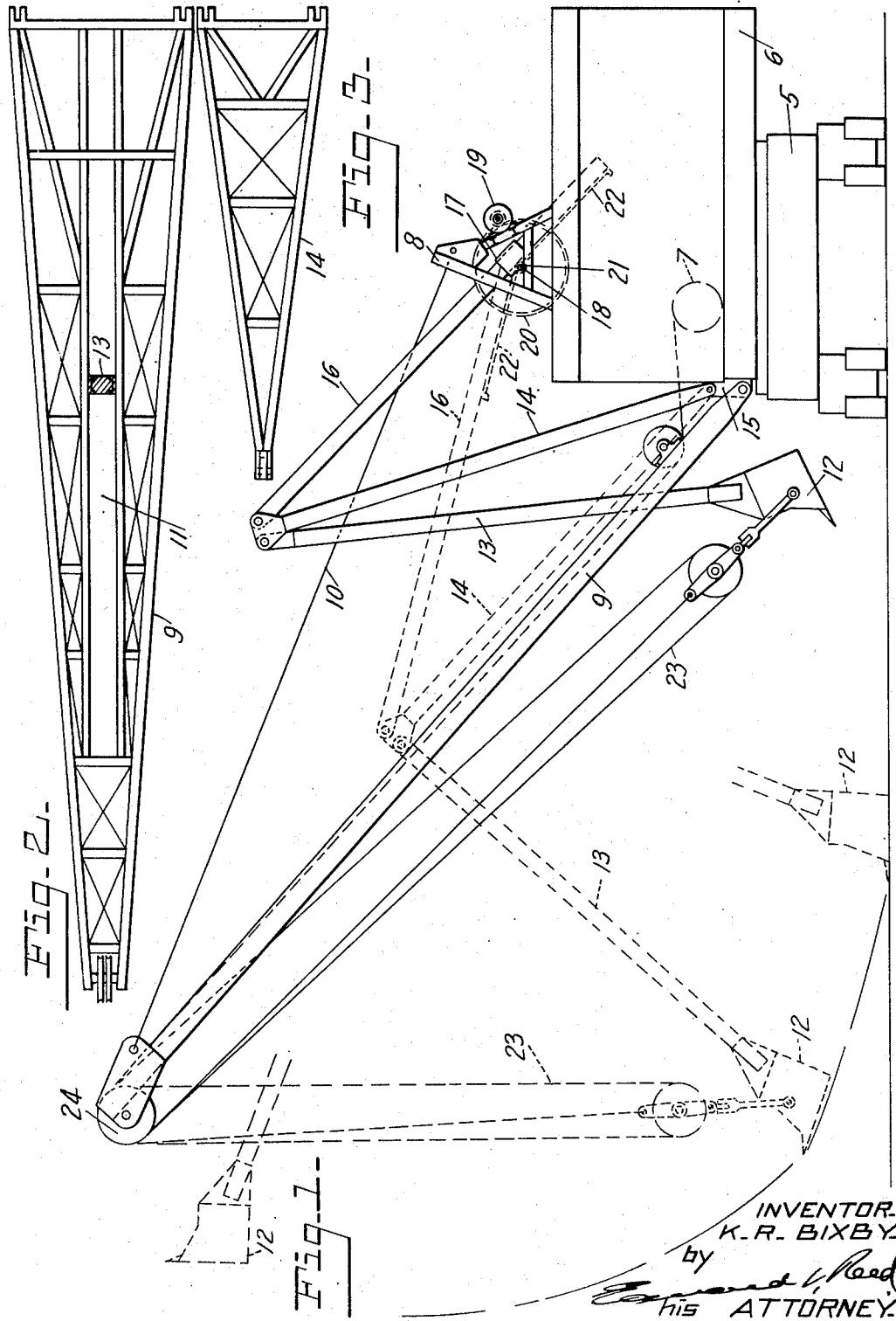
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EXCAVATING MACHINE

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EXCAVATING MACHINE

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This invention relates to excavating machines and more particularly to a power operated shovel. In power operated shovels the dipper arm usually extends across the boom and is connected with a crowding mechanism carried by the boom itself which operates to force the dipper into the material to be excavated during the digging operation. The thrust thus imposed upon the dipper arm is transmitted through the crowding mechanism to the boom and tends to flex the latter and to weaken the same. To overcome this flexing of the boom it has been necessary to make the boom of a very heavy rigid construction which not only adds greatly to the weight and cost of the machine but imposes a very definite limitation upon the length of boom which can be used.

One object of the present invention is to provide an excavating machine of this type in which the dipper will be so supported and crowding movement imparted thereto in such a manner as to eliminate the thrust on the boom at the point at which the dipper arm intersects the same.

A further object of the invention is to provide such an excavating machine in which the dipper may have a relatively long substantially horizontal movement when in its lower position, thereby materially increasing the efficiency of the machine when the dipper is operating on a substantially horizontal surface adjacent the level on which the machine stands.

A further object of the invention is to provide such an excavating machine which will be very simple in its construction and of a relatively light and inexpensive character.

Other objects of the invention may appear as the mechanism is described in detail.

In the accompanying drawing Fig. 1 is a side elevation of an excavating machine embodying the invention; Fig. 2 is a plan view of the boom; and Fig. 3 is a plan view of the lever which supports the dipper arm.

In the drawing I have illustrated one embodiment of the invention and have shown the same as applied to a power operated shovel of a well known type. It will be noted, however, that the invention may take various forms and may be applied to excavating machines of different kinds and that the excavating element, or dipper, may be of any suitable form.

The excavating machine as here shown comprises the usual base 5 on which is mounted a revolving platform 6 which carries the power plant and operating mechanism, including a hoisting drum 7. Extending upwardly from the platform is a gantry 8. The boom 9 extends up-

wardly and forwardly and is supported at a normally fixed inclination by the usual cable connections 10 between the point of the boom and the gantry 8. As here shown the boom is mounted at its foot on the platform 6 and is of a relatively light inexpensive construction which tapers laterally from its foot to its point. In this particular embodiment of the invention the boom is provided with a longitudinal slot 11 which extends for a major part of its length. The excavating element or dipper 12 is carried at the lower end of a dipper supporting arm 13 which extends across the boom and is bodily movable both lengthwise thereof and transversely thereto, the dipper arm in the present instance extending loosely through the slot 11 and having no connection with the boom other than its contact with the side walls of the slot. Digging movement is imparted to the dipper by the usual hoisting cable 23 which extends about a sheave 24 at the point of the boom and thence rearwardly to the hoisting drum 7 on the platform. Supported on the platform 6 is a lever 14 which is preferably pivotally mounted adjacent to the foot of the boom and is here shown as mounted on an extension of the foot casting 15. In the particular arrangement here shown, this lever 14 extends for approximately half the length of the boom and is pivotally connected at its outer end with the dipper arm 13. Connected with the outer end of the lever, adjacent to the point of connection of the lever with the dipper arm, is a movable member or rearwardly extending arm 16, which is supported at its free end on the platform 6 and is preferably mounted on the gantry 8 at an elevation substantially above the foot casting 15. This arm 16 is mounted for both longitudinal movement and movement about a transverse axis and, as here shown, it is guided in a yoke 17 which is pivotally mounted on a shaft 18 carried by the gantry. Actuating mechanism for the arm 16 is mounted on the gantry and, as here shown, it is in the form of the usual crowding mechanism and comprises a motor 19 which is connected by a gear 20 with the shaft 18, this shaft having rigidly secured thereto a pinion 21 which meshes with a toothed rack 22 on the adjacent side of the arm 16.

In Fig. 1 of the drawing the dipper is shown substantially in its fully retracted position and when the arm 16 is actuated by the crowding mechanism the lever 14 will move forwardly and downwardly to the position shown in dotted lines. During this movement the dipper will be moved forwardly, in digging direction, by a cable 23 and 55

the movement of the lever 14 will move the dipper arm both transversely and longitudinally of the boom and thus force the dipper into the bank which is being excavated, the operation of 5 the crowding mechanism being so timed with relation to the operation of the hoisting cable as to cause the dipper to engage the bank at the desired point. It will be apparent therefore that the entire thrust of the dipper handle is 10 transmitted through the lever 14 and connecting arm 16 to the platform 6 and that none of this thrust will be imposed upon the boom.

The dipper can be moved from its retracted position as shown in Fig. 1 into contact with the 15 floor of the cut, on which the machine rests, at a point slightly in advance of the position shown, and, due to the mounting of the dipper arm on the lever 14, it can then be caused to move along the floor of the cut in a substantially horizontal plane for a substantial distance, as shown 20 by the lower dotted line position of the dipper in Fig. 1, thus greatly increasing the efficiency of the machine when the dipper is operating on a substantially flat surface near the level on 25 which the machine stands.

It will be apparent that with the mechanism described the dipper can be controlled and the excavation effected in the usual manner and that due to the fact that the crowding mechanism 30 and its connection with the dipper are supported wholly independent of the boom, the latter may be made of a relatively light construction, because it is subjected to no strain other than that imposed thereon by the hoisting cable 35 and such strain as may be imposed thereon by the swinging movement thereof to carry the dipper to dumping position. The crowding mechanism is of the usual type and the means for connecting the same with the dipper are very 40 strong and rigid but are of such a simple character that they can be produced at a relatively low cost.

While I have shown and described one embodiment of my invention I wish it to be understood 45 that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described my invention, what I claim as new and desire to secure by Letters 50 Patent, is:

1. In an excavating machine, a platform, a boom, a dipper, a supporting arm for said dipper extending across said boom and bodily movable both transversely thereto and lengthwise thereof, 55 means carried by said boom for imparting digging movement to said dipper, a lever mounted on said platform and connected with said dipper arm, an arm connected with said lever and supported on said platform for both longitudinal 60 movement and pivotal movement, and mechanism for actuating the last mentioned arm.

2. In an excavating machine, a platform, a boom, a dipper, a supporting arm for said dipper extending across said boom and bodily movable both transversely thereto and lengthwise thereof, means carried by said boom for imparting digging movement to said dipper, a lever pivotally mounted on said platform near the foot of said boom and pivotally connected with said dipper arm, an arm pivotally connected with said 65 lever adjacent to said dipper arm and supported on said platform above the pivotal mounting of said lever for both longitudinal and pivotal movement, and mechanism for actuating the 70 last mentioned arm.

3. In an excavating machine, a platform, a gantry, and a hoisting drum carried by said platform, a boom, a dipper, a supporting arm for said dipper extending across said boom and bodily movable both lengthwise thereof and 5 transversely thereto, a sheave carried by said boom, a cable extending about said sheave and connecting said dipper with said drum, a lever mounted on said platform and pivotally connected with said dipper arm, an arm pivotally connected with said lever, means for slidably and pivotally supporting the last mentioned arm on said gantry, and crowding mechanism mounted on said gantry and operatively connected with said last mentioned arm. 15

4. In an excavating machine, a platform, a boom having a longitudinal slot extending for a substantial portion of its length, a dipper arm extending loosely through said slot, a dipper carried by said arm, means carried by said boom for 20 imparting digging movement to said dipper, a lever pivotally mounted on said platform near the foot of said boom and connected with said dipper arm above said boom, crowding mechanism supported on said platform a substantial 25 distance above the foot of said boom, and a movable member connecting said crowding mechanism with said lever.

5. In an excavating machine, a platform, an inclined boom mounted on said platform, a dipper 30 arm extending across said boom and movable bodily both transversely to said boom and lengthwise thereof, a dipper secured to the lower end of said dipper arm, an upright member pivotally mounted at its lower end on said platform for 35 movement toward and from said boom and operatively connected with said dipper arm, means supported on said platform to actuate said member, and means to impart digging movement to said dipper. 40

6. In an excavating machine, a platform, an inclined boom mounted on said platform, a dipper arm extending across said boom and movable bodily both transversely to said boom and lengthwise thereof, a dipper secured to the lower end of said dipper arm, an upright member pivotally mounted at its lower end on said platform for 45 movement toward and from said boom and operatively connected with said dipper arm, a rigid actuating member movably supported on said 50 platform and operatively connected with said pivoted member, means for imparting movement to said actuating member, and means for imparting digging movement to said dipper.

7. In an excavating machine, a platform, an inclined boom mounted on said platform, a dipper arm extending across said boom and movable bodily both transversely to and lengthwise thereof, a dipper secured to the lower end of said dipper arm, a member supported on said platform, 60 connected with said dipper arm above said boom and capable of fore and aft movements with relation to said boom to move said dipper arm both lengthwise of and transversely to said boom, means supported on said platform independently 65 of said boom for imparting said fore and aft movement to said member, and means for imparting digging movement to said dipper.

8. In an excavating machine, a platform, an inclined boom mounted on said platform, a dipper 70 arm extending across said boom and movable bodily both transversely to and lengthwise thereof, a dipper secured to the lower end of said dipper arm, a member pivotally supported on said platform near the foot of said boom for move- 75

ment from a substantially upright position to a position adjacent to said boom and pivotally connected near its upper end with said dipper arm above said boom, means supported by said platform independently of said boom for imparting said bodily movements to said arm, and means for imparting digging movement to said dipper.

9. In an excavating machine, a platform, an inclined boom mounted on said platform, a dipper arm extending across said boom and movable bodily both transversely to and lengthwise thereof, a dipper secured to the lower end of said dipper arm, a member supported on said platform, connected with said dipper arm above said boom and capable of fore and aft movements with relation to said boom to move said dipper arm both lengthwise of and transversely to said boom, a bar mounted on said platform for both longitudinal and pivotal movements and operatively connected with said member, means for actuating said bar, and means for imparting digging movement to said dipper.

10. In an excavating machine, an inclined boom, a supporting member pivotally mounted adjacent to the foot of said boom and extending upwardly in the rear of said boom, a dipper arm extending across said boom and supported by said supporting member for free transverse movement lengthwise of said boom and for longitudinal movement transversely to said boom, a dipper carried by said dipper arm, means for imparting digging movement to said dipper, and means supported independently of said boom for imparting said movements to said dipper arm during the digging movement of said dipper.

11. In an excavating machine, a platform, a boom supported on said platform at a fixed inclination, a supporting member pivotally supported at one end on said platform, a dipper arm connected with and supported by the other end of said supporting member, a dipper carried by said dipper arm, said supporting member being arranged for movement to a position adjacent to and substantially parallel with said boom when said dipper arm is moved to the limit of its movement toward digging position of said dipper, means independent of said boom for actuating said supporting member, and means for imparting digging movement to said dipper.

12. In an excavating machine, a forwardly extending inclined boom, a supporting member arranged above and to the rear of said boom for movement toward and from the same, a dipper arm connected with and supported by said supporting member for bodily movement thereby both lengthwise of and transversely to said boom, a dipper carried by said dipper arm, means for imparting digging movement to said dipper, an actuating device supported in the rear of said supporting member and connected therewith to move said dipper arm downwardly and forwardly during the digging movement of said dipper.

13. In an excavating machine, an inclined boom, a dipper arm supported for bodily movement both lengthwise of and transversely to said boom and extending across said boom in all positions of said dipper arm, a supporting member movably mounted adjacent to the foot of said boom, said supporting member being connected with and constituting the sole support for said dipper arm, means supported independently of said boom for actuating said supporting member and imparting said bodily movements to said dipper arm, a dipper carried by said dipper arm,

and means for imparting digging movement to said dipper.

14. In an excavating machine, an inclined boom, a dipper arm supported for bodily movement both lengthwise of and transversely to said boom and extending across said boom in all positions of said dipper arm, a supporting member movably mounted adjacent to the foot of said boom, said supporting member being connected with and constituting the sole support for said dipper arm, an actuating member supported in the rear of said supporting member for bodily movement in the direction of the length of said boom and operatively connected with said supporting member, means for imparting movement to said actuating member, a dipper carried by said dipper arm, and means for imparting digging movement to said dipper.

15. In an excavating machine, an inclined boom, a dipper arm movable bodily both lengthwise of and transversely to said boom and extending across said boom throughout said movements, a dipper carried by said dipper arm, a device mounted for movement lengthwise of said boom and having supporting connection with said dipper arm above said boom, means supported independently of and movable lengthwise of said boom for actuating said device to impart bodily movements to said dipper arm, and means for imparting digging movement to said dipper.

16. In an excavating machine, an inclined boom, a dipper arm supported independently of said boom for bodily movement both lengthwise thereof and transversely thereto and extending across said boom in all positions of said dipper arm, a dipper carried by said dipper arm, a movable supporting member for said dipper arm, means supported independently of said boom for movement lengthwise thereof and acting on said supporting member to impart said bodily movements to said dipper arm, and means for imparting digging movement to said dipper.

17. In an excavating machine, an inclined boom, a dipper arm having bodily movement both lengthwise of and transversely to said boom and extending across said boom in all positions of said dipper arm, means for supporting said dipper arm and imparting said bodily movements thereto, said means comprising two separately mounted rigid members which converge upwardly and forwardly and which are operatively connected with the upper portion of said dipper arm, operating mechanism supported independently of said boom and connected with one of said members, a dipper carried by said dipper arm, and means for imparting digging movement to said dipper.

18. In an excavating machine, a forwardly extending inclined boom, a dipper arm extending across said boom and supported independently thereof for free bodily movement both lengthwise of and transversely to said boom, a supporting member arranged above said boom, pivotally mounted for movement toward and from the same and connected with and constituting the sole support for said dipper arm, an actuating member connected with said supporting member and extending rearwardly therefrom, means supported independently of said boom for moving said actuating member lengthwise of said boom, a dipper carried by said dipper arm, and means for imparting digging movement to said dipper.

19. In an excavating machine, a platform, an inclined boom supported on said platform for swinging movement about a vertical axis, a dip-

- per arm extending across said boom when in digging position, a dipper carried by said dipper arm, a supporting member supported on said platform for fore and aft movements with relation thereto, means for pivotally connecting the upper end of said dipper arm with said supporting member, a rigid actuating member mounted on said platform for bodily movement lengthwise of said boom and operatively connected with said supporting member to impart bodily movement to said dipper arm both lengthwise of and transversely to said boom, means for operating said actuating member, and means for imparting digging movement to said dipper.
- 5 20. In an excavating machine, an inclined boom, a supporting member mounted adjacent the foot of said boom for movement toward and from said boom, a dipper arm supported by said supporting member independently of said boom for movement by said supporting member both lengthwise of and transversely to said boom, a forwardly facing dipper carried by said dipper arm, means for imparting digging movement to said dipper toward the point of said boom, and 20 crowding mechanism supported independently of said boom, connected with said supporting member and operable to impart downward and forward movement to said dipper arm during the digging movement of said dipper.
- 25 21. In an excavating machine, a platform, a boom supported on said platform at a normally fixed inclination thereto, a dipper arm supported independently of said boom for movements both lengthwise of and transversely to said boom, a forwardly facing dipper carried by said dipper arm, a supporting member supported by said platform for fore and aft movements with relation thereto and pivotally connected with said dipper arm, said boom, dipper arm and supporting member being mounted for simultaneous movement about a vertical axis, means for imparting digging movement to said dipper in a direction away from said platform, a crowding member supported by said platform independently of said boom and connected with said supporting member, and means for actuating said crowding member to move said dipper arm downwardly and forwardly during the digging operation.
- 10 22. In an excavating machine, a platform, an inclined boom supported on said platform for swinging movement about a vertical axis, a dipper arm supported independently of and extending across said boom in all positions of said dipper arm, a dipper carried by said dipper arm, a supporting member supported by said platform for fore and aft movements with relation thereto and for movement about a vertical axis, means for pivotally connecting said supporting member with said dipper arm above said boom, a crowding member supported on said platform for operative movement lengthwise of said boom and operatively connected with said supporting member independently of said boom to impart bodily movement to said dipper arm both lengthwise of and transversely to said boom, means for operating said crowding member, and means for imparting digging movement to said dipper.
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