March 21, 1933. R. R. DOWNIE 1,902,691

EXCAVATING MACHINE

Filed July 14, 1928 2 Sheets-Sheet 1

Fig. 1.

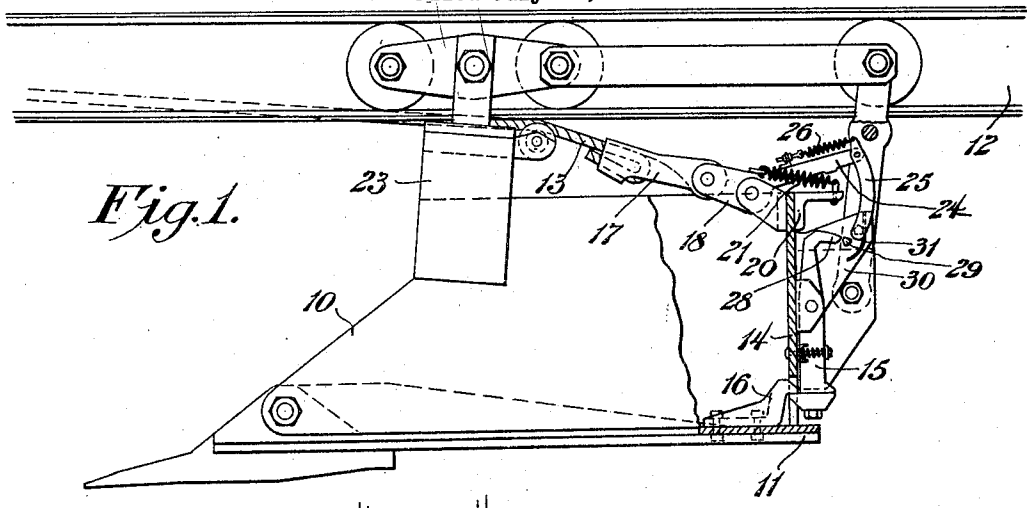
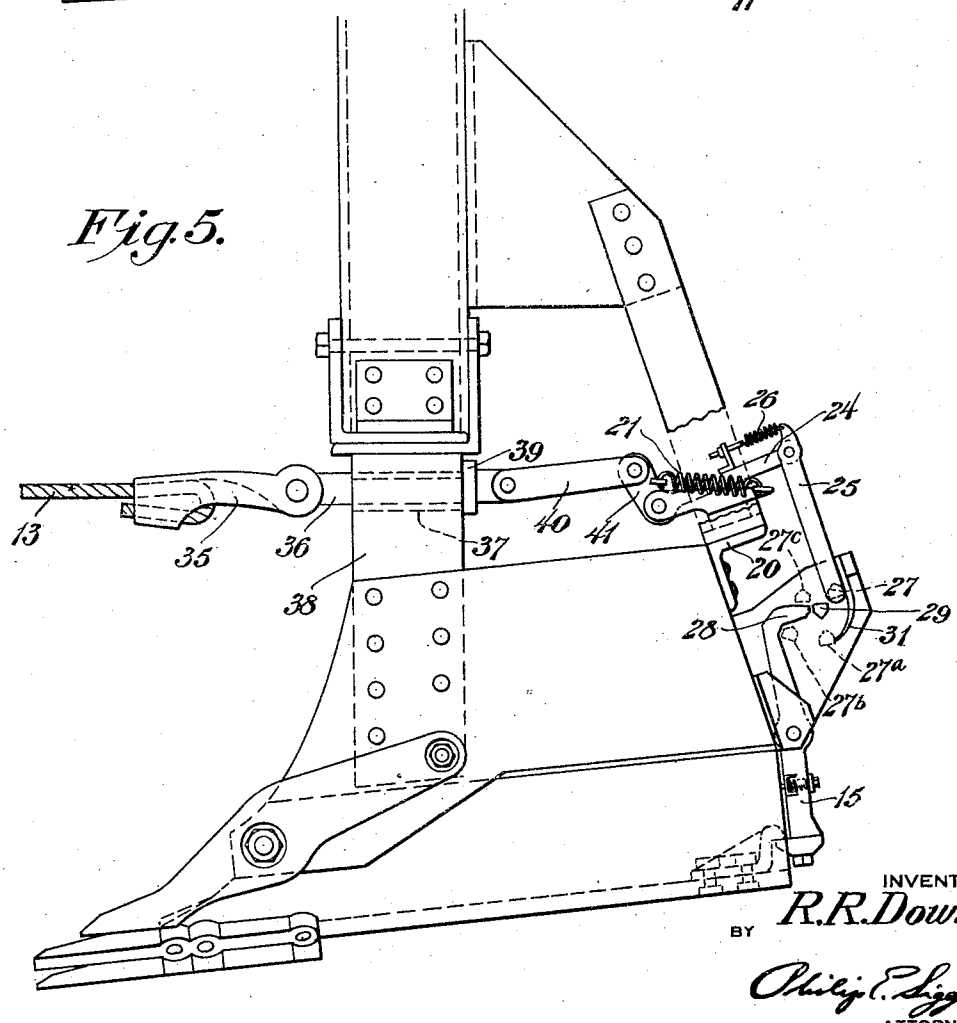


Fig. 5.



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Fig. 2.

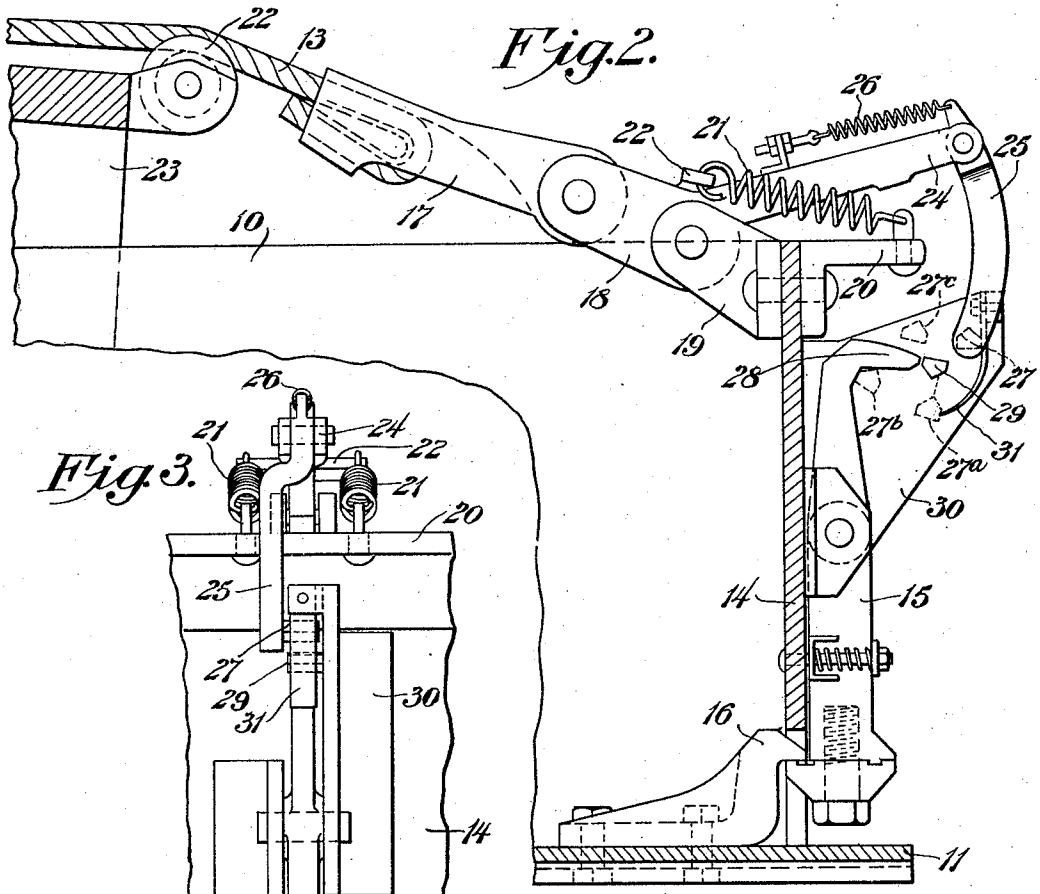
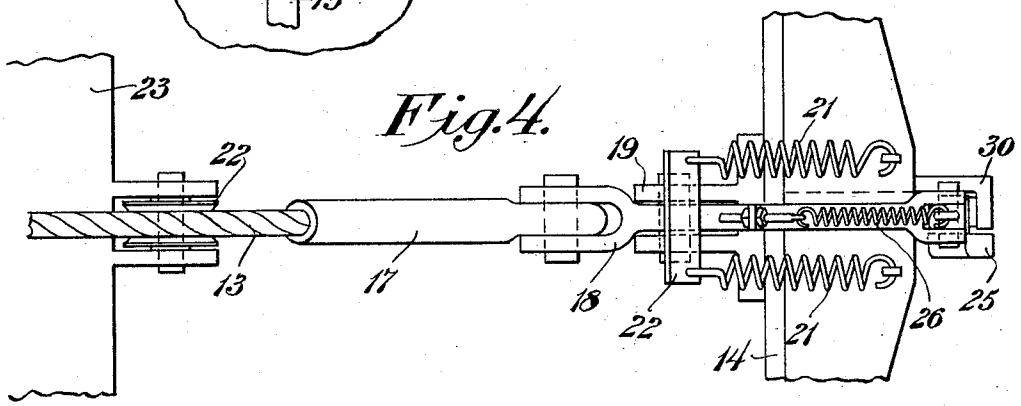


Fig. 3.

Fig. 4.



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UNITED STATES PATENT OFFICE

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EXCAVATING MACHINE

Application filed July 14, 1928. Serial No. 292,655.

This invention relates to methods of and means for operating excavating machines, particularly in the dumping phase of the excavating cycle; and among other objects, the invention aims to provide an improved method and means permitting control of dumping in any position of the scoop, without material change in the position of the scoop, and without the provision of a special dumping line or its mechanical equivalent.

Referring to the accompanying drawings,

Fig. 1 is a sectional elevation of a skimmer scoop with a latch operating mechanism embodying the invention;

Fig. 2 is an enlarged vertical section of the same, the parts being broken away;

Fig. 3 is a fragmentary rear elevation;

Fig. 4 is a fragmentary plan view; and

Fig. 5 is a side elevation of a ditcher scoop with a latch operating mechanism embodying the invention.

Referring to the scoop of Figs. 1 to 4 inclusive, there is shown a skimmer scoop 10 of the type shown in Patent 1,536,390, to which reference is made for a complete disclosure of the same. The skimmer scoop has a latched bottom 11 and is moved longitudinally of the boom 12 by means of the hauling line 13.

In the operation of excavating machines, it has always been a desideratum to employ as few power operated lines as possible. In skimmer scoops which have met with commercial success, the excavating is controlled by only two lines, one for elevating and lowering the boom and the other for pulling the scoop upwardly on the boom or horizontally along the boom during excavation. Also in commercial forms of ditcher scoops, as shown for example in Patent No. 1,511,114, control of the scoop during excavation is obtained by but two power lines. In both types of machines, however, dumping has been effected by pulling on a tag line attached to the latch which secures the bottom of the scoop, or else power devices of one kind or another have been provided to relieve the operator of the manual labor of tripping the latch. There are serious drawbacks either to hand tripping or to power tripping. Hand tripping usually requires an extra operator whose sole duty is to pull the line; and besides the expense of an additional operator, there is the further drawback that unless his efforts are closely coordinated with those of the operator of the machine, there will be frequent spillage of the load. Special power-tripping devices always add considerably to the cost of the machine, and being of relatively light duty are of relatively light construction and because of their position on the projecting digging structure of the machine, which is subjected to very rough use both in the way of battering and over-stressing, and hence to distortion, are difficult to protect adequately from damage and to keep in proper adjustment.

According to the invention, the latch is made releasable by reciprocative manipulation of the hauling line which is attached directly or indirectly to the scoop itself. The invention is advantageous in that it may be practiced and used without conflict with the normal operation of the excavating machine during excavation, and without change in the construction of the scoop itself, and hence its preferred embodiments are readily adaptable to present forms of scoops.

On the back wall 14 of the scoop a latch 15 is pivotally mounted and has its lower end engaging a latch piece 16 fixed to the bottom of the scoop. The latch-releasing mechanism to be described is interposed between the latch 15 and the hauling line 13 and in the preferred embodiment of the invention is directly actuated by forces imparted to the hauling line 13. It is within the scope of the present invention, however, to arrange the parts so that the force of the hauling line is indirectly used to release the latch. Examples of mechanisms operated by the hauling line and releasing the latch by means indirectly connected with the hauling line are shown in my companion applications, Serial Nos. 292,656 and 292,657, filed July 14, 1928.

To connect the hauling line 13 with the scoop and yet permit direct actuation of the latch releasing means, the hauling line is secured to a cable clamp 17 which is pivoted to

an arm 18 of a bell crank lever, in turn pivoted upon a bracket 19 riveted upon the top part of the rear wall 14. Another bracket 20 is secured to the scoop wall on the outside thereof and provides a convenient means whereby a pair of coil springs 21 may be attached so as to tend to rotate the arm 18 in a clockwise direction against the resistance of the hauling line, a cross arm 22 attached to the bell crank lever providing means for securing the other ends of the coil springs. To permit a slight reciprocation of the hauling line, a roller 23 is mounted on the bail 23^a of the scoop. From the foregoing it will be obvious that if the hauling line 13 is released, the bell crank lever will be moved clockwise by the springs 21; and if the hauling line is then retracted, the bell crank lever will move counter-clockwise through a small angle until the line of pull of the cable 13 is alined with the two pivots of the arm 18, as shown in Fig. 2. It is this slight oscillation of a lever responsive to reciprocative manipulation of the hauling line which is used to operate the latch-releasing mechanism proper, as will now be described.

Thes other arm 24 of the bell crank lever is pivoted at its outer end to an offset arm 25 (see Fig. 3) which has tendency to move counter-clockwise because of a spring 26 preferably carried on the arm 24 and secured to an upper extension of the offset arm 25, as shown. The lower end of the offset arm 25 carries a wedge 27 (Figs. 2 and 3), so called because it is provided with two upper plane faces which may be nearly at right angles to each other and which are designed to co-act with the latch and with a stationary guide post to effect bottom-releasing movement of the latch when the hauling line is properly manipulated.

As shown, the upper end of the latch has an outwardly projecting arm 28, the under surface of which is so shaped and placed that it may be readily engaged by the wedge 27, when the arm 25 is swung by the bell crank lever, permitting the wedge to slide over it immediately before tripping of the latch. The guide post 29 projects from a plate 30 secured to the back of the scoop adjacent the latch, the guide post being located very close to the end of the latch arm 28, as shown. Preferably the guide post has two downwardly converging plane surfaces complementary to the surfaces on the wedge 27 and preferably is so arranged that it will prevent release of the latch unless the wedge has been moved inwardly a predetermined distance relative to the latch. The critical point is the position indicated in dotted lines at 27^a, Fig. 2. Unless the wedge 27 moves slightly beyond this critical point, it will return to the initial position. For the purpose of insuring an inward movement of the wedge past the critical point, there is a guide provided preferably in the form of a curved spring 31 which may be carried upon the upper end of the plate 30 and extend downwardly therefrom with its lower end curved inwardly toward the latch as shown in Fig. 1. Obviously, spring 26 holds the wedge normally in contact with the guide spring 31.

The operation of the mechanism will now be easily understood. Any reciprocative manipulation of the hauling line will necessarily oscillate the bell crank lever, moving the wedge 27 up and down an arcuate path. Upon sharp release of the line, the guiding member 31 will normally throw the wedge over against the latch or against the arm 28 of the latch, and a sharp retraction of the line at any time after the wedge leaves the base of the guide and before it returns to that point will cause the wedge to be drawn into and through the space between the guide post and the arm 28, consequently swinging the lower end of the latch 15 outwardly a sufficient distance to release the latch piece 16, permitting the bottom to dump. The motion of the wedge during a complete effective cycle is indicated in Fig. 2, and includes the starting position, positions 27^b and 27^c, and the return to the initial position. Position 27^a is only attained when the wedge is at rest at the base of the guide, as after descending the guide slowly, or after returning from the swing across to position 27^b. In rapid descent the wedge passes a little above position 27^a.

It will be clear that the mechanism is designed so that it will not operate in the event the hauling line is released slowly and retracted. Such release causes the wedge to move to the position 27^a (the critical point) and a following retraction of the line, either slow or sharp, merely causes the wedge to move directly upward, as indicated by the dotted line in Fig. 2, striking the outer face of the guide post, and thence to the starting position. The described mechanism is designed to effect tripping engagement only upon a sharp release followed rapidly by a sharp retraction of the hauling line. This sequence is chosen as being a convenient one, but the method may be practiced with other sequences, and the means here shown may be readily modified to permit use of other sequences, e. g., the guide 31 may be lengthened, thus shifting the critical position 27^a further toward the left as the parts are viewed in Fig. 2, so that any sharp retraction, whether preceded by slow release, sharp release or an interval of rest, will cause release of the bottom.

It will be clear that a single release and retraction are all that is ordinarily necessary to trip the latch. If through inexperience the operator does not move the hauling line properly the first time, he may rapidly

repeat the operation until the bottom is released.

In Fig. 5 there is shown a ditcher scoop wherein substantially the same mechanism as previously described is shown mounted on the rear of the scoop. In this form, the hauling line 13 is connected to a cable clamp 35 pivotally connected to a slidable bar 36 which may be carried by a strap guide 37 secured to the bail 38 of the scoop. A shoulder 39 upon bar 36 permits the power of the cable 13 to be delivered to the scoop during excavation. A link 40 pivotally connects the other end of bar 36 with a bell crank lever 41 pivotally mounted upon the rear wall of the scoop, as indicated. The rest of the mechanism has been described in connection with Figs. 1 to 4 inclusive.

While the invention is most useful when used with skimmer scoops and ditcher scoops, it it is not necessarily confined to such use.

While one of the primary objects of the present invention is to eliminate the use of a special tag line, whether hand or power operated, I believe that I am the first to provide for the direct or indirect manipulation of a scoop latch (i. e., a latch either for the scoop itself or for the pivoted scoop bottom), by any mechanism of the character shown in this and in the companion applications; and hence any equivalent mechanism, whether or not operated by a hauling line, is within the scope of many of the claims. I also regard the employment of a latch mechanism of any description, if manipulated by a hauling line, as within the broad claims of this application. As the prior art shows no example of latch mechanisms similar in principle to those of the applications referred to, I believe I am entitled to a very broad range of equivalents.

No hauling line reciprocating mechanism is described or shown because such mechanism is believed to be properly claimable only in a separate application.

Obviously the present invention is not restricted to the particular embodiment thereof herein shown and described. Moreover, it is not indispensable that all the features of the invention be used conjointly, since they may be employed advantageously in various combinations and sub-combinations. Also, the method of the invention may be practiced with other mechanisms.

What I claim is:—

1. An excavating machine comprising, in combination, a scoop with a latched bottom; a hauling line for moving the scoop in its excavating stroke; a connection between the hauling line and the scoop permitting slight longitudinal movement of the line relative to the scoop; and a latch operating mechanism secured to the hauling line by means of said connection and constructed and arranged to release the latch whenever the hauling line is sharply released and rapidly thereafter sharply retracted.

2. An excavating machine comprising, in combination, a scoop having a latched bottom; a reciprocable line for moving the scoop; a wedge member on the scoop moved by the line; and means on the scoop for guiding the wedge member during its movement into such a position that it moves the latch to release the bottom of the scoop.

3. An excavating machine comprising, in combination, a scoop having a latched bottom; a reciprocable line; a wedge member movably carried by the scoop and connected with the line so as to be moved by a sharp release of the line to a position adjacent the latch, and moved by a sharp retraction of the line to a position above the latch; the movement last described effecting tripping of the latch to release the bottom.

4. An excavating machine comprising, in combination, a scoop having a latched bottom; a reciprocable line connected to the scoop; a wedge member movably carried by the scoop and connected with the line so as to be moved synchronously with the line; and a guide-way for directing the wedge member, which latter, impelled by momentum, over-travels the guide-way into a position adjacent the latch, so that upon pulling the line before the wedge can return to a position adjacent the guide-way, the latch may be released.

5. A machine of the class described comprising, in combination, a scoop having a pivoted bottom; a reciprocable line connected to the scoop; a pivoted latch securing the bottom and having an upper arm; a guide post fixed on the scoop near said upper arm; and a wedge member movably carried by the scoop and connected with the line so as to be moved by reciprocation of the line first to a position of entry between the guide post and the latch and then movable between said parts to swing the latch and release the bottom.

6. A machine of the class described comprising, in combination, a scoop having a pivoted bottom; a reciprocable line connected to the scoop; a pivoted latch securing the bottom and having an upper arm; a guide post fixed on the scoop near said upper arm; a lever connected with the line to swing on the scoop; and an arm pivoted to the lever and carrying a projecting part which is moved by reciprocation of the line first to a position between the guide post and the latch and then movable between said parts to swing the latch and release the bottom.

7. An excavating machine comprising, in combination, a scoop having a pivoted bottom; a reciprocable line connected to the scoop; a spring-actuated latch for holding the bottom in closed position; the latch being pivoted between its ends to the back of the

scoop and having an arm at its upper end which projects outwardly from the scoop; a guide post near said latch arm; a wedge of such dimensions that when it passes between said latch arm and the guide post it will move the latch far enough to release the bottom; mechanism connecting the line with the wedge; and means for guiding the wedge during a portion of its cycle to insure latch release upon sufficient movement of the line.

8. An excavating machine comprising, in combination, a scoop having a pivoted bottom; a reciprocable line connected to the scoop; a spring-actuated latch for holding the bottom in closed position: the latch being pivoted between its ends to the back of the scoop and having an arm at its upper end which projects outwardly from the scoop; a guide post near said latch arm; a wedge of such dimensions that when it passes between said latch arm and the guide post it will move the latch far enough to release the bottom; mechanism connecting the line with the wedge: and a curved spring against which the wedge bears for guiding the wedge during a portion of its cycle to insure latch release upon sufficient movement of the line.

9. An excavating machine comprising, in combination, a scoop with a pivoted bottom; a latch for the bottom; a hauling line for moving the scoop during excavation; and latch tripping mechanism interposed between the hauling line and the latch and connected with said line and having a part movable into direct contact with the latch to trip the latch by power derived directly from the hauling line.

10. An excavating machine comprising, in combination, a scoop; a hauling line connected to the scoop and to a source of power and capable of being reciprocated: said scoop having a pivoted bottom which is controlled by a pivoted latch; a latch arm which projects outwardly from the scoop: a guide post fixed on the scoop outwardly of but closely adjacent to the extremity of the latch arm; an arm carrying a wedge at its lower end: mechanism connecting the upper end of the arm with the hauling line so that upon reciprocation of the line the wedge end of the arm may be moved in a closed path and pass between the latch arm and the guide post; and means for guiding the wedge past the critical point in said path so as to insure movement in one direction only when the line is reciprocated properly.

11. An excavating machine comprising, in combination, a scoop; a hauling line connected to the scoop and to a source of power and capable of being reciprocated; said scoop having a pivoted bottom which is controlled by a pivoted latch; a latch arm which projects outwardly from the scoop; a guide post fixed on the scoop outwardly of but closely adjacent to the extremity of the latch arm; an arm carrying a wedge at its lower end; mechanism connecting the upper end of the arm with the hauling line so that upon reciprocation of the line the wedge end of the arm may be moved in a closed path and pass between the latch arm and the guide post; said mechanism including a bell crank lever one end of which is pivotally connected to the upper end of said arm, means connecting the other end of the bell crank lever with the hauling line, a spring connected to the bell crank lever for maintaining a tension on the hauling line, and another spring connected to the arm for urging the wedge outwardly; and means for guiding the wedge past the critical point in said path so as to insure movement in one direction only when the line is reciprocated properly.

12. An excavating machine comprising, in combination, a scoop; a hauling line connected to the scoop and to a source of power and capable of being reciprocated; said scoop having a pivoted bottom which is controlled by a pivoted latch; a latch arm which projects outwardly from the scoop; a guide post fixed on the scoop outwardly of but closely adjacent to the extremity of the latch arm; an arm carrying a wedge at its lower end; mechanism connecting the upper end of the arm with the hauling line so that upon reciprocation of the line the wedge end of the arm may be moved in a closed path and pass between the latch arm and the guide post; and means for guiding the wedge past the critical point in said path so as to insure movement in one direction only when the line is reciprocated properly; said guide post having two downwardly converging faces; the wedge having two upwardly converging faces one of which is adapted to slide over that face of the guide post which is adjacent the end of the latch arm, as the wedge moves upwardly past the latch arm to trip the latch.

13. An excavating machine comprising, in combination, scoop; a hauling line connected to the scoop and to a source of power and capable of being reciprocated; said scoop having a pivoted bottom which is controlled by a pivoted latch; a latch arm which projects outwardly from the scoop; a guide post fixed on the scoop outwardly of but closely adjacent to the extremity of the latch arm; an arm carrying a wedge at its lower end; mechanism connecting the upper end of the arm with the hauling line so that upon reciprocation of the line the wedge end of the arm may be moved in a closed path and pass between the latch arm and the guide post; and an inwardly curved flat spring mounted on the scoop outside of the guide post and spaced therefrom so as to permit the wedge to move downwardly between it and the guide post, the curvature of the spring

causing the wedge to move inwardly past the critical point in its path so as to insure movement of the wedge upwardly between the post and latch arm when the line is reciprocated properly.

14. An excavating machine comprising, in combination, an excavating scoop provided with a pivoted bottom normally held closed by a spring-actuated discharge latch; a hauling line connected with the scoop to pull the scoop into the material being excavated; and latch operating mechanism connected to said latch and to the hauling line, and so constructed and arranged that a release of the hauling line, followed by a short and sharp retraction of said line in the direction of its pulling stroke, effects a release of said latch.

15. A machine of the class described comprising, in combination, an excavating scoop having an automatically latched bottom; a hauling line for the scoop; latch-releasing mechanism; a bell-crank lever pivotally mounted on the scoop and connected at one end to the hauling line and connected at the other end to the latch-releasing mechanism; said latch-releasing mechanism being so constructed and arranged that a sharp release of the hauling line followed rapidly by a sharp retraction will actuate it to trip the latch.

16. A machine of the class described comprising, in combination, an excavating scoop having a bottom pivoted at the forward end; an automatically engaging latch for the bottom having an arm extending outwardly from the rear wall of the scoop; a hauling line connected to the scoop; and a latch-releasing mechanism interposed between the aforesaid latch arm and the hauling line and carried by the scoop, and so constructed and arranged that the hauling line, when vibrated longitudinally, causes it to deliver a hammer blow against the latch arm.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature.

ROBERT REX DOWNIE.