

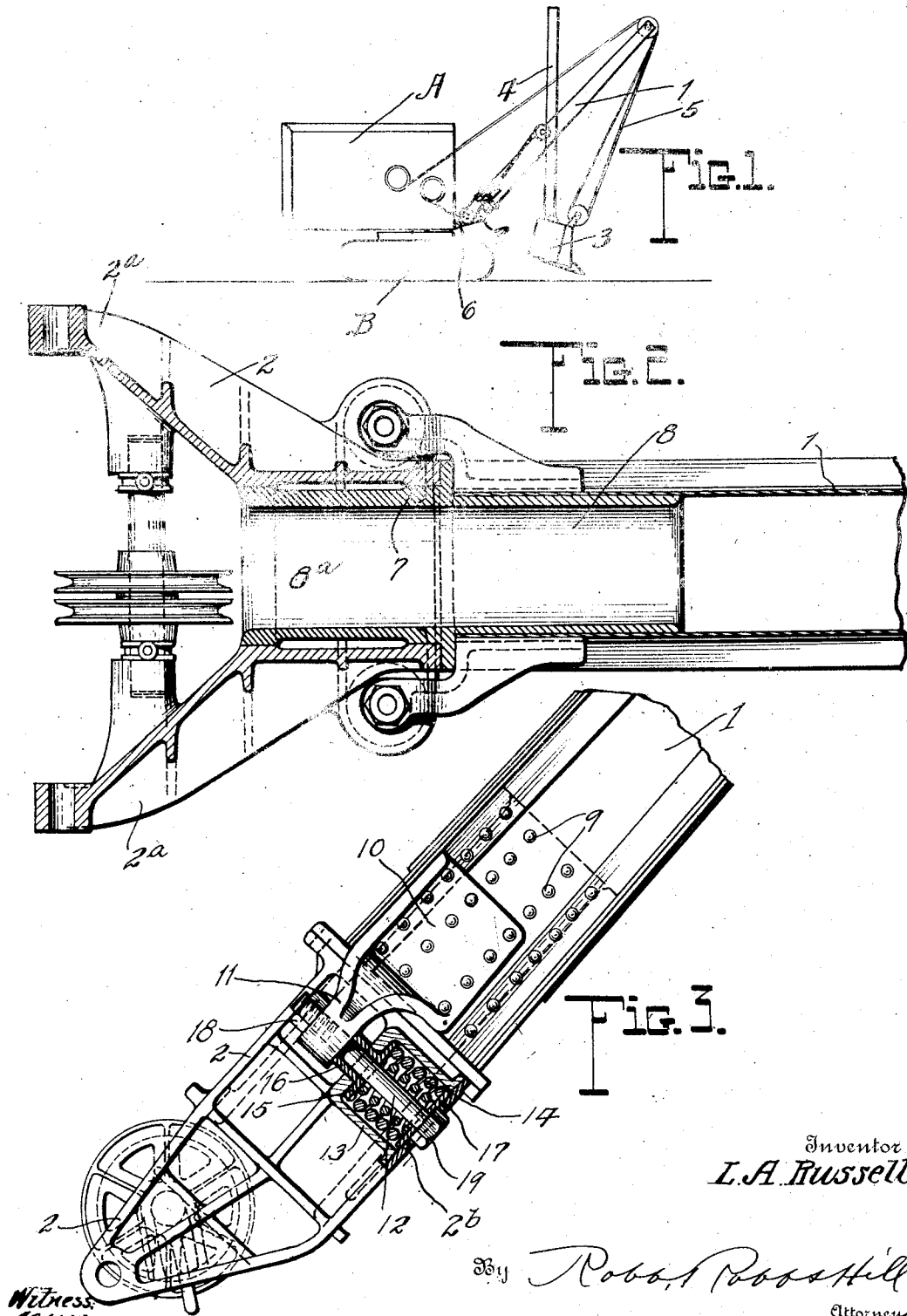
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SHOVEL CRANE BOOM

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UNITED STATES PATENT OFFICE.

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SHOVEL-CRANE BOOM.

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This invention has relation to excavating machines of the type known commonly as shovel cranes or power shovels, wherein is employed a shovel boom and dipper means mounted on said boom and operated from the power plant carried by the body of the crane.

The ordinary operation of cranes of the above type contemplates an excavating movement of the dipper or shovel member usually involving elevating action thereof as it is crowded to its work, a lateral swinging or sweeping of the dipper and its handle by which is connected with the boom, to bring the dipper into an unloading position over a vehicle or a place on which the contents of the dipper may be dumped, and a subsequent restoration of the dipper by reverse operations to bring it back to its excavating position. Now it is well known in the art that with the usual types of supporting boom, dipper and dipper stick or handle constructions a rigid mounting of the boom upon the crane is usually provided. The dipper stick either straddles the supporting boom therefor, or passes between spaced parts of such boom in the usual constructions. The said stick forms a long lever, and the operations of the crane usually are such that as the car or body of the crane turns to swing the boom and the dipper instrumentalities considerable momentum of these parts is created in their movement. The ordinary operation of the machine furthermore, for efficiency, requires rather sudden stoppage of the boom movement in swinging, this being true both when the dipper is loaded and when it is unloaded. Necessarily this action of the boom and dipper in the stopping movements creates severe stresses and strains both upon the boom supporting means at the point of connection with the crane body or car and upon the dipper stick or handle itself. At times the operator of the machine accidentally side-swipes a vehicle or bank or other obstacle, giving rise to additional severe strains on the connections at the foot of the boom and the dipper stick of the dipper.

The object of the present invention has been to produce a comparatively simple dipper supporting boom construction, wherein the body of the boom is mounted, practically speaking, for turning movement relatively to the foot of the boom, about an axis longitudinally of the boom, the said body and foot members of the boom being maintained in

their normal positions by resilient means such as springs. These springs are designed to absorb the shocks and stresses to which the boom and dipper stick may be subjected incident to their use in ordinary excavating operations.

The foregoing resilient mounting of the boom, or its facility to turn about a longitudinal axis, is advantageous for general mechanical operations, previously discussed, and is additionally advantageous from a manufacturing view-point because the construction of the supporting means for the boom is not required to be so heavy and shock resistant as otherwise is the case, and furthermore this same thing applies to the construction of the dipper stick or handle as well.

In the accompanying drawings,

Figure 1 is a diagrammatic side view showing a shovel crane equipped with the constructional features embodying my invention.

Figure 2 is a longitudinal sectional view of a somewhat fragmentary nature showing the foot of the boom and a portion of the body thereof, bringing out clearly the rotative mounting of the body upon the foot and the arrangement of the resilient device for absorbing shocks incident to lateral stresses transmitted to the boom through the dipper means thereof.

Figure 3 is a side view showing substantially the same parts as are illustrated in Figure 2.

Describing my invention specifically, I designate the car or body of my crane at A in Figure 1, and the traction support thereof at B, the latter being composed of endless traction members, and there being provided the usual swing body or turntable mounting intermediate the car A and said traction support B. My shovel boom or boom element is designated at 1 and is supported by the foot 2. The dipper is designated at 3 and is connected to and supported by the boom by the dipper stick 4. The dipper is hoisted by the hoisting cable 5, and suitable crowding out and racking in mechanism may be employed of a more or less conventional nature so far as the invention hereof is concerned. It will be observed that the dipper stick 4 straddles the boom 1 according to my particular construction illustrated, although this is not a necessary feature of the said construction because my invention is adapted to

perform useful functions in respect to other types of shovel booms and dipper stick arrangements.

Referring particularly to Figures 2 and 3, it will be observed that the foot 2 of the boom is a casting comprising the opposite sides or legs 2^a, pivotally supported at 6 upon any suitable bracket means projecting from the car A of the crane. The outer portion of the boom foot 2 is equipped with a longitudinal bearing opening 7 in which is journaled the round journal end portion 8^a of a boom casting 8, the opposite end of which is of square form and fits into the lower end of the body of the boom 1. Rivets or other suitable fastenings 9 may be employed to rigidly connect the boom casting 8, which is virtually a journal casting because it provides the journal member 8^a, with respect to the boom 1. At opposite sides of the boom 1 and at its lower end adjacent to the square extremity of the casting 8, are attached plates 10 by means of rivets or the like, and these plates are equipped with downwardly off-standing arms or lugs 11. The lugs 11 are provided with apertures through which pass bolts or rods 12, which bolts also pass through spring casings or housings 13 that are preferably cast with the foot member 2 of the boom. The casings 13 enclose a spring or springs of the expanding coil type designated at 14, and mounted in each casing 13 at its upper end is a plate 15 having a sleeve extension 16 that passes through the upper end of the casing and abuts with the under-side of the adjacent lug 11. At its lower end the casing has a second plate 17 which abuts with the lower ends of the springs, and is under-hung by an abutment portion 2^b on the foot member 2. A nut 18 is screwed upon the upper end of each bolt 12, and the head 19 of each bolt has an abutment relation with the under-side of the adjacent plate 17.

In effect, therefore, the boom 1 has radial projections 11, and the foot member 2 opposed radial projections 13 with intermediately acting resilient devices.

It is to be noted that the casings, springs, and lugs or arms above set forth are normally disposed in substantially vertical planes in opposite sides of the boom 1 and its foot member 2. Furthermore, normally the springs 14 by their expanding action hold the parts 15 and 17 at the opposite ends of the casings 13. But said springs when compressed allow fully rotary play of the boom 1 in the foot member 2 by reason of the provision of the journal member 8^a. In view of the foregoing features of construction it will be obvious that many shocks or stresses transmitted to the boom 1 and tending to twist the boom by torsional action, which stresses and shocks are common today in shovel cranes, will be absorbed by a yielding turning move-

ment of the boom 1 on its foot member 2. In other words, the boom 1 is capable of rotating relatively to the foot 2 and the said shocks or stresses are fully absorbed by the provision of the springs 14. It is notable, too, that the springs 14 at opposite sides of the boom act in common to take up the shocks or stresses referred to. In other words, when the plate 15 at one side of the boom is pushed downwards the plate 17 at the opposite side is pulled upwards, and vice-versa, whereby the springs at both sides of the boom are utilized in lending their resistance to compression incident to the absorptive of the stresses involved in the rotative turning tendencies of the boom as transmitted thereto by the dipper stick in the constant swinging and stopping movements of the latter.

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

1. In a crane of the class described, in combination, a swing body, dipper shovel mechanism comprising a boom element, a dipper shovel mounted thereon, and a connection between the swing body and the said boom element comprising shock absorbing means maintaining the boom element in a certain normal relative position to the swing body but adapted to yield upon undue resistance to the movement of the shovel as it is swung with the swing body.

2. In a crane of the class described, in combination, a swing body, a shovel supporting boom element, a dipper shovel mounted thereon, means for racking in and crowding out the said dipper shovel, and an operative connection between the said boom element and the swing body comprising shock absorbing springs normally acting to hold the boom element in a certain position with its dipper shovel, in relation to the swing body, the said shock absorbing springs being adapted to yield and permit of relative movement of the boom element laterally in respect to the swing body when the dipper shovel meets with undue resistance as it is swung laterally with the boom element in working operations.

3. In a crane construction of the class described, in combination with the body of the crane, a boom construction including a foot member connected with the body aforesaid, and a boom body member rotative about a longitudinal axis relatively to and mounted upon the foot member, together with yielding means intermediate the boom body and foot members whereby to resiliently maintain them in normal operative positions.

4. In a crane of the class described, in combination, a crane body, a boom mounted thereon, shovel means comprising a dipper and dipper stick connected to the boom, the said boom embodying resiliently connected

members adapted for movement relatively to each other about an axis longitudinally of the boom.

5 In a crane of the class described, in combination, a swing body, a shovel supporting boom element, a dipper shovel mounted upon said boom element, mechanism on the swing body for racking in and crowding out the dipper shovel as it is carried by the boom element, and a mounting connection intermediate the boom element and the swing body and comprising cushion devices to absorb the shock incident to abnormal resistance to the lateral swing of the boom element when the dipper shovel meets with resistance transmitted to the boom element, the said cushion devices acting to absorb shocks set up by the undue stresses transmitted by the shovel to the boom element and therefrom to the said connection with the swing body.

6. As a new article of manufacture, a power shovel boom comprising a foot member, a body member movably mounted upon the foot member, and resilient means intermediate the two for absorbing the shocks or stresses created by sweeping and stopping movements of the boom under actual conditions of service.

7. A boom unit structure for shovel cranes comprising a foot member, a body member movably connected to the foot member, and yielding devices intermediate the two comprising springs mounted upon one of said parts, lugs carried by the other of said parts cooperative with said springs, and connections between the lugs and springs substantially as described.

8. In combination a crane body, shovel boom apparatus carried thereby including a boom, a dipper stick and dipper carried by said dipper stick, the boom comprising a foot member connected with the crane and a body member and carrying the dipper stick movably mounted upon the foot member, together with resilient means intermediate the boom foot member and the boom body member for absorbing shocks as an incident to relative movement of said parts.

9. A boom structure for power shovels comprising a foot member, a body member rotatively mounted upon the foot member and resilient connecting means between the body member and the foot member located at opposite sides thereof, said resilient means including springs so connected with the foot and body members that the spring means at one side of the boom cooperates to resist

twisting or turning of the body of the boom in either direction.

10. A boom structure for power shovels comprising a foot member having spring casings at opposite sides thereof, a body member having off-standing arms at opposite sides thereof terminating in line with the said casings, journaling means between the foot and body members including a journal casting having a square end portion fastened to the body member and the round journal end portion fitting into and rotatable on the foot member, together with springs and spring connecting parts carried by the casings and attached to the said arms of the foot member and body member substantially as set forth and described.

11. A revolving crane body, a boom assembly comprising a rockable boom foot pivoted to the said body for swinging in a vertical plane and a boom arm longitudinally journaled in the boom foot, a dipper stick supported by the said arm, resilient means normally maintaining the said stick and the said arm in planes, parallel with the crane body's vertical center line while allowing the said arm and the dipper stick aforesaid to depart therefrom under stress in either lateral direction.

12. A shovel boom comprising a vertically rockable boom foot and a rotatable boom arm, resilient means oppositely positioned adjacent the said foot and said arm, opposed shoulder formations upon the rockable boom foot and upon the rotatable boom arm to offer abutting flanges limiting a longitudinal bearing connecting the said foot and the arm aforesaid.

13. A shovel boom comprising two elements, a non-rotative foot member and a rotative arm, opposed radial projections outstanding from the said member and the said arm, resilient means affecting the said projections to resist rotation of the said arm, the said means located for responding to stresses circumferentially applied.

14. A boom for shovel excavators, comprising, a base plate journaled oscillatorily about a horizontal axis on a rotary part of the excavator, a pivot mounting the boom on the base plate for rotation about the longitudinal axis of the boom and a spring construction arranged to bias the boom about its pivot to its central position on the base plate.

In testimony whereof I affix my signature.

LESLIE A. RUSSELL.