

Nov. 24, 1931.

H. L. MITCHELL

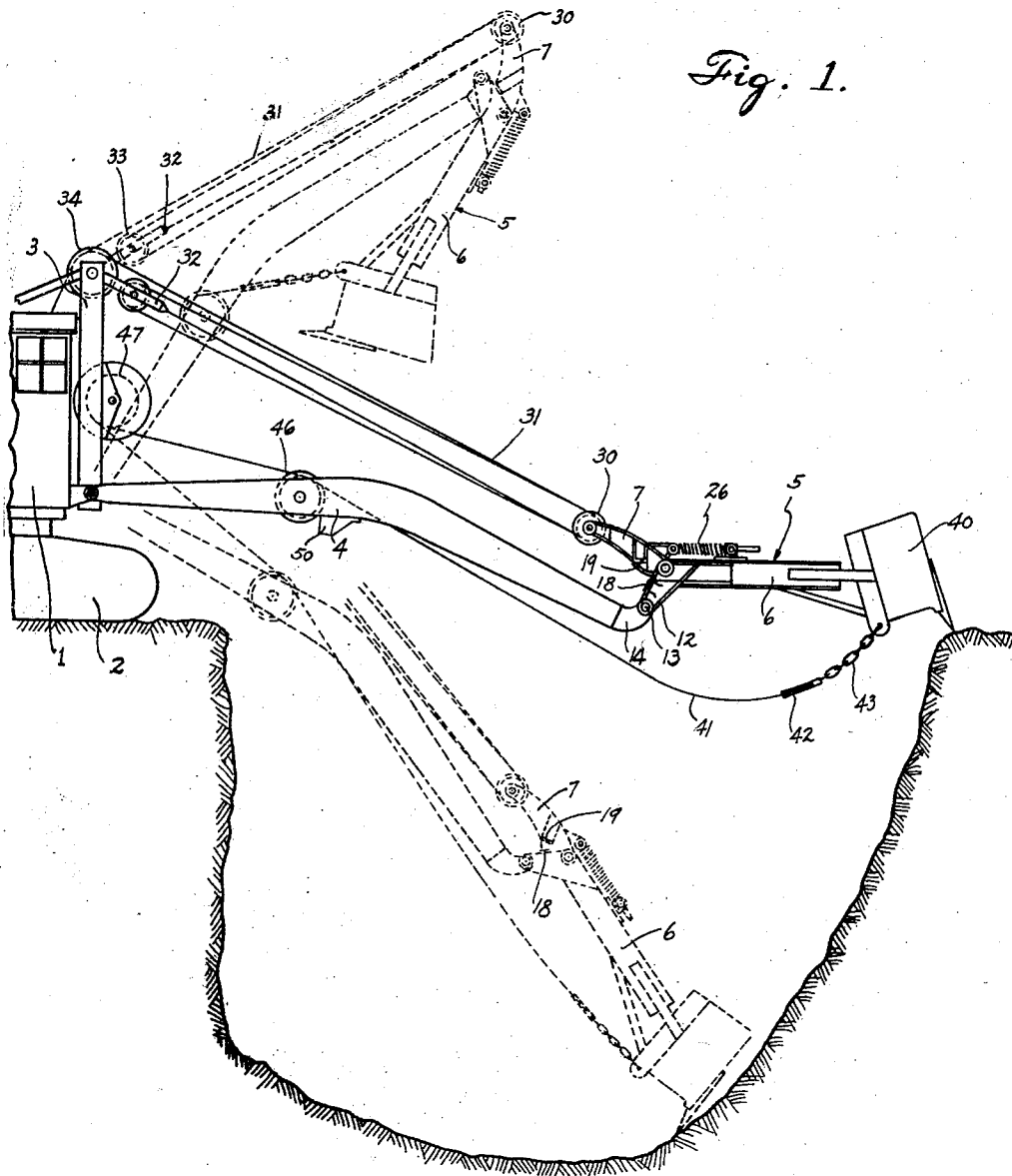
1,832,911

POWER HOE

Filed Dec. 31, 1927

3 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

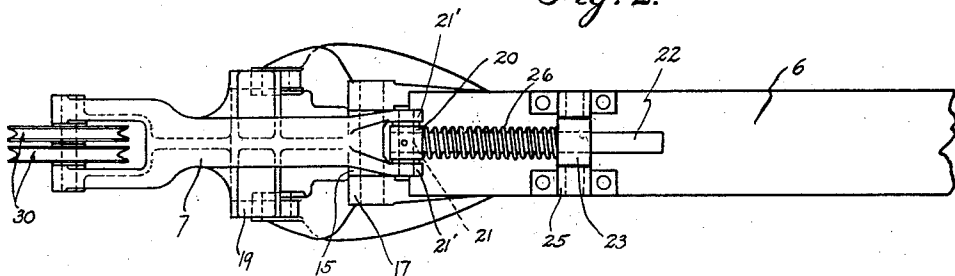


Fig. 3.

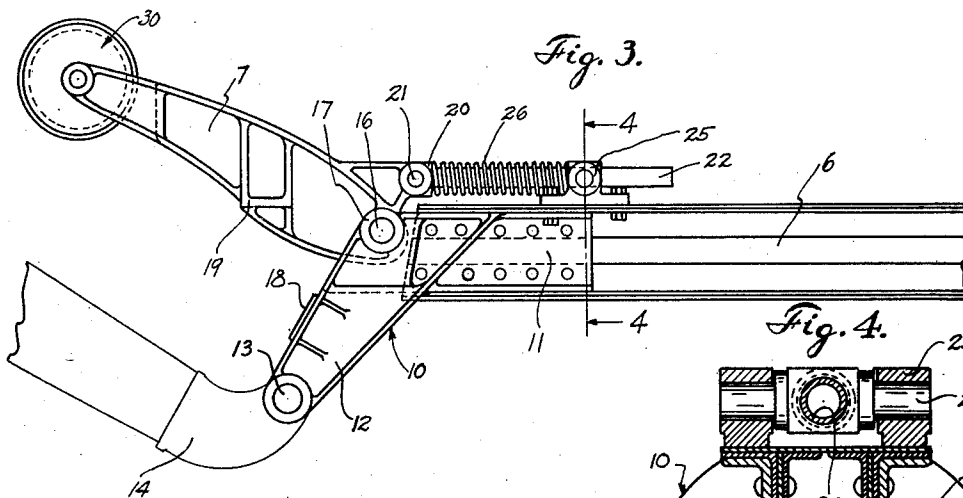


Fig. 4.

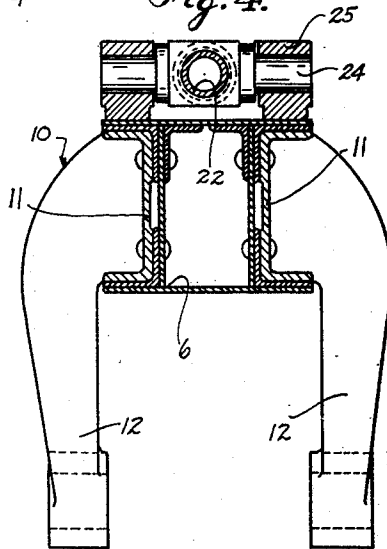


Fig. 5.

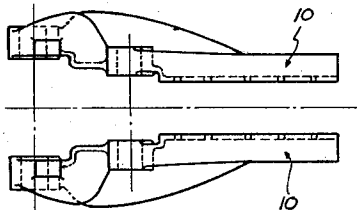


Fig. 6.

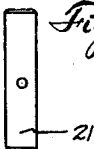


Fig. 7.



Fig. 9.



Fig. 8.

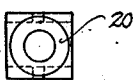
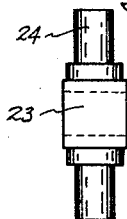


Fig. 10.



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3 Sheets-Sheet 3

Fig. 11.

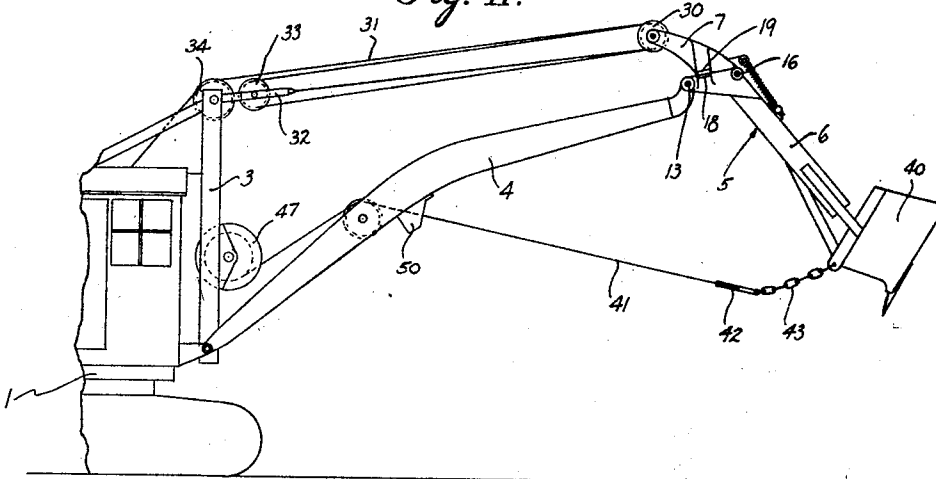


Fig. 13.

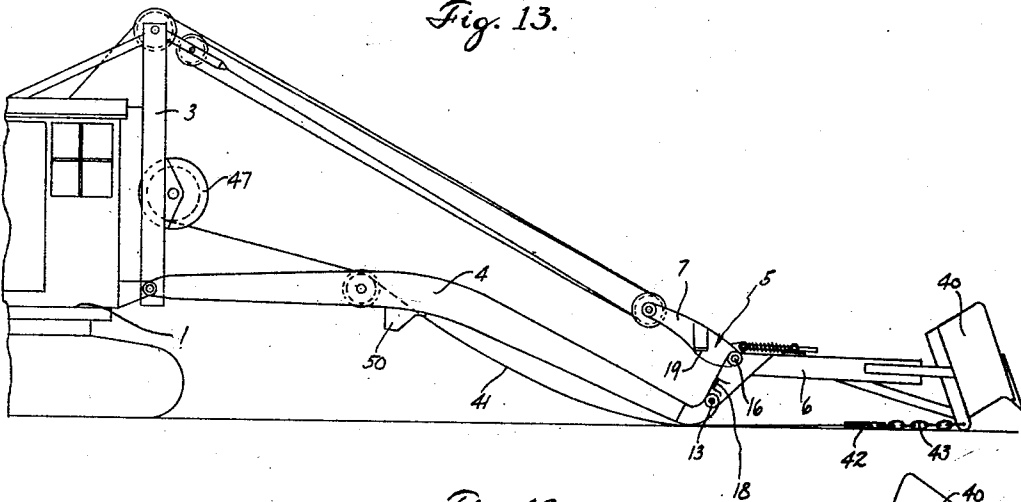
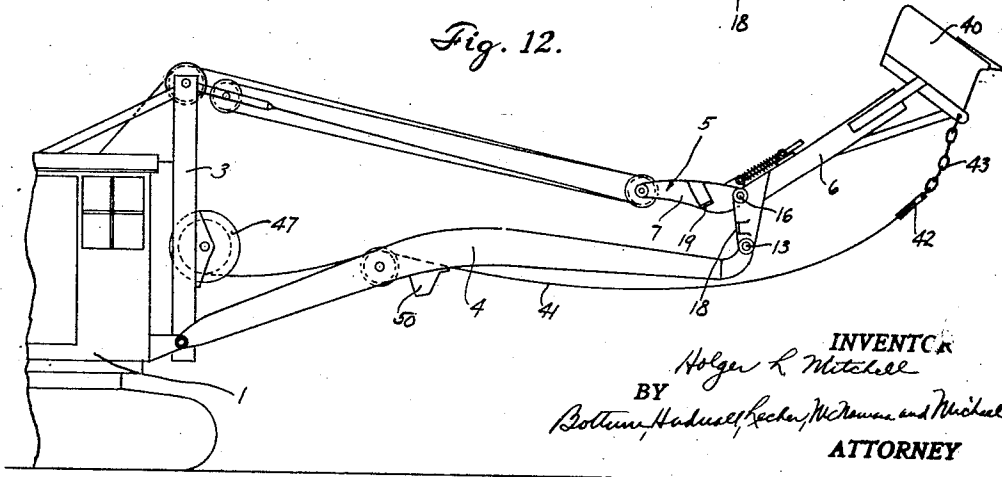


Fig. 12.



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POWER HOE

Application filed December 31, 1927. Serial No. 243,875.

This invention relates to a power shovel of the back-acting or "hoe" type, sometimes referred to as an instroke ditcher.

This type of excavating machine is exemplified in the patent to Johannes S. Huber for power shovel, granted April 26, 1927, No. 1,625,855. As will be understood from the patent referred to and as is well known in the industry, such power shovels comprises a revolvable platform mounted on a tractor or suitable running gear, a swingable boom mounted on the platform for up and down movement, a dipper stick pivoted to the boom and extending above and below the same, a hoisting line connected to the upper end of the stick, an excavating bucket carried by the lower end of the stick, and a hauling line connected to said bucket. In such machines, the hoisting line effects the raising and lowering of the boom and coacts with the hauling line to control the angular position of the dipper stick and excavating bucket.

When the dipper stick is swung upwardly and outwardly to an extended position there is danger of the upper end portion of the dipper stick, which projects above the boom, striking the boom, and as a result the dipper stick, the boom and associated parts are not infrequently severely damaged. Then again at times when the dipper stick is in an extended position the boom and stick suddenly drop due to failure of the hoisting tackle or to other reasons; and under such circumstances the whole force of the impact is taken by the excavating bucket at the outer end of the dipper stick, thus forcibly arresting the downward movement of the bucket and dipper stick while the boom continues to drop. This swings the upper end of the dipper stick around into engagement with the boom with terrific force and as a consequence the boom or the stick or both as well as other associated parts are frequently broken or seriously damaged.

One of the objects of the present invention is to provide an excavating machine of this character wherein damaging engagement or interference between the boom and the upper end of the dipper stick is prevented either when the dipper stick is swung up-

wardly and outwardly under the influence of the hoisting tackle or when the dipper stick and boom drop to the ground with the dipper stick extended and the force of impact and the momentum of the descending boom combine to tend to cause such damaging interference or engagement.

Another object is to provide an excavating machine of this character which has these advantages and yet is well adapted for digging ditches, trenches, or other excavations, speedily and with facility and to comparatively great depth and width.

A further object is to provide an excavating machine of the character described and having the advantages and capacities mentioned and which is of extremely strong and rugged construction, reliable and effective in operation, and not liable to be damaged or injured by interference of any of its parts or tackle either during ordinary working conditions or under conditions of abnormal stress and strain.

In carrying out this invention, the dipper stick mounted at the outer end of the boom and extending above and below the same is made up of a plurality of sections, the lower section being pivotally connected to the boom. A pivotal connection is provided between the upper section and the lower section and is so positioned and so operates that the upper section moves relative to the lower section in one direction in certain phases of the dipper stick movements. Means is provided on the dipper stick sections for limiting the movement of the upper section relative to the lower section in an opposite direction thereby making the dipper stick rigid and unyielding in respect of all strains set up during normal digging operations except in the extreme extended position of the dipper stick. Spring means may be provided for holding the upper section of the dipper stick at the limit of its movement in one direction. With this construction, when in the extreme extended position of the dipper stick, the upper end thereof swings over the boom and into a position where it would be apt to have damaging engagement with the boom, the dipper stick yields,

in that the upper section thereof swings relative to the lower section to avoid damaging interference or engagement between the upper section and the boom and to avoid the setting up of the injurious and destructive stresses that would follow such engagement. But even with the upper section swinging in this manner, the control of the dipper stick and its bucket is in no wise impaired and any desired movement may be readily imparted thereto under the control of the operator. As soon as the dipper stick and boom resume their normal or ordinary relation the spring means automatically resets the upper section of the dipper stick. Thus, in its broadest aspect, the present invention consists in the provision of an excavating machine of the character described which includes a boom, and a dipper stick mounted on the boom, the dipper stick being yieldable in one direction to prevent damaging engagement or interference between the stick and the boom.

This novel dipper stick construction has another very material advantage in that it renders it an easy matter to avoid interference between the hoisting tackle and the boom when the dipper stick is drawn inwardly toward the machine and under the boom as far as it may be, and this without the employment of any links or the establishment and maintenance of any especial relationship between the various pivots or connections of boom, dipper stick, hoist line, etc. With applicant's construction, the portion of the dipper stick above the boom is curved rearwardly over the boom and is of such height above the boom that even with the dipper stick swung in fully under the boom, the hoist line and its tackle clear the outer end of the boom. This is possible only because of the action of the two part dipper stick with its yieldable property. With the ordinary rigid dipper stick such an expedient would be fatal as the upper part of the dipper projecting above the boom would strike the boom with damaging force whenever the dipper stick was extended.

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 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 fragmentary view in side elevation showing an excavating machine constructed in accordance with the present invention, one position of the boom and dipper stick being shown in full lines and two other positions thereof being shown in dotted lines;

Figure 2 is a fragmentary plan view showing the upper end of the dipper stick;

Figure 3 is a view in side elevation of the parts shown in Figure 2, a portion of the boom also being shown;

Figure 4 is a sectional view on line 4—4 of Figure 3;

Figure 5 is a detail view in elevation of the brackets employed for connecting the lower section of the dipper stick to the boom and to the upper section thereof;

Figures 6, 7, 8, 9 and 10 are detail views in elevation of the parts coacting with the spring for the purpose of normally maintaining the upper section of the dipper stick at the limit of its movement in one direction; and

Figures 11, 12 and 13 are views in side elevation illustrating the action of the dipper stick in different relative positions of the boom and dipper stick.

Referring to the drawings, the numeral 1 designates a revolving platform of an excavating machine, this revolving platform being mounted on suitable running gear such as indicated 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, are all mounted on the platform 1. All of this is well known in the art and needs no detailed 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 pivotally mounted on the platform 1 at the foot of the A-frame 3, so as to be capable of swinging up and down in a vertical plane. A dipper stick designated generally at 5 is provided at the outer end of the boom.

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 provide a very strong and rigid construction. The upper end of this lower section 6 is pivotally mounted on the outer end of the boom by means of a pair of brackets 10. Each bracket 10 has an attaching portion 11 riveted or otherwise suitably secured to the upper end of the section 6 of the dipper stick and also has angled or offset arms 12 which embrace and are pivotally connected as at 13 to the upwardly and outwardly curved end member 14 of the boom 4. 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. 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 portion or corner 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 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 Figure 1 and normally the section 7 is positioned in substantial alinement with the lower section, as shown in full lines in Figure 11 and in the upper dotted line position in Figure 1, 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' provided on the section 7. A spring guide 22 is fixed to this pivoted abutment 20 and slides through an opening provided therefor in an abutment 23 having trunnions 24 pivoted in bearing blocks 25 fixed to the section 6 of the dipper stick. A coil spring 26 encircles the guide 22 between the abutments 20 and 25 and engages these abutments, this coil spring 26 being tensioned and compressed to maintain the section 7 so positioned that the stops 18 and 19 are engaged.

The section 7 projects above the boom and its upper end carries a sheave assembly 30. A hoisting line 31 is provided and has one end dead-ended as at 32 on the A-frame 3 and its intermediate portions trained around the sheaves 30 of the dipper stick and a sheave 33 on the A-frame, and then extended and secured to and wound on the usual hoisting drum provided on the platform after having passed over the guide pulley 34 at the top of the A-frame.

An excavating bucket or scoop 40 is carried by and secured to the lower end of the section 6 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 line 41 is connected by means of a yoke 42 and chains 43 to this excavating bucket 40. The hauling line passes through an opening provided therefor in the boom and around a sheave 46 mounted in the boom. If desired a guide roller may be provided therefor on the underside of the boom and near its outer end. On the A-frame 3 a booster drum arrangement 47 is mounted and around the smaller drum of this booster drum arrangement 47 the hauling line 41 coils and is secured. The larger drum of the boosting drum arrangement is connected by a cable or line with the digging drum on the platform. The booster drum merely increases the power factor available for dig-

ging, and, of course, it may be omitted when it is not necessary. Abutments 50 are mounted on the boom and are engageable with the yoke 42 to limit the inward movement of the bucket.

As shown in Figure 11 the dipper stick is swung outwardly a slight distance beyond the vertical, and the sections 6 and 7 of the dipper stick are in substantial alinement with the stops 18 and 19 engaged. By slackening on the hoisting line and drawing in on the hauling line 41 the dipper stick may be swung in a clockwise direction, as viewed in Figure 11, bringing the teeth of the bucket into engagement with the ground so as to dig up the earth and fill the bucket. When the dipper stick is positioned as shown in Figure 11, it functions as a rigid one piece stick. In the fully extended position of the dipper stick as shown in Figure 12, the upper section of the dipper stick swings in a clockwise direction about the pivot 21, as viewed in Figure 12, and relative to the lower section 7, the spring 26 being further compressed by this swinging movement of the upper section 7 of the dipper stick. When the spring 26 is fully compressed it provides a positive stop which prevents the section 6 of the dipper stick from being swung over on top of the boom. The swinging of the upper section 7 is entirely automatic and occurs before the upper section can engage the boom, and in fact, just as soon as the offset or angled arms 18 between the lower section of the dipper stick and the boom approach a vertical position. But this swinging of the upper section 7 does not impair the support of the boom and the dipper stick nor the control over these parts. To swing the dipper stick in a clockwise direction, as viewed in Figure 12, and bring the bucket down to the ground it is only necessary to take in on the hauling line and appropriately slacken the hoisting line. If the boom and dipper stick should fall or be permitted to fall when the dipper stick and its bucket are extended the dipper stick and boom will not come into destructive or colliding engagement or contact as when the upper section 7 of the dipper stick engages the boom, the spring 26 yields thereby permitting the lower section 6 and the bucket 40 to move relative to the upper section 7.

Not only is interference between the dipper stick and the boom precluded but fouling or interference of the hoisting tackle with the boom is effectively prevented and this even when the dipper stick is swung inwardly under the boom and toward the machine as far as it may be, as illustrated in the upper dotted line position in Figure 1. This clearance between the hoisting line or hoist line tackle and the boom is preserved at all times by deflecting or curving the upper section of the dipper stick inwardly so that the sheaves 30 to which the hoist line is connected are never

moved down to such a position that the hoisting tackle rubs or chafes on the boom. In other words, the hoist line always extends along a line located above every part of the boom. It is only by using a two part dipper stick that it is feasible to have the upper section of the dipper stick so curved and extended.

It has been found in practice that as an incident to the construction described and especially as an incident to the two part dipper stick construction with the rearwardly offset pivot between the lower section of the dipper stick and the boom, the dipper stick may be manipulated either for the purpose of clearing the bucket of accumulations of dirt or for the purpose of breaking up hard ground such as frost incusted earth. Considering Figure 13, it will be seen that the outer end of the boom rests upon the ground and also that the bucket engages the ground. At this time the hauling line 41 is slack and by pulling in on the hoisting line to a certain extent the lower section 6 of the dipper stock is swung upwardly in a vertical plane about the pivot 13. Then by suddenly releasing the strain on the hoisting line the weight of the lower section of the dipper stick and of the bucket causes the bucket to fall to the ground with a jarring impact, thereby tending to dislodge dirt or clay that might have adhered to the bucket structure and also tending to break up the ground which the bucket strikes.

The invention claimed is:

1. An excavating machine of the character described comprising a swingable boom mounted for up and down movements, a dipper stick located at the outer end of the boom and made up of a lower section and an upper section, means for pivotally connecting the upper end of the lower section to the boom, means for interconnecting the sections whereby to permit relative movement thereof, means for limiting relative movement of the sections in one direction, spring means for maintaining the sections at the limit of their relative movement in the one direction in which position the sections are in substantial longitudinal alignment, a hoisting line connected to the upper section, 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 stick is in its extended position, and a hauling line connected to the bucket.

2. An excavating machine of the character described comprising a boom, a two part dipper stick extending above and below the boom, means for operatively connecting the lower part to the boom, a one way hinge connection between the upper part and the lower part positioned and operating to positively limit the movement of the upper part rela-

tive to the lower part in one direction but permitting the upper part to move relative to the lower part in the other direction, said sections being in substantial longitudinal alignment at all times except when the dipper stick is in its fully extended position, a hoisting line connected to the upper part, a bucket carried by the lower part and a hauling line connected to the bucket.

3. An excavating machine of the character described comprising a boom, a dipper stick having a lower section and an upper section, an offset pivotal connection between the upper portion of the lower section and the boom, a pivotal connection between the outer portion of the lower end of the upper section and the outer portion of the upper end of the lower section, said sections having engaging surfaces limiting the movement of the upper section in one direction, yieldable means resisting movement of the upper section in the opposite direction and tending to maintain the engaging surfaces of said sections in engagement, a sheave on the upper section, a hoisting line connected with the sheave, a bucket carried by the lower section and a hauling line connected to said bucket.

4. An excavating machine of the character described comprising a boom, a two part dipper stick having the upper end of its lower section pivoted to the boom, a one way hinge connection between the upper part and the lower part positioned and operating to limit the movement of the upper section in one direction while leaving the upper section free to move in an opposite direction, spring means for resisting movement of the upper section away from the boom including opposed abutments mounted on the parts of the dipper stick, a spring guide extending between the abutments, a coil spring mounted on said guide and engaging the abutments, a hoisting line connected to the upper part, a bucket carried by the lower part and a hauling line connected to the bucket.

5. An excavating machine of the character described comprising a swingable boom mounted for up and down movements, a dipper stick made up of an upper and a lower section disposed in substantial longitudinal alignment, means providing an offset pivotal connection between the lower section and the boom, a pivotal connection between the upper section and the lower section, cooperating stops on the sections for limiting the movement of the upper section in one direction, a sheave at the upper end of the upper section, a hoisting line coacting with the sheave, a bucket carried by the lower end of the lower section and having its open end facing the machine when loading and also facing downwardly toward the ground when the stick is extended, and a hauling line connected to the bucket.

6. An excavating machine of the charac-

ter described comprising a swingable boom mounted for up and down movements, a dipper stick located at the outer end of the boom and consisting solely of a lower section and an upper section disposed in substantial longitudinal alignment with the lower section at all times except when the dipper stick is in its fully extended position, means for pivotally connecting the upper end of the lower section to the boom, means for pivotally connecting the outer corner of the upper end of the lower section to the outer corner of the lower end of the upper section, the adjacent ends of said sections being adapted to have abutting engagement, the upper section extending rearwardly over the boom, a hoisting line connected to the upper section, a bucket carried by the lower end of the lower section and having its open end facing the machine when in loading position and facing downwardly toward the ground when the stick is in its extended position, and a hauling line connected to the bucket.

7. An excavating machine of the character described comprising a platform, a swingable boom mounted on the platform 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 bucket carried by the lower section and having its open end facing the machine when in loading position and facing downwardly toward the ground when the stick is in its extended position, a one-way pivotal connection between the upper section and the lower section, said lower section having a rearwardly directed extension pivotally connected to the outer end of the boom, and a hoisting line operatively connected to the upper section of the dipper stick whereby when the hoisting line is paid out to permit the outer end of the boom to rest upon the ground it may be alternately tensioned and slackened to raise the lower section of the dipper stick and the bucket carried thereby above the ground and to permit these parts to fall to the ground with a jarring impact.

8. An excavating machine of the character described comprising a boom, a dipper stick including a lower part carrying a bucket at its lower end and having its upper end formed with a rearwardly directed lateral engagement pivoted to the outer ends of the boom, said dipper stick also having an upper part, disposed in approximate longitudinal alignment with the lower part at all times except when the dipper stick is in its fully extended position, a one way pivotal connection between said parts of the dipper stick, a hoisting line connected to the upper part, and a hauling in line connected to the bucket.

9. An excavating machine of the character described comprising a swingable boom, a dipper stick located at the outer end of the boom and consisting solely of a lower section and an upper section disposed in substantial longitudinal alignment with the lower section at all times except when the dipper stick is in its fully extended position, means for pivotally connecting the upper end of the lower section to the boom, means for pivotally connecting the upper section to the lower section, said sections having cooperable engaging surfaces adapted to be engaged when the sections are in substantial alignment, the upper section being rearwardly curved and of such length as to extend inwardly and upwardly over the boom during digging, a hoisting line connected to the upper section, a bucket connected to the lower section, and a hauling in line connected to the bucket.

In witness whereof, I hereto affix my signature.

HOLGER L. MITCHELL.