

No. 710,223.

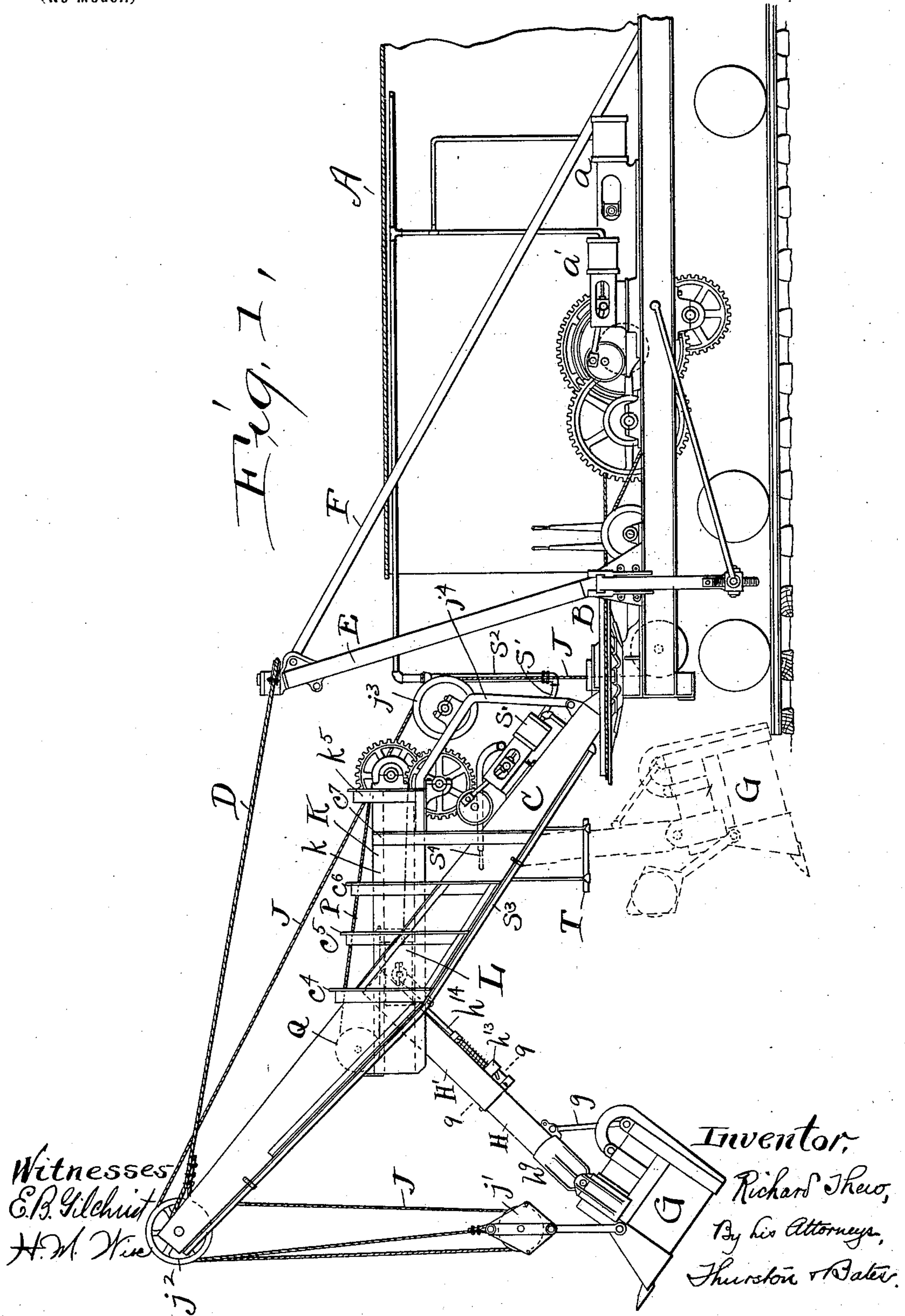
Patented Sept. 30, 1902.

R. THEW.
POWER SHOVEL.

(Application filed June 10, 1901.)

(No Model.)

3 Sheets—Sheet 1.

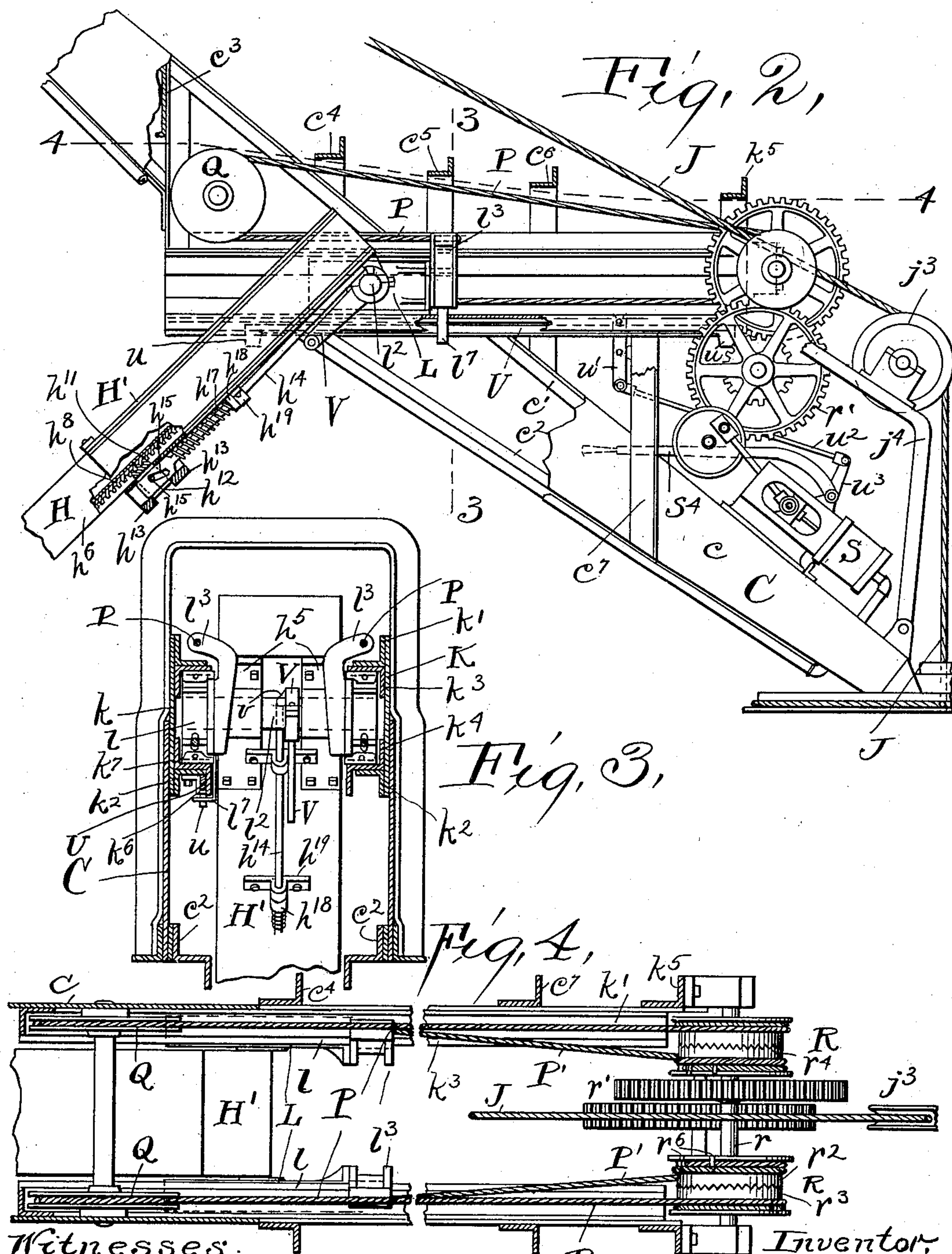


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3 Sheets—Sheet 2.



Witnesses.
E. B. Gilchrist
H. M. Wise

Inventor,
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By his Attorneys,
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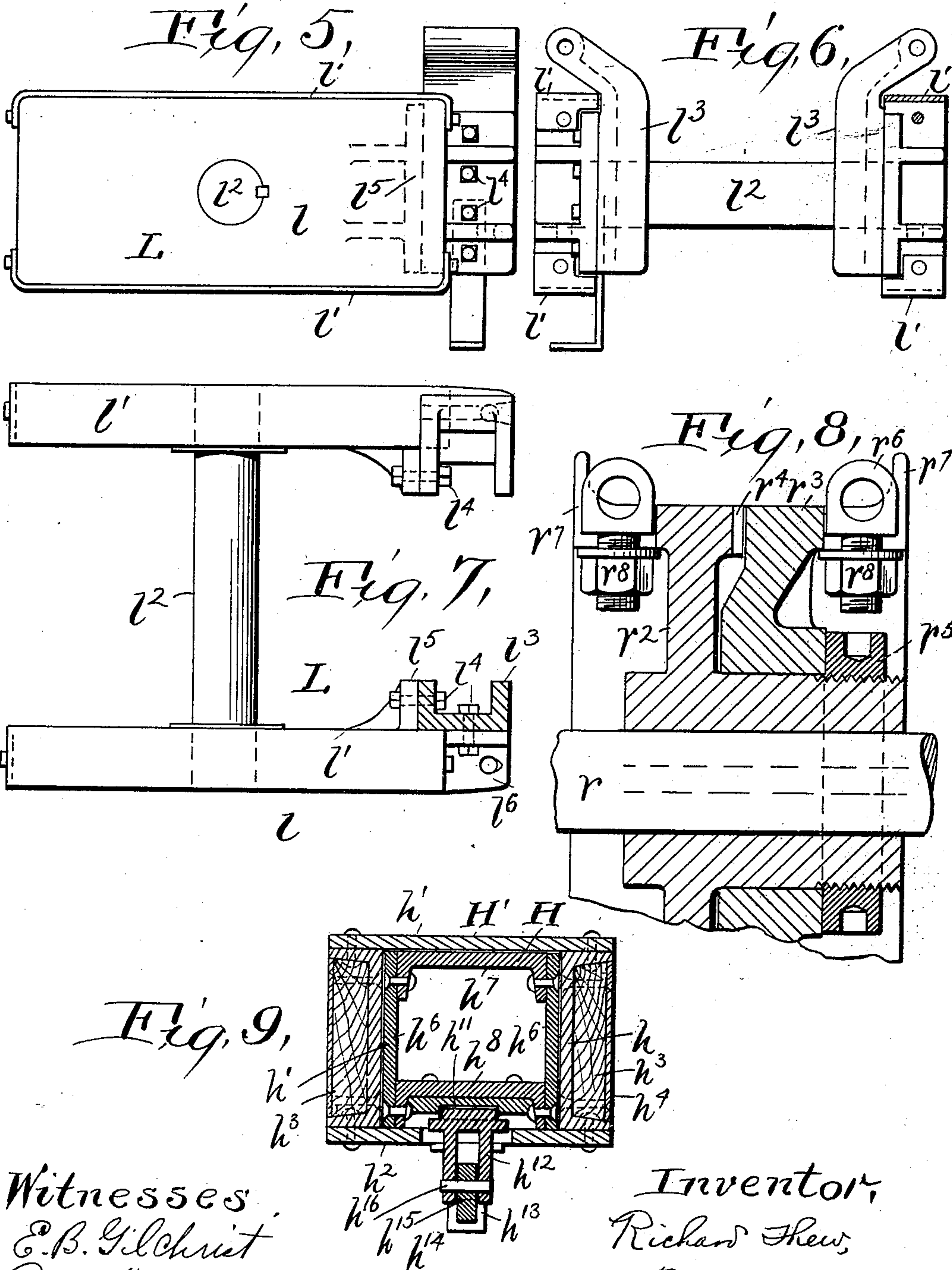
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3 Sheets—Sheet 3.



Witnesses
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UNITED STATES PATENT OFFICE.

RICHARD THEW, OF LORAIN, OHIO, ASSIGNOR TO THE THEW AUTOMATIC SHOVEL COMPANY, OF LORAIN, OHIO, A CORPORATION OF OHIO.

POWER-SHOVEL.

SPECIFICATION forming part of Letters Patent No. 710,223, dated September 30, 1902.

Application filed June 10, 1901. Serial No. 63,930. (No model.)

To all whom it may concern:

Be it known that I, RICHARD THEW, a citizen of the United States, residing at Lorain, in the county of Lorain and State of Ohio, have invented a certain new and useful Improvement in Power-Shovels, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of this invention is to provide a power-shovel (whether operated by steam, electricity, or otherwise) with a boom swinging independently of the body of the machine and carrying a substantially horizontal trackway, along which the upper end of the dipper-arm may be caused to travel in and out. Such a construction allows the hoisting and crowding motions to be exerted in the most efficient directions, keeps the bucket in the most advantageous position, so that its cutting edge is effectively taking hold without its heel wasting force by rubbing against the excavation, permits the absolute leveling and cleaning of an extended floor-space, as well as providing for the removal of the greatest possible amount of material.

The invention consists, broadly, of a swinging boom carrying a trackway combined with a trolley movable therein and a bucket-arm pivoted to the trolley, as hereinafter more fully explained.

Other features which contribute to the efficiency of operation as well as to simplicity and cheapness of construction are included within my invention and will also be hereinafter explained, and set out in the claims.

The drawings clearly disclose my invention embodied in a steam-shovel.

Figure 1 is a side elevation thereof, the part of the car occupied by the boiler being broken away. Fig. 2 is an enlarged side elevation, partly sectional, of the lower portion of the boom, the trolley-track, and the upper end of the bucket-arm. Fig. 3 is a vertical section through the trolley-track, being on the line 3 3 of Fig. 2. Fig. 4 is a horizontal section through such track, being on the line 4 4 of Fig. 2. Fig. 5 is a side elevation of the trolley. Fig. 6 is an end elevation thereof

looking from the right of Fig. 2, and Fig. 7 a plan thereof. Fig. 8 is a vertical central section of one of the racking-drums. Fig. 9 is a cross-section of the dipper-arm, being on the line 9 9 of Fig. 1.

The same letters of reference designate the same part in each figure.

As shown in the drawings, A represents what may be called the "body" of the steam-shovel. It is really a railway-car supported on two trucks and carrying the furnace and boiler (not shown) and the engines $a a'$ for operating the hoisting-cable and for rotating the boom, as well as for moving the car along the track, there being suitable valves for controlling these engines; but these features, being no part of the present invention, need not be described in detail.

At the forward end of the car is the rotatable table B, from the periphery of which a suitable cable runs to the winding-drum of the engine a' . From this table extends diagonally upward the boom C. This boom is supported at its upper end by a tension member, as the cable D, which leads to a point directly over the center of the table B. This point is at the junction of the struts E with the tie F, which lead from the two bolsters of the car. The inner end of the cable D is secured by a rotatable sleeve, so that the boom may be rotated as desired by turning the table B.

The bucket or dipper G is secured to the dipper-arm H H', to be hereinafter described, and is supported by the hoisting-cable J, secured to the tackle-block j' and passing around the sheave therein and the sheave j^2 on the extreme end of the boom and the guide-sheave j^3 near the rear end, passing down axially through the table B and around a drum driven by one of the engines $a a'$. The bucket is thus adapted to be elevated without regard to the position the boom may occupy.

I will now describe those features wherein my invention particularly resides. The boom C is preferably built of metal and has two parallel side plates c extending from one end of the boom to the other and held apart at the lower end by a suitable distance-block (not shown) and at the upper end by the axle

of the sheave j^2 and intermediately by the horizontal trackway K, which lies between the plates of the boom. The edges of the plates c are strengthened by interior angle-strips c' above and **Z**-strips c^2 along the lower edge. These **Z**-strips form also guides for the dipper-arm H' . The boom is braced internally by the cross channel member c^3 , Fig. 2, and externally by the arches $c^4 c^5 c^6$. These arches are made of angle-iron shape and are riveted to the outer side of the boom and pass up over the trackway K. There are also a pair of braces c^7 , of angle-iron, riveted to the boom and the trackway K. The plates of the boom are thus very efficiently braced, making a rigid and at the same time light structure, which is open along its lower side to allow the swinging of the dipper-arm at the lower portion and at the upper portion to allow the cable J to run to the dipper, whatever its position.

The horizontal trackway K consists of a built-up structure made of a pair of side plates k , the angle-strips $k' k^2$ at the upper and lower edges thereof, and the angle-strip k^3 and the **Z**-strip k^4 within these two outer angle-strips. These plates k are suitably held by being riveted to the plate c of the boom, between which they pass, and the arches $c^4 c^5 c^6$, the braces c^7 , and the rear arch k^5 , to all of which they are riveted. This presents a rigid horizontal trackway defined by the angle k^3 and the **Z**-bar k^4 , the space between these members being open above and below. Slidable within the trackway is the trolley L. (Shown in detail in Figs. 5, 6, and 7.) It consists of the two castings l , which are faced above and below by rubbing-strips l' , on which they slide between the angle-bars k^3 and the **Z**-bars k^4 , being rigidly held together by the axle l^2 , on which the bucket-arm is journaled. To the rear end of the castings l are bolted the blocks l^3 , to which the ends of the upper racking-cables are secured, the bolts being indicated by l^4 and passing through flanges l^5 on the rear ends of the castings l into flanges on the blocks l^3 .

The racking is shown as accomplished by means of two pairs of cables, each in two reaches (designated P and P', respectively.) The former or upper of these are secured to the blocks l^3 near their upper ends and pass forward over guide-sheaves Q and then back onto the upper side of the winding-drums R. The cables P' are secured to the webs l^6 of the castings l and pass to the under side of the winding-drums R. Each of these cables, therefore, has one end secured to the trolley and the other end to one of the winding-drums R, whereby the two cables operate as an endless cable, and the trolley is shifted back and forth, according as the drums are rotated in one direction or the other.

The drums R in operation are rigid on a shaft r , which is connected by suitable gearing r' with a motor S, suitably supported on the boom C. To provide for taking up slack

in the cables P P', the drums R are preferably made in two parts, which may be adjusted with reference to each other. Thus, as shown in Figs. 4 and 8, there is one part of the drum R, as r^2 , which is rigid on the shaft r , while the other part, as r^3 , may turn on the hub of the part r^2 . Normally the two parts are locked together by intermeshing teeth r^4 in the two parts, the teeth being held in engagement by the lock-nut r^5 , screwing onto the hub and bearing against the part r^3 . The cables are locked at their ends to the two parts of the drum by suitable means, that shown being an eye r^6 , occupying a notch r^7 in the edge of the drum and being adapted to be drawn inward by the nuts r^8 , screw-threaded onto the stem of the eyes and bearing against the inner periphery of the flange of the drum. There are preferably two of these eyes to each portion of the drum, and the cable passes through them and they bite it sufficiently to hold it securely to the drum. When the cable becomes slack from use, the nut r^5 is loosened and the portion r^3 of the drum turned in the proper direction to tighten up the cable, whereafter the parts are again locked in place by the nut r^5 .

As stated, the racking of the trolley is caused by a motor S, suitably supported on the boom. This motor may be a steam-engine receiving its steam through a flexible hose s' , leading to a supply-pipe s^2 , which is supported as nearly as practicable axially with the table B. The drawings show an exhaust-pipe s^3 for this engine S, running along the under edge of the boom and discharging at the upper end thereof. A suitable lever s^4 , grasped by the attendant standing on the platform T, carried by the boom, furnishes convenient means for operating the engine.

It is desirable to have automatic means for shutting off the engine S when the trolley reaches the limit of its movement at either end. This is provided by the shiftable bar U, supported by clips k^6 on the under side of the angle-strip k^2 at one side of the trackway. This bar has at each end depending lugs, which are adapted to be engaged by an arm l^7 , depending from the trolley. Thus as the trolley reaches either extremity of its movement this arm impinges one of the lugs u , shifting the bar U in one direction or the other. This bar is connected by a rock-lever u' and the link u^2 with a rocker-arm u^3 , which is secured to the valve of the engine S. This valve referred to may be of any suitable construction. It is so arranged that when it is shifted in the direction to drive the trolley forward the bar U is thereby shifted rearward, so that when the arm l^7 impinges the forward end of this bar the valve is thereby returned to its off position. When the valve is shifted in the opposite direction to reverse the trolley, the bar U is thereby shifted forward, so that when the arm l^7 impinges the rear stop on this bar the valve is again brought to its normal position. Thus if the

attendant who is operating the racking movements neglects to shut off the engine S no harm is done.

In order to make the bucket-arm of adjustable length, I make it of two telescoping members H H'. As shown most clearly in Fig. 9, the member H' is built up of a pair of channel-shaped beams h , facing outward, and a pair of plates h' h^2 , riveted thereto. To make the members smooth on the outside and further strengthen them, the spaces between the channels are filled with wooden beams h^3 , surfaced on the outside by plates h^4 , these parts being held in place by suitable bolts or rivets. Near the upper end of the dipper-arm on the back side are bolted the eye members h^5 , which take around the axle l^2 of the trolley, pivoting the bucket-arm thereto.

The lower member H of the bucket-arm is a built-up hollow construction consisting of the two side plates h^6 h^6 and the two channel-bars h^7 h^8 , the former of which faces inward and the latter outward. This arm H has at its lower end a ferrule or shoe h^9 , by which it is pivoted to the bucket G. The bucket is locked rigid with the arm, however, by the brace g . At its upper end the arm H lies within the arm H'. The two are normally locked together by a rack h^{11} , secured to the arm H within the channel-space of the channel h^8 , and the dog h^{12} , which meshes with this rack and is held between lugs h^{13} , secured to the back side of the member H'. Slidably held within these lugs and guided by them is the lower end of the bar h^{14} , which has an inclined slot h^{15} , across which takes a pin h^{16} , carried by the bifurcated arms of the dog h^{12} . A spring h^{17} , surrounding this bar and compressed between a collar h^{18} thereon and the face of the upper lug h^{13} , tends to move the bar upward until stopped by said collar engaging the stirrup h^{19} , carried by the arm H', through which the bar h^{14} passes. The slot h^{15} is so placed that in normal operation the dog is held thereby in engagement with the teeth, as shown in Figs. 2 and 9, whereby the two parts of the arm operate as one rigid member.

To release the engagement of the dog h^{12} with the rack h^{11} , it is only necessary for the attendant to pull inward the lower end of the arm V, which is journaled on the axle l^2 and carries a lug or nose v , which engages the upper end of the bar h^{14} . Such pull swings this arm on its axis, forcing downward the bar h^{14} , whereby the incline h^{15} withdraws the dog from engagement with the teeth of the rack h^{11} . Thereupon the composite arm lengthens by the weight of the bucket if unsupported on its lower end, or it may be shortened by the drawing in of the winding-cable J if the arm is at the proper angle.

Having described my invention, I claim—

1. In a machine of the general character described, the combination of a diagonal swinging boom, a trackway secured at its forward end directly to the boom and at its rear end

by brackets or braces rising from the boom, a trolley movable along said trackway, and a dipper-arm carried by said trolley, substantially as described.

2. In a machine of the general character described, in combination, a diagonal swinging boom having a pair of separated side plates, a trackway carried by said boom intercepting it and extending rearward therefrom at an angle thereto, said trackway being secured forwardly to the side plates of said boom and supported at its rear by a bracket or brace, a trolley slidable in said trackway, a dipper-arm pivoted to said trolley, and a bucket or scoop on said dipper-arm, substantially as described.

3. In a machine of the general character described, in combination, a diagonal swinging boom, a trackway supported thereby at an angle thereto, a dipper-arm whose upper end is guided by said trackway, an engine carried by said boom, and suitable connections between the same and the upper end of the dipper-arm for racking the same in or out, substantially as described.

4. In a machine of the general character described, a diagonal swinging boom having a pair of parallel separated side plates, a horizontal trackway having also a pair of side plates passing between those of the boom and there riveted, said trackway projecting rearward of the boom on the upper side thereof, braces secured to the boom and the trackway at the rear portion of the latter, a trolley movable in said trackway, a driving-motor supported by said boom, and a racking connection between said motor and trolley, substantially as described.

5. In a machine of the general character described, in combination, a diagonal swinging boom, an intercepting trackway supported thereby at an angle thereto, a trolley guided in said trackway, a dipper-arm pivoted to said trolley, a rotatable drum, and flexible connection between the same and said trolley whereby the rotation of the drum may rack the trolley in or out, and a driving-motor carried by said boom and suitably connected to said drum, substantially as described.

6. In a machine of the general character described, in combination, a metallic boom having a pair of parallel separated side plates, a metallic trackway intercepting the boom at an angle thereto and having side plates riveted to the side plates of the boom, substantially as described.

7. In a machine of the general character described, in combination, a metallic boom having a pair of parallel separated side plates, a metallic trackway intercepting the boom at an angle thereto and having side plates riveted to the side plates of the boom, and brackets or braces connected to said boom and to the trackway for supporting its extending portion, substantially as described.

8. In a machine of the general character described, in combination, a diagonal boom hav-

ing a pair of separated parallel side plates, a trackway also having a pair of separated parallel side plates, the side plates of the trackway passing between those of the boom and being riveted thereto, and angle-strips riveted to the inner side of the side plates of the trackway to form a trolley-track, substantially as described.

9. In a machine of the general character described, in combination, a metallic boom having a pair of parallel separated side plates, a metallic trackway intercepting the boom at an angle thereto and having side plates riveted to the side plates of the boom, and an arched brace passing over the trackway and secured to the sides thereof and to the sides of the boom, substantially as described.

10. In a machine of the general character described, in combination, a metallic boom having a pair of parallel separated side plates, a metallic trackway intercepting the boom at an angle thereto and having side plates riveted to the side plates of the boom and guide-strips on the inner side of the trackway-plates, a trolley slidable upon said strips, and a bucket-arm carried by said trolley, substantially as described.

11. In a machine of the general character described, in combination, a metallic boom having a pair of parallel separated side plates, a metallic trackway intercepting the boom at an angle thereto and having side plates riveted to the side plates of the boom and guide-strips on the inner side of the trackway-plates, a trolley slidable upon said strips, a bucket-arm secured to said trolley, a rotatable drum carried by said trackway, a flexible connection leading from the same in one direction to the trolley, and a flexible connection leading from the drum around a guide-sheave in the opposite direction to the trolley, and means for rotating said drum to move the trolley in or out, substantially as described.

12. In a machine of the general character described, in combination, a diagonal boom, an intercepting-trackway carried thereby at an angle thereto, a trolley in said trackway, a rotatable drum carried at the rear of said trackway, a flexible cable leading from said drum directly to the trolley, and a cable leading from said drum around a sheave at the forward end of the trackway and connected to the trolley, and means for rotating said drum, substantially as described.

13. In a machine of the general character described, in combination, a diagonal boom, an intercepting-trackway carried thereby at an angle thereto, a trolley in said trackway, a rotatable drum carried at the rear of said trackway, a flexible cable leading from said drum directly to the trolley, and a cable leading from said drum around a sheave at the forward end of the trackway and connected to the trolley, said drum being rigid in operation but being composed of relatively adjustable parts, one cable being secured to one part and one to the other, and means for lock-

ing together the two parts of the drum, and means for rotating the drum, substantially as described.

14. In a machine of the general character described, the combination of a diagonal boom having a pair of parallel separated side plates, said boom being open on its under side, a trackway intercepting said boom, a trolley in said trackway, a bucket-arm pivoted to said trolley, and inwardly-projecting bars along the lower edge of the boom which form braces for the boom and guides for said arm, substantially as described.

15. In a machine of the general character described, in combination, a trackway having a pair of parallel side plates, angle-strips riveted to the inner side of the side plates to form a trolley-track, a trolley slidable in said trackway and consisting of a pair of blocks and a connecting-axle, removable rub-plates secured to said blocks, and an arm journaled on said axle, substantially as described.

16. In a machine of the general character described, in combination, a diagonal boom having a pair of separated parallel side plates, a trackway also having a pair of separated parallel side plates, the side plates of the trackway passing between those of the boom and being riveted thereto, angle-strips riveted to the inner side of the side plates of the trackway to form a trolley-track, a trolley slidable in said trackway, a bucket-arm pivoted to said trolley, said trolley consisting of a pair of blocks connected by an axle on which the bucket-arm is journaled and having removable rub-plates on the upper and lower surfaces, substantially as described.

17. In a machine of the general character described, the combination of a boom, a trackway carried thereby, a trolley in said trackway, a dipper-arm secured thereto, driving mechanism, a connection between the same and said trolley to rack the trolley in or out, and an automatic stop engaged at the extreme position of the trolley and connected to shut off the driving mechanism, substantially as described.

18. In a machine of the general character described, the combination of a trackway, a trolley in the same, a driving-motor, a connection between the same and the trolley to rack it in or out, a pair of stops adapted to be engaged by the trolley at opposite ends of its movement, a reversing device for the motor, a connection between the said stops and said reversing device whereby the forward stop is thrown into position to be engaged by the trolley when said device is moved to rack the trolley forward and the rearward stop when said device is moved to rack the trolley rearward, substantially as described.

19. In a machine of the general character described, the combination of a boom, a trackway carried thereby, a trolley in said trackway, a driving-motor, a connection between the same and said trolley to rack the trolley in or out, a reversing device for said motor,

a longitudinally-movable bar carrying a pair of shoulders and connected to said device in such manner that the bar is shifted rearward when the device is moved to rack the trolley forward and vice versa, said shoulders being adapted to be engaged by said trolley and moved thereby to bring the reversing device to the off position, substantially as described.

20. In a machine of the general character described, the combination of a trackway, a trolley slidable along the same, a bucket-arm having a pair of telescoping members, the upper member being pivoted to said trolley, a lock for said members to hold them rigid, and means carried by the trolley and connected to throw said lock, substantially as described.

21. In a machine of the general character described, in combination, a trackway, a trolley therein having a cross-axle, a bucket-arm pivoted on said axle, a telescoping arm adapted to slide within said pivoted arm, a rack on said telescoping arm, a movable pawl carried by the pivoted arm, and a link carried

by the pivoted arm for throwing said pawl, substantially as described.

22. In a machine of the general character described, in combination, a diagonal boom having side plates and open on its under side, a trackway intercepting said boom and having side plates secured to the side plates of the boom, a trolley traveling on the inner side of the trackway, said trolley comprising a pair of blocks and a cross-axle, a hollow bucket-arm journaled on said axle, a telescoping arm within said hollow arm, a bucket carried by said telescoping arm, a lock for locking together the two parts of the bucket-arm, mechanism for operating said lock irrespective of the position of the arm, and mechanism for racking the trolley in or out, substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

RICHARD THEW.

Witnesses:

F. A. SMYTHE,

ALBERT H. BATES.