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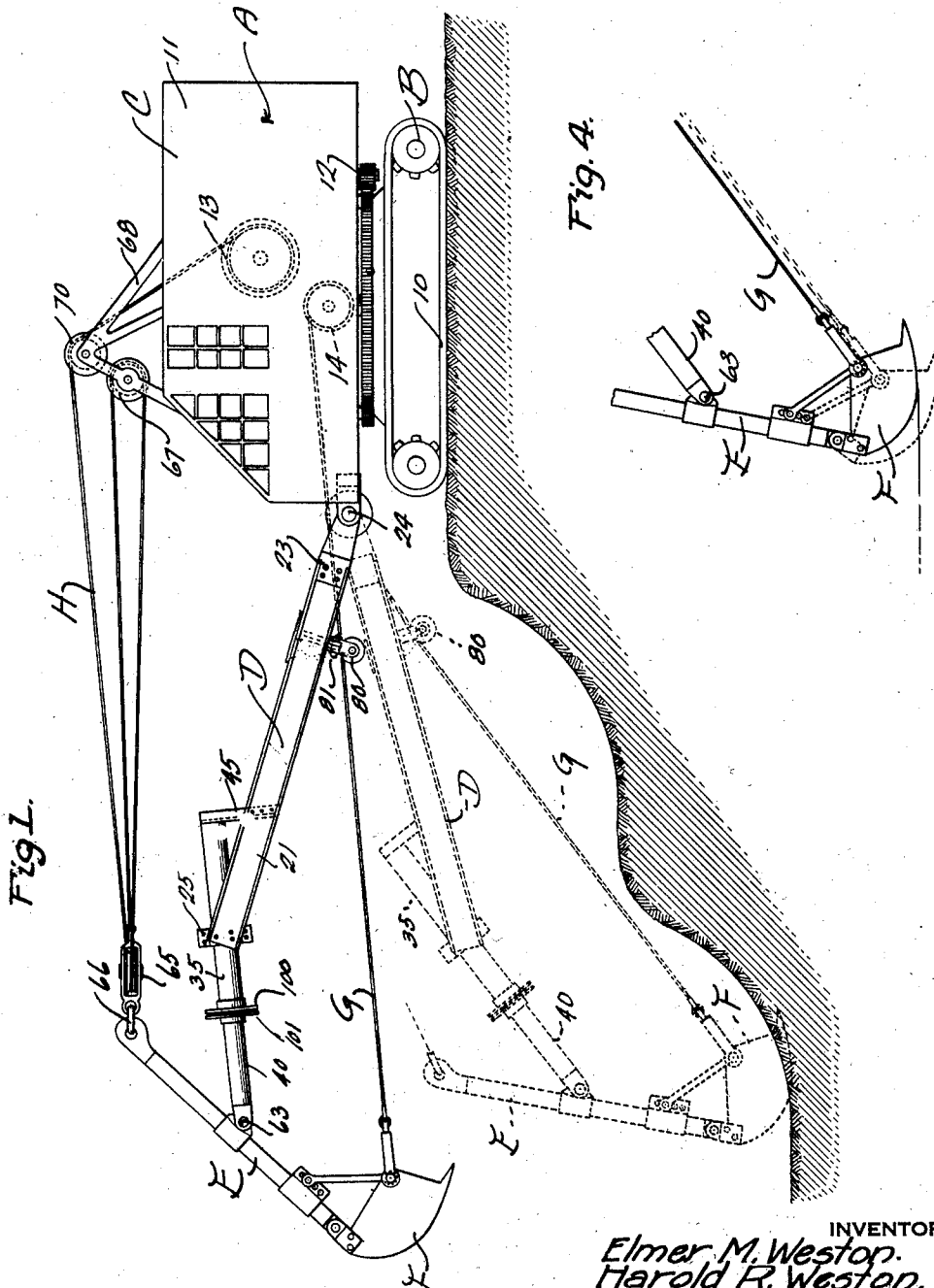
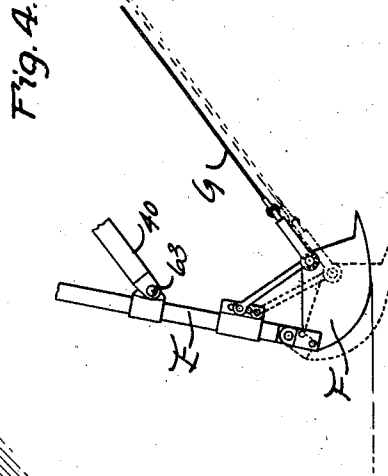
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2,305,566

EXCAVATING MACHINE

Filed Jan. 22, 1942

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

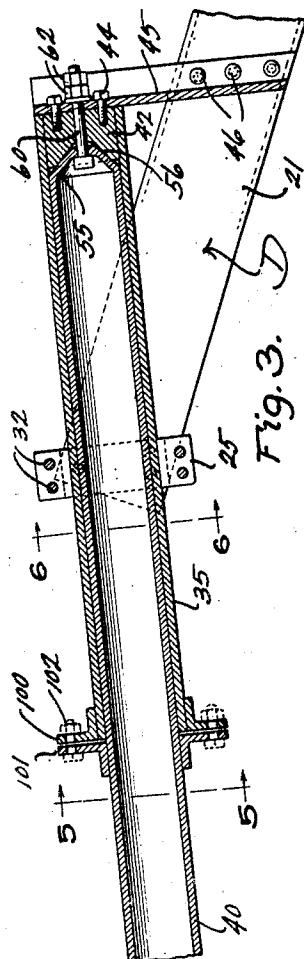


Fig. 3. D

Fig. 6.

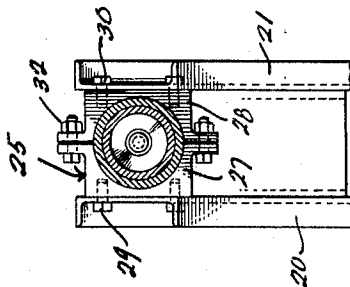


Fig. 5

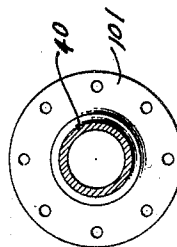
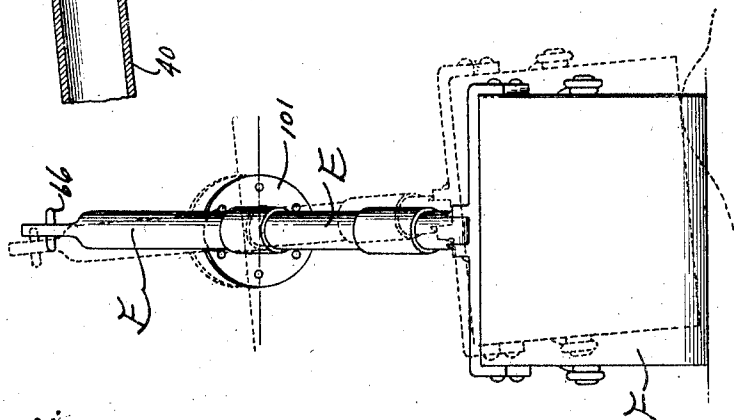


Fig. 2.

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UNITED STATES PATENT OFFICE

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EXCAVATING MACHINE

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15 Claims. (Cl. 214-138)

This invention relates to improvements in excavating machines.

Operators of excavating machines and others skilled in the art relating to this invention, are familiar with the fact that extreme stresses are imposed upon the dipper, dipper handle, boom and other parts of an excavating machine due to side drag or torque. This occurs such as when movable rock obstructions are encountered at one side of the dipper during the excavating movement, and also it is sometimes necessary to excavate at an angle which is not perpendicular to the vertical. To overcome these stresses we have provided an improved boom structure for excavating machines which has the following advantages:

(a) Greater flexibility and ease of operation of the excavating machine.

(b) The boom and dipper handle construction and other associated parts can be made of lighter construction than conventional.

(c) It is possible to utilize a dipper of greater holding capacity than is conventionally the case.

(d) There will be less maintenance cost, because there will be fewer repairs necessary.

(e) More accurate and symmetrical excavations will be attainable.

(f) There will be greater versatility in handling a large range of excavations under various conditions with various materials.

(g) The operator will not become fatigued as quickly as he does with conventional excavating machines.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawings, forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views—

Figure 1 is a side elevation of the improved excavating machine, many of the features of which are conventional.

Figure 2 is a front elevation of the dipper and dipper handle construction of the excavating machine showing certain improved structural features.

Figure 3 is a longitudinal sectional view taken thru an improved portion of the boom structure, constituting the principal novelty of this invention.

Figure 4 is a view of the dipper and associated drag cable.

Figures 5 and 6 are cross sectional views taken

substantially on their respective lines in Figure 3 of the drawings.

In the drawings, wherein for the purpose of illustration is shown only a preferred embodiment of the invention, the letter "A" may generally designate the improved excavating machine, which may consist of a chassis "B"; rotatable frame "C" thereon; pivoted boom structure "D"; dipper handle "E"; dipper "F"; drag cable construction "G" and hoist means "H."

The chassis construction "B" is conventional. It includes an endless tread arrangement 10 of conventional construction. The revolving frame "C" includes a housing 11 with means 12 to rotate the same upon the chassis construction, as in conventional construction. The interior of the housing 11 is provided with suitable power equipment (not shown) all of which is conventional, so that the operator can rotate a hoist drum 13 in connection with the hoist mechanism, and a drag drum 14; the latter, thru the hoist cable "G," operating the dipper "F," as in conventional construction.

The boom structure "D" preferably includes the main beam or channel portions 20 and 21, suitably secured together at 23 at their rear ends and pivoted at 24 upon the revolving frame "C," so that the boom "D" on the pivot 24 can swing in a vertical plane, that is, in a plane normal to the axis of the pivot 24.

The boom construction "D" at its forward end is provided with a rigidly positioned supporting block 25, which may be of any approved construction, but as shown in Figure 6, may consist of sections 27 and 28 bolted at 29 and 30 to the main beams 20 and 21; the block sections 27 and 28 being segmental and detachably connected together at 32 and securing therebetween a tubular socket section 35. This socket section 35 may be welded in the block sections if desired, and it is intended that it should be absolutely rigid in its mounting in the block 25. A swivel tube 40 is partially telescoped in the tube 35 and axially rotatable therein. This swivel tube 40 may be rotatably supported by any anti-friction means desired, or the construction employed in Figure 3 may be used. It is anchored against any longitudinal play in the socket tube 35 in the following manner:

A step bearing block 42 may be welded in the end of the tube 35, as shown in Figure 3. This step bearing 42 is provided with bolt means 44 by which it is secured to a firm supporting plate 45 which is riveted or otherwise secured at 46 between and upon the main beams 20 and 21

of the boom structure; the plate 45 being positioned in upwardly extending relation from the longitudinal margins of the beams 20 and 21 in acute angled relation therewith. This positions the axis of the tubes 35 and 40 at an acute angle to the run of the beams 20 and 21, as is shown in Figures 1 and 3 of the drawings.

The swivel tube 40 at its rear end is provided with a tapered bearing wall 55 complementary to the tapered seat 56 provided in the bearing block 42. An axial centering bolt 60 holds the tube 40 against longitudinal movement in the tube 35; lock nut means 62 being provided upon the exterior end of the bolt 60, to adjust the bearing surface of the tube 40 in step bearing 42.

The swivel tube 40 at its forward end is pivoted at 63 intermediate the ends of the dipper handle E. The latter at its lower end is, of course, provided with a dipper F, which may be of conventional construction.

A sheave 65 constituting part of the hoist structure H is swiveled at 66 upon the upper end of the dipper handle E, as in conventional practice. The hoist cable H has a dead end attachment to the sheave 65, as is conventional, and from thence is trained about a sheave 67 disposed upon the gantry support 68 of the revolving power frame of the excavating machine; the cable H thence being trained back upon the sheave 65 and returned to a sheave 70 also upon the gantry structure 68; the cable thence extending to the hoist drum 13, as shown in Figure 1 of the drawings.

In operation, the dipper and dipper handle are lowered by means of the hoist cable H to a position for securing a load of dirt or other material, as shown in dotted lines in Figure 1 of the drawings. Should the level of the desired excavation be at an odd angle, for instance acute to the horizontal, or should an obstruction be met with at a corner of the dipper during the excavating operation, the lateral force imposed upon the dipper will be transmitted thru the dipper handle "E" to the swivel tube 40. The latter will rotate to the desired angle in the socket tube 35, and thus will free the dipper; dipper handle and boom structure and all of their connections from undue stresses due to the side drag or torque incident to the excavating operation.

The load cable sheave 80 over which the drag cable or load cable G is trained, is pivoted at 81 upon the boom D to compensate for variation in load of the cable as it responds to rotary shift of the boom swivel tube or joint.

Under certain circumstances it may be desirable to operate the excavating machine without the swivel action of the boom above described. To permit this, we provide flanges 100 and 101 suitably secured, as by welding, to the tubes 35 and 40 adjacent the outer end of the tube 35. They are provided with complementary openings for detachably receiving bolts 102, shown in dotted lines in Figure 3 of the drawings. Normally these bolts are not in place, so as to permit of the swivel action of the boom, but when in place, the boom structure is absolutely rigid, so that the power excavating machine may be operated just as is any conventional excavating machine.

The tubes of course should be made of seamless steel tubing and together with the step bearing they should be sufficiently strong to withstand all lateral loads, as well as compression shocks imposed upon the bearing block 42.

Various changes in the shape, size and arrangement of parts may be made to the form of in-

vention herein shown and described, without departing from the spirit of the invention or the scope of the following claim.

We claim:

1. In an excavating machine the combination of a boom, a dipper handle pivoted to the boom, a dipper pivoted to the dipper handle, means for operating the dipper, dipper handle and boom for excavating purposes, an elongated member mounted upon the boom and axially disposed at an acute angle with respect to the axis of the boom, and means swivelly mounting the dipper handle upon said member for swivelling axially of said member so as to permit lateral angular movement of the dipper and dipper handle with respect to the normal plane of boom movement to compensate for desired angles of excavation and obstructions met with during excavating operations and relieve undue stresses upon the excavating machine parts.

2. In an excavating machine the combination of an excavating frame and power structure, a main boom pivoted upon the frame, a dipper, a dipper handle to which the dipper is pivoted, hoist means associated with the dipper handle and power mechanism of the frame, drag cable means connected with the power mechanism and with the dipper, and means pivoted intermediate the ends of the dipper handle having a swivel bearing upon said boom on an axis which lies in the vertical plane of movement of the boom at an acute angle with respect to the boom axis.

3. In an excavating machine the combination of an excavating frame and power structure, a main boom pivoted upon the frame, a dipper, a dipper handle to which the dipper is pivoted, hoist means associated with the dipper handle and power mechanism of the frame, drag cable means connected with the power mechanism and with the dipper, means pivoted intermediate the ends of the dipper handle having a swivel bearing upon said boom on an axis which lies in the vertical plane of movement of the boom, and sheave means supporting the drag cable intermediate its ends, said sheave means being mounted intermediate the ends of the boom and having a pivot which permits lateral swivel movement of the sheave with respect to the plane of movement of the boom.

4. In an excavating machine the combination of a main frame structure including a power unit, a boom pivoted upon the frame for movement in a vertical plane, a bearing member mounted upon the outer end of the boom and extending appreciably beyond the extreme outer end of the boom, a dipper, a dipper handle to which the dipper is pivoted, a member pivoted upon the dipper handle intermediate its ends, the last mentioned member being supported for swivel action in the bearing member of the boom on an axis of movement which lies within or parallel to the vertical plane of movement of the boom whereby the dipper and dipper handle may tilt at an angle to the normal vertical plane of movement of the boom during certain excavating operations.

5. In an excavating machine the combination of a main frame structure including a power unit, a boom pivoted upon the frame for movement in a vertical plane, a bearing member mounted upon the outer end of the boom, a dipper, a dipper handle to which the dipper is pivoted, a member pivoted upon the dipper handle intermediate its ends, the last mentioned member being supported for swivel action in the bearing of the boom on

an axis of movement which lies within or parallel to the vertical plane of movement of the boom whereby the dipper and dipper handle may tilt at an angle to the normal vertical plane of movement of the boom during certain excavating operations, a drag connected between the dipper and power unit, hoisting means for operating the dipper handle and connected with said power unit, and a sheave pivoted upon said boom and supporting said drag cable intermediate its ends, the pivot of said last mentioned sheave being on an axis parallel or within the vertical plane of movement of said boom.

6. In a boom construction for excavating machines the combination of a main boom beam structure, a socket bearing at the outer end of said boom having the socket arranged at an angle of less than 180° with respect to the longitudinal axis of the boom, and a member rotatably mounted within said socket, said member being adapted to support a dipper construction.

7. In a boom construction for excavating machines the combination of a main boom beam structure, a socket bearing at the outer end of said boom having the socket arranged at an acute angle to the longitudinal axis of the boom extended, and a member rotatably mounted within said socket, said member being adapted for attachment to a dipper construction, and means for firmly fixing the dipper attaching member with the socket construction so as to make it rigid with said boom main beam structure.

8. In an excavating machine the combination of a frame, a boom beam pivoted upon the frame upon a horizontal axis, a socket tube supported upon the outer end of the boom, a dipper structure member rotatably socketed in the socket tube for rotation on an axis which lies parallel with or within the plane of movement of the beam, and means to detachably and rigidly connect the dipper attaching member to said socket tube.

9. In a boom structure for excavating machines the combination of an elongated main boom beam structure, a socket tube fixedly connected upon said main boom beam structure, a dipper attaching member swivelly mounted within said socket tube for rotation on a fixed axis which lies within the plane of normal movement of the beam, means to prevent endwise movement of said dipper attaching member within said socket tube, and selective means to detachably and rigidly connect said dipper attaching member to said tube.

10. In a boom construction for excavating machines the combination of a main boom beam, a member mounted upon the end of said main boom beam providing an elongated socket aligned directly in the plane of movement of the boom and having a dead end, a shaft member having a step bearing in the dead end of said socket and swivelly mounted therein for axial turning movement in said socket, and a dipper handle pivotally mounted upon the shaft.

11. In an excavating machine the combination of a frame, a boom beam pivoted upon the frame, a socket tube rigidly supported upon said boom, a shaft rotatably mounted in said socket for rotary swivel movement upon its axis, said shaft extending externally of the socket very appreciably beyond the free end of the boom, and a

dipper handle pivotally mounted upon said shaft.

12. In an excavating machine the combination of a frame, a boom beam pivoted upon the frame, a socket tube rigidly supported upon and extending beyond the free end of said boom, a shaft rotatably mounted in said socket for rotary swivel movement upon its axis, said shaft extending externally of the socket appreciably beyond the outer end of the socket, a dipper handle pivotally mounted upon said shaft, a flange rigidly connected with the outer end of said socket, a flange rigidly connected with said shaft between its ends, and detachable means for securing said flanges together.

13. In an excavating machine the combination of a frame, a boom pivoted upon a horizontal axis upon said frame, a dipper handle, a member pivoted intermediate the ends of the dipper handle, means swivelly socketing said member upon the boom for swivel action of said member and said dipper handle on an axis which lies within the plane of movement of the boom and will permit of lateral tilting movement of the dipper handle, a dipper pivoted upon the lower end of the handle, dipper control cable means including a sheave rotatably mounted upon the boom by means which provides a pivot admitting of bodily movement of the sheave laterally of the plane of normal movement of the boom, control cable means for the upper end of the dipper handle above its swivel mounting including a sheave swivelly mounted for bodily movement angularly with respect to the plane of movement of the dipper handle upon its swivel mounting means.

14. In an excavating machine the combination of a frame, a boom pivoted upon a horizontal axis at its rear end upon said frame, a dipper handle, a shaft member pivoted at its outer end intermediate the ends of the dipper handle and movable with respect to the dipper handle in the plane in which the axis of the dipper handle lies, an elongated socket member mounted upon the outer end of said boom presenting an elongated socket, said shaft being swivelly seated and bearing in said elongated socket member and extending beyond the outer end of said boom and socket member an appreciable distance for mounting said dipper and dipper handle a distance very appreciably spaced from the outer end of said boom.

15. In an excavating machine the combination of a frame, a boom pivoted upon a horizontal axis at its rear end upon said frame, a dipper handle, a shaft member pivoted at its outer end intermediate the ends of the dipper handle and movable with respect to the dipper handle in the plane in which the axis of the dipper handle lies, an elongated socket member mounted upon the outer end of said boom presenting an elongated socket, said shaft being swivelly seated and bearing in said elongated socket member and extending beyond the outer end of said boom and socket member an appreciable distance for mounting said dipper and dipper handle a distance very appreciably spaced from the outer end of said boom, the axis of said socket member and the shaft pivoted therein being on a line at an acute angle with respect to the axis of the boom extended.

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