June 30, 1925.

1,543,838

J. G. FOGARTY

EXCAVATING MACHINE

Filed July 15, 1920

2 Sheets-Sheet 1

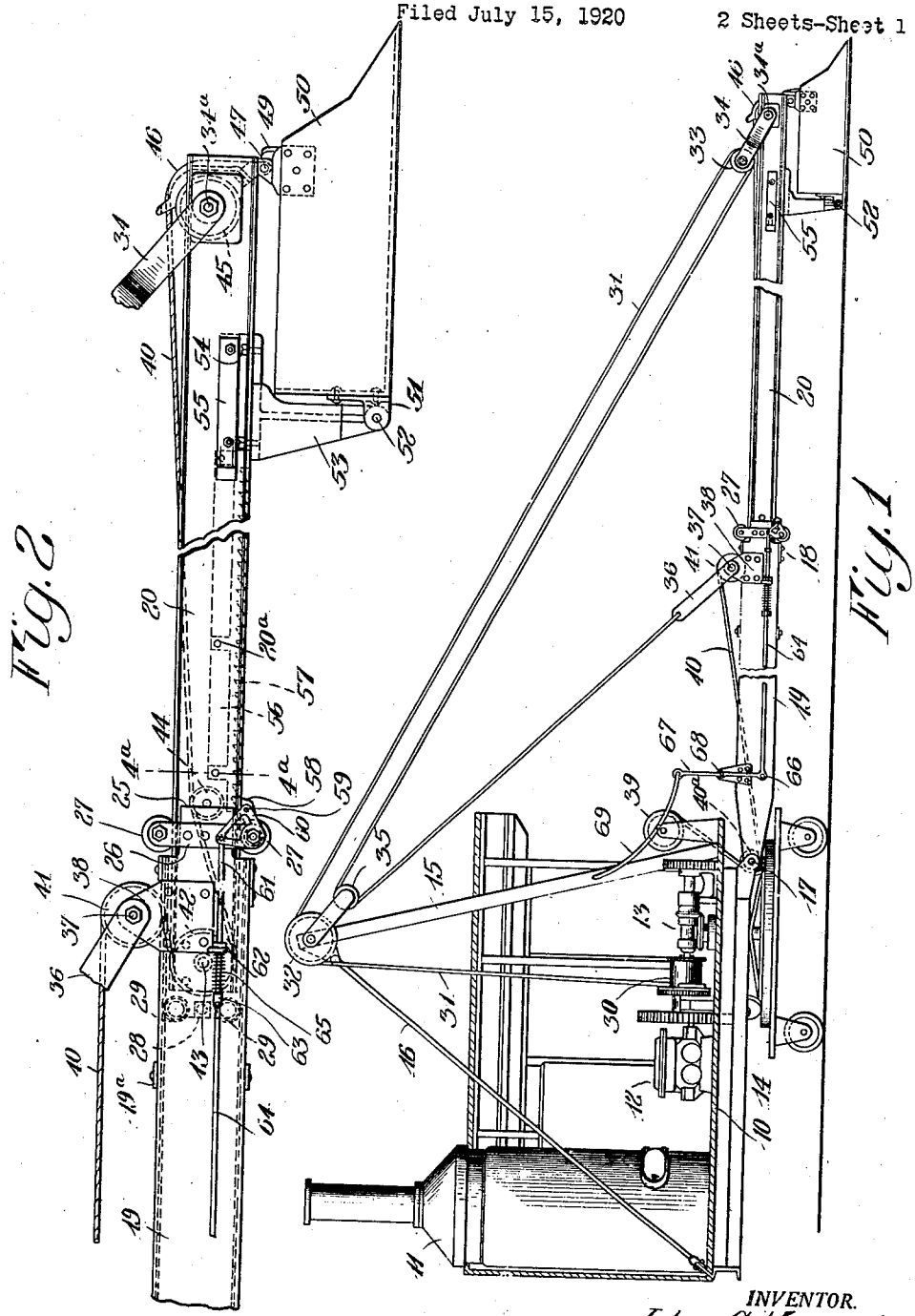


Fig. 2

Fig. 1

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2 Sheets-Sheet 2

Fig. 4

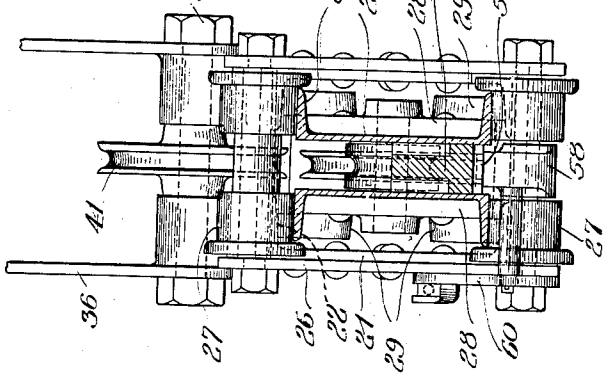


Fig. 6

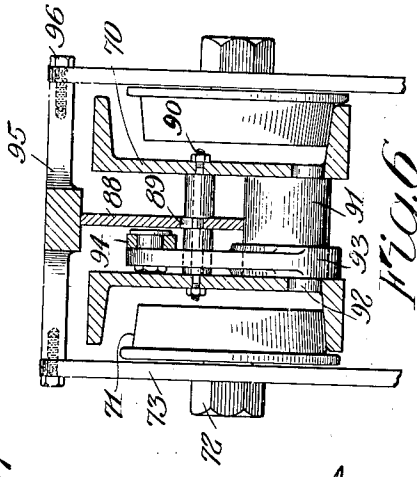


Fig. 5

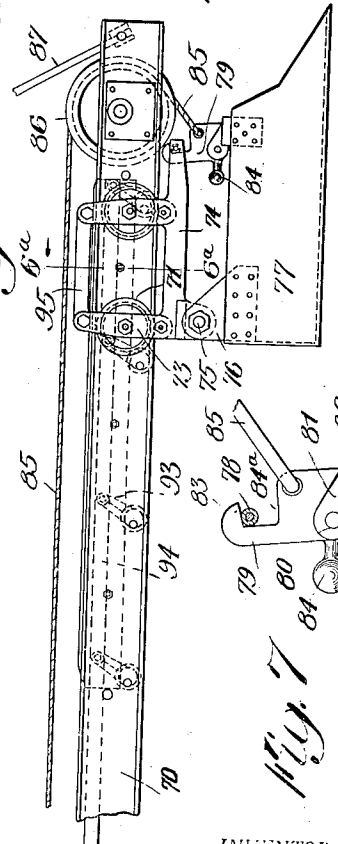


Fig. 3

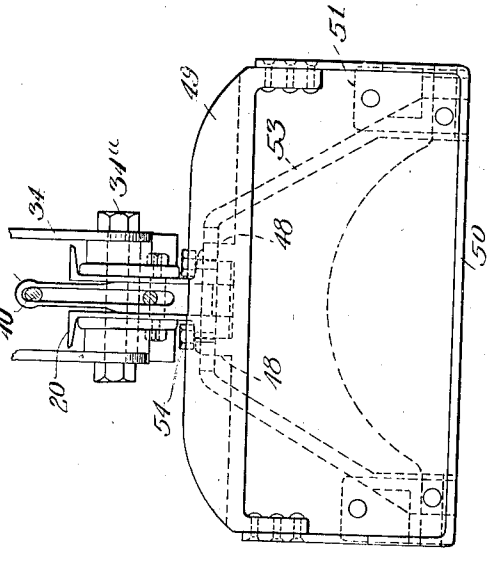


Fig. 7

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1,543,838

UNITED STATES PATENT OFFICE.

JOHN G. FOGARTY, OF ROCHESTER, NEW YORK, ASSIGNOR OF ONE-HALF TO STANLEY SHEPARD, OF ROCHESTER, NEW YORK.

EXCAVATING MACHINE.

Application filed July 15, 1920. Serial No. 396,349.

To all whom it may concern:

Be it known that I, JOHN G. FOGARTY, a citizen of the United States, residing at Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Excavating Machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of the specification, and to the reference numerals marked thereon.

This invention has to do with excavating machines and, more particularly, with machines of this variety employing a movable boom provided with a scoop or bucket for excavating dirt, gravel, and the like, the chief object of the invention being to provide an improved machine of this character having a simple form of construction comprising but few parts of inexpensive and durable form, and which is convenient to control and rapid in operation. To these and other ends the invention consists in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Figure 1 is a side elevation of an excavating machine embodying the invention.

Figure 2 is an enlarged side elevation of a portion of the boom and bucket.

Figure 3 is an end elevation of the boom and bucket as viewed from the right in Figure 2.

Figure 4 is a section on the line 4^a—4^a of Figure 2.

Figure 5 is a view similar to Figure 2 of a modified form of construction.

Figure 6 is a section on the line 6^a—6^a of Figure 5, and

Figure 7 is an enlarged detail view of a portion of the bucket controlling means shown in Figure 5.

Similar reference characters throughout the several views indicate the same parts.

The embodiment of the invention herein shown and described is intended merely by way of illustration of the principle of the invention and the preferred mode of application thereof and is susceptible of various modifications of the details of construction and mode of operation. The present embodiment illustrates the invention as applied to an excavating machine of a type commonly in use employing a movable boom and bucket or scoop and provides a machine adapted for excavating or digging operations and also for scraping or "skimming" operations for producing a given surface or grade, scraping up loose earth, gravel and the like. Referring to the drawings and more particularly to Figure 1, there is shown an excavating machine having the usual platform 10 on which is carried a steam boiler 11, engine 12, and gearing or other operative mechanism driven thereby and indicated generally at 13 for actuating the various parts. Platform 10 is rotatably supported on a truck 14 provided with wheels which may be suitable for travel either on an ordinary road or railway tracks as may be desired, the operating mechanism 13 having the usual provision well known in the art for rotating the platform on the truck to vary the direction of the boom and direct the operations of the bucket. The platform supports the usual post or mast 15 braced as at 16 and has pivotally supported thereon as at 17 for movement in a vertical plane the boom for carrying the bucket. These parts being old and well known in the art require no further description, and while they form one means in conjunction with which the present invention may be carried out, it is to be understood that the latter may be adapted for use with other excavating machines of the same general character.

In the present instance, the boom, indicated generally at 18, preferably comprises inner and outer sections 19 and 20 respectively arranged for relative telescopic movement, the term telescopic being employed in the present instance to indicate generally an arrangement of the sections by which they may be moved one upon the other to either extend or draw in the outer section on which the bucket is carried for moving the latter longitudinally of the boom. The inner section 19 preferably comprises a pair of spaced channel bars 21 having their flanges 22 turned inwardly, while the outer section 20 comprises similar spaced bars, of smaller size, however, arranged with their flanges turned outwardly, so that the outer section may slide longitudinally of the inner section within the latter. The bars of the

inner section are suitably supported in spaced relation by means of braces 19a while the bars of the outer section are similarly connected and braced by the bolts 20a and other suitable means as found necessary.

The outer ends of the bar of the inner section are preferably formed with reduced projecting portions 25 on which are secured by bolts or rivets bracket arms 26 extending above and below the bars and rotatably supporting at their ends, pairs of rollers 27 engaging the upper and lower flanges of the bars of the outer section for slidably supporting the latter. Similarly the inner ends of the bars of the outer section are provided with projecting brackets 28 on which are rotatably carried pairs of rollers 29 engaging the inner side of the upper and lower flanges on the inner section so that the two sections are provided with spaced roller bearings on each other rigidly supporting the same and permitting longitudinal telescopic movement of the outer section within the inner section.

Means are provided for raising and lowering the boom section as a unit in a vertical plane comprising, in conjunction with the usual cable winding drum 30 on the excavating machine, a cable or fall line 31 passed over a sheave 32 rotatably carried at the top of mast 15 and thence around a sheave 33 rotatably supported by a link or yoke 34 pivotally connected with the outer end of the outer boom section. Cable 31 is then carried back over a sheave 35 rotatably supported at the top of mast 15 and thence to a link or yoke 36 to which it is attached and which is pivotally connected as at 37 to brackets 38 fixed adjacent the outer end of the inner boom section. By this means wher cable 31 is drawn in or paid out the boom is swung vertically and raised or lowered to locate the bucket for the work and to elevate the latter for discharging the material. It is apparent also that the tension of the cable, through its connection with the outer boom section tends to retract the latter and the bucket.

The means for drawing in or retracting and extending the outer boom section for advancing the bucket to excavate or scrape up the material comprises preferably, in conjunction with the usual power operated winding drum 39 of the excavating machine, a digging line or cable 40 wound thereon and passing downwardly around a sheave 40a rotatably supported concentric with the pivotal center of support 17 of the boom, from which the cable passes over a sheave 41 rotatably supported at the outer end of the inner boom section. The cable is then carried downwardly around a sheave 42 rotatably supported between the inner ends of the bars of the outer section whence the cable is carried over an idler sheave 44 and forwardly over a sheave 45 rotatably carried between the outer ends of the bars of the outer section. The outer end of the cable, passing downwardly over sheave 45, is fixed to a keeper 46 pivotally supported at 47 between upstanding lugs 48, Figure 3, on a bracket 49 bridging the forward upper end of the bucket indicated at 50 and riveted at its end to the sides of the latter. As shown, the bucket is open at its top and forward end and the latter is suitably formed for scraping up the material. Keeper 46 is preferably arcuate in shape so as to conform to a portion of the periphery of sheave 45 and is provided at its upper end with an eye through which cable 40 is passed, the keeper being also grooved as shown in Figure 3 to provide a suitable seat for the cable. Bucket 50 has fixed on either side at its rear end bearing brackets 51 pivotally connected as at 52 with the lower ends of an arching bracket 53 secured by means of bolts 54 to the flanges of the boom section. The bucket is thus pivotally supported at its rear end for swinging movement on the section and at its forward end by the cable so that it is raised and disposed in the substantially horizontal excavating position shown in the drawings when the cable is drawn taut and in a substantially vertical dumping position, when cable 40 is paid out for discharging the material through the open front end of the bucket. When the cable is drawn taut however, the bucket is swung upwardly about its pivot until bracket 49 contacts with the bottom of the section and the curved keeper 46 is partially hooked over sheave 45 and held in such relation by the cable to aid in sustaining the weight of the bucket in this relation the cable is in effect, through the keeper, fixed to the outer boom section. The bucket is thus held in its excavating position as shown in the drawing. With the bucket in this position further winding in of cable 40 on drum 39 brings an outward pressure to bear on sheave 42 at the inner end of the outer section thereby forcing the latter outwardly and advancing the bucket to scrape up the material. Suitable stops (not shown) are provided to limit the outward movement of the section and a stop 55 limits its inward movement by engagement with the outer end 25 of the inner section. Since cable 40 passes over its sheave at the center of pivotal support of the boom, the latter may be raised or lowered vertically by the means described without affecting the tension of cable 40 or disturbing the position of the bucket or relation of the boom sections.

The outer boom section is moved telescopically inward by the force of gravity when the boom is elevated by the fall line and in fact the tension of the fall line ap-

plied to the telescoping boom section serves to retract the latter and the bucket whenever released by slackening off the digging line 40 and by releasing a locking means which will now be described. Secured between the bars of the outer section by means of the bolts 20ª, and serving also to space and support the latter on each other, is a bar 56 the lower edge of which is adjacent the bottom of the section and formed with rearwardly inclined ratchet teeth 57 with which is adapted to engage a locking dog 58 pivotally supported on bracket arms 26 and having pivotally connected thereto as at 59, a substantially triangular frame 60, which is also supported on bracket arm 26 concentrically with the dog. Pivotally secured to the other corner of frame 60 is a push rod 61 passing loosely through an eye 62 on the boom and provided adjacent the latter with a head portion 63 to which is pivotally connected a rod 64. A spring 65 coiled about rod 61 between eye 62 and head 63 normally urges dog 58 into engagement with ratchet bar 56. Rod 64 extends adjacent the inner end of the boom and is pivotally connected at 66 with a lever 67 pivotally supported at 68 on a bracket on the boom and having a handle 69 extending upwardly over platform 10 by means of which the locking dog may be moved out of engagement with the ratchet bar on the boom. By means of this construction the outer boom section may be locked against inward telescopic movement, and when the outer end of the boom has been elevated and cable 40 paid out to discharge the contents of the bucket, locking dog 58 may be withdrawn from the ratchet bar on the outer section by means of handle 69 so that the outer section slides inwardly within the inner section to retract the bucket. It is obvious from this construction also that under some conditions of operation the locking dog 58 may be held inoperative as by means of handle 69 and the boom section 20 and bucket held extended by tension maintained on the digging line, by braking or otherwise holding its drum 39, until it is desired to dump the bucket. The slackening of the digging line then allows the bucket to dump and releases the same and the outer boom section for inward telescopic movement to initial digging position. Thus the outer section may be moved in either direction as desired and a single cable serves to forcibly extend the outer boom section to excavate the material while at the same time automatically controlling the disposition of the bucket as required for operation. With the locking dog held inoperative, the outer boom section and bucket may be advanced and retracted and elevated for dumping by merely manipulating the fall and digging lines, and by holding the fall line, as by braking or otherwise holding its drum 30, the bucket may be advanced to dig and then retracted by merely drawing in and paying off the digging line alone which causes the bucket to describe an arcuate path elevated at its outer end as convenient for dumping into a vehicle. By manipulating both the fall and digging lines, the bucket may be caused to describe any desired path for either digging or scraping operations, and dumping, and manipulation of the digging line alone causes the bucket to describe an arcuate path as stated, for digging and dumping the bucket, as useful, for example, in digging into the side of a bank, especially in view of the simplicity of control. It is to be noted that in this embodiment the bucket extends in advance of the end of the boom so that the latter does not interfere with such operations for example as digging into a bank.

In Figures 5, 6 and 7 is shown a modified form of construction in which the bucket is slidably supported on a unitary boom by means of a trolley device instead of by a telescopic boom section and in this modification also a single cable serves both to move the bucket longitudinally of the boom and to dispose the same in position for either excavating the material or discharging the same therefrom. In the modification the boom comprises spaced channel bars 70 having their flanges turned outwardly. Rolling on the upper side of the lower flanges are rollers 71 rotating on trunnions 72 carried by a trolley device comprising arms 73 extending above and below the boom and attached at their lower ends to side bars 74. The latter carry bolts 75 on which is pivotally supported at the top of its rear end the bucket 77 which as before is open at its top and front end. The forward ends of bar 74 carry a roller 78 over which is adapted to engage the upper hooked end of a member 79 pivoted at 80 on lugs 81 on a bar 82 extending across the upper forward end of the bucket and secured to the sides thereof. The hooked portion 83 of member 79 is inclined upwardly so that when released from support it will tend to slide off roller 78 and release the forward end of the bucket so that the latter may swing to a vertical position about its pivot and discharge its contents, this action of member 79 being assisted if desired, by a suitable counterweight 84ª attached thereto. Member 79 has a projection 84 extending under roller 78 and to this portion of the member is attached the forward end of a cable 85 passing upwardly over a sheave 86 rotatably carried between the outer ends of the boom bars from whence the cable passes rearwardly along the boom over suitable guiding means and to the winding drum. It is apparent from this construction that elevation of the outer end

of the boom by means of a suitable cable 87, and paying out of cable 85 permits the bucket to first swing to vertical discharging position and then to roll inwardly of the boom, while winding in of the cable serves to raise the bucket to excavating position as shown in the drawings so that member 79 engages over roller 78 and serves to support the bucket in such position as long as the cable is maintained taut. Continued winding in of the cable then forces the bucket outwardly of the boom to excavate the material.

A means is provided in this modification also for locking the bucket against movement longitudinally of the boom, comprising a locking bar 88 extending longitudinally of the boom and provided with slots 89 embracing bolts 90 which guide the bar for a slight vertical movement and also serve to brace the channel bars of the boom on each other. The lower edge of locking bar 88 rests on a plurality of cam rollers 91 eccentrically and rotatably supported by trunnions 92 in bearing openings in the channel bars. Fixed to each cam roller is an arm 93 extending upwardly and having pivotally connected to its upper end a pull rod 94 carried by suitable connections to the platform 10. Movement of bar 94 inwardly of the boom turns cam rollers 91 and forces bar 88 upwardly so that its upper edge is brought into clamping engagement with a frame 95 secured as by means of bolts 96 to the upper ends of arms 73 of the bucket trolley, thereby locking the bucket in adjusted position on the boom. The operating bar 94 may of course be spring actuated if so desired, and it is apparent from the construction described that, with the bucket thus locked in adjusted position adjacent the outer end of the boom, the latter may be elevated and cable 85 slackened to allow the bucket to discharge its contents after which the bucket may be unlocked and allowed by further paying out of cable 85 to slide by gravity inwardly along the boom. When cable 85 is then drawn inwardly the bucket is raised and secured in excavating position on the boom and is moved outwardly of the latter to scrape up the material.

The operation of the invention has been described in connection with the explanation of the construction. The invention is capable of application to various types of excavating machines and the preferred form, by reason of the location of the bucket or shovel on the outer end of the boom, as well as the construction and arrangements for operating the same, affords the combination in a single apparatus of both a shovel for general excavating work and a scraping bucket or skimmer for leveling a surface to grade. By reason of its simplicity the cost of manufacture is small. The arrangement and operation of the parts, while securing the above advantages, affords also a mechanism which is convenient to handle and rapid and effective in operation.

I claim as my invention:

1. In an excavating machine, the combination of a mast, a longitudinally extensible boom supported for vertical and horizontal swinging movements, a bucket on said boom, a fall line connecting said mast and boom and adapted primarily to effect vertical swinging movement of the latter, a digging line connected with the boom for primarily effecting extensible movement thereof and adapted conjointly with said fall line to control the movements of said boom in a vertical plane, and power operated means for actuating said lines.

2. In an excavating machine, the combination of a mast, a boom supported for vertical and horizontal swinging movements and for longitudinal reciprocating digging movement, a bucket on said boom, a cable carried by said mast and connected with said boom for swinging the latter vertically and effecting reciprocating movement thereof in one direction, a second cable extending longitudinally of said boom for effecting reciprocating movement thereof in the other direction, and means for actuating said cables.

3. An excavating machine comprising a mast, a boom constructed of telescoping sections one of which is supported for vertical and horizontal swinging movements and the other for reciprocating digging movement on the first section, a bucket on said other boom section, a cable carried by said mast and connected with said other section, and arranged to swing the boom vertically, a second cable connected with said other section and arranged to reciprocate the same, and means for actuating said cables to effect digging movement of said boom and bucket.

4. An excavating machine comprising a frame, an inner boom section supported for vertical and horizontal swinging movements on said frame, an outer boom section having a reciprocating digging movement on said inner section, a bucket adjacent the outer end of said outer section, a fall line connected with said outer section, a digging line extended along said inner section and connected with the outer section for reciprocating the latter, and means for actuating said lines to effect digging movement of said boom sections and bucket.

5. A combined excavating shovel and skimmer comprising a frame, a mast thereon, an inner boom section supported on the frame for vertical and horizontal swinging movements, an outer boom section provided with a bucket and telescopically supported and guided on the inner section for reciprocating excavating and skimming move-

ments, a fall line carried by said mast and connected with said outer section, a digging line carried by said inner section and connected with said outer section, and power operated means for actuating said lines to effect digging and skimming movements of said boom and bucket.

6. A combined excavating shovel and skimmer comprising a frame, a mast thereon, an inner boom section constructed of a pair of beams connected in spaced relation and supported on said frame for vertical and horizontal swinging movements, an outer boom section telescopically supported and guided between the beams of said inner section for reciprocating excavating and skimming movements, bucket means adjacent the outer end of said outer section adapted to be disposed in either material retaining or dumping position, a fall line carried by said mast and connected with said outer section, a digging line carried by said inner section and connected with said outer section through attachment to said bucket means, and means for actuating said lines to effect excavating and skimming movements of said boom and bucket and coincidently controlling disposition of said bucket means in either material retaining or dumping position.

7. In an excavating machine, the combination of a mast, a boom supported for vertical and horizontal swinging movements and for longitudinal reciprocating digging movement, a bucket on said boom, a fall line carried by said mast and connected with said boom, a digging line carried longitudinally of said boom for effecting reciprocating movement thereof, means for actuating said lines, and locking means for releasably securing said boom against reciprocating movement.

8. An excavating machine comprising a boom having telescopic sections, a bucket on one of said sections adapted to be disposed for either excavating material or dumping the same therefrom, and a common means for effecting relative telescopic movement of the boom sections and also said excavating and dumping dispositions of the bucket.

9. An excavating machine comprising a boom having telescopic sections, a bucket on the outer one of said sections adapted to be disposed for either excavating material or dumping the same therefrom, and a cable arranged to effect relative telescopic movement of the boom sections and also said excavating and dumping dispositions of the bucket.

10. An excavating machine comprising a boom having telescopic sections, a bucket on the outer one of said sections adapted to be disposed for either excavating material or dumping the same therefrom, a cable arranged to effect relative telescopic movement of the boom sections and also said excavating and dumping dispositions of the bucket, and locking means on said sections for securing the same in adjusted position against relative telescopic movement.

11. An excavating machine comprising a boom having telescopic sections, a bucket pivotally supported on the outer of said sections, and a cable arranged on said sections to effect telescopic movement thereof and connected with said bucket to control the movement thereof about its pivotal support.

12. An excavating machine comprising a boom having telescopic sections, a bucket supported on the outer of said sections for movement to excavating and dumping positions, sheaves on the outer end of the inner of said sections and on both ends of the outer of said sections, and a cable arranged on said sheaves to effect extensional telescopic movement of said sections and connected with said bucket to effect said excavating and dumping movements thereof.

13. An excavating machine comprising a boom supported for vertical and horizontal swinging movements and formed of telescopically movable sections, a bucket supported on the outer of said sections for movement to excavating and dumping positions, cable guiding means on said sections, a cable on said guiding means arranged to effect extensional telescopic movement of the sections, and connected to said bucket to effect said excavating and dumping movements thereof, and releasable locking means for securing said sections against contractional telescopic movement.

14. An excavating machine comprising a boom having telescopic sections, a bucket supported on the outer of said sections for movement to excavating and dumping positions, a connecting element movably attached to said bucket and adapted for supporting engagement with the boom, a cable arranged on the boom to effect telescopic movement of said sections and extended over the outer end thereof and connected with said element to effect said excavating and dumping movements of the bucket, said element being brought by said cable into supporting engagement with the boom upon excavating movement of the bucket, and releasable locking means for securing said boom sections against telescopic movement.

15. An excavating machine comprising a boom having telescopic sections, a bucket on the outer one of said sections adapted to be positioned for either excavating material or dumping the same therefrom, a device for holding the bucket in excavating position, and a common means for effecting relative telescopic movement of the boom sections and controlling movement of the bucket to said excavating or dumping positions and controlling said holding device.

16. An excavating machine comprising a boom having telescopic sections, a bucket on the outer one of said sections adapted to be positioned for either excavating material or dumping the same therefrom, a device for holding the bucket in excavating position, a common means for effecting relative telescopic movement of said boom sections and controlling movement of the bucket to either excavating or dumping position and controlling said holding device, and mechanism for securing said boom sections against telescopic movement after adjustment.

17. In an excavating machine, the combination of a mast, a boom supported for vertical and horizontal swinging movements and for longitudinal reciprocating digging movement, a bucket means pivotally supported on said boom, a fall line carried by said mast and connected with said boom, a digging line carried longitudinally of said boom and secured thereto through connection with said bucket means for pivotally actuating the latter and reciprocating said beam, and locking means for releasably securing said beam against reciprocating movement.

18. An excavating machine comprising an inner boom section supported for vertical and horizontal swinging movements, an outer boom section supported and guided on said inner section for reciprocating digging movement, a bucket on said outer section, a fall line connected with said outer section, a sheave adjacent the outer end of said inner section, a digging line carried over said sheave and thence inwardly of the boom and connected with the outer section to effect outward reciprocating movement thereof, and means for actuating said lines to effect digging movements of said outer section and bucket.

19. A combined excavating shovel and skimmer comprising a frame, a mast thereon, an inner boom section supported on the frame for vertical and horizontal swinging movements, an outer boom section provided with a bucket and telescopically supported and guided on the inner section for reciprocating excavating and skimming movements, a fall line carried by said mast and connected with said outer section, a sheave adjacent the outer end of said inner section, a digging line carried over said sheave and thence rearwardly of the boom and connected with said outer section to effect outward reciprocating movement thereof, and means for actuating said lines to effect digging movements of said outer section and bucket.

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