Aug. 4, 1931. L. S. WALLACE 1,817,595

EXCAVATING BUCKET

Filed Aug. 1, 1929 3 Sheets-Sheet 1

Fig. 1.

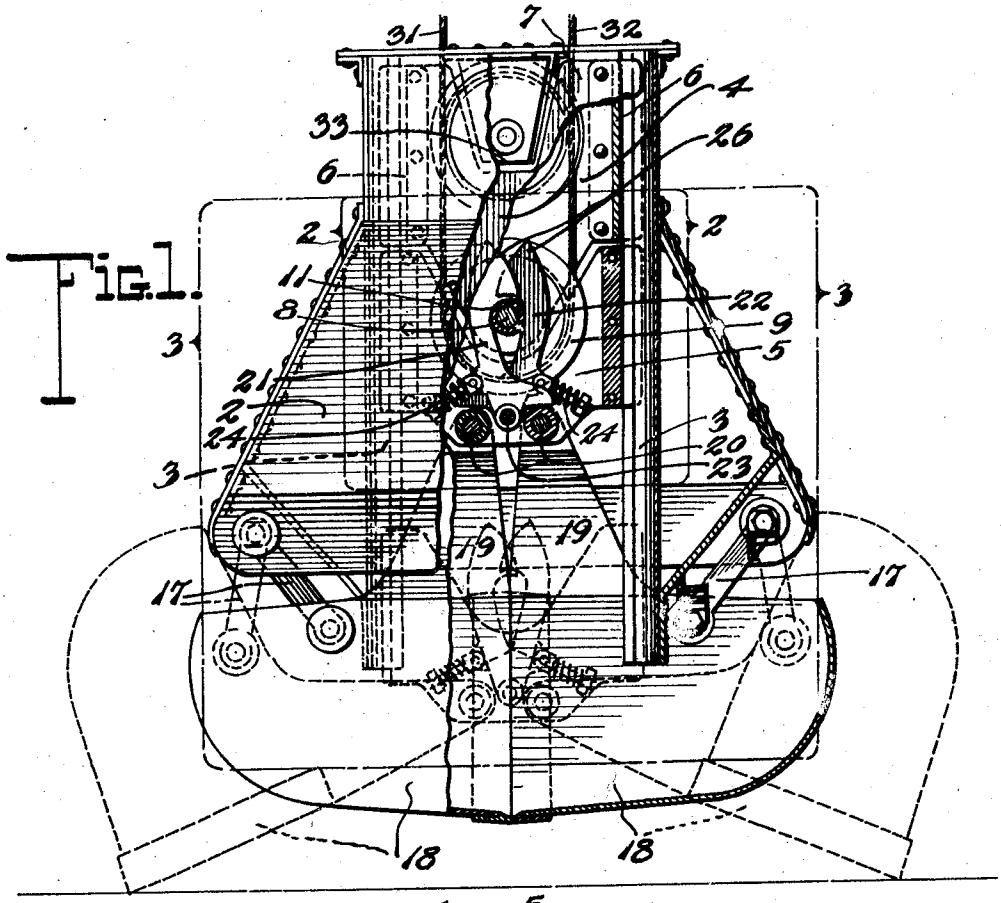

Fig. 2.

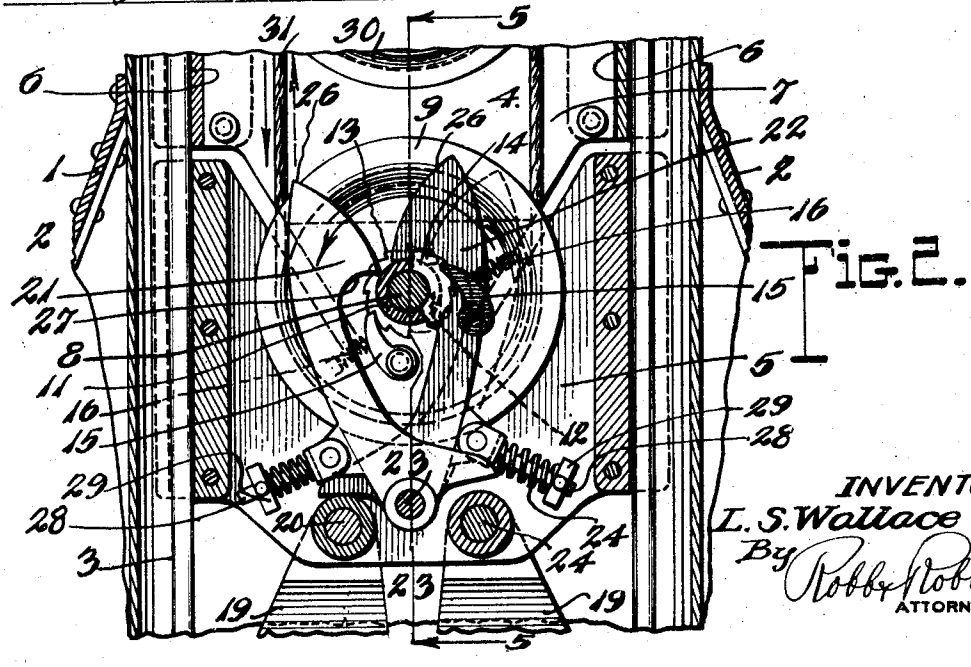

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Fig. 3.

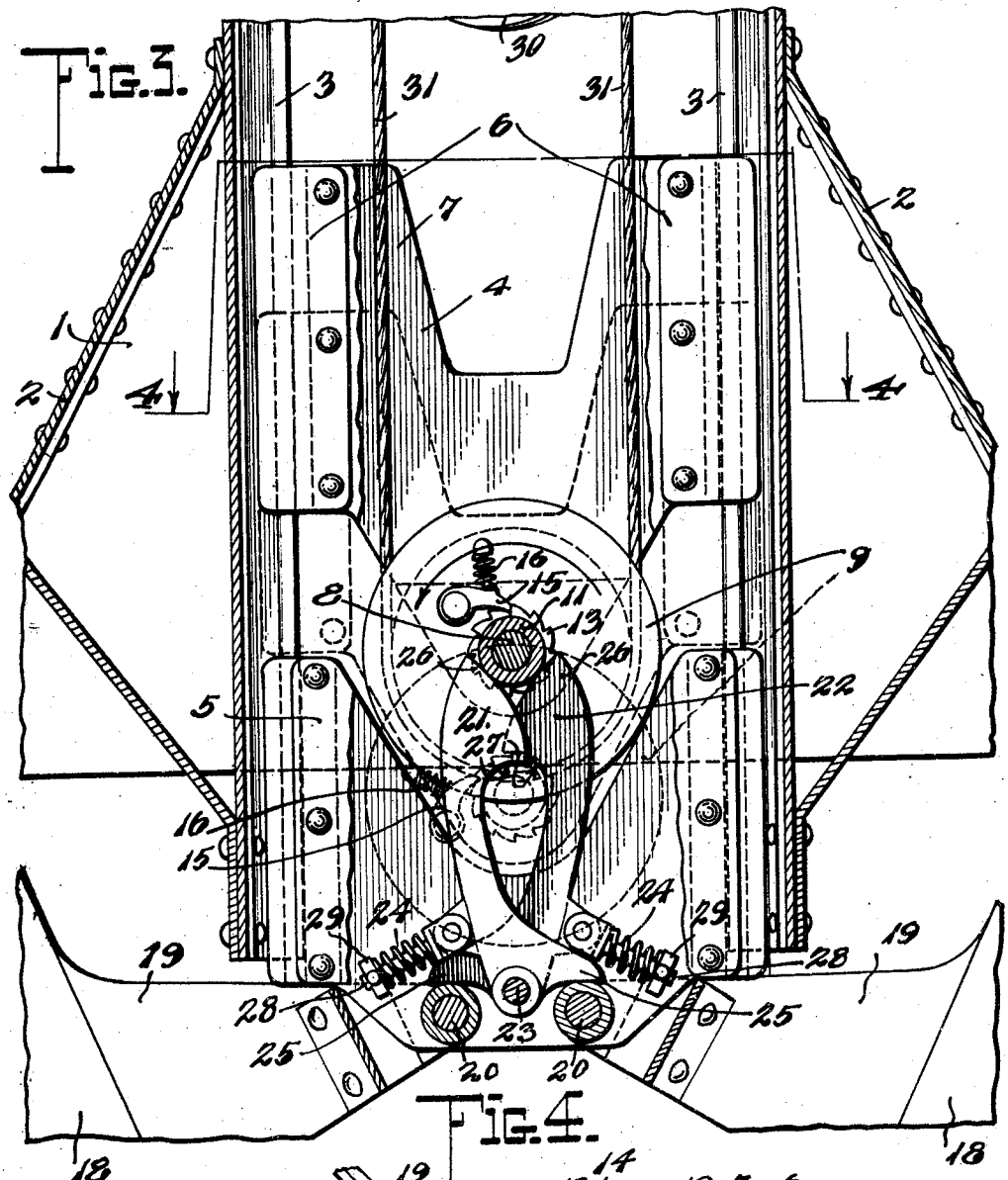
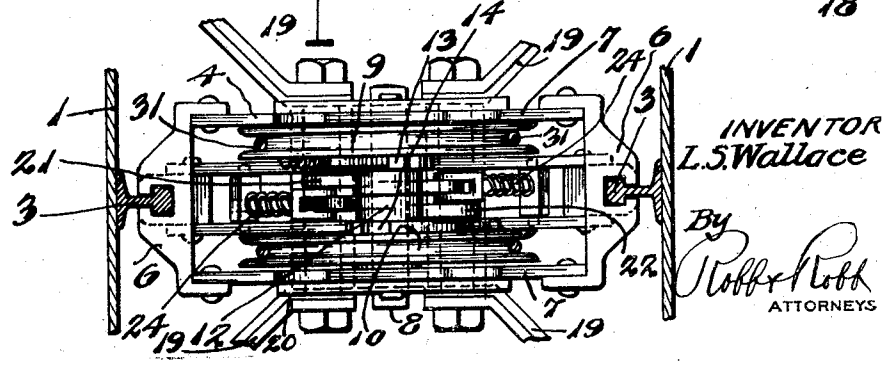


Fig. 4.



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Filed Aug. 1, 1929 3 Sheets-Sheet 3

Fig. 5.

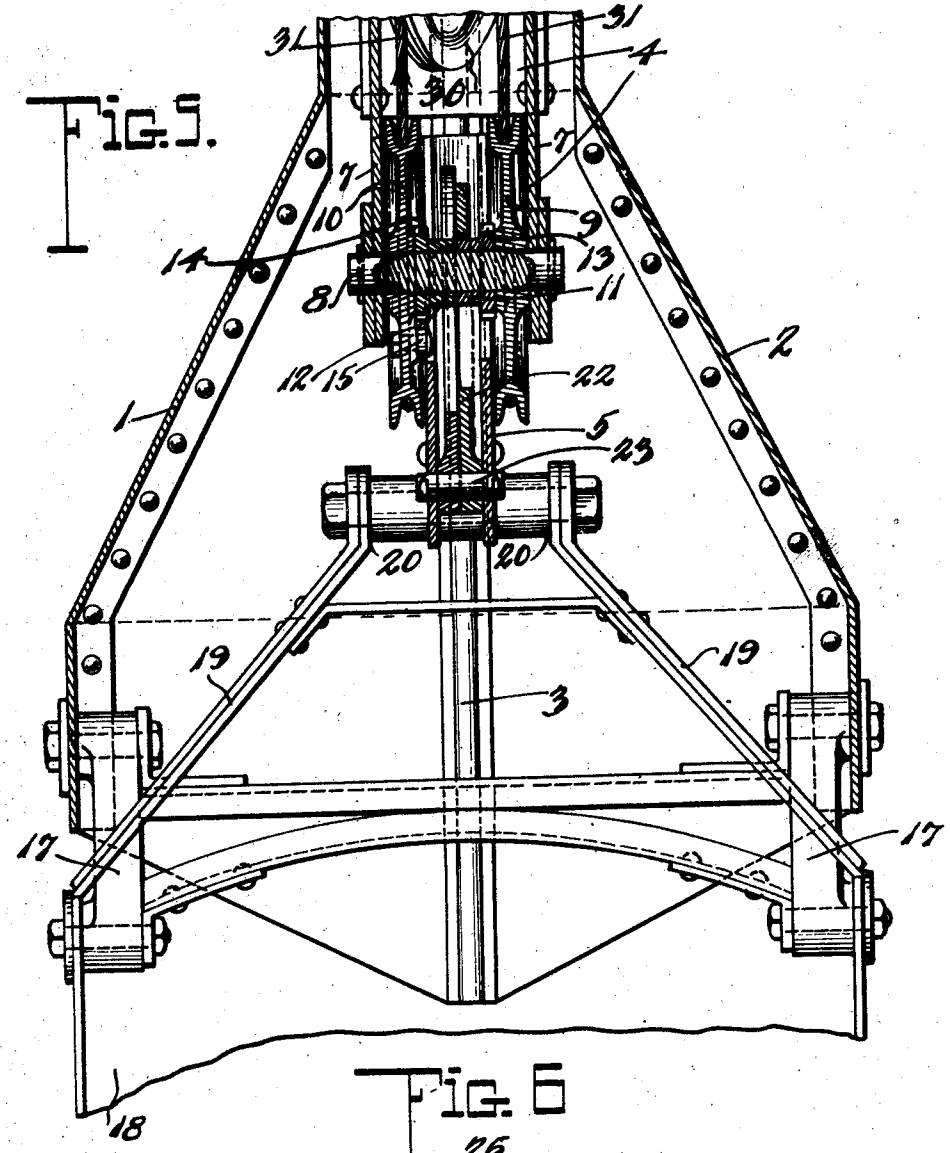
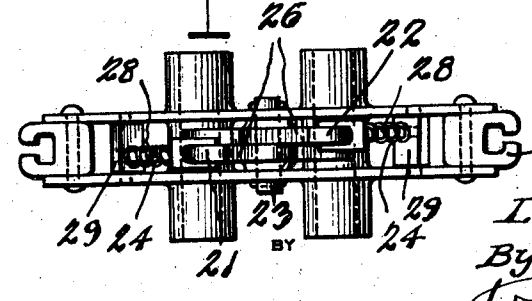


Fig. 6



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Patented Aug. 4, 1931 1,817,595

UNITED STATES PATENT OFFICE

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EXCAVATING BUCKET

Application filed August 1, 1929. Serial No. 382,715.

This invention relates to improvements in excavating and like load shifting apparatus, and more particularly to the construction of clam-shell bucket operating and controlling mechanism.

The essential object in view is the simple and inexpensive actuation and control of a clam-shell bucket, and more in detail the object includes the control of such a bucket from a single power line.

A more detailed object is the provision for required manipulation, retention of the bucket in a closed condition to the predetermined time and location, and opening of the bucket all under control of a single power line.

With these and further objects in view as will in part hereinafter become apparent and in part be stated, the invention comprises relatively pivoted clam-shell buckets and means for sustaining and releasing said buckets in and from a closed position controlled by manipulations of the power or bucket sustaining line.

The invention also comprises a frame, vertically tandem independent slides shiftably carried thereby, bucket shells pivoted to the frame and connected to be sustained in a closed position by one of the slides, and means carried by the other other slide for controlling movement of the first slide incident to manipulations of the supporting or power line for the bucket.

The invention further comprises other novel constructions, combinations, and arrangements of parts as will be subsequently specified and claimed.

In the accompanying drawings,—

Figure 1 is a sectional elevation of apparatus embodying the features of the present invention.

Figure 2 is an enlarged, detailed, vertical section through portions of the parts seen in Figure 1, parts being broken away for the saving of space, and parts being seen in elevation, the portions included being those encompassed within the dash lines 2—2 of Figure 1.

Figure 3 is a view similar to Figure 2 with the bucket illustrated in the open position, the parts shown being those encompassed in the dot and dash line 3—3 of Figure 1.

Figure 4 is a sectional plan taken on the plane indicated by line 4—4 of Figure 3, and looking downward.

Figure 5 is a vertical section taken on the plane indicated by line 5—5 of Figure 2.

Figure 6 is a plan view of the lower slide or cross head detached.

To facilitate a detailed understanding of the specific features of a preferred embodiment of the present invention, a general description may be helpful preceding discussion of details with reference to the accompanying drawings. To this end, it is obviously desirable to reduce the number of parts of a crane, steam shovel, or excavating or load transferring apparatus so far as the same can be done while improving efficiency and without loss of capacity. It is the object of the present invention to reduce the number of lines extending to a clam-shell bucket to a single cable, and to provide apparatus whereby the manner of handling that cable makes possible manipulation of the bucket with thoroughly efficient and acceptable results. The outer end of the cable is dead or fixed to an outer portion of the crane or boom. The cable is extended thence down and about a pulley upward and about a second pulley, and down and about a third pulley, and then upward to the crane or boom and about a pulley and back to the power drum about which it is wrapped. The second pulley mentioned is an idler and the first and third pulleys mentioned serve to provide the control for the manipulations of the clam-shell. The second pulley mentioned is journaled in a frame while the first and third pulleys are journaled in a slide carried by the frame. A second slide is carried by the frame and movable with respect to the first slide. The two shells of the clam-shell bucket are pivoted to the said frame and also pivoted to the second-mentioned slide in a manner to be opened when the second-mentioned slide is lowered and to be closed when the second-mentioned slide is raised. A pair of hook-shaped dogs upstand from the second-mentioned slide and are spring-pressed in po-

sition to cam past and snap to an overhanging position with respect to stub shafts actuated by the first and third above-mentioned pulleys in position for one of the dogs to engage one of said shafts to sustain the second-mentioned slide in an elevated position with the clam-shell closed, and the other dog to engage the other shaft at an appropriate time also to sustain the second slide in the elevated position. One of said dogs upstands a little higher than the other, so that, when the latter is in engagement with its corresponding shaft, the former will be above its shaft. The first-mentioned pulley is constructed to be rotated when the operating cable is slacked away in a direction to cause its corresponding shaft to turn in a manner to throw off the engaging dog, which allows the second slide to drop sufficiently for causing the second dog to engage its corresponding shaft, and then, when the power cable is taken up in a manner to lift the clam-shell, the third pulley rotates in a direction to force its dog out of engagement with its shaft, which releases the second slide and leaves it free to drop by gravity to the open position of the clam-shell bucket. When the parts are in this last position, the clam-shell, being lowered into engagement with dirt or other material to be loaded, will allow its carrying slide to remain stationary while the slide above lowers by gravity with the slacking away of the power cable until the dogs cam past their supporting shafts, and thus provide means to enable the upper slide to lift the lower slide under the lifting action of the power cable and thereby, by virtue of the pivotal connection of the clam-shell to the lower slide, to close the clam-shell. The parts will remain thus closed until the power line is again slacked away for releasing the first dog, and then reeved in for releasing the second dog.

These operations may be accomplished by apparatus susceptible of a wide range of modification of details, as will be readily recognized, and it should be understood that the specific illustration in the accompanying drawings is but the preferred embodiment of the present invention and various other embodiments may be constructed effectively incorporating the invention.

Referring to the drawings by numerals, 1 indicates the super-structure or frame having the hooding or cover sheets 2 enclosing the operating parts. The said frame also carries the vertically disposed parallel slide bars 3, 3, slidingly engaged by an upper cross head or slide 4 and a lower cross head or slide 5. The cross head 4 comprises the slides 6, 6, connected by spaced plates 7, 7. An axle 8 extends through the two plates 7 and is preferably journaled therein. Arranged within the space between plates 7 are a pulley wheel 9 and a pulley wheel 10, each mounted on the shaft 8. Between the two pulley wheels 9 and 10 and journaled on shaft 8 are sleeve stub shafts 11 and 12, stub shaft 11 abutting against wheel 9, while stub shaft 12 abuts against wheel 10, and the stub shafts 11 and 12 are of sufficient length to have their inner ends abut. Shaft 11 carries a ratchet wheel 13, and shaft 12 carries a similar ratchet wheel 14 facing in the opposite direction from ratchet 13. A pawl 15 pressed by a spring 16 is provided for each of the ratchets 13 and 14 and engages its respective ratchet, the pawl engaging ratchet 11 being pivotally carried by wheel 9 while the pawl engaging ratchet 14 is pivotally carried by the wheel 10. Thus, when wheel 9 is rotated in one direction, its pawl will click over the ratchet 13, but, when the wheel is rotated in the opposite direction, the stub shaft 11 rotates with it and likewise, when wheel 10 is rotated in one direction, its pawl clicks over ratchet 14, but when wheel 10 is rotated in the other direction, stub shaft 12 rotates with it. Each stub shaft or sleeve 11 and 12 has a smooth portion inward of its respective ratchet, as clearly seen in Figures 4 and 5.

Pivoted by links 17, 17 to the frame 1 are the shells 18 of the clam-shell bucket, each of which shells is provided with upstanding ears or arms 19, 19 preferably arranged to converge, as best seen in Figure 5. At their upper ends, the arms 19 pivotally engage, at 20, 20, the lower cross head or slide 5. Slide 5 is similar in construction to slide 4, having the spaced side plates to which the pivots 20 are connected and between which, above pivots 20, are located pivoted dogs 21 and 22, both of said dogs being preferably pivoted at 23 to the lower portion of the side plates of slide 5 and upstanding from their pivots. Springs 24 are provided to stress the dogs 21 and 22 toward each other, and each dog is provided with a nose 25 to prevent the respective spring 24 from pressing the dog beyond a substantially upright or vertical position. Each dog consists of a bar terminating in a converging or pointed tip 26 adapted for wedging purposes hereinafter mentioned, each bar being widened or thickened at its upper portion which tapers to form the point 26, and just below the thickened portion each dog is formed into an open hook 27 proportioned at times to rest upon the smooth portions of the respective sleeves 11 and 12 to support parts beneath, as will be hereinafter set forth. Springs 24 are preferably guided by appropriate rods or plungers 28 pivoted to the respective dogs 21 and 22 and extending at their outer end portions through lugs or other appropriate parts 29 carried by slide 5 and against which the respective springs 24 abut. The dogs 21 and 22, as best seen in Figure 4, are proportioned and located to

move readily between the wheels 9 and 10 for engaging the smooth portions of sleeves 11 and 12. Dog 21 has its hook 27 located slightly below the hook 27 of dog 22, so that in operation, when dog 21 is moved out of engagement with sleeve or stub shaft 11, dog 22 will drop into engagement with the smooth portion of sleeve 12 and continue to afford a support for the parts beneath.

Journaled within the casing 2 at the upper part thereof, and preferably disposed obliquely is an idler pulley wheel 30 located above the pulley wheels 9 and 10 and arranged at such an angle as to direct a cable ascending from one of pulleys 9 and 10 to a proper location for lacing about the other. Each of pulleys 9, 10 and 30 is grooved to receive an operating cable, and an operating cable 31 is provided with an upwardly extending lap 32 which may be referred to as a dead end because it is fixed to the boom of the excavating device or crane. Starting with the dead end 32, the cable 31 is passed down and about pulley 9, upwardly over pulley 30 and down and about pulley 10, and thence up to the boom pulley and down to the winding drum, not illustrated.

In operation, the parts being in the position seen in full lines in Figure 1, to open the clam-shell bucket, it is necessary to lower the bucket by slacking away on cable 31, which causes pulley 10 to revolve in a direction causing its ratchet to turn sleeve 12 in a direction to back off dog 21, which allows the cross head or slide 5 and parts carried thereby to drop sufficiently for causing dog 22 to engage sleeve 11. The operator then takes up the cable 31 starting an elevating movement of the bucket apparatus, which causes a reverse revolution of pulley 9 from the former movement thereof, effecting movement of the sleeve 11 in a direction for backing off pawl 22, which allows the cross head 5 to drop and thereby allows the shells or sections of the clam-shell bucket to swing by gravity to the open position shown in dotted lines in Figure 1, and indicated in full lines in Figure 3. With the bucket in this position, the operator may slack away on cable 31 to lower the whole bucket apparatus until the edges of the bucket sections engage the load to be picked up when the interruption of the downward movement of the bucket shells or sections will allow the cross head 4 to descend by gravity toward the cross head 5 and this downward movement causes the stub shafts 11 and 12 to strike the camming surfaces of dogs 22 and 21 forcing the same back against the pressure of springs 24 until the shafts have passed down into line with the space below the hooks 27, when the dogs will spring back to a closed or upright position over the stub shafts. Then, when the operator hauls in again on the cable 31, the rotation of pulley 10 is in a direction causing the respective pawl 15 to click over its ratchet whereby the respective sleeve or stub shaft remains stationary, and the upward movement can continue as long as required without releasing the dog 21. The next lowering away movement by slacking cable 31 will release dog 21 and the next upward movement by reeving in cable 31 will release dog 22 and allow the bucket to open.

The limit of upward movement of slide 4 may be established by any appropriate stop, such as parts 33 forming rigid parts of the frame and housing 1 and 2, and appropriately located at the upper portion of the supporting frame.

It will be observed that effective manipulations may be accomplished by the use of a single dog, one dog being omitted, and the retained dog located to release upon a descending movement only of the load-carrying bucket and its super-structure. The effect of the provision of a single dog can be provided by fastening the dog 22 in a detached position, that is, backed off against the pressure of spring 24 and held far enough away from cooperating parts to prevent its hook 27 from affording a support. When dog 22 is thus entirely out of operative capacity, the operation will consist, when the bucket is open, of lowering the complete apparatus down upon the material to be picked up by the bucket, dropping the slide 4 down upon slide 5 to a position where dog 21 engages its supporting stub shaft or sleeve, and then elevating the parts by reeving in cable 31. The clam-shell will be drawn to the closed position by the ascent of the slides 4 and 5 and held closed as long as upward movement is imparted, because upward movement produces such rotation as not to cause the supporting stub shaft to kick dog 21 off. The parts may be swung about or otherwise shifted by movements of the boom or other carrying means to the position for discharge, and then, when the cable 31 is slacked away, the descending movement will cause the dog 21 to be kicked off or tripped and the clam-shell to open.

It should further be observed that while a boom has been referred to, a travelling crane or any other appropriate supporting and shifting means is intended to be included, since the present invention is applicable to clam-shell buckets without reference to the particular carrier with which the same may be connected and by which it may be shifted.

What is claimed is:

1. In single line excavating apparatus of the class described, the combination with a load carrier and a load-carrying cable therefor to raise and lower said load carrier, of trip means adapted to be tripped by said load-carrying cable to discharge the load carrier, said means being so arranged that the load carrier is free to be raised and lowered

to any desired height before tripping the same by the said cable.

2. In single line excavating apparatus of the class described, the combination with a load carrier and a load-carrying cable therefor to raise and lower said load carrier, said cable being arranged in a single live lap for suspending the said load carrier by the bight and having one end dead-ended, of trip means adapted to be tripped by said load-carrying cable to discharge the load carrier, said means being so arranged that the load carrier is free to be raised and lowered to any desired height before tripping the same by the said cable.

3. In apparatus of the class described, the combination, with movable load-carrying parts adapted to be moved to and from a load-carrying condition, of a dog pivotally connected to said load-carrying parts and adapted to sustain the same in load-carrying condition, a cable for lifting said load-carrying parts, a shaft adapted to be engaged by the dog for sustaining the same in load-carrying condition, and means actuated by the cable for rotating said shaft to a position releasing said dog.

4. In apparatus of the class described, the combination, with movable load-carrying parts, adapted to be moved to and from a load-carrying condition, of a dog pivotally connected to said load-carrying parts and adapted to sustain the same in load-carrying condition, a cable for lifting said load-carrying parts, a shaft adapted to be engaged by the dog for sustaining the same in load-carrying condition, means actuated by the cable for rotating said shaft to a position releasing said dog, a second dog also pivoted to sustain the load-carrying parts in load-carrying condition, a second shaft located to be engaged by the second dog and to sustain the same in load-carrying condition, and cable actuated means for moving said shaft for shifting the second dog out of supporting relation thereto.

5. In apparatus of the class described, the combination, with movable load-carrying parts, adapted to be moved to and from a load-carrying condition, of a dog pivotally connected to said load-carrying parts and adapted to sustain the same in load-carrying condition, a cable for lifting said load-carrying parts, a shaft adapted to be engaged by the dog for sustaining the same in load-carrying condition, means actuated by the cable for rotating said shaft to a position releasing said dog, a second dog also pivoted to sustain the load-carrying parts in load-carrying condition, a second shaft located to be engaged by the second dog and to sustain the same in load-carrying condition, and cable actuated means for moving said shaft for shifting the second dog out of supporting relation thereto, the second-mentioned dog being dimensioned and located to engage its supporting shaft when the load is released by the first dog.

6. In apparatus of the class described, the combination of a frame, slides mounted therein to slide vertically, a clam-shell pivoted to the lower slide, a dog pivoted to the lower slide, means carried by the upper slide for sustaining the dog and lower slide in an elevated position with the clam-shell closed, and cable actuated means for releasing the engagement of the dog for allowing descent of the lower slide and opening the clam-shell.

7. In apparatus of the class described, the combination of a frame, slides mounted therein to slide vertically, a clam-shell pivoted to the lower slide, a dog pivoted to the lower slide, means carried by the upper slide for sustaining the dog and lower slide in an elevated position with the clam-shell closed, and cable actuated means for releasing the engagement of the dog for allowing descent of the lower slide and opening the clam-shell, said releasing means including a pulley engaged by the cable and a ratchet shifted with one directional movement of the pulley for effecting release movement of said dog.

8. In apparatus of the class described, the combination of a frame, slides mounted therein to slide vertically, a clam-shell pivoted to the lower slide, a dog pivoted to the lower slide, means carried by the upper slide for sustaining the dog and lower slide in an elevated position with the clam-shell closed, and cable actuated means for releasing the engagement of the dog for allowing descent of the lower slide and opening the clam-shell, said releasing means including a pulley engaged by the cable, a ratchet wheel adjacent the pulley, a pawl carried by the pulley to actuate the ratchet wheel, and a shaft actuated by the ratchet wheel and located to be engaged by and sustain the dog when not actuated by the ratchet wheel.

9. In apparatus of the class described, the combination of a frame, slides mounted therein to slide vertically, a clam-shell pivoted to the lower slide, a dog pivoted to the lower slide, means carried by the upper slide for sustaining the dog and lower slide in an elevated position with the clam-shell closed, and cable actuated means for releasing the engagement of the dog for allowing descent of the lower slide and opening the clam-shell, said releasing means including a pulley engaged by the cable, a ratchet wheel adjacent the pulley, a pawl carried by the pulley to actuate the ratchet wheel, and a shaft actuated by the ratchet wheel and located to be engaged by and sustain the dog when not actuated by the ratchet wheel, said pulley, ratchet wheel, and shaft being carried by the upper slide and the dog having a camming surface and being spring-pressed for enabling the shaft to move past the dog to supporting relation therewith upon descent of

the upper slide relative to the lower slide.

10. In apparatus of the class described, the combination, with a load carrier, a supporting frame therefor, and a cable for raising and lowering said carrier and frame of independent slides carried by the frame, means connecting one of the slides to the load, means for detachably connecting the two slides together to sustain the load carrier in load-carrying position, and means for detaching the said slides while the load carrier is in suspension, said means being operable by said cable.

11. In apparatus of the class described, the combination, with a load carrier, and a supporting frame therefor, of a slide carried by the frame, a power cable for supporting the frame, slide and load carrier, another slide slidingly engaging the frame and connecting the load carrier thereto, and means directly operable by the cable for detaching the two slides for discharging the load carrier.

12. In excavating apparatus of the clam-shell type, a carrier bucket, a hoist cable suspending said bucket, and means for tripping and discharging the bucket contents actuated by the cable upon its reverse movement following a lowering movement of the bucket.

13. In excavating apparatus of the class described, a clam-shell bucket, a hoist cable to raise and lower said bucket, and tripping mechanism cooperating with the bucket and operable by the cable to discharge the bucket incident to raising movement of the cable, said tripping mechanism being so arranged as to effect tripping of the bucket at any desired elevation of the latter.

14. In excavating apparatus of the class described, a claim-shell bucket, mechanism for opening and closing the bucket, and a hoist cable cooperating with said mechanism for actuating the same and raising and lowering the bucket, said mechanism being operable to close the bucket upon initial hoisting of the cable and further operable during suspension of the said bucket by subsequent lowering and hoisting movements to discharge the bucket.

In testimony whereof I affix my signature.

LEE SYLVESTER WALLACE.