

June 12, 1934.

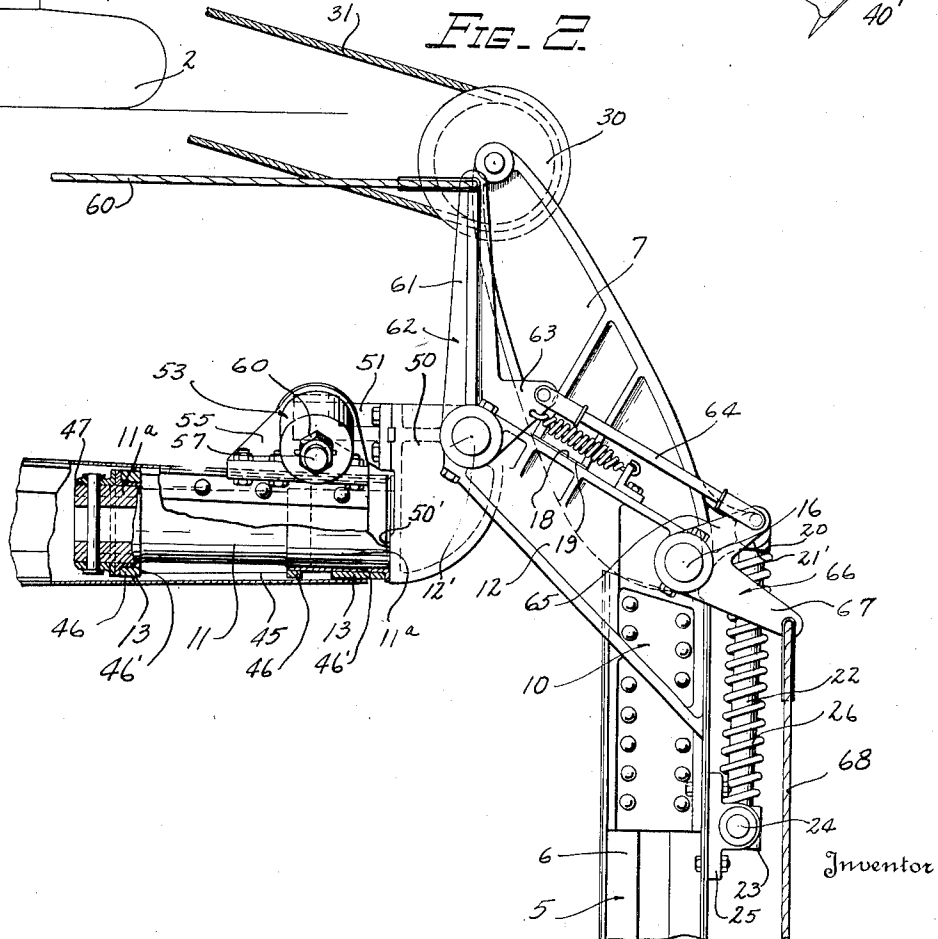
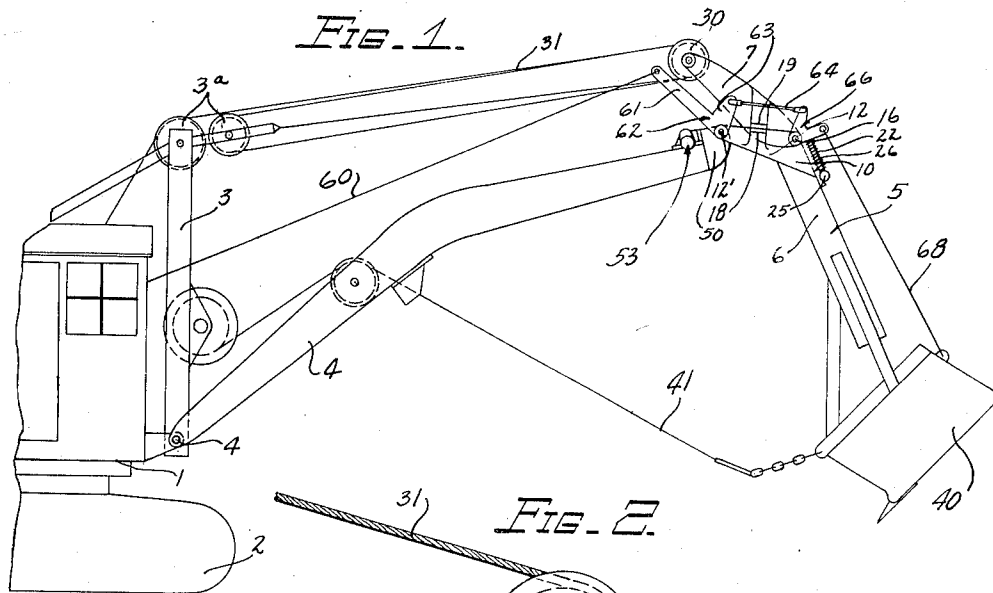
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1,962,516

POWER HOE

Filed Dec. 29, 1928

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

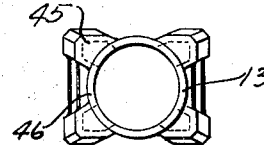
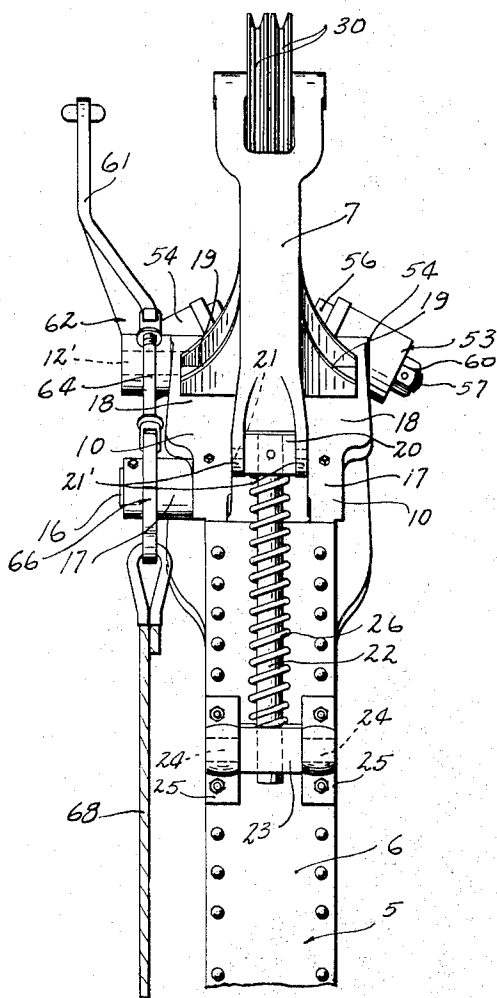
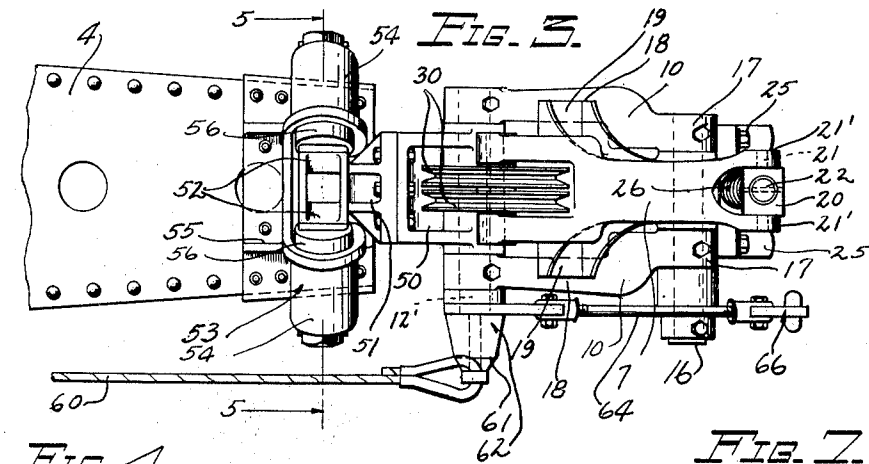


FIG. 5

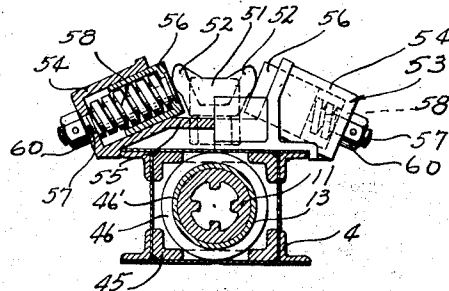
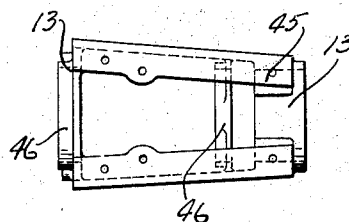


FIG. 6



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UNITED STATES PATENT OFFICE

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POWER HOE

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22 Claims. (Cl. 214—138)

This invention relates in general to excavating machinery and more particularly to a power shovel of the back acting or hoe type some times referred to as an instroke ditcher.

Such power shovels have a vertically swingable boom mounted on a revolvable platform of a tractor or the like and a dipper stick pivoted to the outer end of the boom for swinging movement in a vertical plane about a horizontal axis. The dipper stick is controlled or swung and the boom retained at the desired elevation by means of the usual hoisting line connected to the upper end of the dipper stick and the hauling line or digging line connected to the excavating bucket carried by the lower end of the dipper stick. In the use of a machine of this character the dipper stick is frequently subjected to side swiping or to other laterally acting shocks or impacts, and, as neither the boom nor the dipper stick are capable of any lateral movement, such laterally acting impacts or shocks set up severe and destructive stresses in the dipper stick, boom and their pivots and associated parts.

The present invention is concerned particularly with the absorption of such laterally acting impacts or shocks and aims to preclude the setting up of excessive or destructive strains or stresses in any of the parts of the machine as a result of the action of such forces.

A further object is to provide a power hoe or shovel having this laterally yieldable or shock absorbing capacity and which also embodies a dipper stick construction and mounting which precludes interference or damaging engagement between the boom and the upper end of the dipper stick.

In carrying out the present invention a power hoe is provided which has the usual revolving platform and a boom supported upon the platform for swinging movement in a vertical plane in accordance with the usual practice. A dipper stick is provided and extends above and below the boom, the dipper stick being made up of two sections between which there is a one-way pivotal connection and also a device for normally and yieldably holding the sections of the dipper stick in alinement. Between the lower section of the dipper stick and the boom, means is provided for mounting the dipper stick for pivotal movement in a vertical plane and this means is also so constructed as to permit the dipper stick to rock, against a yieldable resistance, about an axis extending longitudinally of the boom, whereby the dipper stick is capable of lateral or side sway. Normally, however, the dipper stick is biased or yieldably constrained to swing in a vertical plane, that is, in the plane of the boom, and this result may be effected by means of a pair of dash pots or other suitable yieldable or resilient means mounted on the outer end of the

boom and bearing upon an arm or part which is constrained to partake of any lateral movement of the dipper stick. As this pivoting and biasing means coacts with the lower section of the dipper stick it permits the upper section of the dipper stick to freely move relative to the lower section when such relative movement is necessary to prevent interference with the boom.

Other objects and advantages reside in certain novel features of the construction, arrangement and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawings forming a part of this specification, and in which:

Figure 1 is a view in side elevation showing a power hoe embodying the present invention;

Figure 2 is an enlarged fragmentary view showing the outer end of the boom and associated part of the dipper stick, parts being broken away and shown in section for the sake of illustration;

Figure 3 is a plan view of the part shown in Figure 2;

Figure 4 is a view thereof in front elevation;

Figure 5 is a view in section on line 5—5 of Figure 3, parts being shown in elevation for the sake of simplicity in illustration; and

Figures 6 and 7 are detail views in top plan and front elevation respectively showing one form of bearing incorporated in the outer end of the boom.

Referring to the drawings, and more particularly to Figure 1, the numeral 1 designates the revolving platform of an excavating machine, this revolving platform being mounted on suitable running gear, indicated diagrammatically at 2. As is conventional in the art, mechanism for driving the machine and swinging the platform and the motor driven drums for imparting the desirable hoisting and digging movements to the instrumentalities of the excavating means all are mounted on the platform 1. All of this is well known in the art and needs no detail description here.

At the forward end of the platform 1 the so-called A-frame 3 is mounted and suitably supported and held. A boom 4 is provided and has its foot pivotally supported as at 4' on the forward end of the platform 1, the pivot 4' being horizontally disposed and positively constraining the boom 4 to up and down swinging movement in a vertical plane. A dipper stick designated generally at 5 is provided.

The dipper stick 5 includes a lower section 6 and an upper section 7. The lower section 6 may be and preferably is built up of structural steel elements such as angles and plates riveted together to form a very strong and rigid construction. At its upper end the lower section

6 is provided with a pair of brackets 10 securely riveted to the upper end of the lower section and formed with upwardly and rearwardly offset or angled arms 12 which embrace and are pivotally connected as at 12' to the upwardly curved outer end of a swivel pin or shaft 11. The main portion of the pin or shaft 11 extends axially of the outer end of the boom and is rotatably fitted in a bearing member 13 built into the point or outer end of the boom. The upper section 7 of the dipper stick may consist of a single piece casting having a pivot bearing adjacent one end which receives a pivot pin 16 supported in pivot bearings 17 provided on the brackets 10 of the lower section of the dipper stick. In this way the section 7 is mounted on the section 6 of the dipper stick for pivotal movement. It is to be noted that the section 7 is pivotally connected to the outer corners of the upper end of the brackets 10. The arms 12 of the brackets 10 are formed with stops or engaging surfaces 18 adapted to engage similar stops or engaging surfaces on integral lateral extensions or wings 19 of the section 7 whereby to limit the swinging movement of the section 7 relative to the section 6 in one direction. The upper section 7 is slightly curved inwardly over the boom, as shown to advantage in Figures 1 and 2, and normally the section 7 is positioned in alinement with the lower section 6, the stops 19 engaging the stops 18 in the alined position of the sections. Engagement of the stops 18 and 19 may be maintained by the provision of suitable spring means for this purpose. The spring means shown includes an abutment 20 pivotally mounted on the section 7 by means of a pivot pin 21 fitted in ears 21' formed on the section 7. A spring guide rod 22 is fixed to this pivoted abutment 20 and slides through an opening provided therefor into an abutment 23 having trunnions 24 pivoted in bearing blocks 25, bolted or otherwise fixed to the lower section 6 of the dipper stick. A coil spring 26 encircles the guide 22 between the abutments 20 and 23 and has its ends engaging these abutments, the coil spring 26 being tensioned and compressed between the abutments so as to maintain the section 7 positioned in alinement with the section 6 and the stops 18 and 19 engaged.

A hoisting line 31 reeved in the usual way around the pulleys 3^a of the A-frame and controlled from the usual hoisting drum on the platform coacts with a sheave assembly 30 at the upper end of the section 7. An excavating bucket or scoop 40 is carried by and secured to the lower end of the dipper stick and is so disposed as to face the machine when loading and face downwardly toward the ground when the dipper stick is in an extended position. A hauling or digging line 41 controlled from the usual digging drum on the platform connects with the excavating bucket 40 and coacts with the hoisting line 31 to control the position of the boom and the position of the dipper stick and its excavating bucket and to impart the desired movements to these parts in accordance with the usual practice. This two part construction of the dipper stick precludes any interference between the dipper stick and the boom and also prevents fouling or interference of the hoisting tackle with the boom.

Usually it is desirable to constrain the dipper stick to swing in a vertical plane but at times, due to side swiping or to various other forces which act laterally on the dipper stick with more or less

severity, the positive means usually employed for constraining the dipper stick to swing in a vertical plane results in the imposition of heavy and destructive or damaging strains and stresses on the dipper stick, boom and associated parts. To obviate this serious disadvantage the dipper stick is connected as described to a swivel pin or shaft 11 which rotatably fits in the bearing 13. This permits the dipper stick to rock or swing about an axis extending lengthwise of the boom. The bearing member 13 includes a frame-like structure 45 fitted in the outer end of the boom and secured thereto and annular bearing rings 46 integral with or suitably fixed to the frame-like structure 45. The bearing rings 46 are provided with bushings 46' and receive the journals 11^a of the swivel pin or shaft 11. While the swivel pin 46 may rotate freely in its bearings it is held against any axial movement relative to its bearing 13 or to the boom 4 by virtue of the engagement of a shoulder 50' formed on the swivel pin 11 with the flange of the bushing 46' of the forward bearing ring 46 and by means of a flanged collar 47 fixed to the rear end of the swivel pin 11 and engaged with the flange of the bushing 46' of the rearward bearing ring 46.

For the purpose of normally maintaining the dipper stick in the vertical plane of the boom and for constraining it to swing in such vertical plane the swivel pin 11 is formed as shown at Figure 2 with an upwardly directed offset or extension 50 which projects well above the top of the boom. An arm 51 is bolted and keyed to the extension 50 above the boom and is formed with camming lugs or members 52 (see Figure 5). The camming lugs or members 52 are engaged by dash pots or other yieldable or spring means designated generally at 53 and serving to yieldably hold the arm 51 and consequently the dipper stick 5 in its proper vertical position without interfering in any way with its vertical swinging about pivot 12'. However, when the dipper stick is subjected to side swiping or to forces acting laterally of the boom, the dash pots yield sufficiently to permit limiting transverse rocking or swinging of the boom thereby absorbing the shock and relieving the dipper stick, the boom and associated parts of damaging or destructive stresses. While the nature and construction of these dash pots may vary widely they are shown as consisting of a pair of cylinders 54 integrally formed with a connecting web or casting 55 securely bolted to the outer end of the boom (see Figure 5). The cylinders 54 are angled inwardly and upwardly and have their outer ends closed and their inner ends open. Cups or pistons 56 are slidably fitted in the cylinders 54 and carry guide rods 57 which slide through openings formed in the outer closed ends of the cylinders 54. Heavy coil springs 58 encircle the rods 57 and each spring 58 has one end engaging the inner closed end of its cup or piston 56 and has its outer end bearing against the outer closed end of its cylinder. A nut 60 is threaded on the outer end of each guide rod 57 outside of its associated cylinder 54 and engages the outer end of its cylinder to limit the extent to which the associated spring 58 forces its piston or cup 56 inwardly. These nuts 60 are adjusted until the parts operate to maintain the dipper stick in its proper vertical position.

With this construction, when shocks or forces act laterally on the bucket or dipper stick, the dipper stick rocks or swings, the swivel pin 11 permitting this movement. Such rocking or swinging movement is resisted by action of dash pots 53 as the camming lugs 52 of the arm 51

connected to the dipper stick directly engages the pistons of the dash pots. However, the dash pots may and do yield a limited amount to absorb the shock and prevent the setting up of excessive stresses in any part of the boom or dipper stick. But after absorbing the shock or impact, the dash pots immediately return the dipper stick to its normal vertical position.

For tripping the usual latch of the dumping door of the excavating bucket 40, a section 60 of a latch line leads from a convenient point of control on the platform 1 to an arm 61 of a bell crank designated generally at 62 and pivotally supported on an extension of pivot 12'. The other arm 63 of the bell crank 62 is pivotally connected to one end of a connecting rod 64, and the opposite end of the connecting rod 64 is pivotally connected to an arm 65 of a bell crank designated generally at 66 and pivotally supported upon an extension of the pivot end 16. The other arm 67 of the bell crank 66 is connected to one end of the other latch line 68 which leads to the latch of the dumping door of the excavating bucket 40. With this arrangement the operator has the latch mechanism of the excavating bucket under his complete control in all positions of the dipper stick and relative movement of the sections of the dipper stick does not effect the tension or the operation of the latch line.

The invention claimed is:

1. An excavating machine of the character described comprising a boom, a dipper stick, a swivel pin fitted in the outer end of the boom for rotative movement about an axis extending lengthwise of the boom, a pivotal connection between the swivel pin and the dipper stick permitting the dipper stick to swing in a vertical plane, a pair of dash pots fixed to the boom, and an arm connected to the swivel pin and controlled by said dash pots.

2. An excavating machine including a boom, a dipper stick, means for mounting the dipper stick on the boom for fore and aft swinging and for transverse rocking movement, and a pair of opposed spring devices carried by the boom and coacting with said means and operating to resist transverse rocking movement of the dipper stick and to bias the dipper stick to its normal position where it is free to swing fore and aft.

3. An excavating machine including a boom, a dipper stick, means for mounting the dipper stick on the boom for fore and aft swinging and for transverse rocking movement, a pair of dash pots fixed to the boom and disposed in confronting relation with respect to each other and a member constrained to partake of any transverse rocking of the dipper stick and interposed between and subject to the influence of both of said dash pots whereby the dipper stick is constrained to swing fore and aft, although adapted to yield transversely.

4. An excavating machine comprising a boom having a bearing in its outer end, a swivel pin rotatably fitted in the bearing, a dipper stick pivoted to the swivel pin for fore and aft swinging movement, an arm carried by the swivel pin and projecting rearwardly along the boom and opposed yieldable devices carried by the boom and acting on the arm to yieldably resist rotation of the swivel pin and to yieldably constrain the dipper stick to fore and aft swinging.

5. An excavating machine comprising a boom having a bearing in its outer end, a swivel pin rotatably fitted in the bearing, a dipper stick pivoted to the swivel pin for fore and aft swing-

ing movement, an arm carried by the swivel pin and projecting rearwardly along the boom and opposed dash pots secured to the boom and engaged with the arm to resist transverse rocking movement of the dipper stick and yieldably constraining the dipper stick to fore and aft swinging movement.

6. An excavating machine comprising a boom having a bearing in its outer end, a swivel pin rotatably fitted in the bearing, a dipper stick pivoted to the swivel pin for fore and aft swinging movement, an arm carried by the swivel pin and projecting rearwardly along the boom, opposed cylinders secured to the boom and having their open ends confronting, slidable members mounted in the cylinders and engaged with the arm, and springs coacting with the cylinders and slidable members to resist outward movement of either slidable member whereby to yieldably constrain the dipper stick to fore and aft swinging.

7. An excavating machine of the character described comprising a boom, a bearing fitted in the outer end of the boom and having spaced bearing rings, a swivel pin having journals engaged with the bearing rings, means for holding the swivel pin against axial movement while leaving it free to rotate, a dipper stick pivoted to the swivel pin for fore and aft swinging movement, said swivel pin having an offset at its forward end, an arm secured to said offset and projecting rearwardly along the boom, and spring means coacting with the arm to resist rotation of the swivel pin to bias it to one position.

8. In an excavating machine of the type including a boom, a dipper stick including an upper section and a lower section, a one-way pivotal connection between the sections, a pivotal connection between the lower section and the boom, and an excavating bucket carried by the dipper stick, a latch line for controlling the dumping of the bucket and including a section leading from a point of convenient control and a section leading to the excavating bucket and means connecting said sections and including members linked together and pivotally supported on the pivot between the dipper stick sections and on the pivot between the dipper stick and the boom, respectively.

9. An excavating machine comprising a swingable boom mounted for up and down movement, a dipper stick located at the outer end of the boom and made up of a lower section extending below the boom and an upper section extending above the boom, a one-way pivotal connection between said sections, means for mounting the lower section of the dipper stick on the boom for fore and aft swinging and for transverse rocking movement, an arm partaking of the transverse rocking movement of the dipper stick and extending along the boom, opposed yieldable devices carried by the boom and coacting with said arm to yieldably resist transverse rocking movement of the dipper stick and to yieldably constrain the dipper stick to fore and aft swinging, a hoisting line connected to the upper section of the dipper stick, a bucket carried by the lower end of the dipper stick and having its open end facing the machine when in loading position and facing downwardly toward the ground when the dipper stick is in its extended position, and a hauling line connected to the bucket.

10. In a machine of the class described, the combination of a main frame, a boom, pivoted at its lower end to the frame, for swinging in a

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- vertical plane about its pivot, a dipper handle, a digging dipper carried thereby, means for swinging said boom and said handle, to perform the digging operations, a universal joint connecting the handle, intermediate its ends, with the outer end of the boom, and means extending substantially widely beyond the width of said handle, limiting the lateral swing of the handle out of the vertical plane of the boom.
11. In a machine of the class described, the combination of a main frame, a boom pivoted at its lower end to the frame for swinging in a vertical plane, a dipper stick connected to the boom for swinging in the vertical plane thereof and also laterally with respect thereto, a dipper carried by the stick, cable means for swinging the boom and stick to perform the digging operations, and means independent of said cable means for yieldably resisting the lateral swinging of the stick out of the vertical plane of the boom and for normally maintaining the stick in such plane.
12. In a machine of the class described, the combination of a main frame, a boom pivoted at its lower end to the frame for swinging in a vertical plane, a dipper stick, a dipper carried thereby, a universal joint connecting the stick with the outer end of the boom, means for swinging the boom and stick to perform the digging operations, and means associated with the universal joint for yieldably resisting the lateral swing of the stick out of the vertical plane of the boom and for normally maintaining the stick in such plane.
13. In a machine of the class described, the combination of: a main frame; a boom, pivoted at its lower end to the frame, for swinging in a vertical plane about its pivot; a dipper handle; a digging dipper carried thereby; means for swinging said boom and said handle, to perform the digging operations; a universal joint connecting the handle, intermediate its ends, with the outer end of the boom; and means independent of said first named means for limiting the lateral swing of the handle out of the vertical plane of the boom and tending to positively return the handle to the same vertical plane with the boom.
14. An excavating machine including a boom, a dipper stick, means for mounting the dipper stick on the boom for fore and aft swinging and for transverse rocking movement, an arm carried by the said dipper stick mounting means, and a pair of opposed spring devices carried by the boom and coacting with said arm to resist transverse rocking movement of the dipper stick and to bias the dipper stick to its normal position where it is free to swing fore and aft.
15. An excavating machine including a boom, a dipper stick, means for pivotally supporting the dipper stick on the boom for fore and aft and transverse swinging movement, and opposed spring devices on the boom coacting with said means for yieldably resisting transverse rocking movement of the dipper stick and for returning the dipper stick to its normal position after it has been rocked transversely under the influence of forces acting laterally on the dipper stick.
16. In a crane of the class described, a boom, a dipper and dipper stick assembly therefor, shock absorbing means and a yielding bearing member carried by the boom, the bearing member carrying the dipper stick assembly for fore and aft and transverse swinging movement, and means associated with said bearing member and coacting with said shock absorbing means to resist transverse rocking movement of the dipper stick and to return the same to its normal position after it has been rocked transversely under the influence of forces acting laterally on the dipper stick.
17. In a machine of the class described, the combination of a main frame, a boom pivoted at its lower end to the frame for swinging in a vertical plane, a dipper stick connected to the boom for swinging in the vertical plane thereof and also laterally with respect thereto, a dipper carried by the stick, cable means for swinging the stick to perform the digging operations, and spring means carried by the boom and independent of said cable means for yieldably resisting the lateral swinging of the stick out of the vertical plane of the boom and for normally maintaining the stick in such plane.
18. An excavating machine including a boom, a dipper stick, means for pivotally supporting the dipper stick on the boom for fore and aft and transverse swinging movement, and interengaging means between the boom and dipper stick for yieldably resisting transverse rocking movement of the dipper stick and for returning the dipper stick to its normal position after it has been rocked transversely under the influence of forces acting laterally on the dipper stick.
19. An excavating machine including a boom, a dipper stick, means for mounting the dipper stick on the boom for fore and aft and transverse swinging movement, and interengaging means on the boom and said mounting means for yieldably resisting transverse rocking movement of the dipper stick and for returning the dipper stick to its normal position after it has been rocked transversely under the influence of forces acting laterally on the dipper stick.
20. In an excavating crane, the combination with a crane body, of a boom mounted thereon, shovel means comprising a dipper stick assembly carried by the boom for fore and aft and transverse swinging movement, the connections for the dipper stick assembly with the boom comprising a resilient shock absorbing bearing member mounted on the boom and directly carrying the dipper stick assembly, the bearing member serving to absorb shocks or stresses created by movements of the dipper stick under actual conditions of service.
21. An excavating machine including a boom, a dipper stick, means for mounting the dipper stick on the boom for fore and aft and transverse swinging movement, and resilient means associated with said mounting means for yieldably resisting transverse rocking movement of the dipper stick and for returning the dipper stick to its normal position after it has been rocked transversely under the influence of forces acting laterally on the dipper stick.
22. In a machine of the class described, the combination of a main frame, a boom pivoted at its lower end to the frame for swinging in a vertical plane, a dipper stick connected to the boom for swinging in the vertical plane thereof and also laterally with respect thereto, a dipper carried by the stick, cable means for swinging the stick to perform the digging operations, and means independent of said cable means for yieldably resisting the lateral swinging of the stick out of the vertical plane of the boom and for normally maintaining the stick in such plane.