C. E. BATHRICK.

CLAM SHELL EXCAVATING MACHINE.

APPLICATION FILED MAY 25, 1911.

1,162,740.

Patented Dec. 7, 1915.

4 SHEETS—SHEET 1.

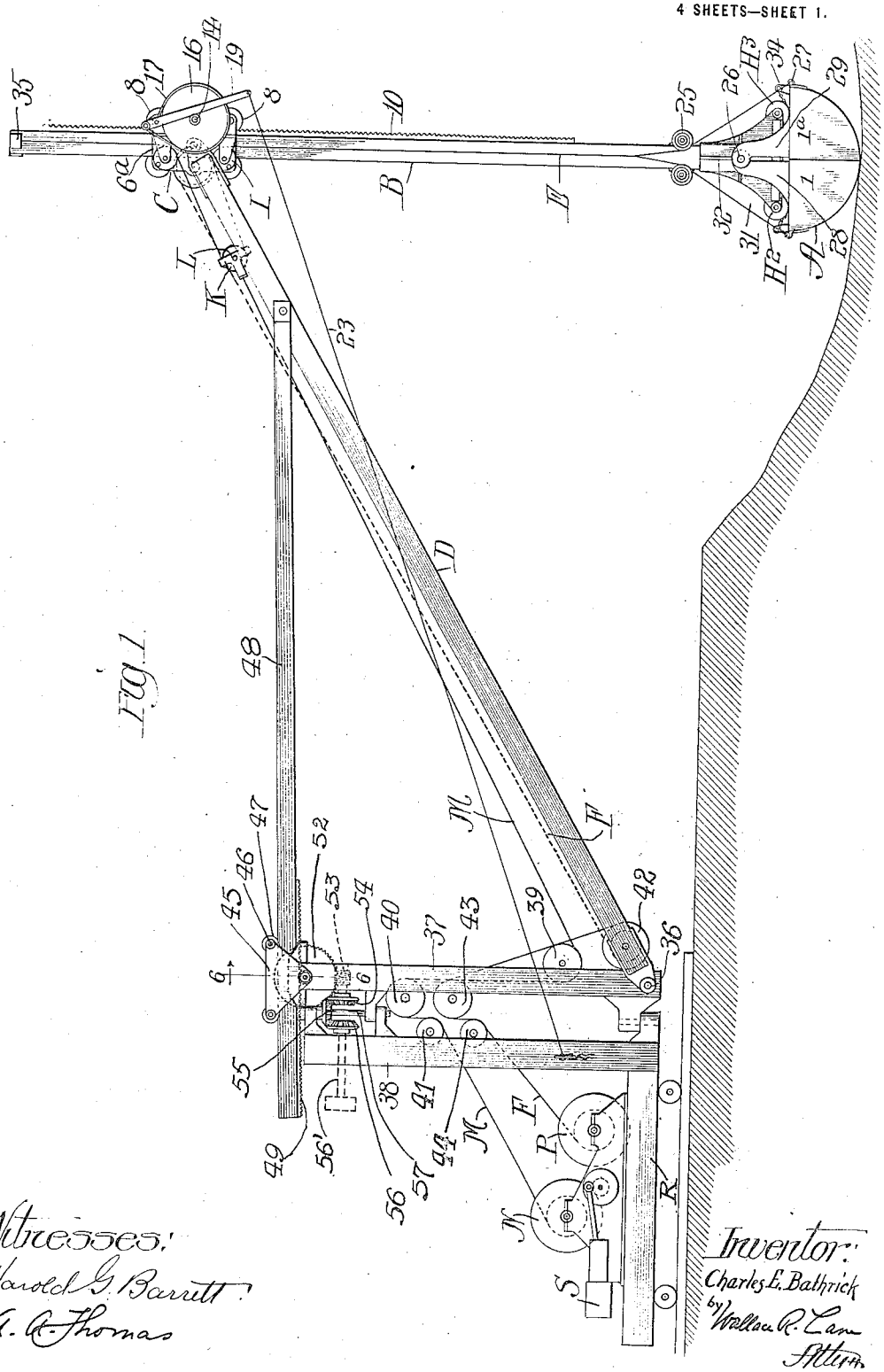


FIG. 1.

Witnesses:
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A. R. Thomas.

Inventor:
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by Wallace R. Lane
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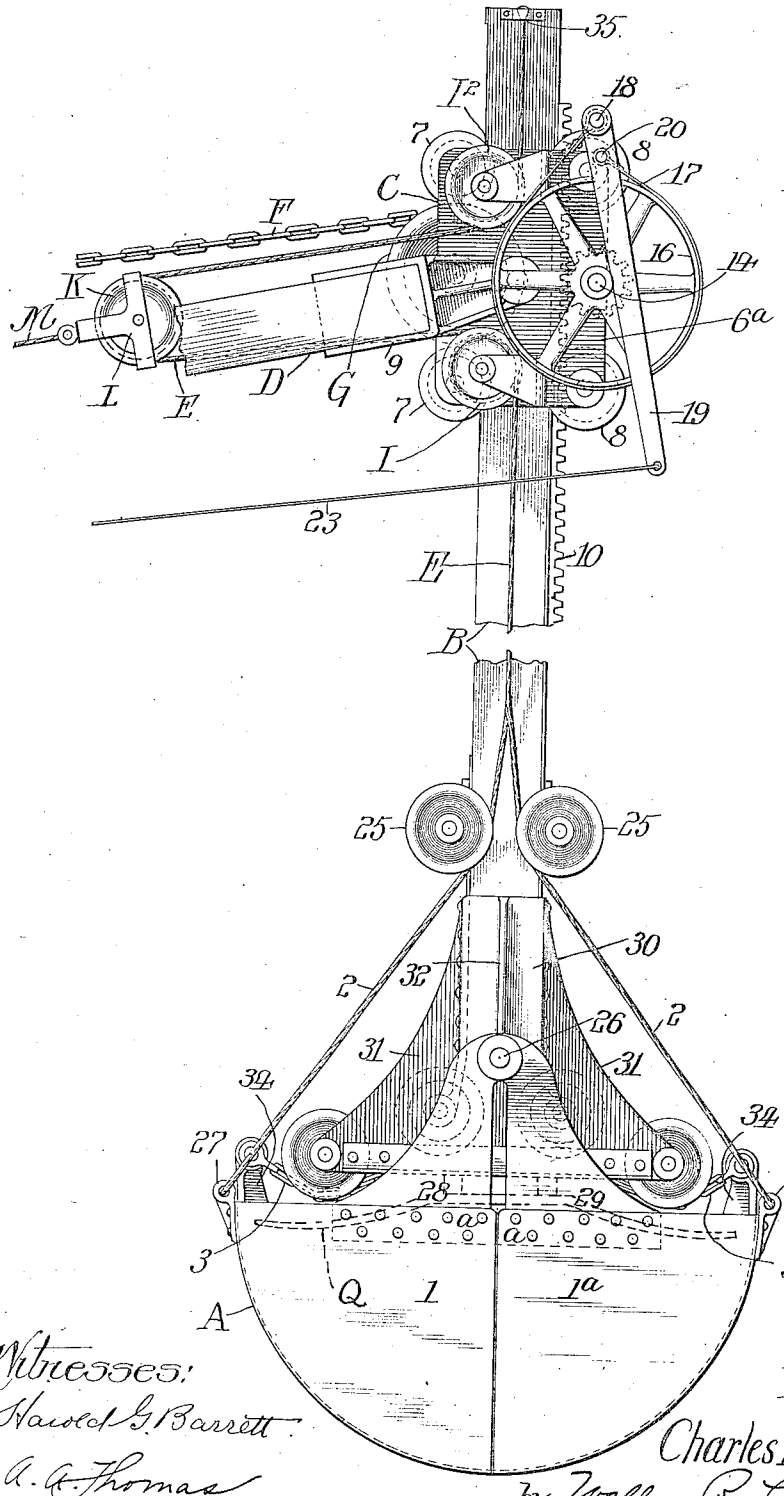


Fig. 2

Witnesses:
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4 SHEETS—SHEET 3.

Fig. 3

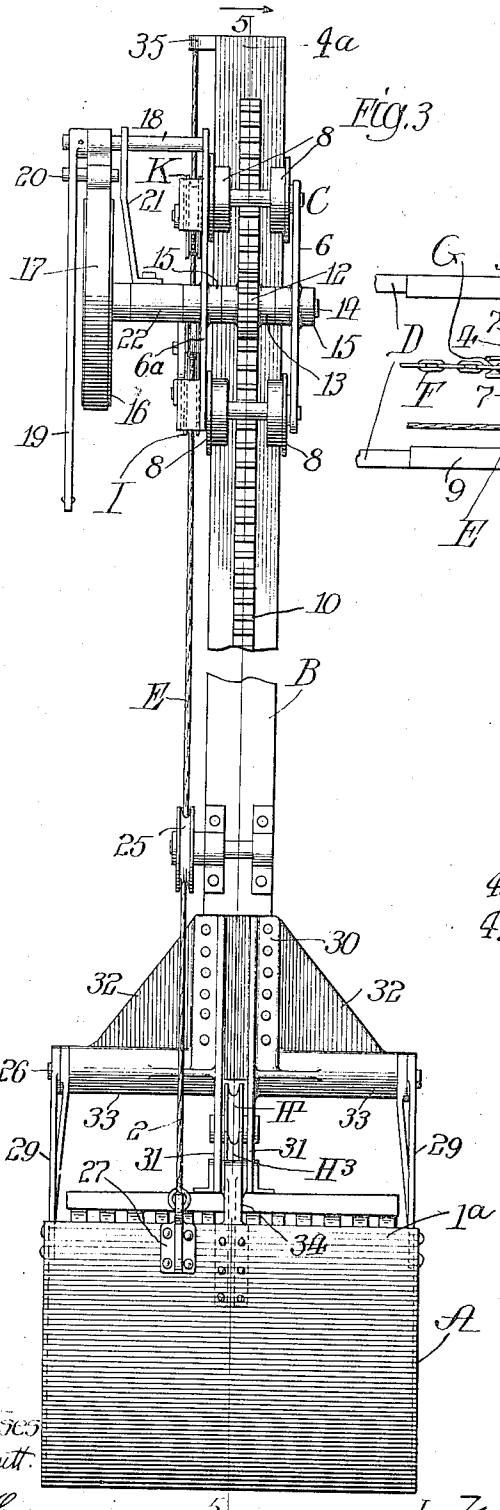


Fig. 4

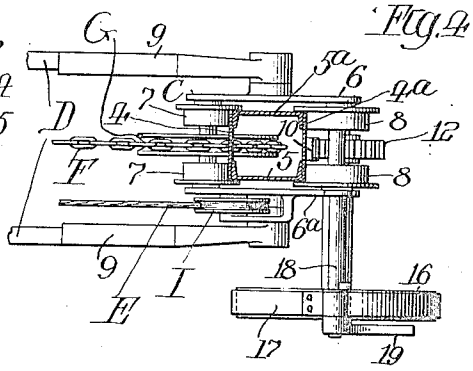
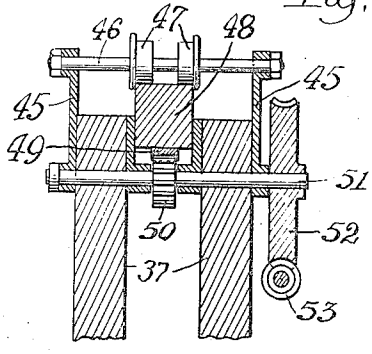


Fig. 6



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4 SHEETS—SHEET 4.

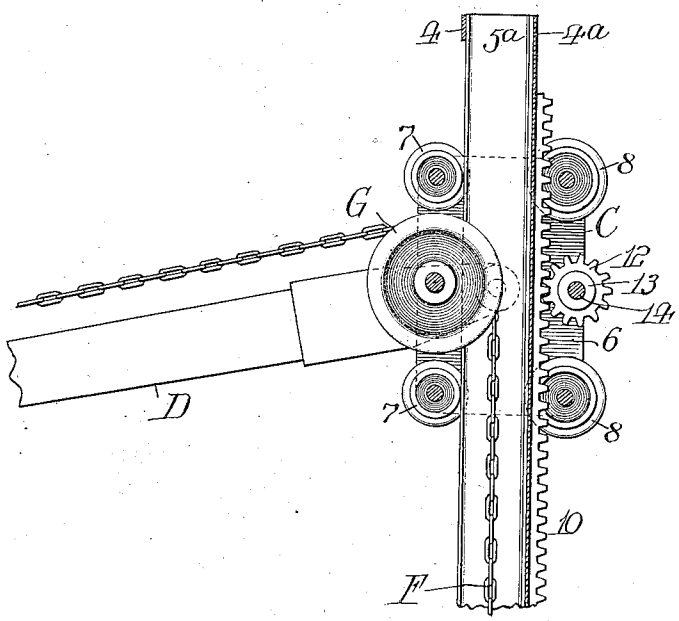
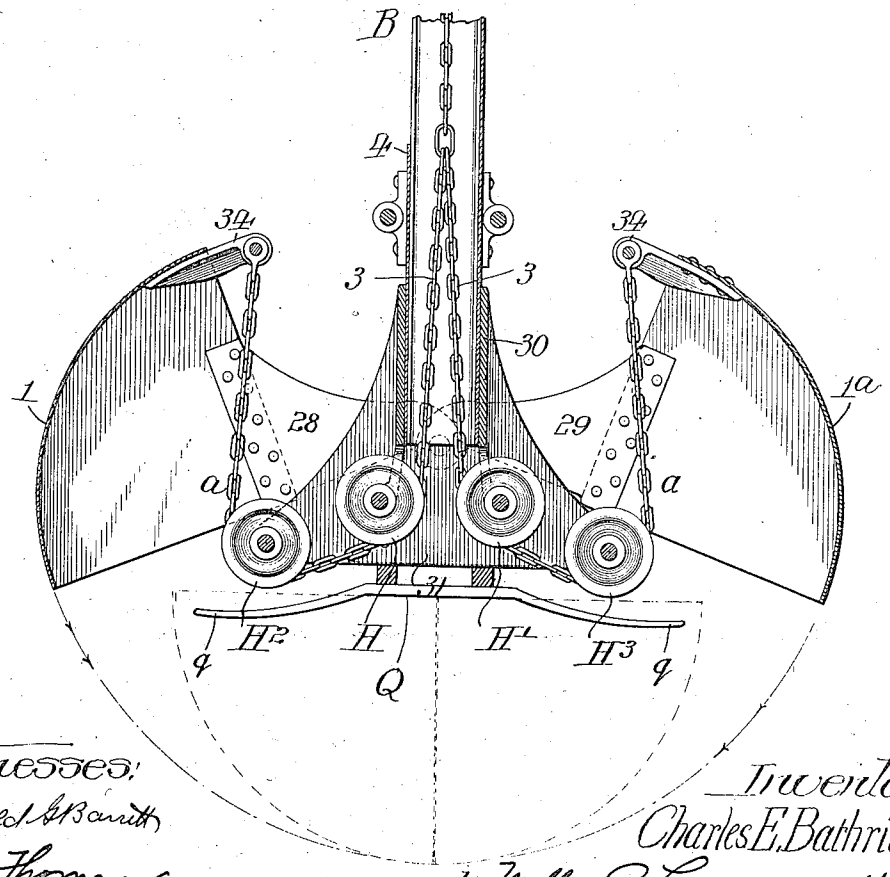


Fig. 5



Witnesses:

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A. A. Thomas

Inventor:

Charles E. Bathrick

by Wallace R. Lane Atty.

UNITED STATES PATENT OFFICE.

CHARLES E. BATHRICK, OF CHICAGO, ILLINOIS, ASSIGNOR TO FREDERICK C. AUSTIN, OF CHICAGO, ILLINOIS.

CLAM-SHELL EXCAVATING-MACHINE.

1,162,740. Specification of Letters Patent. Patented Dec. 7, 1915.

Application filed May 25, 1911. Serial No. 629,358.

To all whom it may concern:

Be it known that I, CHARLES E. BATHRICK, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement in Clam-Shell Excavating-Machines, (Case 3,) of which the following is a specification.

My invention relates to excavating machines of the clam shell type and has for its object the provision of an excavating machine embodying various features of improvement over those heretofore constructed.

The various features of novelty which characterize my invention will become apparent from a detailed description of the accompanying drawings, in which—

Figure 1 is a side elevation of the excavating machine embodying my invention; Fig. 2 is a view in side elevation of the vertical stem or mast which supports the clam shell bucket, the latter being shown in closed position; Fig. 3 is a front view of the mechanism shown in Fig. 2; Fig. 4 is a top plan view of Fig. 3, the bucket being for the sake of clearness omitted; Fig. 5 is a cross-sectional view taken on line 5—5 of Fig. 3 looking in the direction of the arrows, the bucket sections being in this figure shown in open position in full lines and in closed position in dotted lines; Fig. 6 is a cross-sectional detailed view taken on line 6—6 of Fig. 1.

The clam shell bucket, indicated as a whole by A, is attached to the lower end of the upright stem or mast B, which is adjustably held in position on a boom D by a locking device to be hereinafter specifically referred to. The locking device is supported upon a guide member C attached to the elevated upper end of the boom D which is supported for movement in any desired direction, so that it can be operated during the progress of the work for any desired purpose. The sections 1 and 1^a of the clam shell scoop or bucket A are opened by a cord or cable E and closed by a chain or cable F. The latter is also employed for raising the mast B independently of the guide C so as to bodily raise the clam shell bucket after the latter has been suitably filled and closed. The bucket sections 1 and 1^a are pivotally connected to the lower end of the mast B and arranged so that they can swing apart sufficiently to dump the load, as shown in full lines in Fig. 5. The sections are also adapted to swing together for excavating or scraping up the soil, and to close as shown in Figs. 1 and 2 so as to form a bucket or receptacle to retain the load until the sections are again opened or swung apart for the purpose of dumping the collected material. The cord or cable E is at its lower portion provided with branches 2 which are secured at their free ends to the eye-plates 27 on the bucket sections. The chain or cable F terminates at its lower portion in branches 3 which are at their free ends connected with the rear upper portions of the bucket sections by suitable fastening devices 34. The chain F passes over a sheave G on the guide member C, and extends from said sheave to any suitable operating means.

As illustrated in the drawings the mast or beam B is hollow, being formed by oblong plates or bars suitably connected together, as best illustrated in Fig. 4. The bars or plates 4 and 4^a are secured to the channel bars 5 and 5^a so as to form a hollow beam substantially rectangular in cross-section. With this construction of bucket-carrying mast a suitable length of the bar or plate 4 is removed, as illustrated in Fig. 5, to permit the sheave G for the chain F to project within the hollow beam, and thereby allow the chain which is subject to the greatest tensional strain to extend longitudinally and centrally within the hollow beam. This arrangement also permits the branch portions 3 of the chain F to emerge from the lower open end of the hollow beam B for connection with the fastening devices 34 on the bucket sections. After the branch portions 3 emerge from the lower end of the hollow beam or mast, they first pass under the sheaves H and H′ respectively, thence under the sheaves H^2 and H^3 respectively, and thence to the attaching devices 34, which are secured to the upper ends of the bucket sections, substantially at the center thereof, as best shown in Fig. 3. The sheaves under which the branches 3 of the chain F thus pass are all supported by the mast B.

The guide member C is constructed with rigidly connected side portions 6 and 6^a at opposite sides of the mast B. At one side of the mast the guide member C is provided with a suitable bearing for the sheave I upon which the bucket closing cord or cable E is trained. To the rear of the mast the guide member is provided with bearings for

two pairs of anti-friction rollers 7. At the opposite side of the mast B the guide member is provided with suitable bearings for two pairs of anti-friction rollers 8. The anti-friction rollers 7 and 8 are suitably flanged and arranged so as to engage and steady the bucket-carrying mast in its vertical adjustment. The side portions 6 and 6^a of the guide member C are also provided with a suitable spindle or axle for the sheave G over which the chain F passes. The sheave G is arranged substantially midway of said side portions, as best shown in Fig. 4. The outer end portion of the boom D is divided or forked so as to straddle the guide member C. In the particular arrangement shown by way of illustration in the drawings, the boom consists of two parallel members 9 to which are pivoted the side portions 6 and 6^a of the guide member C.

As a means for temporarily locking the mast B to the guide member C on the boom D the mast is provided on one side with a longitudinally extending rack or line of teeth 10. The guide member C is provided with a pinion 12 having its hub portion 13 (see Fig. 5) fixed upon the transverse rotary axle 14 arranged to revolve in bearings 15 on the side portions 6 and 6^a. One end of the axle 14 projects considerably beyond the side portion 6^a and is provided with a friction brake-band wheel 16 fixed thereon. This band wheel 16 can be locked and released in alternation by a brake device consisting of a brake-band 17 having one end attached to a horizontal rod 18 which provides a pivotal support for the brake lever 19. The opposite end of the brake-band 17 is attached to a stud 20 arranged on the lever 19 at a point between the band wheel 16 and the pivot 18 on which the brake lever is supported. The rod or pivot 18 is supported by a bracket 21 which is in turn secured upon a sleeve 22 upon the shaft or axle 14. The rod 18 is further supported and held in place by the side portion 6^a of the guide member C, as best shown in Fig. 3. To operate the brake lever 19 a rod, or preferably a cord or cable 23, is attached to the free end of the brake lever and extends back therefrom to the truck or carriage R which is understood to be provided with any suitable means for operating the bucket-actuating cables. By pulling on the cable 23 the lever 19 is caused to swing in a direction to tighten the brake-band upon the brake wheel 16, whereby the pinion 12 is locked against rotation. This locks the mast B to the guide member C. The release of the brake cord or cable 23 slackens the brake-band 17 on the brake wheel 16 so as to permit the latter to turn, and thereby unlock the pinion 12. This permits the mast B to be raised or lowered independently of the boom D. It should be observed that when the mast B is thus raised or lowered the pinion 12 and brake wheel 16 are free to turn as a pair of idlers secured upon a common spindle.

The branches 2 in which the cord or cable E terminates extend between a pair of sheaves 25 which are mounted as idlers upon the mast above the pivotal axis 26 for the bucket sections. The cable portions 2 diverge outwardly from the sheaves or pulleys 25 and have their lower terminals fastened to attachments 27 secured to the upper outer corners of the bucket sections. Each bucket section is also provided with a pair of arms or side extensions 28 and 29 which extend upwardly from the bucket when the sections are closed. These arms are connected to the upper inner portions *a* of the bucket sections and extend therefrom to the transverse pivot pin 26, carried by the bucket-carrying mast B. The lower end of the mast B is fitted and secured into the socket casting 30. The socket casting 30 is provided with web portions 31 and 32 arranged in vertical planes at right angles to each other. More particularly described, the casting 30 is provided at each of two opposite sides with a lateral web portion 32, and these two web portions unite at their bases with two bearing portions 33 for the pivot pin 26. At each of the other two sides the socket 30 is provided with a pair of spaced web portions 31, thereby providing space for the chain branches 3 and for the sheaves H, H^1, H^2 and H^3, the axles for these sheaves being supported by the web portions 31.

One portion of the bucket-opening cable E drops from the sheave I on the guide member C, while the other portion of the cable extends from said sheave I rearwardly to the movable sheave K and thence upwardly and forwardly to the upper portion of the mast B to which it is suitably secured as at 35 (see Figs. 1 and 2). The sheave K is mounted upon a bearing or sheave block L to which is attached an operating cord, wire or cable M. When the cable M is drawn rearwardly so as to exert a suitable pull on the sheave block L, the sheave K is drawn laterally away from the mast B, whereby the pendant portion of the cable E is drawn up to open the bucket sections 1 and 1^a. The mast B can be locked in any adjusted position by the locking device previously described. In order to permit the bucket sections 1 and 1^a to swing together from the position indicated in full lines in Fig. 5, the cable M is allowed to slacken or pay-out from the winding device N (see Fig. 1) to which it is attached. In order to force the bucket sections together so as to close against the resistance opposed to their cutting or scooping action in excavating, the bucket closing cable F is wound

upon a suitable winding device P, whereby the cable is drawn upwardly through the hollow mast B so as to cause the branch portions 3 to pull upon the bucket sections and swing the same into closed position about the axis 26, as indicated in dotted lines in Fig. 5. By this operation the bucket is filled with the excavating material which is retained within the closed bucket. In order to bodily raise the closed bucket to any desired extent, the mast B is unlocked from the guide member C by releasing the cable 23 and allowing the same to slacken. This automatically slackens the brake-band 17 on the brake wheel 16. Then, by continuing to wind up the cable F, the mast B and bucket A are raised as a whole, the upward movement of the mast between the guide rollers 7 and 8 being permitted by the now unlocked pinion 12. While the bucket sections are being closed the pendant portion of the bucket-opening cable E is, of course, slackened and allowed to descend. Consequently, the winding device N permits the cable M to pay-out therefrom, it being understood that the winding devices N and P are reversible and subject to the control of an attendant, whereby they can be operated in accordance with requirements. After the bucket has thus been brought over the dump or spill-pile, the beam B can, if desired, be unlocked and lowered by paying out the chain or cable F from the winding device P and paying out the cable M from the winding device N. By next winding up the cable M, the cable E is drawn up within the hollow mast B so as to open the bucket sections and thereby discharge the load. During this discharge action the soil is wiped or scraped from the bucket sections by the scraper Q preferably attached to the lower portion of the web 31. The arms *q* of the scraper Q are arranged to project within the bucket sections, so that when the latter are swung apart the soil is forced out by the scraper arms. Where the soil is sticky this feature is of importance. The bucket sections and the rigid arms 28 and 29 form levers to which the chain branches 3 are attached between the pivot of those arms and the connecting edges of the bucket sections which encounter the resistance.

It will be seen that the axes of the sheaves H^2 and H^3 are in a horizontal plane below the horizontal plane of the pivot bolt 26, and that the said axes are on opposite sides of a vertical plane passing through the axis of the pin 26. By this arrangement the bucket-closing power is effectively applied and by providing sheaves H and H′ for the chain branches 3 the upward draft of the chain F is substantially a direct up-draft from such sheaves when the bucket is closed and the mast B elevated. The sheaves H and H^1, H^2 and H^3 are all practically attached to the mast B, since the socket casting 30 is substantially a part of the mast. In closing the bucket sections for the purpose of excavating, the weight of the mast holds or assists in holding the bucket sections down to their work.

While I do not confine myself to any one form of construction of boom or crane device, I have illustrated as one construction the boom D hinged by a horizontal shaft 36 to a laterally swinging upright bar 37 which is in turn hinged to the upright frame portion 38 of the truck or carriage R. This truck serves as a support for a suitable engine or motor S which operates the winding devices N and P. In the arrangement shown in Fig. 1 the cable M is guided by sheaves 39 and 40 carried by the laterally swinging frame 37. The cable M is also guided by the sheave 41 on the frame portion 38. The chain or cable F passes around the sheave 42 on the boom D, thence over the sheave 43 on the frame 37, thence under the sheave 44 on the frame 38 and thence to the winding device P. The frame 37 to which the boom D is attached is provided at its upper portion with bearings 45. These bearings support a pair of shafts 46 each of which carries a pair of flanged wheels or rollers 47 arranged to steady the movable bar 48 which has the rear end portion thereof supported on the frame 37 and the other end portion pivoted to the boom D near the upper end portion of the latter. As illustrated in Figs. 1 and 6, the bearings or cheek plates 45 are secured to opposite sides of the frame 37. As a means for longitudinally moving the bar 48, the latter is provided on its under side with a rack 49 which is arranged to be engaged by a pinion 50 on the frame 37. The shaft 51 to which the pinion 50 is secured is at one end provided with a worm-wheel 52 fixedly mounted thereon. The worm-wheel 52 is adapted to be operated by the worm 53 driven in any suitable way. For example, in the embodiment illustrated in the drawings, the worm 53 is supported on the frame 37 and provided with a beveled gear 54 engaging a beveled gear 55, which in turn engages a beveled gear 56. The latter is carried on the frame 38 and is fixed to one end of an operating shaft 56′ adapted to be driven in any suitable way. With this arrangement the gear 55 is intermediate between the gears 56 and 54 and arranged to turn about a vertical spindle 57 which also forms the hinge connection between the frames 37 and 38. In this way the bar 48 can be adjusted so as to vary the angle of the boom D. When desired, the boom and supporting frame 37 can be swung laterally as a whole, so as to swing the mast B and the bucket A from the point of excavation to the point of discharge.

From the foregoing detailed description of one embodiment of my invention, it will be seen that the weight of the mast B assists in lowering the bucket and that when the latter is closed, as in the process of excavation, the closure is effected by the direct upward pull of chain or cable F against the weight of the bucket and mast. As soon as the bucket has been thus closed the attendant at a conveniently remote distance can at once unlock the mast from its connection with the boom D and thereby permit the action of the chain F to continue so as to draw the mast and bucket up to a suitable height. It will also be apparent that the bucket is opened by an upward pull on the cable E, during which action the bucket-carrying mast B can be locked to the boom D. The cables F and M extend from sheaves on the guide members C downwardly to their respective winding drums, whereby the use of gear devices as a means for generating the opening and closing power in the near vicinity of the bucket itself is effectually avoided. It will also be seen that the depth to which the bucket is allowed to descend can be readily controlled by the brake device. Furthermore, by means of such brake device the speed at which the bucket-carrying mast B is allowed to descend can be easily regulated; or if the bucket is allowed to descend while in a closed condition the descending can be governed by the winding device P for the chain F which is used both for closing the bucket and for hoisting the same. Broadly considered, the bucket opening cable may be regarded as consisting of the cable portion M (which is operated by the reversible winding device N) and the cable portion E. As a matter of further improvement the cable portion E passes about the sheave K of the independently movable sheave block L and has its upper end attached to the upper portion of the mast B at a point above the guide connection between the mast and the boom D, so that when the sheave block L is drawn rearwardly by the cable portion M, away from the bucket-carrying mast, the lower section of the cable E pulls upwardly, while its upper terminal section draws downwardly on the mast B. It will also be seen that the bucket sections have levers fulcrumed at their inner ends to swing about the axis of the pin 26. The cable branches 2 and the chain or cable branches 3, are tied to said levers near the free ends thereof. It will be clear that when the bucket sections are open, as shown in Fig. 5, the closing action of the chain or cable F causes the branch portions 3 to exert a downward pull on the bucket sections.

While I have thus described and illustrated one particular embodiment of my invention, I would have it understood that I do not wish to be limited to the exact construction illustrated, but that on the contrary changes and modifications may be made without departing from the scope of the invention as defined in the appended claims.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a clam-shell excavating machine, the combination of a boom, a vertically movable hollow mast suspended from the outer end of said boom, a clam-shell excavating bucket having its sections pivotally connected to the lower end of said mast, a flexible actuating member for closing the bucket sections and raising the mast having two branches each fastened to the upper rim of one of the two bucket sections, said flexible member passing longitudinally through said hollow mast, and a flexible actuating member also having two branches each fastened to the upper rim of one of the two bucket sections for opening the bucket sections.

2. In a clam-shell excavating machine, the combination of a vertically movable hollow mast, a casting secured to the lower end of said mast, a pair of spaced web portions extending from opposite sides of said casting, a plurality of sheaves journaled between said web portions, a second pair of oppositely extending web portions arranged on said casting at right angles to said first-mentioned web portions, a clam-shell bucket having its sections pivotally connected to said second pair of web portions, a flexible actuating member connected to said sections and passing below said sheaves upwardly through the hollow mast for closing the bucket sections and raising the mast, and means for opening the bucket sections.

3. In a clam-shell excavating machine, the combination of a vertically movable mast, a casting secured to the lower end of said mast, a pair of oppositely extending web portions on said casting, pivot pins carried by said web portions, a clam-shell bucket having its sections journaled on said pins, means for closing the bucket sections, a pair of sheaves journaled on the opposite sides of the mast, and a flexible actuating member connected to said sections and passing below said sheaves upwardly for opening the bucket sections.

4. In a clam-shell excavating machine, the combination of a vertically movable hollow mast, a casting secured to the lower end of said mast, a pair of spaced web portions extending from opposite sides of said casting, a plurality of sheaves journaled between said web portions, a second pair of oppositely extending web portions arranged on said casting at right angles to said first-mentioned web portions, a clam-shell bucket

having its sections pivotally connected to said second pair of web portions, a flexible actuating member connected to said sections and passing below said sheaves upwardly through the hollow mast for closing the bucket sections and raising the mast, a pair of sheaves journaled on the mast above the said casting, and a flexible actuating member connected to said sections and passing below said sheaves upwardly for opening the bucket sections.

5. In a clam-shell excavating machine, the combination of a hollow mast built of bars rigidly connected together, a boom for supporting said mast, a casting rigidly secured to the lower end of said mast, a two part clam-shell bucket having its sections pivotally connected to said casting, and flexible means attached to the upper rim of each of the two bucket sections for operating said bucket sections.

6. In a clam-shell excavating machine, the combination of a boom, a guide member pivoted to the outer end of said boom and including a pair of spaced plates, a sheave and a plurality of rollers journaled between said plates, a hollow mast passing through said guide member between said rollers, a clam-shell bucket having its sections pivoted to the lower end of said mast, a flexible member connected at its lower end to the bucket sections for closing the same and raising the mast, said member passing upwardly through the hollow mast over said sheave, a pair of rollers mounted on the outside of one of said plates, a second flexible member connected at its lower end to the bucket sections and at its upper end to the upper portion of said mast, said second flexible member engaging said pair of rollers, a movable block provided with a sheave over which said cable is trained, and means for drawing said block away from said mast to open the bucket sections.

7. In a clam-shell excavating machine, the combination of a boom, a guide member pivoted to the outer end of said boom and including a pair of spaced plates, a sheave journaled between said plates, a hollow mast passing through said guide member, a clam-shell bucket having its sections pivoted to the lower end of said mast, a flexible member connected at its lower end to the bucket sections for closing the same and raising the mast, said member passing upwardly through the hollow mast over said sheave, a pair of rollers mounted on the outside of one of said plates, a second flexible member connected at its lower end to the bucket sections and at its upper end to the upper portion of said mast, said second flexible member engaging said pair of rollers, a movable block provided with a sheave over which said second flexible member is trained, and means for drawing said block away from said mast to open the bucket sections.

In witness whereof, I hereunto subscribe my name this 23d day of December, A. D. 1910.

CHARLES E. BATHRICK.

Witnesses:
GEO. MANKLE,
A. A. THOMAS.