July 14, 1925. 1,545,805

T. K. WHITE

TRENCH FORMING MACHINE

Filed April 8, 1925 3 Sheets-Sheet 1

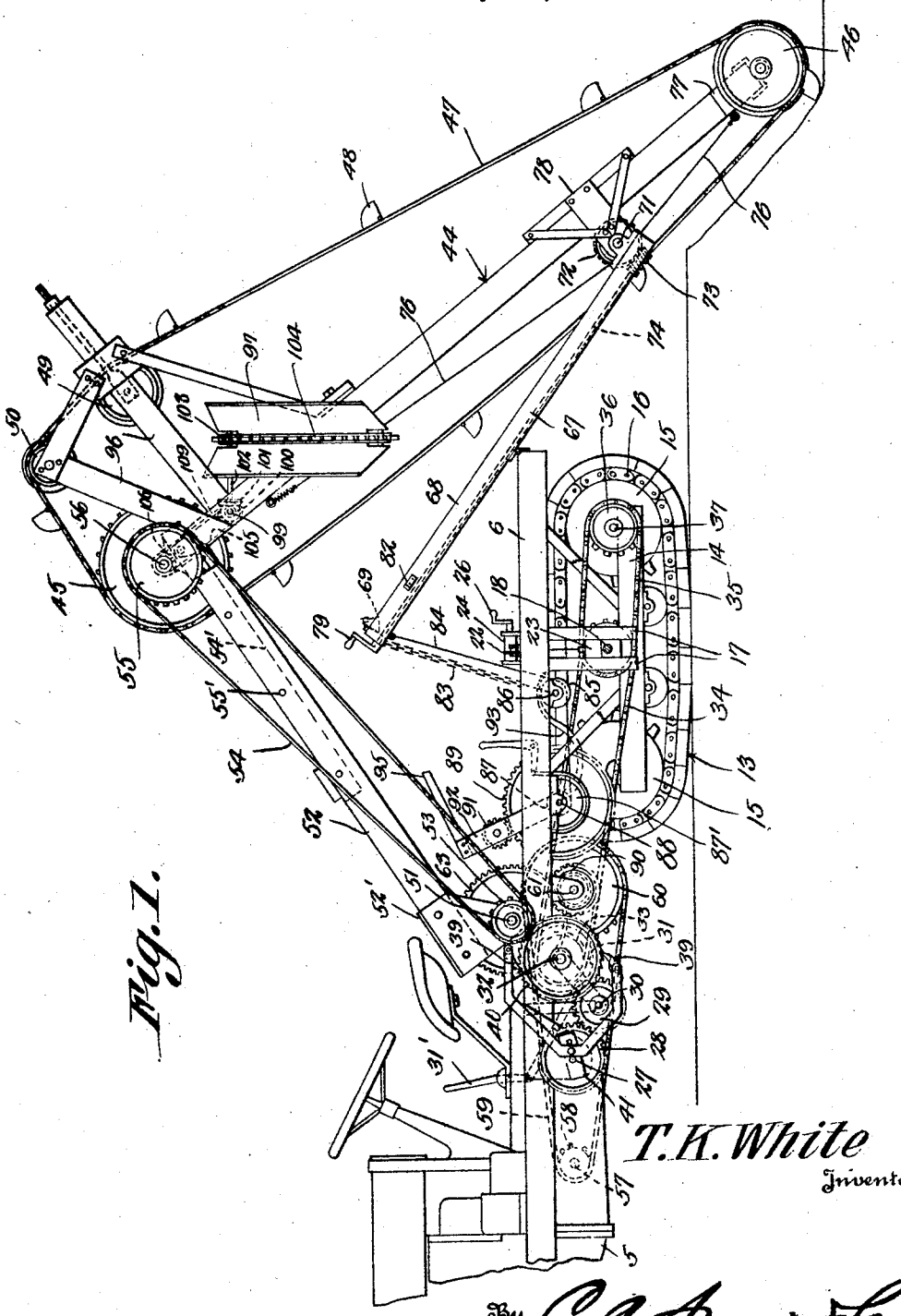


Fig. 1.

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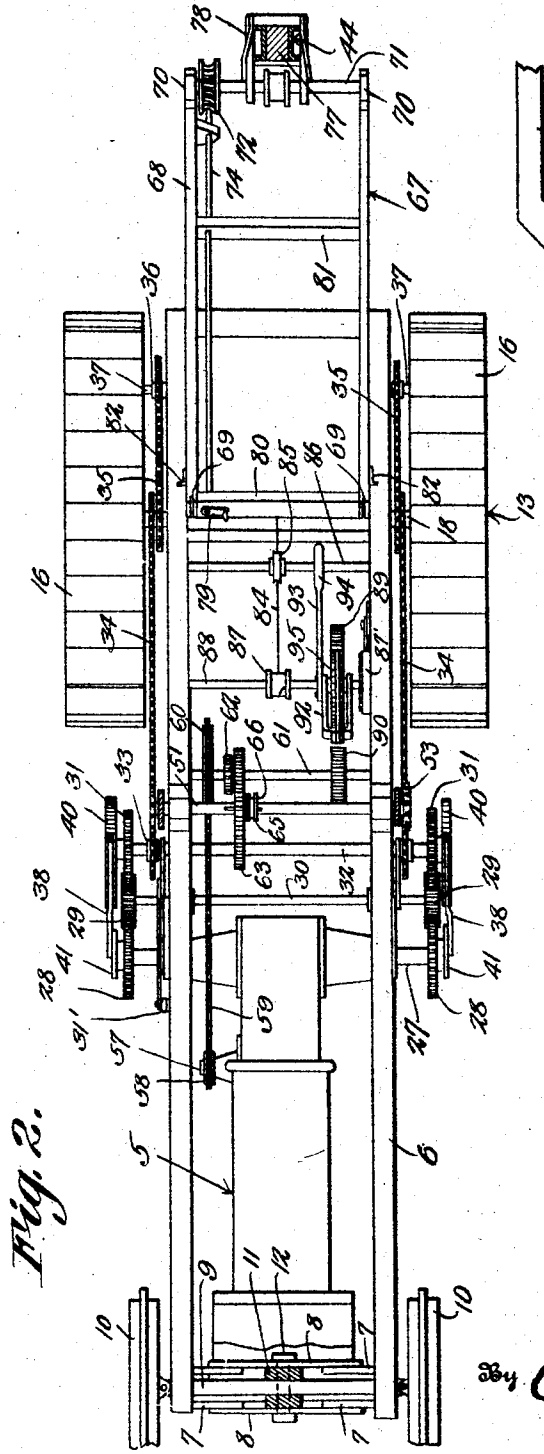


Fig. 2.

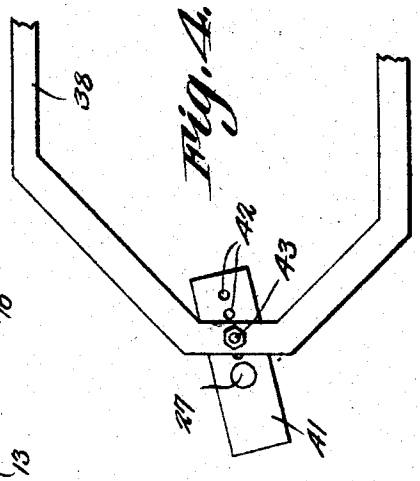


Fig. 4.

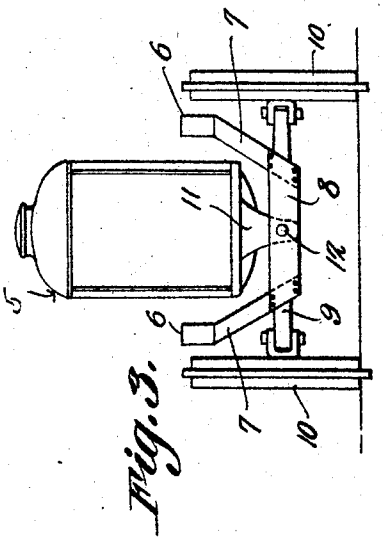


Fig. 3.

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TRENCH FORMING MACHINE

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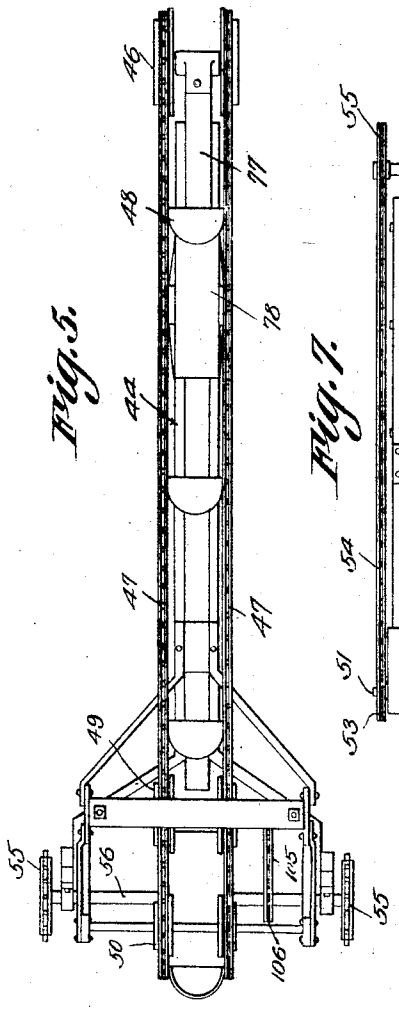


Fig. 5.

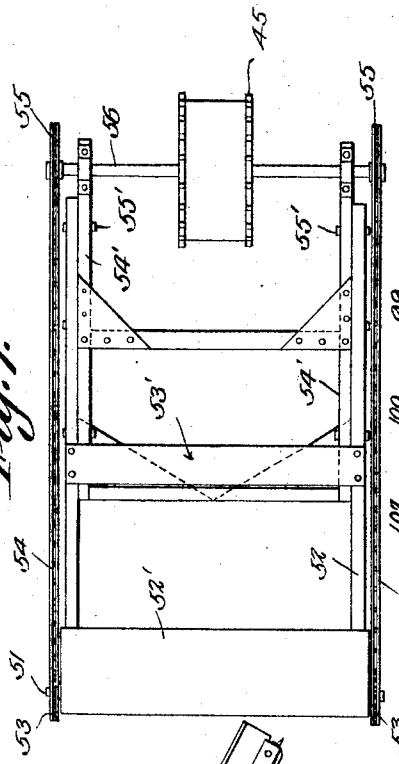


Fig. 7.

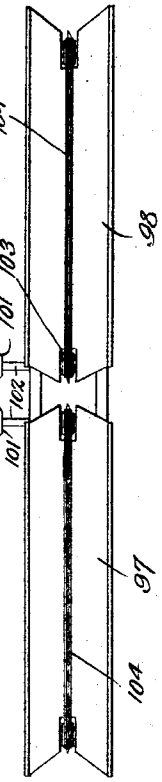


Fig. 8.

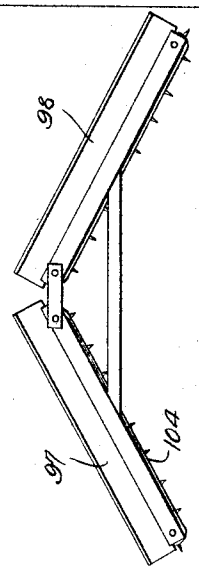


Fig. 6.

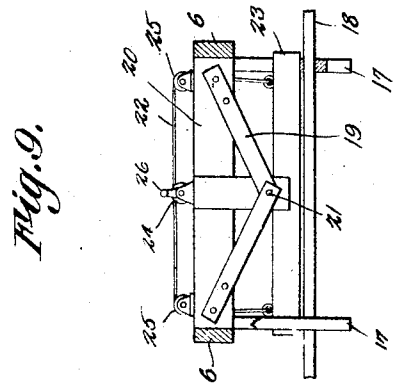


Fig. 9.

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Patented July 14, 1925. 1,545,805

UNITED STATES PATENT OFFICE.

THOMAS KENNEDY WHITE, OF HURON, SOUTH DAKOTA.

TRENCH-FORMING MACHINE.

Application filed April 8, 1925. Serial No. 21,633.

To all whom it may concern:

Be it known that I, THOMAS K. WHITE, a citizen of the United States, residing at Huron, in the county of Beadle and State of South Dakota, have invented a new and useful Trench-Forming Machine, of which the following is a specification.

This invention relates to trench or ditch forming machines, the primary object of the invention being to provide an adjustable boom acting as a support and carrier for the scoops forming the digging elements of the machine.

Another object of the invention is to provide means for gradually advancing the machine to its work as the scoops are operated to accomplish the digging result.

A still further object of the invention is to vary the speed at which the machine is being advanced, adapting the machine for use in digging trenches in hard or soft soil and at widely differing depths.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed, may be made within the scope of what is claimed, without departing from the spirit of the invention.

Referring to the drawings:

Figure 1 is a side elevational view of a trench forming machine constructed in accordance with the invention.

Figure 2 is a plan view thereof.

Figure 3 is a front elevational view illustrating the manner of securing the machine to a tractor to permit the machine to operate on side hills.

Figure 4 is a detail view illustrating the pawl supporting member and method of adjusting the movements of the pawl supporting member.

Figure 5 is a plan view of the boom and scoops supported thereby.

Figure 6 is an elevational view illustrating the chutes for receiving the material dug by the scoops.

Figure 7 is an enlarged detail view illustrating the adjustable boom guiding and supporting frame.

Figure 8 is a plan view of the chutes.

Figure 9 is a sectional view through the frame of the machine, illustrating the manner of adjusting the frame.

Referring to the drawings in detail, the reference character 5 indicates a tractor which is of the usual construction and on which the machine, forming the essence of the present invention is mounted.

The machine includes side bars 6 which are relatively long and have their forward ends connected to the bars 7 that extend downwardly and are connected by means of the bars 8 secured to opposite sides of the bars 7.

The bars 8 provide a housing for the axle 9 that in turn supports wheels 10. Forming a part of the tractor is a depending member 11 supplied with an opening to accommodate the bolt 12 that passes through the bars 8 to pivotally support the tractor body with respect to the axle to allow the axle to be adjusted permitting the device to operate on side hills.

The rear end of the machine is supported by the creeper sections 13 that embody spaced bars 14 provided with axles on which the sprockets 15 are mounted, the sprockets acting as supports for the endless track sections 16, so that when the track sections 16 are operated, the machine will be moved forwardly over the ground surface.

Mounted on the side bars 6 of the frame, are spaced depending bars 17 that are arranged on opposite sides of the axle 18, brace bars 19 being provided and secured to the bar 20 of the machine frame to brace the machine frame. These bars 19 have their inner ends connected at 21 so that a tilting movement of the frame with respect to the axle 18 will be permitted.

As clearly shown by Figure 9 of the drawings, the cable 22 has connection with the bar 23 mounted above the axle 18 and connected therewith, the central portion of the cable being formed into a loop passed around the drum 24, the intermediate portions of the cable passing over the idle pulleys 25. A crank handle 26 is formed at one end of the shaft on which the drum 24 is mounted so that upon rotation of the handle, the drum will be rotated, to move the cable 22 thereover in such a way that one end of the member 23 and shaft 18 will be elevated, while the opposite end is low-

ered, thereby compensating for grades to permit the machine to be efficiently operated on side hills.

The reference character 27 indicates the usual power axle of a tractor, which shaft is supplied with gears 28 at its ends, which gears are adapted to mesh with gears 29 mounted at the ends of the swinging shaft 30, which shaft is actuated by means of the lever 31′ disposed adjacent to the operator's seat. The gears 29 are constantly in mesh with gears 31 carried at the outer end of shaft 32 and when moved into engagement with gear 28, transmit rotary movement of the shaft 27 to the intermediate units on shaft 32 through the gearing. Adjacent to the ends of the shaft 32 are sprockets 33 rigidly connected to gears 31 over which the chains 34 operate, the chains also passing over sprocket wheels mounted on the axle 18 which in turn transmits movement to the endless track sections 16, to cause the machine to be moved forwardly when it is desired to move the machine from place to place.

Cooperating with the chains 34 are chains 35 that operate over sprockets secured to the shaft 18. The latter chains also pass over the sprockets 36 mounted on the shaft 37 to the end that rotary movement is also imparted to shaft 36.

Eccentrically mounted at the ends of shaft 27 are arms 38 that carry pivoted pawls 39 at their outer ends, which pivoted pawls are adapted to engage the ratchet wheels 40 so that as the shaft 27 rotates, the pawls will be moved over the ratchet wheels to rotate the ratchet wheels with a step by step movement. It will be obvious that due to this construction, the three wheels which are clamped together and move freely on shaft 32 will be rotated in such a way as to feed the machine forwardly at intervals.

The arms 38 have adjustable connection with the plates 41 which are provided with a plurality of openings 42 that accommodate the bolts 43 to permit of such adjustment to the end that the throw of the arms may be adjusted causing the ratchet wheels 40 to be moved various distances.

The plates 41 have openings to accommodate pins carried on the ends of the shaft 27. Adjustably mounted on the frame is the boom 44 which is supplied with sprocket wheels 45 at one end and sprocket wheels 46 at the opposite end thereof, which sprocket wheels provide supports for the endless chains 47 to which the scoops 48 are secured, the chains 47 also operating over idle pulleys 49 and 50 to the end that the chains are held taut at all times. Pulley 50 serves the further purpose of sharply breaking the direction of motion of chain 47 to the end that an automatic cleaner in scoop 48 be operated or that a loosely pivoted scoop 48 be given a sudden flip which will throw the contents down into the chute 97.

Pivotally mounted on or around the shaft 51 is a boom guiding and supporting frame, the upper end of which is pivotally connected to the top of the boom so that this frame and the boom are mutually supporting when the boom is in digging position, that includes side bars 52 connected at their lower ends by the bar 52′. An auxiliary frame indicated at 53′ forms a part of the guiding and supporting frame and includes side bars 54′ that are formed with openings adapted to register with openings formed in the side members of the frames to receive bolts 55′ so that the frame 53′ may be adjusted longitudinally of the boom guiding and supporting frame providing a further adjustment of the boom.

Sprocket wheels 53 are mounted on the shaft 51 over which sprockets the chains 54 operate, which chains also move over sprocket wheel 55 mounted on head shaft 56, to transmit movement thereto which shaft also supports sprockets 45 to rotate therewith.

The power shaft of the tractor is indicated at 57 and supports the sprocket 58 over which the chain 59 operates, the chain 59 also operating over the sprocket 60 that is mounted on the shaft 61 to impart rotary movement thereto. Thus it will be seen that the shaft 61 is continuously operating. Gear wheel 62 is mounted on shaft 61 and is adapted to transmit rotary movement to the shaft 51 through the relatively large gear wheel 63 that may be splined on the shaft 51 but is preferably connected to shaft 51 by a spring release catch or clutch which cushions the pull on chain 47 and releases on overload. When the gear wheel 63 is splined on the shaft it may be moved into and out of mesh with gear wheel 62 by means of a lever provided with a forked extremity not shown and which operates between the flanges 65 of the clutch operating member 66.

Pivotally mounted at the rear end of the bars 6 is a supporting and adjusting member 67 which is elongated and includes spaced side bars 68 formed with slots 69 at their inner ends, the outer ends thereof supporting bearings 70 in which the shaft 71 operates, the shaft 71 which carries most of the weight of the boom, thus giving the machine a desired resiliency, also acting as a support for the gear 72 that meshes with the worm 73 mounted on one end of the shaft 74 so that upon rotary movement of the shaft 74, the gear 72 will be rotated to rotate the shaft 71. Pulley 75 is also mounted on the shaft 71 and accommodates the cable 76 that is looped therearound, which cable has its lower end connected with

the slidable beam 77 of boom 44 and its upper end connected to boom 44 by a spring, so that as the shaft 71 is rotated, and cable 76 wound on the drum 75, the boom will be slid longitudinally through the bearing member 78 pivotally mounted at one end of the supporting and adjusting member 67.

A handle 79 is provided on the upper end of the shaft 74 and affords means whereby the operator may rotate shaft 74 for accomplishing the rotation of worm 73. The inner ends and central portions of the bars 68 are held in spaced relation with each other by means of the bars 80 and 81 respectively so that the strain directed to the machine while it is in operation, will be distributed throughout the length of the bars 68. Stops 82 may be provided on the bars 68 and engage the bars 52 to restrict downward movement of the upper end of the guiding member.

Secured to the bars 6 are chains 83, which may be secured within the slots 69 to hold the supporting and adjusting member 67 in predetermined positions of adjustment and relieve the cable employed for moving the supporting member, of undue strain.

The cable for moving the supporting member is indicated at 84 and operates under the idle pulley 85 mounted on the shaft 86, from where it passes to the drum 87 to be wound thereon, the drum 87 being however mounted on the shaft 88 supported in suitable bearings formed in the bars 6. Brake 87' retards movement of drum 87. Gear wheel 89 is mounted on the shaft 88 and is adapted to receive motion from the shaft 61 through the gear wheel 90 and gear wheel 91, the latter gear wheel being supported by the swinging arms 92 so that it may be thrown downwardly into mesh with the gear 90.

In order that the downward movement of the upper end of the supporting member 67 will be restricted, a curved arm 93 is provided and bolted to one of the arms 92, the curved arm having a widened portion 94 formed at its free end to be engaged by the bar 80 of the supporting member 67 when the bar 80 is moved downwardly, to the end that as the arm 93 is moved downwardly, the gear wheel 91 is moved to its inactive position or out of mesh with the gear wheel 90. An operating arm 95 is carried by the arms 92 and affords means whereby an operator may throw the gear 91 into and out of operation at will. If it is desired to dig to a greater depth than can be reached by the boom as shown additional links and bucket may be inserted in chain 47, and the slidable beam 77 may be slid out telescopically and bolted to the desired position with relation to boom 44 and additional length of cable 76 inserted to accommodate the new relation; or, if necessary, a longer sliding beam 77 can be substituted.

From the foregoing it will be obvious that due to the construction shown and described, the boom 44 may be operated at various angles and depths with respect to the surface in which a trench is being dug, thereby permitting unlimited use of the device as a ditching machine.

Supported by the boom and arranged under the frame 96 are chutes 97 and 98 which are inclined at oblique angles with respect to the bars 6, and which are disposed transversely of the machine, so that material delivered to the chutes 98 will be delivered laterally of the machine or at points adjacent to the upper edge of the trench under construction.

A transversely disposed shaft 99 is supported at the upper end of the boom and carries beveled pinions 100 which are in mesh with beveled pinions 101 carried at the inner ends of the shafts 102, the shafts 102 also supporting sprockets 103 over which the endless conveyors 104 that move through the central portions of the chutes, operate.

Rotary motion is transmitted from the shaft 56, to the shaft 99, through the chain 105, sprocket 106 and sprocket 107 carried by the shaft 99.

I claim:—

1. An excavating machine comprising a wheel-supported frame, adjustable means for supporting the frame and adapted to hold the frame in a horizontal plane, a supporting member, a vertically adjustable boom having pivotal connection with the supporting member, a guiding member, said supporting member being pivotally supported at one end of the frame, said guiding member being supported at one end of the supporting member, means for swinging the supporting member to adjust the boom vertically with respect to the ground surface, means for maintaining the boom in a vertical plane, an endless chain of scoops operating over the boom, and means for operating the scoops.

2. An excavating machine comprising a wheel-supported frame, pivoted supporting bars mounted on the frame, a boom, a supporting and adjusting member pivotally mounted on the frame, a guide pivotally mounted at one end of the supporting and adjusting member and through which the boom operates, an endless chain of scoops mounted on the boom, manually controlled means for adjusting the boom through the guide, power actuated means for operating the supporting and adjusting member to swing the boom to its inactive position, and means controlled by the movement of the supporting adjusting member for automatically restricting movement of the supporting and adjusting member.

3. An excavating machine comprising a wheel-supported frame, swinging support-

ing members mounted on the frame, a sliding boom pivotally connected with the upper ends of the upper supporting and guiding members, a supporting and adjusting member pivotally supported under the boom and carrying a guide through which the boom operates, means for moving the adjusting and supporting member to adjust the boom with respect to the ground surface, and means for locking the adjusting member against movement.

4. An excavating machine comprising a wheel-supported frame, a boom having a plurality of scoops operating thereover, a supporting and adjusting member having a guide through which the boom operates, a cable supporting the boom and a cable having rigid connection with the lower end of the boom and spring connection with the upper end, a drum on which the cable is wound, means for operating the drum to raise and lower the boom through its guide, means for operating the supporting and adjusting member to raise and lower the boom and guide, and means for operating the scoops.

5. An excavating machine comprising a wheel-supported frame, a boom, an endless chain of scoops operating over the boom, an adjusting and supporting member having a guide through which the boom operates supported at one end of the frame, said adjusting and supporting member adapted to tilt to adjust the boom, a pulley, a cable having connection with the forward upper end of the supporting member and adapted to be wound on the pulley, arms carrying a gear adapted to transmit rotary movement to the pulley, an arm connected with the first mentioned arms and lying in the path of downward travel of the upper or forward end of the supporting member.

6. An excavating machine comprising a wheel-supported frame, a boom, an endless chain of scoops operating over the boom, a boom guiding and supporting frame having pivotal connection with the boom at the inner end thereof, a pivoted supporting member mounted at one end of the frame, a bearing member adjustably supported at the outer end of the pivoted supporting member and through which the boom operates, means carried by the pivoted supporting member and cooperating with the boom for sliding the boom through the bearing member, and means for raising and lowering the pivoted supporting member to regulate the depth of operation of the scoops.

7. An excavating machine comprising a wheel-supported frame, a boom, means for pivotally supporting the inner end of the boom, a supporting member pivotally supported by the frame, means at the outer end of the pivoted supporting member for receiving and guiding the boom, means carried by the supporting members for regulating the angle of operation of the boom, a chain carried by the frame, a securing member cooperating with the chain and adapted to engage a portion of the chain to lock the supporting member against movement, and an endless chain of scoops operating over the boom.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

THOMAS KENNEDY WHITE.

Witnesses:

J. L. ANDERSON,

FERN CLARK.