

No. 797,944.

PATENTED AUG. 22, 1905.

E. F. CRAWFORD.

AUTOMATIC BUCKET LOADER FOR AERIAL TRAMWAYS.

APPLICATION FILED MAR. 28, 1904.

6 SHEETS—SHEET 1.

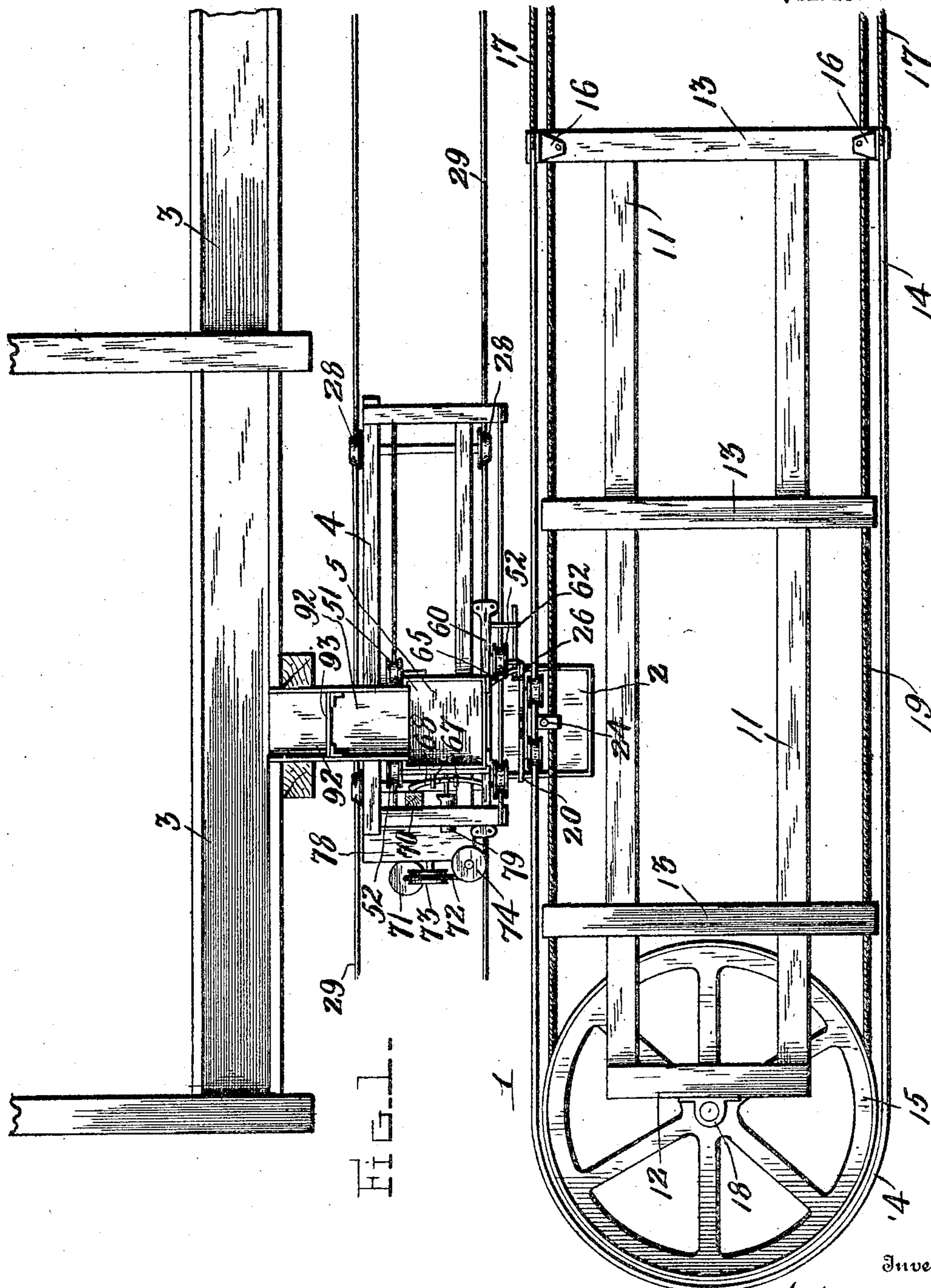


FIG. 1.

Witnesses

for A. Kachl.

E. F. Crawford

Inventor

Emon F. Crawford.

By

A. R. Wilson

Attorney

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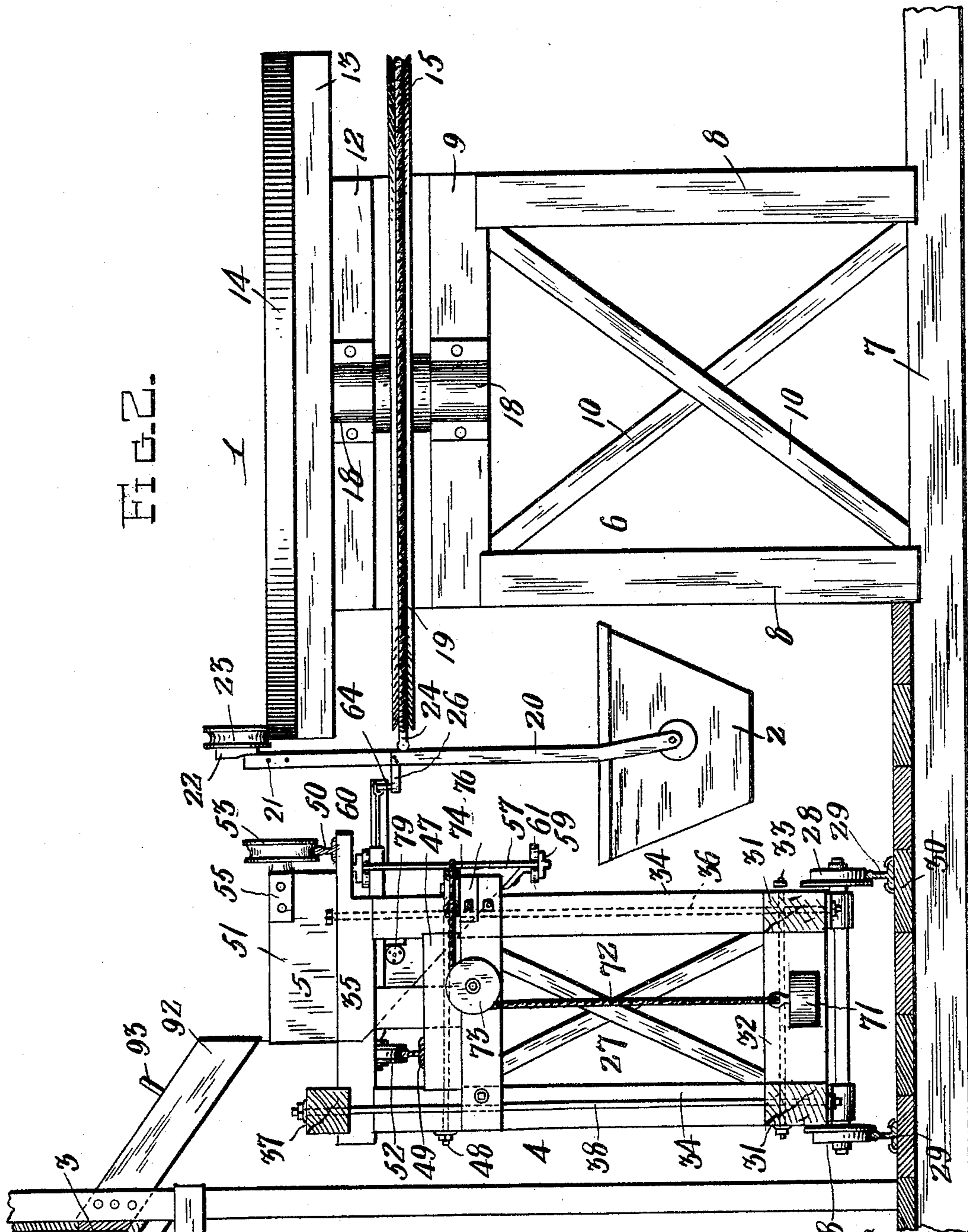


FIG. 2.

Witnesses

Jas. A. Kochl.

Edwin

Enon F. Crawford.

By

A. B. Wilson

Attorney

No. 797,944.

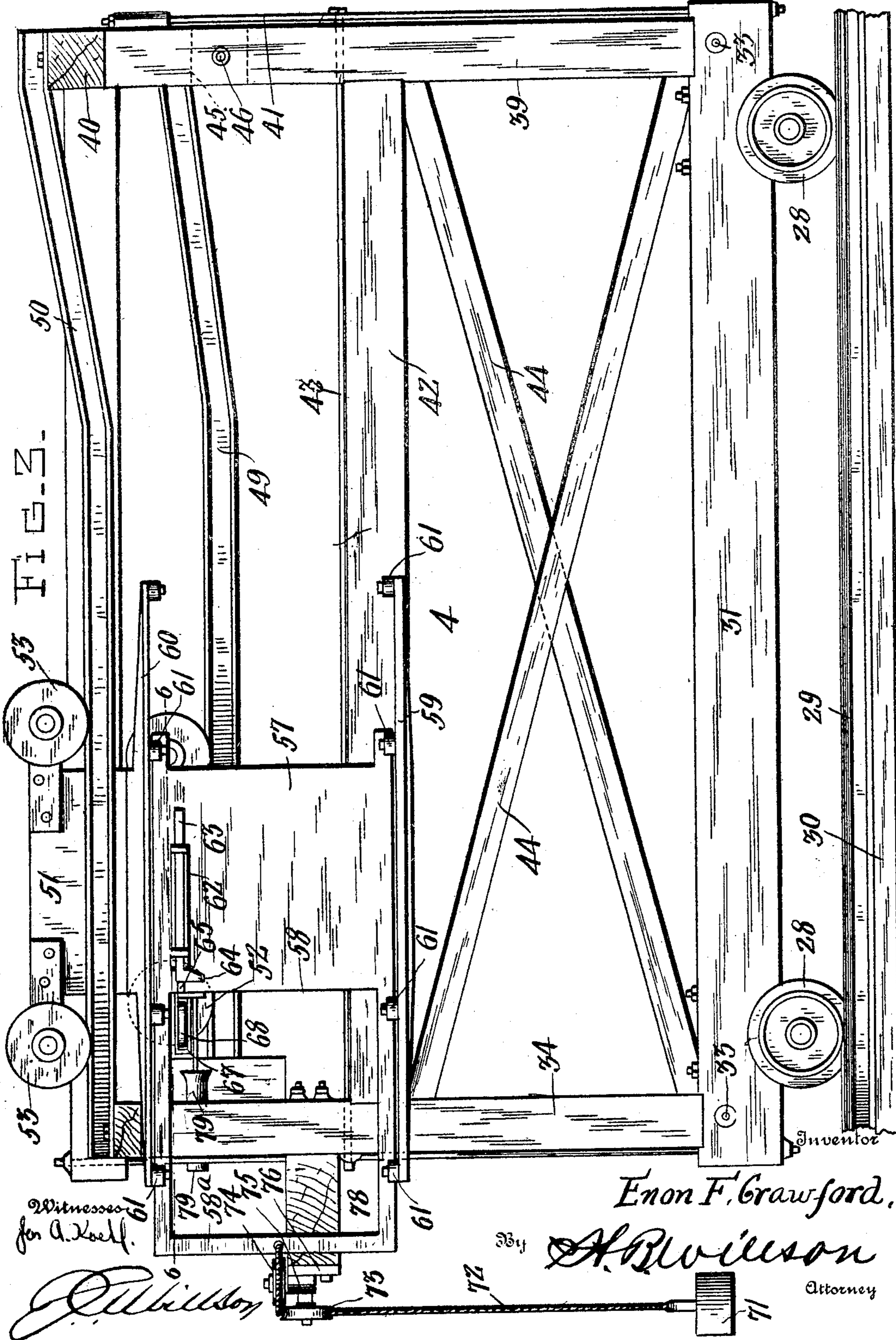
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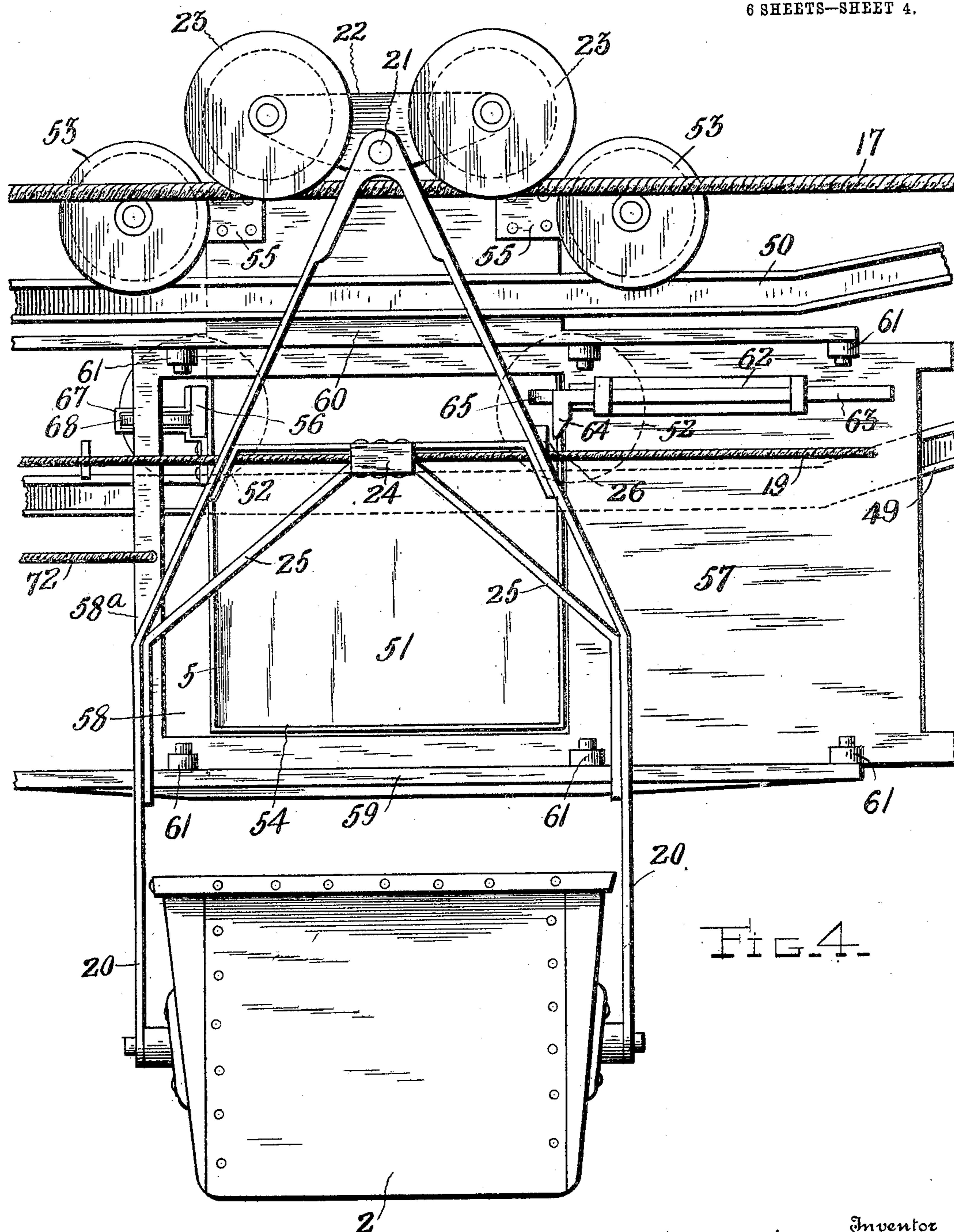


FIG. 4.

Inventor
E. F. Crawford.

Witnesses
for A. Koehl.

E. F. Crawford

By *A. B. Wilson*
Attorney

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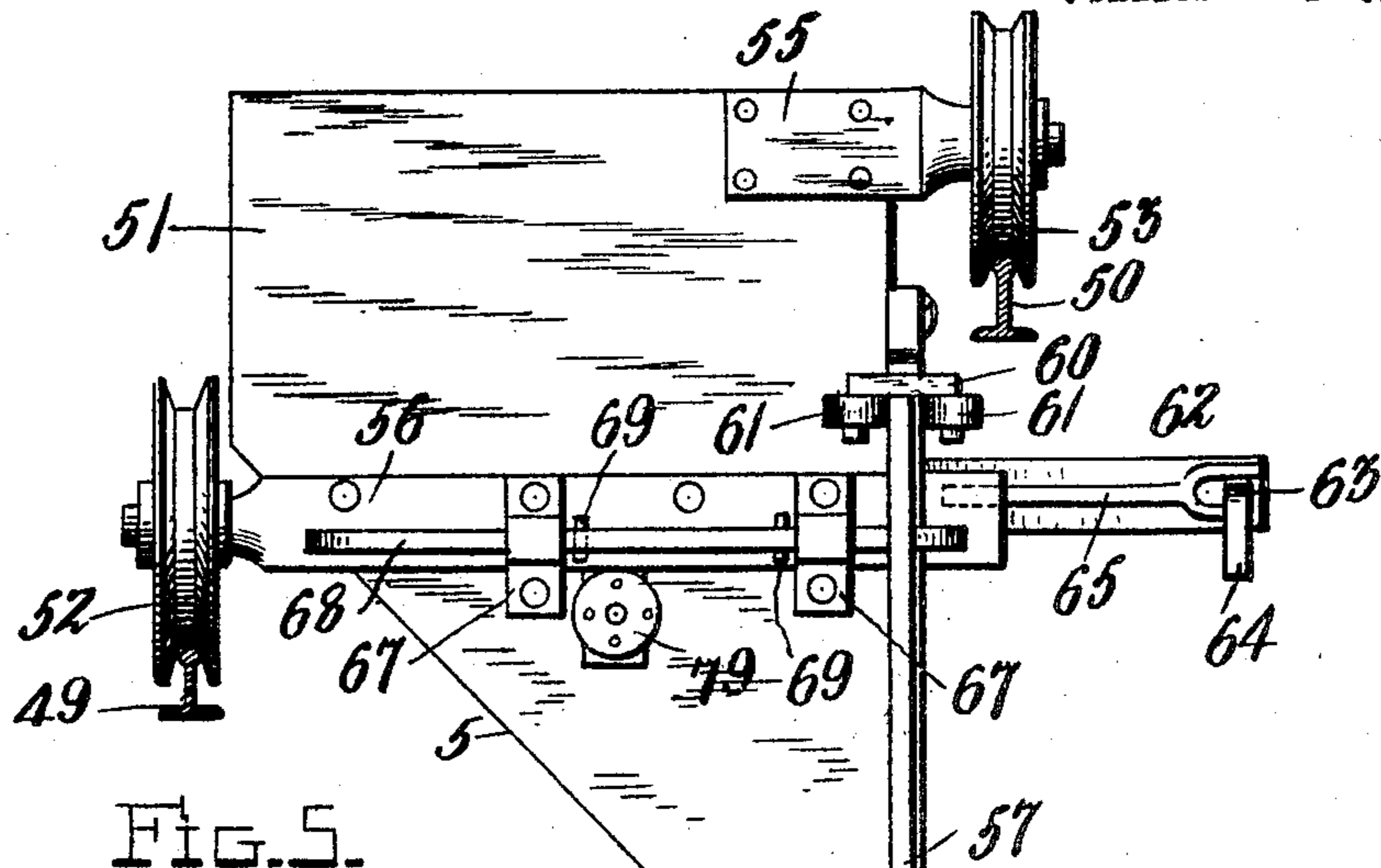
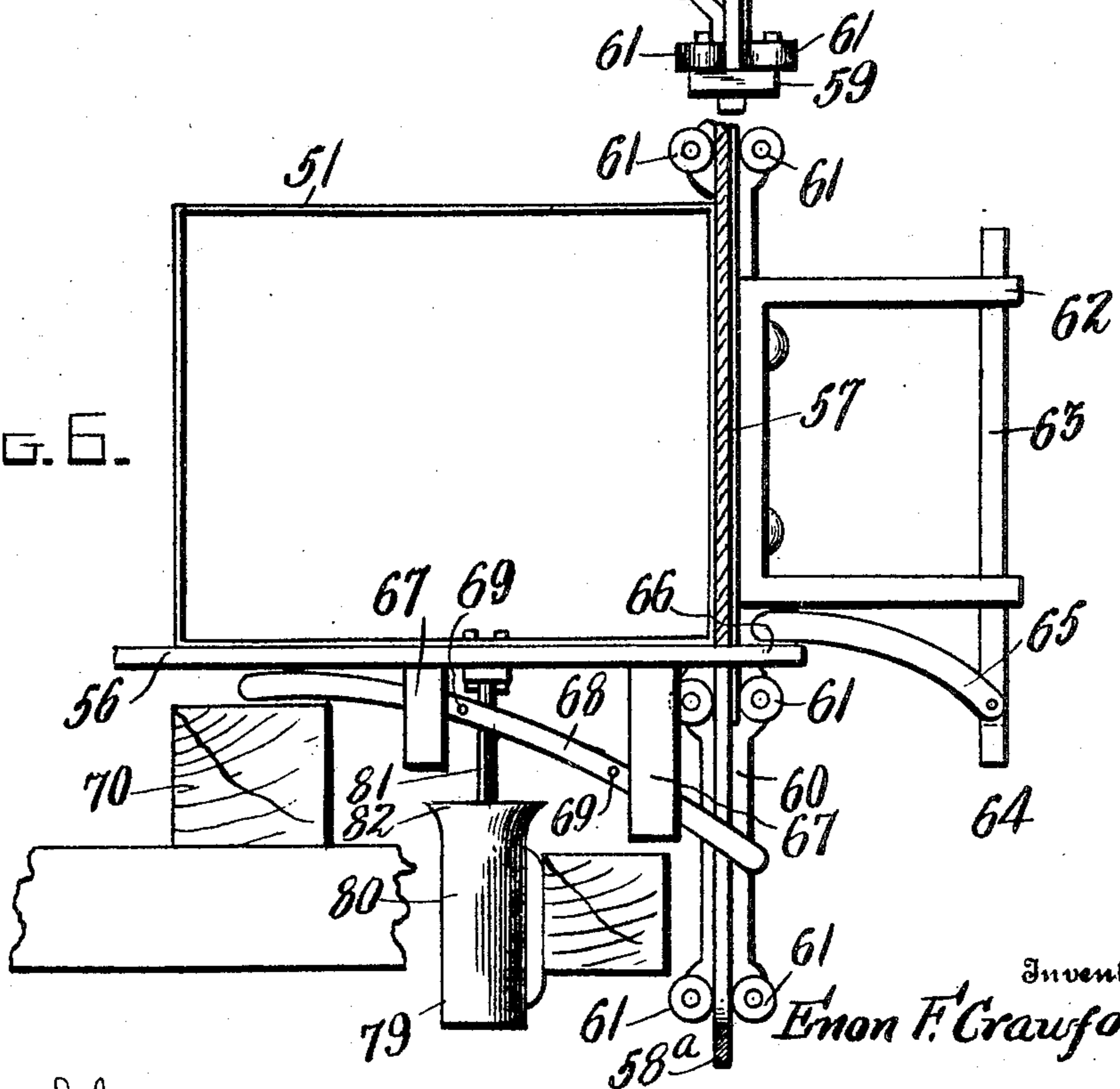


FIG. 6.



Witnesses

Jan A. Koehl.

[Signature]

Inventor

Emon F. Crawford

By

[Signature]

Attorney

No. 797,944.

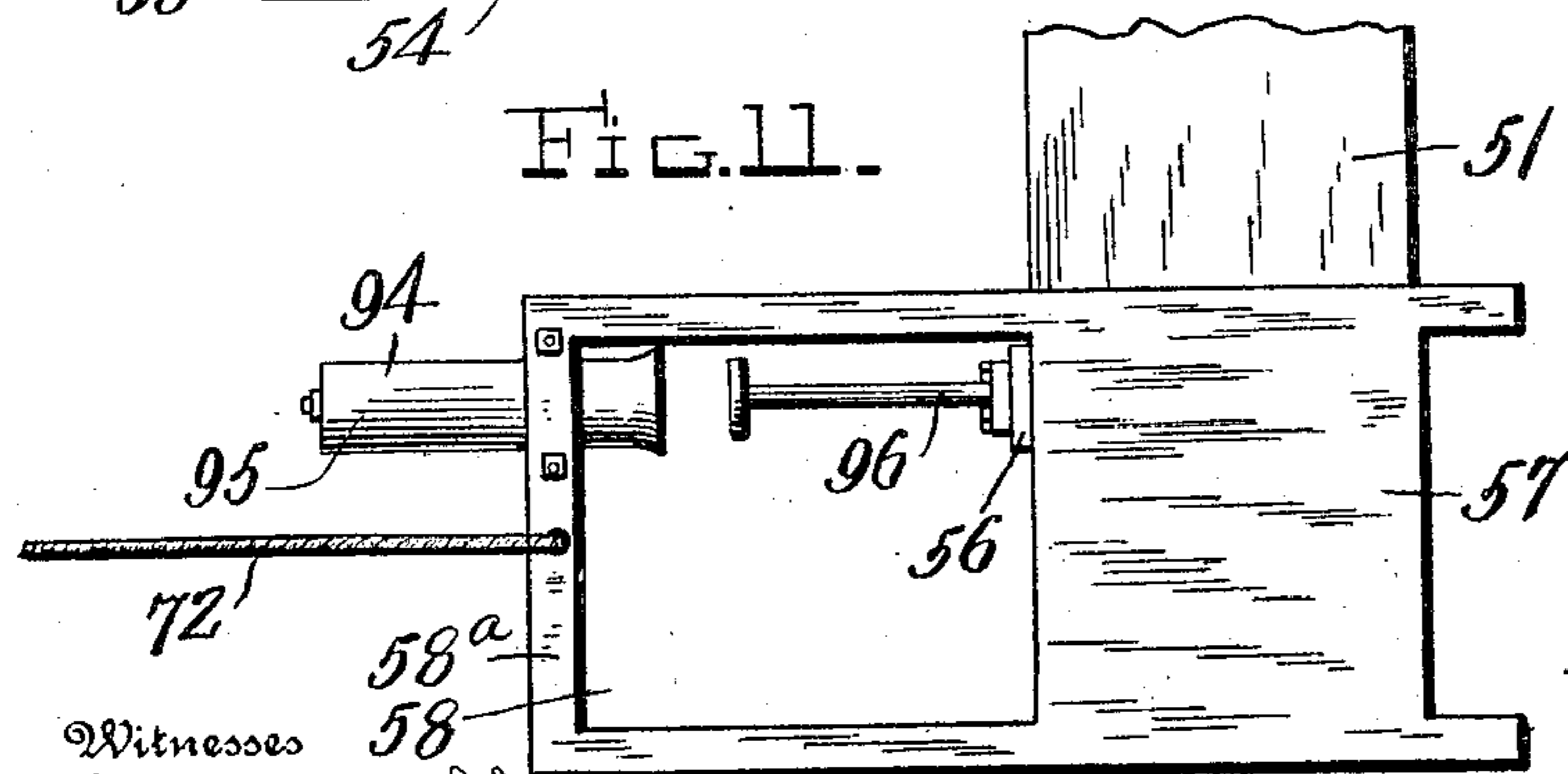
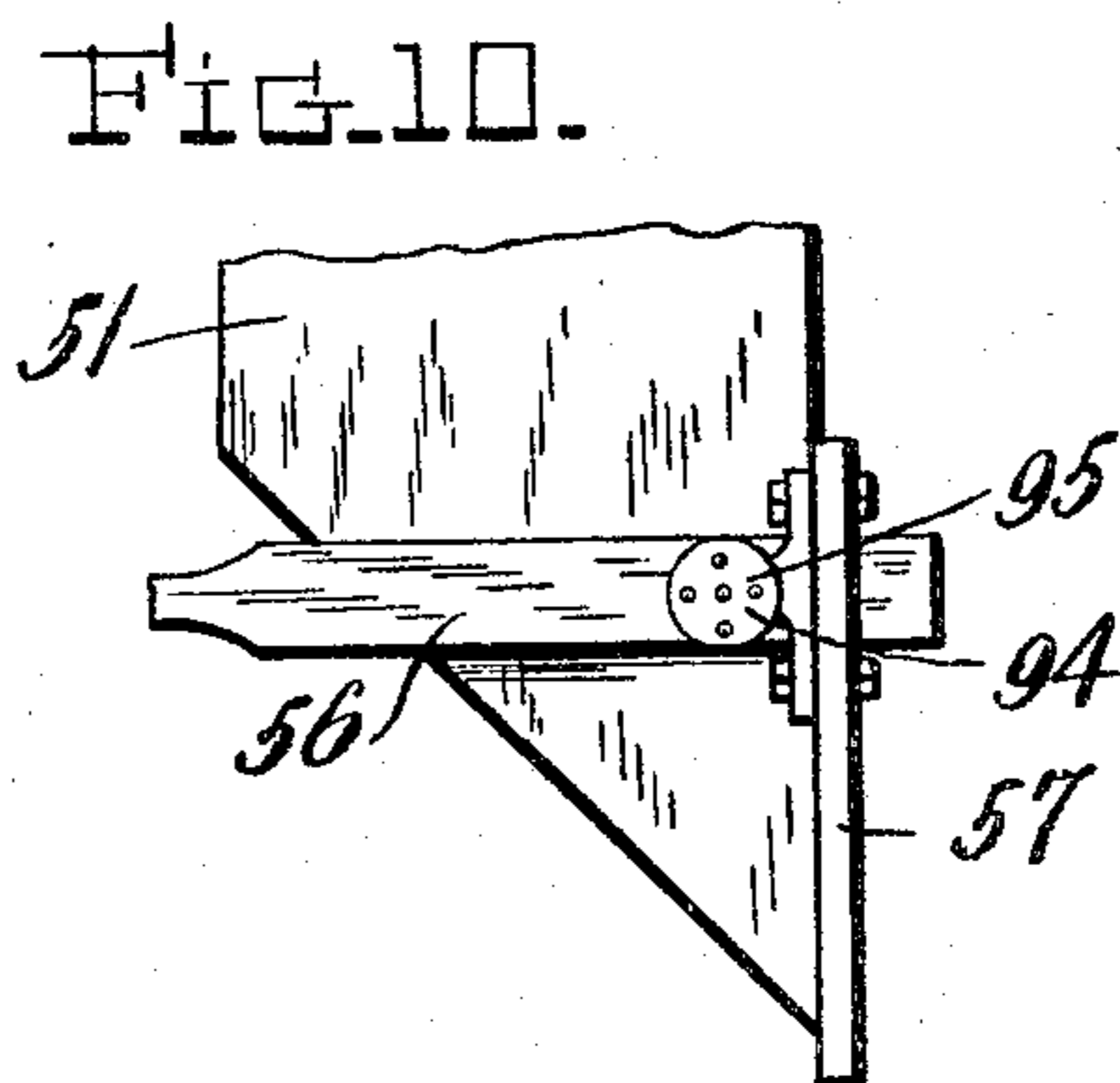
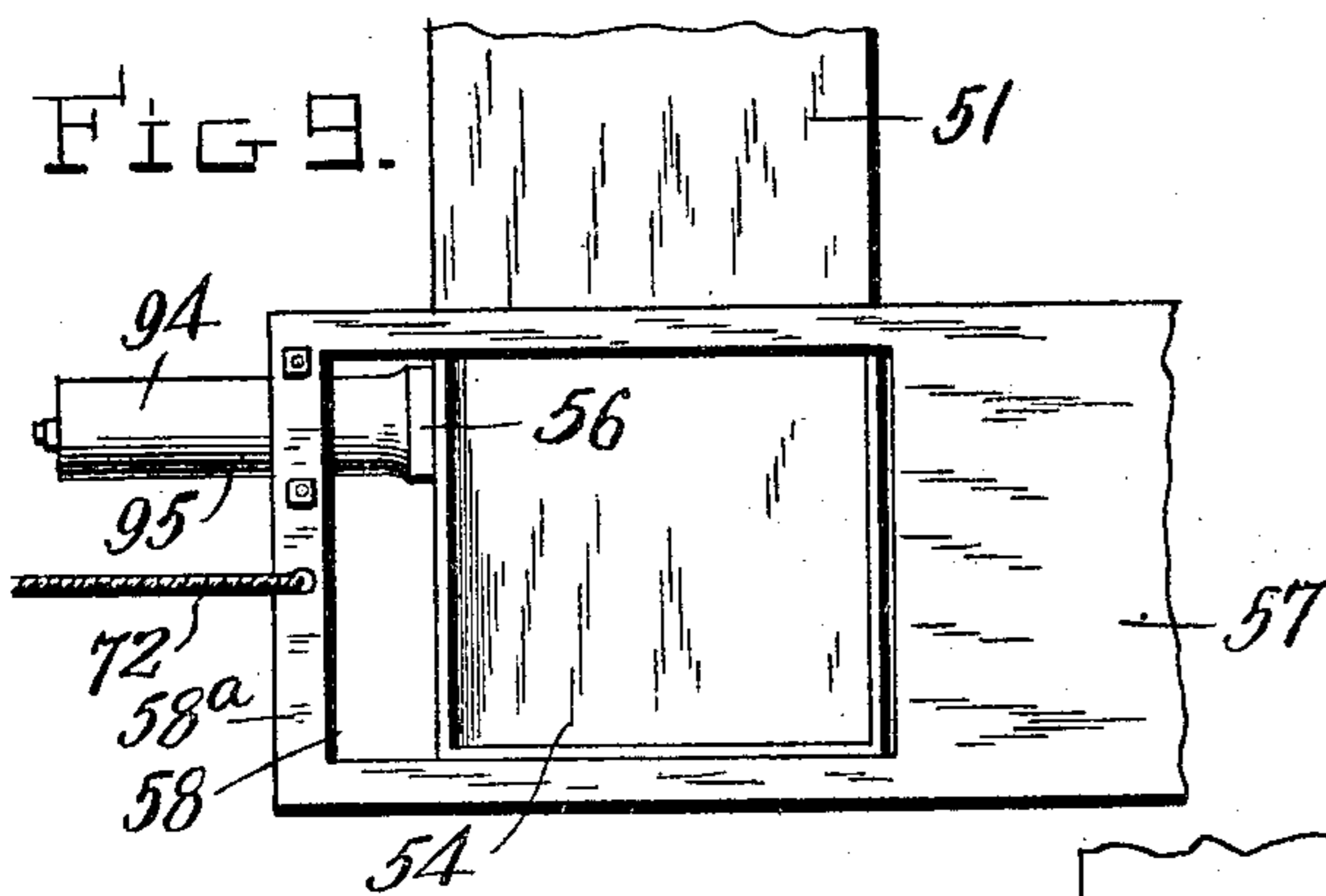
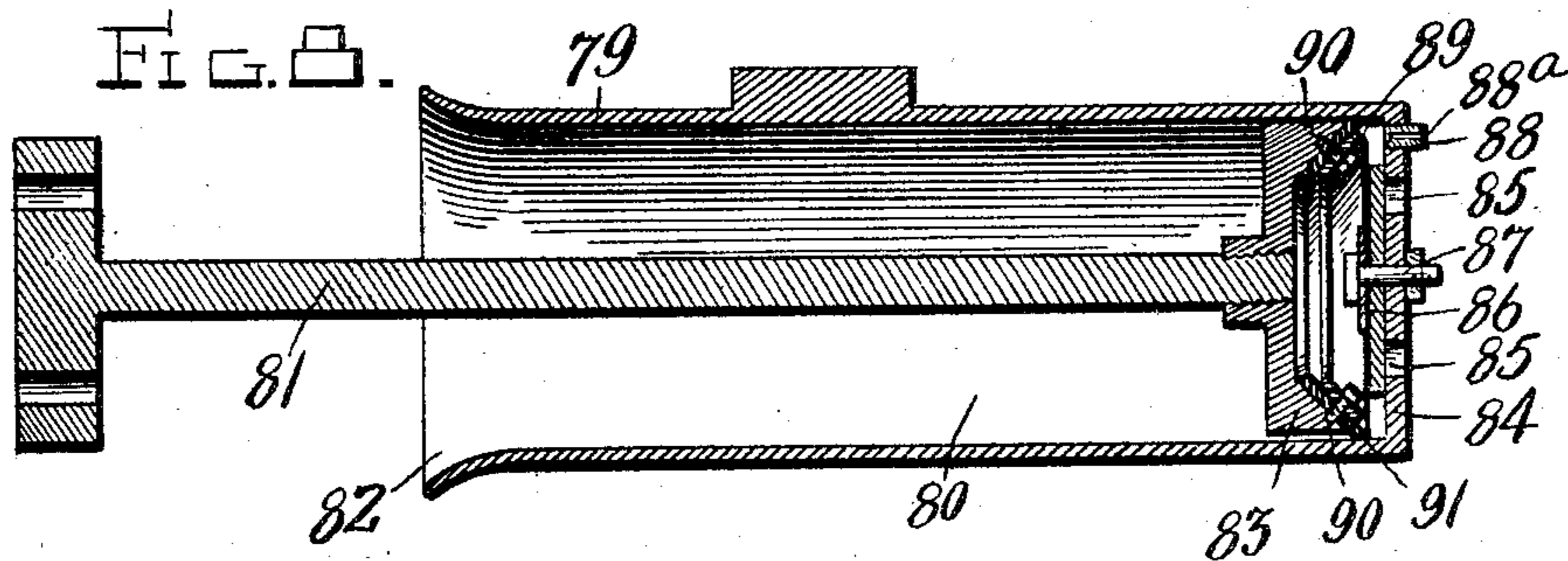
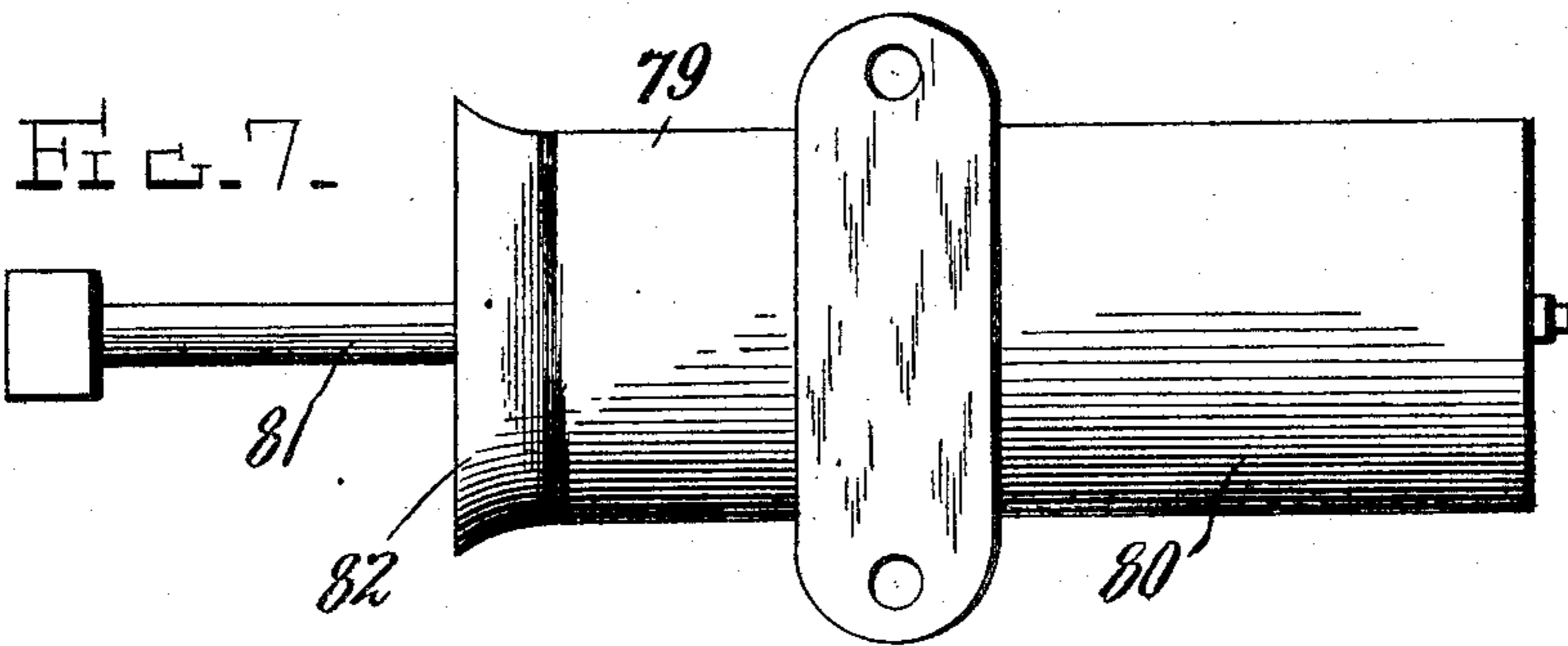
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6 SHEETS—SHEET 6.



Witnesses
for A. Kuehl.

E. F. Crawford

By

A. P. Wilson

Attorney

Inventor
E. F. Crawford

UNITED STATES PATENT OFFICE.

ENON FERNANDO CRAWFORD, OF NELSON, CANADA.

AUTOMATIC BUCKET-LOADER FOR AERIAL TRAMWAYS.

No. 797,944.

Specification of Letters Patent.

Patented Aug. 22, 1905.

Application filed March 28, 1904. Serial No. 200,401.

To all whom it may concern:

Be it known that I, ENON FERNANDO CRAWFORD, a subject of the King of Great Britain, residing at Nelson, in the Province of British Columbia and Dominion of Canada, have invented certain new and useful Improvements in Automatic Bucket - Loaders for Aerial Tramways; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in automatic bucket-loaders for aerial tramways; and it consists in certain novel features of construction, combination, and arrangement of parts hereinafter fully described and claimed.

The principal objects of my invention are, first, to provide means for automatically loading a traveling bucket at either the terminals of the tramway-line or at any intermediate point while the bucket is in motion; second, to provide a movable loading-hopper which can be picked up by the traveling bucket at the loading-station and be carried along by the bucket a predetermined distance, while the latter is being loaded and which when released will return to its loading-station; third, to provide means for automatically opening the discharge-gate of the hopper to permit its contents to discharge into the bucket and for automatically closing said gate upon the return of the hopper or loader to said loading-station, and, fourth, to provide an automatic loader mounted upon a portable carriage which can be placed under any one of a plurality of ore-chutes.

The above and other objects, which will appear as the nature of my invention is better understood, I attain by the construction hereinafter described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of an aerial tramway-terminal and of my improved automatic bucket-loader. Fig. 2 is an end elevation of the same with parts in section. Fig. 3 is a front elevation of the loader mounted upon its carriage and having the discharge-gate of its hopper closed ready to receive its load from an ore-bin. Fig. 4 is a front elevation, on an enlarged scale, of a portion of the loader, the carriage being omitted and the discharge-gate of the loading-hopper being open to permit its contents to discharge into the bucket. Fig. 5 is an end elevation of the

parts of the loader shown in Fig. 4, the bucket being omitted. Fig. 6 is a top plan view of the parts of the loader shown in Fig. 5 and of a portion of the carriage, the discharge-gate appearing in horizontal section on line 6 6 of Fig. 3. Figs. 7 and 8 are respectively an elevation and a section of the pneumatic cushion used on my improved loading device; and Figs. 9, 10, and 11 are detail views of a portion of the loader, illustrating a modification of the same.

Referring to the drawings, and more particularly to Figs. 1 and 2, in which I have illustrated the upper or loading terminal station of an aerial tramway, the numeral 1 denotes an endless tramway-line; 2, a traveling bucket upon said tramway-line; 3, a row or series of ore-bins adjacent to said tramway-line; 4, a carriage mounted to move between said ore-bins and said tramway-line, and 5 a bucket-loader mounted upon said carriage and adapted to load the ore or other contents of said bins into said bucket or buckets while the latter are in motion.

The terminal of the tramway-line 1, as shown, comprises a structure 6, preferably of timber, which is mounted upon sills 7 and which consists of uprights 8, cords 9, cross-braces 10, stringers 11, a cap 12, and ties 13. To the ends of these ties 13 is secured a metal track-rail 14, which extends along the sides of the structure 6 and curves concentrically around and above the outer edge of a pulley or sheave 15, mounted at the outer end of said structure 6, and which has its ends connected by brackets 16 to the up-and-down stretches or runs of a track rope or cable 17. The two stretches of this cable 17, together with the curved rails 14 at the terminals of the line, form an endless track, from which the bucket 2 is supported and around which it travels. As previously stated, only one terminal of this endless track is shown in the drawings; but the construction and arrangement of the other terminal and of the intermediate portions of the track may be the same as that illustrated or of any other suitable form. The said sheave 15 is disposed in a horizontal plane, being journaled in bearings 18 upon the structure 6, as shown, and has its grooved periphery engaged by an endless running rope or traction-cable 19, to which one or more of the buckets 2 are attached. The said bucket or container 2, which may be of any desired construction, is mounted in the lower end of a pendant or hanger 20, having its upper end pivoted at 21 upon a carriage 22, supported by grooved wheels 23,

which run upon the endless track of the tramway, as shown. The bucket is thus mounted to hang from and travel upon the said track, and it is drawn along by the running rope or cable 19, which is attached, by means of a ball-and-socket-joint clip 24, to braces 25 upon said hanger 20. The said hanger 20 is provided at one side with an outwardly-projecting lug 26, the purpose of which will be presently explained. The said carriage or truck 4, upon which the loader 5 is mounted, comprises a timber structure 27, mounted upon supporting-wheels 28, which run upon track-rails 29, laid upon a floor 30, secured to the sills 7, as clearly shown in Fig. 2. Said structure 27 comprises two longitudinal beams or sills 31, cross beams or struts 32, connecting the ends of said sills 31, and tie-bolts 33, uniting said sills and struts to form a rectangular frame or base. Upon one end of the sills 31 are mounted uprights 34, which have their upper ends connected by a cross beam or cap 35. The front end of cap 35 is connected to the front sill 31 by a tie-bolt 36, and the rear end of said cap 35 supports a stringer 37 and is connected to the rear sill 31 by a tie-bolt 38. On the opposite ends of the sills 31 are mounted uprights 39, which are connected by a cap 40, and at the rear said stringer 37, cap 40, upright 39, and sill 31 are held together by a tie-bolt 41. Between the front uprights 34 and 39 extend a cord 42, a tie-bolt 43, and crossed braces 44. A cross beam or strut 45 (indicated in dotted lines in Fig. 3) connects the uprights 39 and is held in place by a tie-bolt 46. Connecting the uprights 34 at a point a little below the cap 35 is a cross beam or strut 47, which is held in place by a tie-bolt 48. Mounted upon the struts 47 and 45 adjacent to their rear ends is a T-shaped track-rail 49, which is adapted to support the rear end of the said movable loader 5, and similarly mounted on the front ends of the caps 35 and 40 is a similar track-rail 50, which supports the front end of the said loader 5. The said track-rails 49 and 50 curve upwardly at one end, as seen in Fig. 3, for a purpose hereinafter explained. The said movable loader 5 comprises a metal hopper-body 51, supported by wheels 52 and 53, which run upon track-rails 49 and 50. The said hopper-body 51 is of rectangular form, having an open top, an inclined bottom, and a vertical front, which latter is formed at its lower end with a large rectangular opening 54, through which its contents discharge into the passing buckets 2. The said wheels 53 are journaled on brackets 55, secured at the front of the sides of the hopper-body, and the said wheels 52 are journaled on brackets 56, also secured on the end walls of the hopper-body 51. The said discharge-opening 54 in the front of the hopper is adapted to be closed by a gate 57, mounted to slide horizontally across said opening and consists of a rectangular metallic plate formed

on one of its ends with a rectangular opening 58, which corresponds in size to the said opening 54 in the front wall of the hopper-body. Said gate is mounted between support and guide brackets or castings 59 and 60 and is guided in its sliding movement by friction-rollers 61, journaled upon said castings, as shown. Said casting 59, which supports the gate, is secured to the bottom of the hopper-body, and the casting 60, which holds the gate in its vertical position, is secured upon its front wall.

Secured upon the front of the solid portion of the discharge-gate 57 is a guide-bracket 62, in the ends of which is slidably mounted a bar 63, having at one end a depending portion 64, which when the loader is on the level portion of the track-rails 49 and 50 lies in the path of the lug 26 upon the bucket pendant or hanger. Pivoted at its outer end to said sliding rod 63 and adjacent to the hook 64 is a curved accelerating-lever 65, the opposite end of which projects between said bracket 62 and the outer or front end 66 of one of the brackets 56, as shown in Fig. 6, when said gate is in its closed position. The said end 66 projects through the opening 58 in the gate 57 and forms an abutment for the concave side of the lever 65 to rest against, while its convex side presses and rolls upon the bracket 62 when the lug 26, carried by the bucket 2, comes in contact with the sliding rod 63 and moves it longitudinally.

It will be seen that by means of this construction the motion of the bucket will be gradually imparted to the gate, which will be thus moved from its closed to its opened position. The accelerating-lever 65 accelerates the discharge-gate from its state of rest to the velocity of the bucket, thereby preventing a sudden shock to any part of the machinery. Secured to the said bracket 56 are two keepers 67, in which a second curved accelerating-lever 68 is mounted. Said lever 68 is retained in slots in said keepers by pins 69, which prevent endwise movement of the lever, but which permit it to rock or swing laterally. The inner end of said lever 68 when the loader is in its normal position rests against an abutment-block 70, secured to the carriage, as shown. The outer end of said lever 68 projects into the opening 58 in the gate 57 and is adapted to be engaged by the end portion 58^a of the gate. It will be seen upon reference to Fig. 6 that when the end portion 58^a of the gate comes in contact with the outer end of said lever 68 the convex side of the latter will roll upon the bracket 56, while its concave end will bear against said abutment 70, and thus accelerate the loader from its state of rest at one end of the carriage to the velocity of the discharge-gate and bucket. The movement of the bucket and discharge-gate is thus gradually imparted to the loader, which owing to this engagement of the parts

will be moved from its normal position at one end of the carriage under one of the chutes of the ore-bins to the opposite end of the carriage. When the hopper or loader reaches the said opposite end of the carriage, the wheels 52 and 53 will run up the inclined portions of the track-rails 49 and 50, and thus elevate the loader to free the end 64 of the sliding bar 63 from engagement with the lug 26 upon the bucket, whereupon the bucket will continue on around the tramway-line, and the loader and its discharge-gate will be automatically returned to their normal or original positions by means of a weight 71, attached to one end of a rope or cable 72, which is passed over suitable guide-pulleys 73 74 and has its opposite end secured to the end portion 58^a of the gate. Said pulleys 73 and 74 are journaled, respectively, on brackets 75 and 76, secured upon an extension-block 78, as shown.

In order to check the return movement of the loader and to bring it to a dead stop under the ore-chute, I provide a pneumatic cushion 79, the construction of which is clearly illustrated in Figs. 7 and 8 of the drawings. It comprises a cylinder 80, which is preferably secured by bolts to one of the uprights 34, and a piston or plunger 81, bolted or otherwise secured to one end of the hopper-body. The said cylinder is formed with a flaring open end 82, into which the head 83 of the plunger 81 passes, and its opposite closed end 84 is formed with a series of valve-openings 85, which are controlled by an inwardly-opening flap-valve 86 in the form of a circular disk of leather or other suitable material, which is secured by a bolt 87 concentrically upon the inner side of said end 84, as shown. The said end 84 is also formed with a screw-threaded opening to receive a screw-plug 88, which is formed with a small opening 88^a to permit the air in the cylinder to escape gradually when the head 83 is forced into the cylinder. Said head 83, which is screwed or otherwise secured upon one end of the rod of the plunger or piston, is formed with a recessed or cup-shaped outer face, to which is secured, by means of a washer 89 and screws 90, a packing-ring 91, which provides an air-tight joint between the said head and the cylinder. It will be seen that when the plunger enters the cylinder the air in the latter will be compressed, since its only escape will be through the small opening 88^a, the valve 86 closing the openings 85. Hence the inward movement of the plunger will be gradually checked. When the plunger is withdrawn from the cylinder, the flap-valve 86 will be raised by the suction thus produced, and there will be little or no resistance to the outward movement of the plunger-head. The weight 71 both closes the gate 57 and returns the loader to its normal position. The closing of the gate will restore the sliding bar 63 and the lever 65 to their original positions,

and the return of the hopper will swing the lever 68 to its original position, as will be readily understood. The said ore-bins 3 may be of any suitable construction and are preferably arranged in a longitudinal row or series, as seen in Fig. 1. Each of said bins is provided with an inclined chute 92, the discharge from which is controlled by a sliding gate 93. Said chutes on each bin are disposed in the same relative position in order that the contents of any one may be discharged into the hopper when the carriage 4 is moved along the tracks 29 to a position in front of that bin.

The operation of my invention will be readily understood from the foregoing detail description, taken in connection with the accompanying drawings and the following brief statement. It will be seen that as the buckets 2 are drawn around the endless tramway-track by the traction-rope 19 they will on arriving opposite the hopper of the loading device cause the discharge-gate of said hopper to be opened, as previously described, to permit its contents to discharge into the said bucket, the capacity of which is equal to that of the hopper, so that there will be no loss of ore or other material, and during this discharge of the contents of the hopper the latter will be carried along with the bucket to the opposite end of the carriage 4, where it will be released, as previously explained. As soon as it is released the gate will be automatically closed, and the hopper will be returned to the front end of the carriage and under the ore-chute to permit it to be again loaded with ore, which it will discharge into the next bucket.

While I have shown and described in detail the preferred embodiment of my invention, I wish it understood that I do not limit myself to the use and to the precise construction and arrangement of parts herein set forth, since various changes in the form, proportion, and minor details of construction may be made within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of my invention. For instance, the tracks 49 and 50 instead of curving upwardly may curve laterally in order to release the loader from the bucket or instead of employing the accelerating-levers 65 and 68 to gradually impart the motion of the buckets to said discharge-gate and the hopper or loader I may use a pneumatic or air cushion 94, as shown in Figs. 9, 10, and 11 of the drawings. In said views the pneumatic cushion 94 is identical in construction to the cushion shown in Figs. 7 and 8 and comprises a cylinder 95, secured, as shown, to the end portion 58^a of the gate 57, and a plunger 96, secured to the end of the hopper-body 51. The operation of this variation of my invention will be readily understood upon reference to said views of the drawings. In Fig. 9 the

gate is opened and the plunger is within the cylinder, and in Fig. 11 the gate is in its closed position and the plunger is withdrawn from the cylinder.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a bucket or other container of a tramway, a loading-hopper mounted to reciprocate and provided with a discharge-gate, an accelerating-lever for imparting the motion of said bucket to said gate to open the same, an accelerating-lever for imparting the motion of said gate to said hopper to cause the latter to move along with said bucket while it is being loaded from said hopper, and means for automatically closing said gate and returning said hopper to its normal position after said bucket has been loaded, substantially as described.

2. The combination of a bucket or other container of a tramway, a loading-hopper mounted to reciprocate and provided with a discharge-gate, an accelerating-lever for imparting the motion of said bucket to said gate to open the same, an accelerating-lever for imparting the motion of said gate to said hopper to cause the latter to move along with said bucket while it is being loaded from said hopper, means for automatically releasing said hopper from said bucket, and means for automatically closing said gate and returning said hopper to its normal position, substantially as described.

3. The combination of a bucket or other container of a tramway, a loading-hopper mounted to reciprocate and provided with a discharge-gate, an accelerating-lever for imparting the motion of said bucket to said gate to open the same, an accelerating-lever for imparting the motion of said gate to said hopper to cause the latter to move along with said bucket while it is being loaded from said hopper, and a weight for automatically closing said gate and returning said hopper to its normal position, substantially as described.

4. The combination of a bucket or other container of a tramway, a loading-hopper mounted to reciprocate and provided with a discharge-gate, an accelerating-lever for imparting the motion of said bucket to said gate to open the same, an accelerating-lever for imparting the motion of said gate to said hopper to cause the latter to move along said bucket while it is being loaded from said hopper,

means for automatically releasing said hopper from said bucket, a weight for automatically closing said gate and returning said hopper to its normal position, and a cushion device for checking the return movement of said hopper, substantially as described.

5. The combination of a bucket or other container of a tramway, a frame provided with a track, a wheeled hopper mounted to reciprocate upon said track, a sliding gate for said hopper, an accelerating-lever for imparting the motion of said bucket to said gate, an accelerating-lever for imparting the motion of said gate to said hopper whereby the latter will be carried along with said bucket, means for releasing said hopper from said bucket, a weight for closing said gate and returning said hopper to its normal position, and a pneumatic cushion for checking the return movement of said hopper, substantially as described.

6. The combination of a bucket or other container of a tramway, a reciprocating loading-hopper, a sliding discharge-gate, accelerating means for imparting the motion of said bucket to the gate to open the same and to the hopper to cause the latter to move along with the bucket while loading the same, means for automatically releasing the gate and hopper from the bucket, and means for automatically closing the gate and returning the hopper to its normal position, substantially as described.

7. The combination of a bucket or other container of a tramway, a reciprocating loading-hopper, a sliding discharge-gate, a sliding element controlling said gate and adapted to be operated by the bucket, accelerating means governed by said element for imparting the motion of said bucket to the gate to open the same and to the hopper to cause the latter to move along with the bucket while loading the same, means for automatically releasing the gate and hopper from the bucket, and means for automatically closing the gate and returning the hopper to its normal position, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ENON FERNANDO CRAWFORD.

Witnesses:

E. A. CREASE,

H. R. JARVIS.