F. D. BUFFUM.

COKE DRAWER AND LOADER.

APPLICATION FILED OCT. 5, 1905.

966,425.

Patented Aug. 9, 1910.

6 SHEETS—SHEET 1.

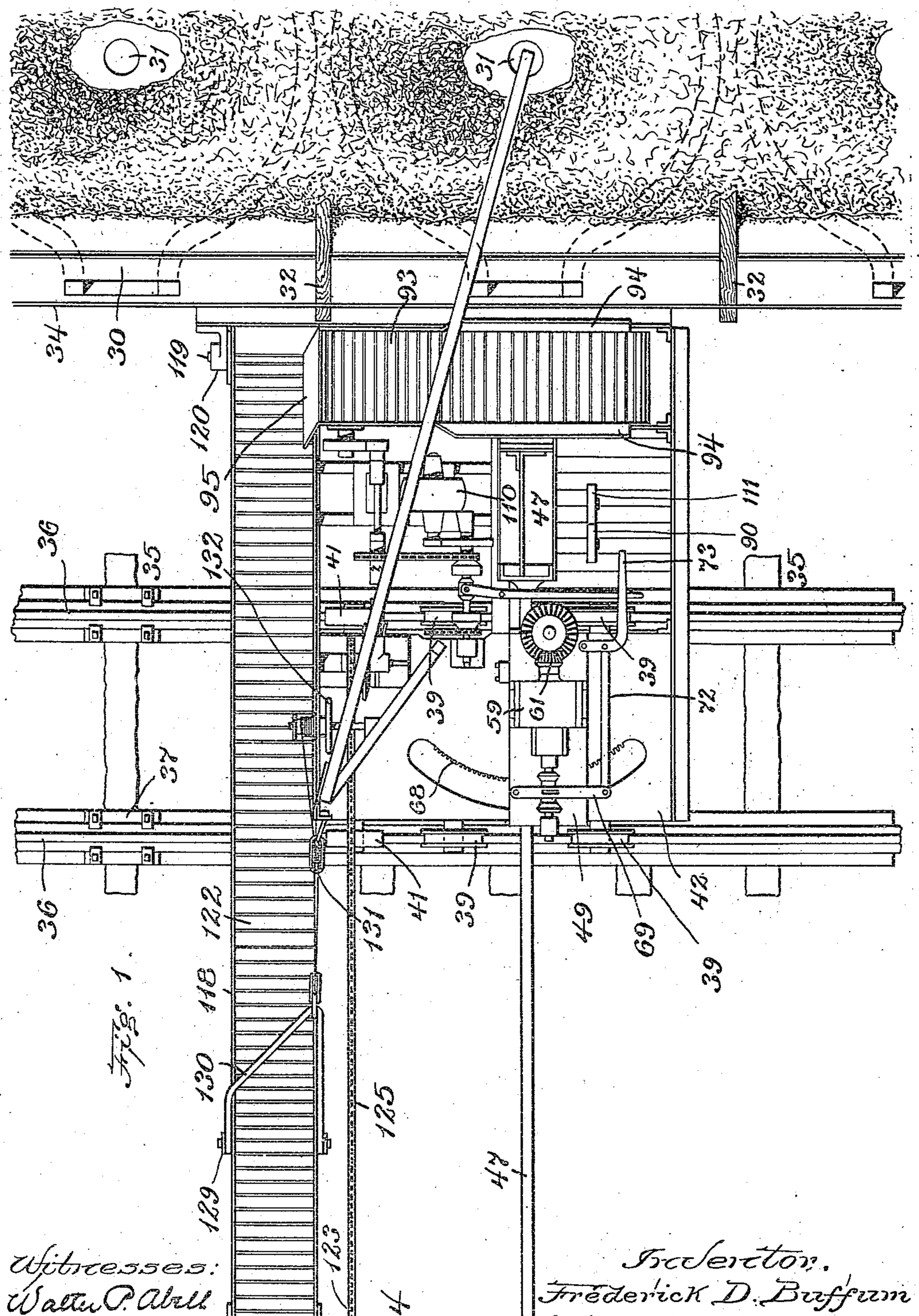


Fig. 1.

Witnesses:
Walter P. Abell
L. E. Kennedy

Inventor.
Frederick D. Buffum
by Wright, Brown, Quinby & May
Attorneys.

F. D. BUFFUM.

COKE DRAWER AND LOADER.

APPLICATION FILED OCT. 5, 1905.

966,425.

Patented Aug. 9, 1910.

6 SHEETS—SHEET 2.

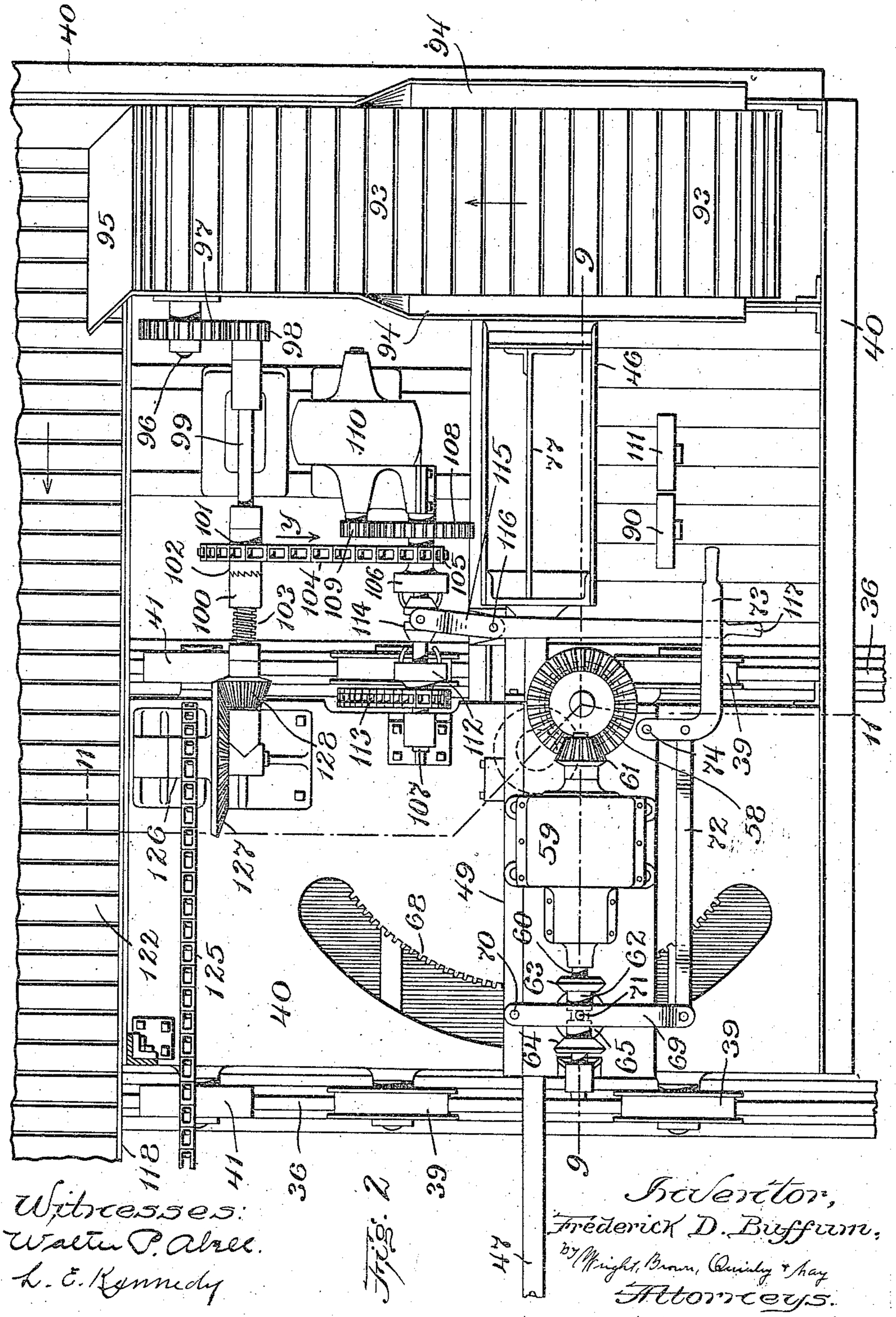


Fig. 2.

Witnesses:
Walter P. Abel.
L. E. Kennedy

Inventor,
Frederick D. Buffum,
by Wright, Brown, Quinby & Shay
Attorneys.

F. D. BUFFUM.

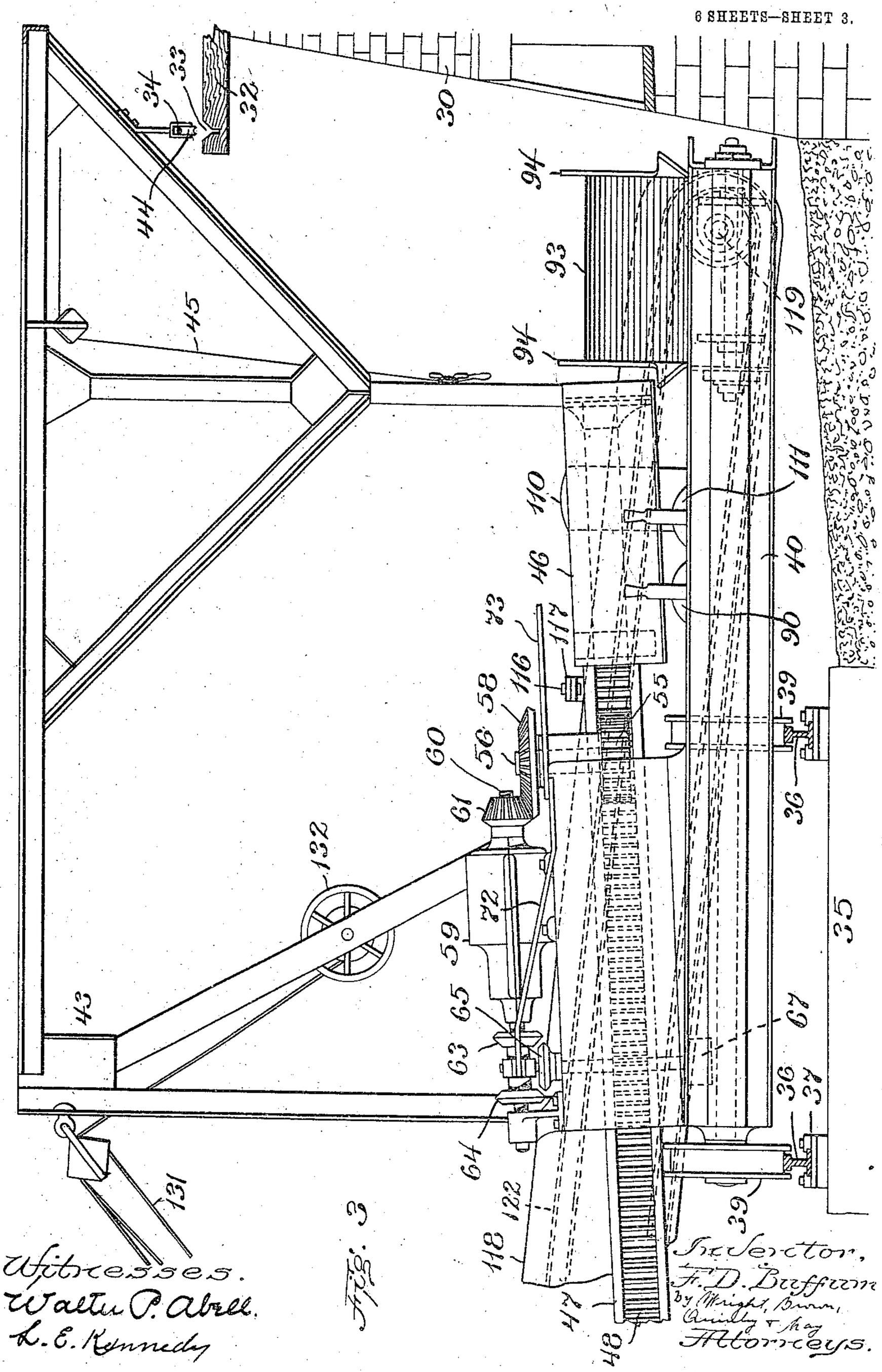
COKE DRAWER AND LOADER.

APPLICATION FILED OCT. 5, 1905.

966,425.

Patented Aug. 9, 1910.

6 SHEETS—SHEET 3.



Witnesses.
Walter P. Abell.
L. E. Kennedy

Fig. 3

Inventor,
F. D. Buffum
by Wright, Brown, Quinby & Shay
Attorneys.

F. D. BUFFUM.

COKE DRAWER AND LOADER.

APPLICATION FILED OCT. 5, 1905.

966,425

Patented Aug. 9, 1910.

6 SHEETS—SHEET 4.

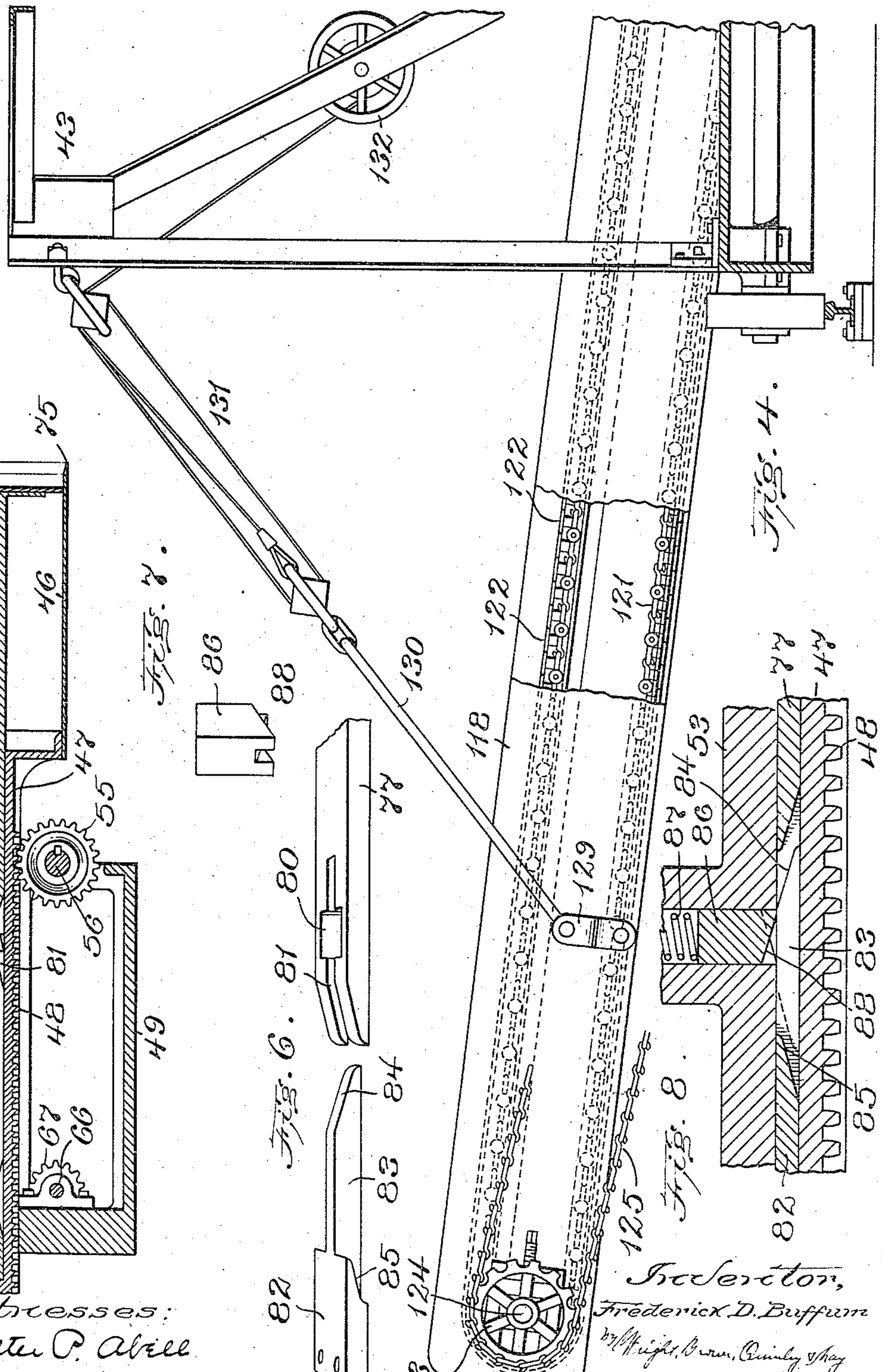


Fig. 4.

Fig. 5.

Fig. 7.

Fig. 6.

Fig. 8.

Witnesses:

Walter P. Abell

L. E. Kennedy

Inventor,

Frederick D. Buffum

by Wright, Brown, Quinby & May

Attorneys

F. D. BUFFUM.

COKE DRAWER AND LOADER.

APPLICATION FILED OCT. 5, 1905.

966,425. Patented Aug. 9, 1910.

6 SHEETS—SHEET 5.

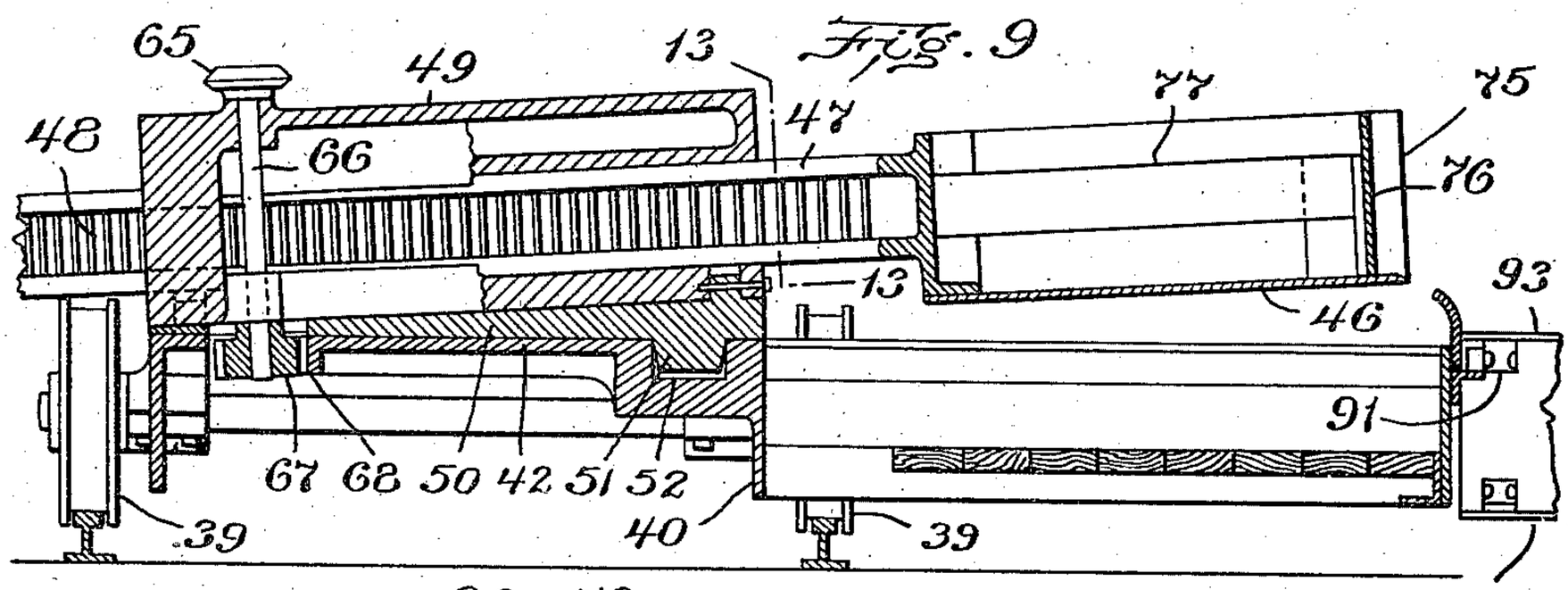


Fig. 9.

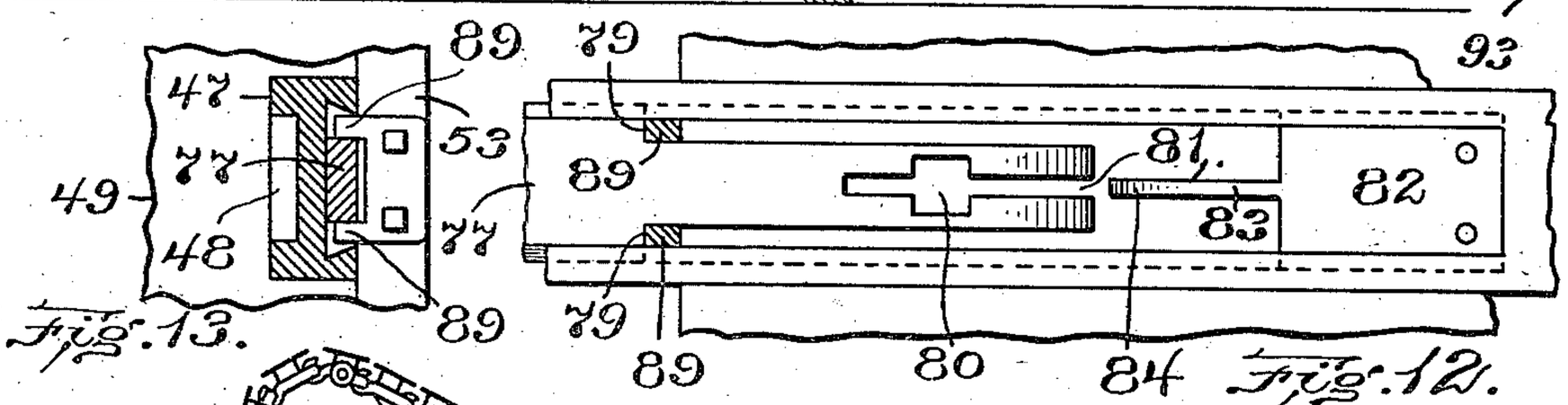


Fig. 13. Fig. 12.

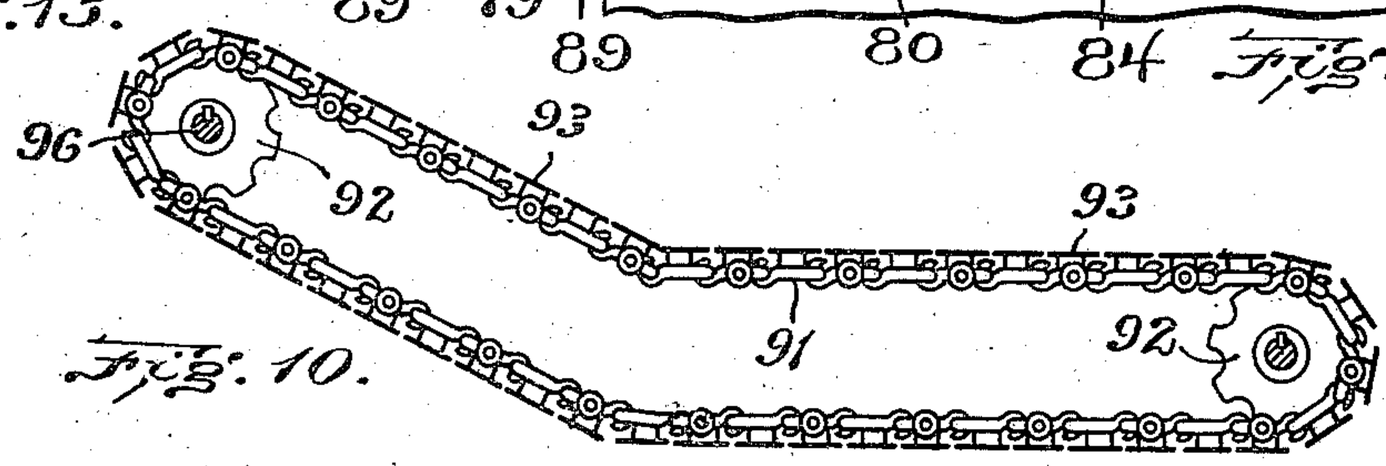


Fig. 10.

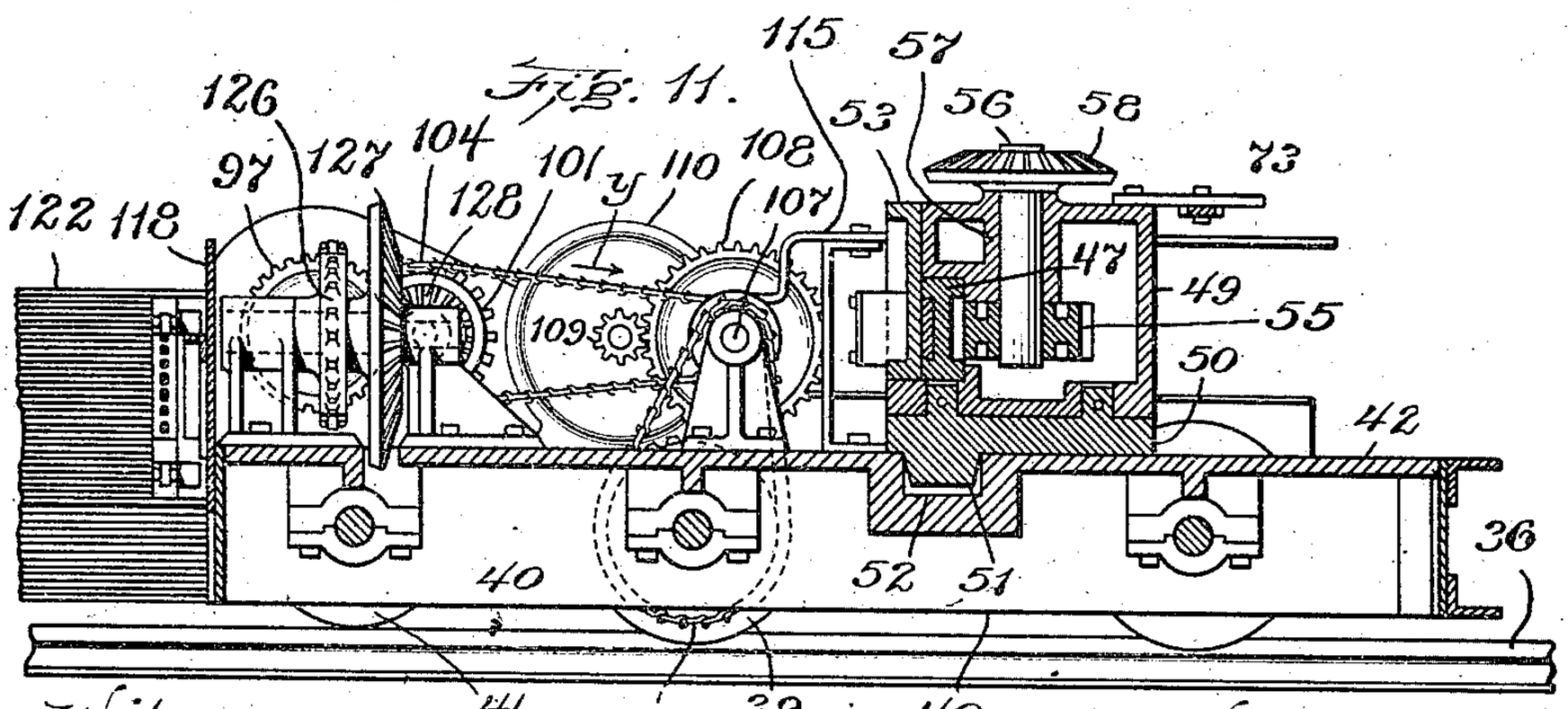


Fig. 11.

Witnesses:
Walter P. Wall.
L. E. Kennedy.

Inventor,
Frederick D. Buffum,
by Wright, Brown, Quinby & Kay
Attorneys.

F. D. BUFFUM.

COKE DRAWER AND LOADER.

APPLICATION FILED OCT. 5, 1905.

966,425.

Patented Aug. 9, 1910.

6 SHEETS—SHEET 6.

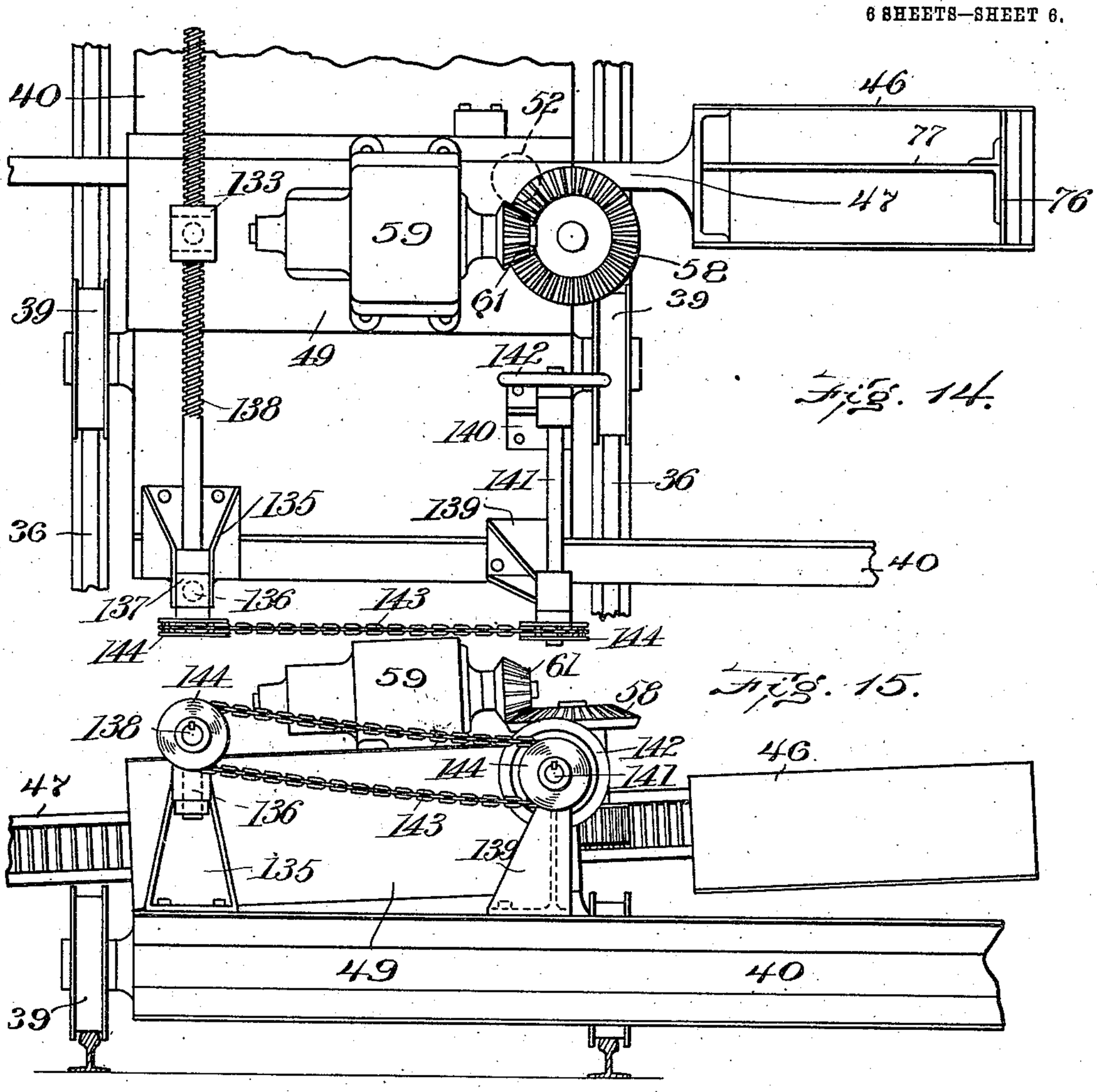


Fig. 14.

Fig. 15.

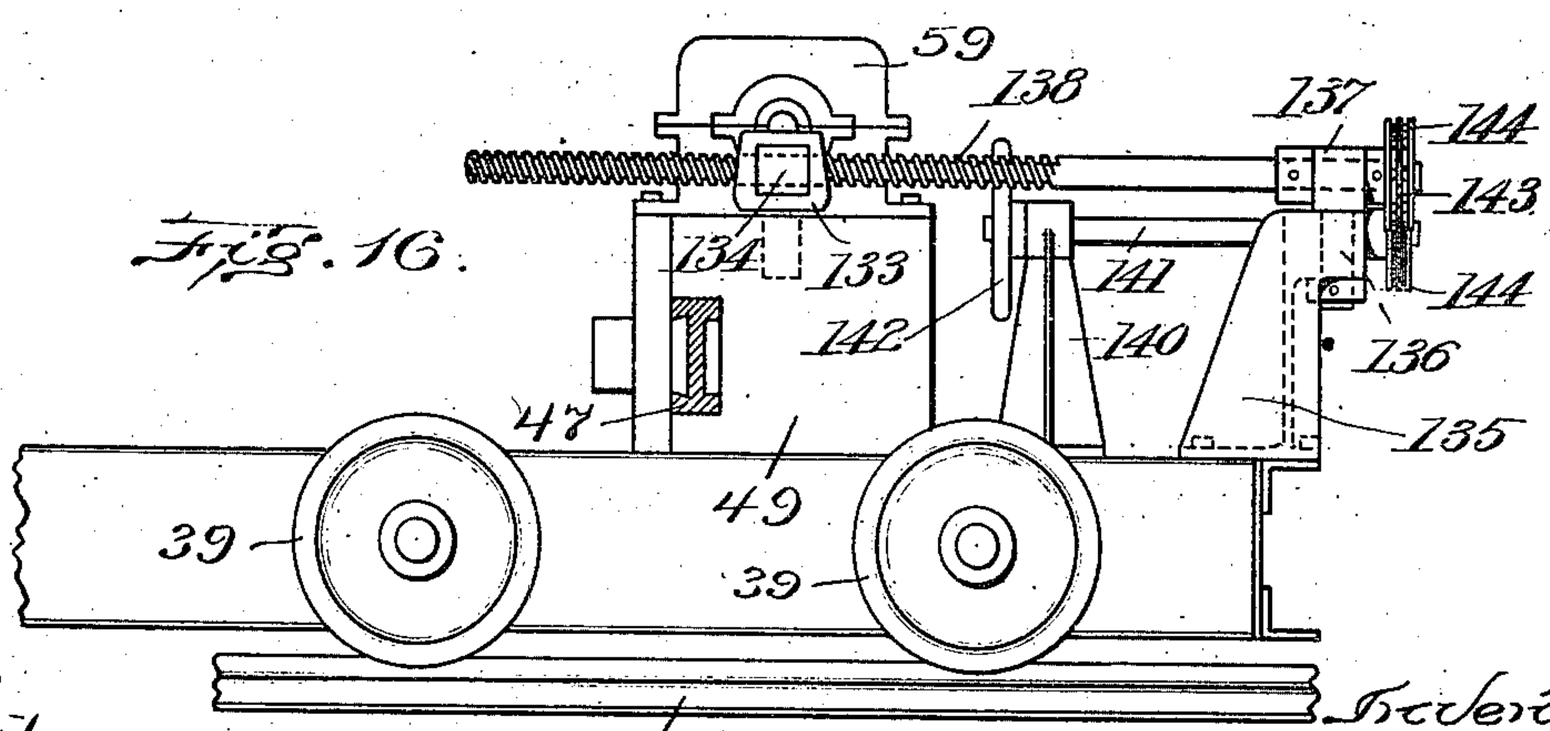


Fig. 16.

Witnesses:
Walter P. Abell
L. E. Kennedy.

Inventor
Frederick D. Buffum
by Wright, Brown, Quinby & May
Attorneys

UNITED STATES PATENT OFFICE.

FREDERICK D. BUFFUM, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR OF ONE-FOURTH TO EDWARD O'TOOLE AND ONE-FOURTH TO HOWARD EAVENSON.

COKE DRAWER AND LOADER.

966,425. Specification of Letters Patent. Patented Aug. 9, 1910.

Application filed October 5, 1905. Serial No. 281,466.

To all whom it may concern:

Be it known that I, FREDERICK D. BUFFUM, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Coke Drawers and Loaders, of which the following is a specification.

This invention relates to machinery or apparatus of the type disclosed in Letters Patent #786,623, granted to me April 4, 1905, in which a shovel that is mounted so that it can be rotated or dumped, can be inserted into a coke oven at any angle to break up and take a load of coke, and be then withdrawn from the coke oven to discharge the coke at a suitable point.

One of the objects of my present invention is to provide apparatus of this type having improved means for conveying the material removed from the coke ovens by the shovel to a car or other place of deposit.

Another object of the invention is to provide apparatus of this type with a shovel having means for removing the coke therefrom without rotating the shovel, whereby the construction and operation of the mechanism is simplified.

Another object of the invention is to provide means for leveling the apparatus to keep the shovel at the correct height and angle relatively to the floor of the oven.

Further objects are to simplify the construction and operation of machines of this character, all as will appear more fully hereinafter.

To the above-recited ends the invention consists in the construction and combination of parts substantially as hereinafter described and claimed.

Of the accompanying drawing, in which similar characters designate like parts throughout the several views, Figure 1 is a plan view of a complete apparatus embodying my invention, said figure also showing a portion of a row of coke ovens. Fig. 2 is a plan view, on a larger scale than Fig. 1, of the principal operating parts of the mechanism, said figure omitting parts of the superstructure. Fig. 3 is a side elevation of the mechanism shown in Fig. 2, the front portion of a coke oven being shown in vertical section. Fig. 4 is a side elevation of the outer part of the conveyer and of the supporting structure, parts being broken out to show internal structures. Fig. 5 represents a section on line 5—5 of Fig. 3. Figs. 6 and 7 are detail perspective views, and Fig. 8 is a detail section similar to a part of Fig. 5 but on a larger scale thereof, showing the mechanism for interlocking the shovel and pusher handles. Fig. 9 is a detail section on line 9—9 of Fig. 2, omitting the motor and the shovel-operating gear. Fig. 10 is a detail elevation of the conveyer which receives the coke from the shovel. Fig. 11 represents a section on line 11—11 of Fig. 2. Fig. 12 is a plan view of the inter-engaging portions of the frame and shovel handles. Fig. 13 represents a section on line 13—13 of Fig. 9. Fig. 14 is a plan view of a portion of a machine having a different or modified construction of means for varying the angle at which the shovel and pusher enter an oven. Figs. 15 and 16 are respectively side and rear elevations of the same.

The coke ovens are indicated somewhat conventionally at 30, each oven having a charging opening 31, which may be of the usual form. Projecting from the coke ovens are supports 32 which are notched as at 33 to enable the trolley-wire 34 to rest loosely in the notches so that said wire may be readily lifted from the supports 32, by the trolley hereinafter described when the machine is caused to travel along the track which is laid in front of the row of ovens. The sleepers or ties are indicated at 35, said sleepers or ties supporting the rails 36 by means of wedges 37 (see Fig. 3). These wedges are usually slotted and roughened to enable them to permit of the passage of the bolts 38 and to be held from slipping. Said wedges are inclined from the horizontal, so that by adjusting them relatively to each other under either rail, correction may be made of inequality of track or irregularity in the height and angle of the oven floors. Sometimes the height or angle of the floor of one oven will vary from the floor of the next oven, and it is of course desirable that the shovel shall operate just as well in connection with one oven as another. Usually the wedge adjustment, once effected, will remain without further attention. In other words, one of the rails 36 may be raised a little higher than the other in front of any particular oven so that when the carriage of the coke loader hereinafter described is before that particular portion

of the track, the said carriage and the mechanism carried thereby including the shovel, will have the proper angle and height relatively to the floor of the particular coke oven to be operated upon by the shovel.

The carriage frame 40 is mounted on flanged wheels 39 adapted to engage the rails 36, and having wheels 41 without flanges, said wheels 41 enabling the carriage to travel on a track provided with curves of short radius. In other words, where the carriage frame is of such size that it is best mounted upon more than two pair of wheels, it is impossible to cause it to travel easily if there are more than two pair of flanged wheels employed. The flangeless wheels 41 afford a proper support for the carriage and conveyers at one side of the axles of the wheels 39, and yet there will be no binding of the wheels upon rails having curves of short radius.

A suitable platform is indicated at 42, and a superstructure at 43. Connected with said superstructure is a trolley 44 which is adapted to run under the trolley-wire 34 and lift it from the supports 32 in the manner heretofore described. The superstructure also supports a cord 45 which may lead to a lamp that may be lowered through the opening of the coke oven as described in my patent above referred to.

The shovel 46 of a substantially rectangular form and preferably having an open top, is provided with a handle 47 having teeth 48 in one side thereof. In cross section, said handle has the appearance somewhat of an I-beam as indicated in Figs. 11 and 13. Said handle is mounted to reciprocate in a suitable guide-way formed in the shovel frame 49, which shovel frame has a base-piece 50 which is provided with a tapering stud 51 fitting a socket 52 formed in the platform 42. This pivotal arrangement permits of a sufficiently loose connection of the shovel frame with its support to allow the shovel frame to tilt slightly so that the shovel may travel on the bottom of the oven in case said bottom and track are not in correct adjustment.

Referring to Figs. 5 and 11, it will be seen that the shovel frame is provided with a side-plate or cap piece 53 which may be removed from the frame to enable the shovel handle to be placed in position in the frame 49 or to be removed therefrom.

The shovel is advanced and retracted by means of a pinion 55 engaging the teeth 48, said pinion being carried by a shaft 56 which is mounted in a bearing 57. As shown in Fig. 5, the teeth 48 do not extend close to the rear wall of the shovel. This is to avoid liability of damage in case the operator should fail to stop the motor which actuates the shaft 56 as hereinafter described. By omitting the teeth, the shovel cannot be run back so that its rear wall would strike the pinion 55. Consequently there is no liability of breaking any of the teeth.

A beveled gear 58 is secured to the shaft 56, and is actuated by a suitable motor 59 which is mounted on the shovel frame 49, through the medium of a gear 61 secured to the shaft 60 of said motor. Preferably the motor is an electrical one as indicated in the drawings. Splined on the shaft 60 is a sleeve 62 (see Fig. 2), said sleeve having beveled friction-disks 63 64, which disks, in practice, are preferably made of paper. To coöperate with either one of said friction-disks, an iron beveled friction-disk 65 is mounted on the shaft 66 extending vertically through the frame 49 (see Fig. 9). Secured to the lower end of the shaft 66 is a pinion 67 which meshes with a toothed-segment or rack 68 formed on or carried by the platform 42. A lever 69 (see Fig. 2) is pivoted at 70 and is provided with a pin 71 entering a suitable annular groove formed in the sleeve 62. A link 72 connects the lever 69 with a hand-lever 73 pivoted at 74 to the shovel frame. By this construction, the operator, standing on the platform near the controllers hereinafter described, may operate the hand-lever 73 so as to shift the lever 69 and cause the shaft 66 to be rotated in one direction or the other to cause the shovel frame to swing on the axis of the pivot formed by the stud 51, so as to introduce the shovel at any desired angle into a coke oven. The front edge of the bottom of the shovel, and preferably of the sides also, is provided with a steel cutting edge 75 which may be removably connected with the shovel bottom and sides in any suitable manner.

Fitted to slide longitudinally of the shovel is a ram or pusher-plate 76 having a handle 77 extending backward through an opening 78 in the rear of the shovel 46. Preferably the ram or pusher-handle 77 is formed with inclined edges to fit dove-tailed grooves formed in the side of the shovel as indicated in Figs. 11, 12 and 13. This structure retains the two handles in proper relative positions, when the shovel and ram are removed from the machine. The rear portion of the pusher handle 77 is reduced so as to form shoulders 79 (see Fig. 12), and is formed with an angular hole 80, preferably square, said hole communicating with the extreme end of said handle by a cut or recess 81. Secured to the shovel handle 47 is a block 82 having a tongue 83 which is formed with a tapered end or tip 84, said tongue being adapted to enter the recess 81 of the pusher handle as indicated in Fig. 8.

It is to be understood that while the shovel handle is of such length as to enable the shovel and the pusher carried thereby to be moved from the position shown in Figs. 1, 2

and 3 to a position at the extreme rear of a coke oven, the handle 77 of the ram or pusher is relatively short as indicated in Fig. 5. This is because the pusher has a movement relatively to the shovel only substantially equal to the length of the shovel itself. Therefore the pusher handle 77 need only be of a length to reach from the plate 76 when the latter is in the position shown in Fig. 5 back to a point where its hole 80 will be in alinement with the locking-pin presently described.

The block 82 is preferably formed with an undercut incline 85 to permit the rear end of the pusher handle 77 to extend under said block when the two handles are in the relative positions indicated in Fig. 8. A stop or locking-pin 86, having a shape in cross-section corresponding to the angular hole 80 formed in the handle 77 is mounted in a recess in the plate 53, and is normally pressed inward by a spring 87. The stop or lock-pin 86 is formed with a middle incline or bevel 88 which is adapted to engage the tapered end or tip 84 of the tongue 83 in a manner that will be presently described. Stops 89 (see Figs. 12 and 13), are secured to the side-plate or cap-piece 53 and project on each side of the reduced or narrowed end of the pusher handle 77.

It is to be understood that the stops 89 are fixed and that, therefore, when the shovel is being retracted, with a load of coke therein the shoulders 79 engage the stops 89 and prevent further rearward movement of the pusher. At the same time, the locking-pin 86 moves into the hole 80. Since the shovel itself will continue to move backward, the plate 76 holds the mass of coke from continuing to move backward, so that the shovel is therefore withdrawn from around the mass of coke and the latter will drop out onto the conveyer hereinafter described.

It is to be understood that while the plate 76 is referred to as a pusher-plate or ram, the term is somewhat a relative one because said plate only pushes the coke out by remaining stationary while the shovel continues to move backward.

After the shovel has moved backward and the load of coke has been discharged, it is desirable that the pusher-plate be held stationary, or in the position shown in Fig. 5 while the shovel itself is advanced far enough to bring the rear wall of the shovel against or close to the back of the plate 76. The stop or locking-pin 86 performs this function because it is in the hole 80 of the pusher-handle 77 and therefore the pusher must remain stationary. But when the shovel has advanced far enough so that the tongue 83 enters the recess 81, the tapered end or tip 84 of said tongue engages the middle incline 88 of the stop 86 to raise said stop out of the hole 80. Then, continued movement of the shovel handle forward causes the block 82 to engage the rear end of the handle 77 and carry the latter and the pusher-plate forward with the handle. A suitable controller for the motor 59 is indicated conventionally at 90 in Fig. 2.

The conveyer which receives the coke from the shovel comprises endless chains 91 (see Fig. 10) mounted on sprockets 92 and having steel slats 93 (see Figs. 1, 2, and 3). Suitably fixed guides 94 are employed to retain the coke in said conveyer, and an apron is indicated at 95 to properly guide the coke as it is discharged from the receiving-conveyer to the loading-conveyer hereinafter described. The sprockets 92 at the end of the receiving-conveyer, close to the apron 95, are mounted on an axle or shaft 96 which is higher than the axle for the sprockets at the other end of said conveyer, as shown in Fig. 10. Said axle or shaft 96 is provided with a gear 97 (see Fig. 2), which gear meshes with a pinion 98 secured to the conveyer driving-shaft 99 which is mounted in suitable bearings and has splined thereon a toothed sleeve 100. A sprocket 101 having a hub 102 loose on the shaft 99, is driven by the chain 104. The hub 102 of the sprocket 101 is toothed to coact with the teeth of the splined sleeve 100. A spring 103 is employed to normally preserve the engagement of the teeth of the sleeve 100 and hub 102. The said teeth are so formed that if the driving-chain 104 should be actuated in a direction the reverse of the arrow *y* in Fig. 2, the sprocket 101 and its hub 102 would rotate freely on the shaft 99 without actuating it or the receiving-conveyer. The reason for this is that the motor which is used to advance the carriage along the track as hereinafter described, is also the motor which actuates the shaft 99, and of course it is not desirable that when the carriage is moving backward there shall be any backward movement of the said conveyer.

The chain 104 connects the sprocket 101 with a sprocket 105 secured to a shaft 107 having a clutch 106 of an ordinary type. Secured to said shaft 107 is a gear 108 meshing with a pinion 109 on the shaft of a motor 110, the controller for which is indicated conventionally at 111. Of course the motor 110, like any ordinary electric motor, can be reversed by means of its controller. When it is being driven in a direction to move the carriage backward, as presently described, the teeth of the hub 102 will slip over the teeth of the splined sleeve 100 and consequently the shaft 99 will not be driven. Mounted upon the shaft 107 is another clutch 112, of an ordinary type, the hub of which is formed with teeth to engage a chain-gear 113 which extends down to en-

gage suitable teeth of a sprocket secured to the axles of one of the carriage wheels 39 (see Fig. 11). A shifting clutch-block 114, of an ordinary type, is adapted to engage either the clutch 112 or the clutch 106 with the shaft 107. Said clutch-block 114 is operated by a shifting-lever 115 pivoted at 116 and having a handle 117, the latter being preferably in a position adjacent to the handle of the lever 73 and also adjacent to the two controllers. By actuating the lever 115 so as to cause the shaft 107 to actuate the chain 113, the carriage may be caused to move either forward or back along the track according to the direction of motion of the motor 110.

It will be understood that the carriage is liable to be run in either direction while the conveyers are designed to run only in one direction. For this reason the shaft 99 can only be actuated in one direction as hereinbefore described, said shaft actuating both conveyers. If the motor is reversed, the teeth will be forced out of inner engagement against the resistance of the spring 103, allowing the conveyers to remain stationary.

The frame 118 of the delivery-conveyer is pivoted on a stud-shaft 119 (see Figs. 1 and 2), by means of bearings such as shown at 120. Conveyer-chains 121 (see Fig. 4) are mounted on sprockets (not shown) on the shaft 119, and are provided with steel slats 122. The outer sprockets 123 for the chains 121 are mounted on a shaft 124 having suitable bearings in the outer end of the frame 118. An endless driving-chain 125 connects a sprocket on the shaft 124 with a sprocket 126 (Fig. 2) on the shaft of which is a beveled gear 127 which engages a pinion 128 secured to the shaft 99. It will now be understood that whenever the receiving-conveyer is actuated by the shaft 99 the delivering-conveyer is also actuated.

I employ suitable means for varying the angle or inclination of the conveyer frame 118 so that the outer end thereof may be caused to deliver coke into a car or other receptacle, the top of which may be at any variable height. The means which I have shown for accomplishing this comprise ears 129 secured to the frame 118 and connected by a bail or loop 130 with the superstructure of the apparatus. In Fig. 4 I have somewhat conventionally shown the adjusting means as consisting of tackle 131, the cord or chain for which extends around a windlass operated by a hand-wheel 132.

When the track has been properly adjusted so that the shovel apparatus may be moved along in front of the row of ovens with the shovel adapted to enter either oven at the proper height and angle, the carriage may be caused to travel from one oven to another by the operation of the proper controller and motor. The trolley-wire 34 lies loosely in the grooves of the supports 32, and as the trolley passes a support it merely lifts the wire out of the groove and the wire will fall back into such groove again after the machine has passed the support. As before stated, said support is of wood, which will form a proper non-conductor of electricity.

I have not attempted to show the connections for supplying the current to the motors, as such connections may obviously be led along any suitable parts and the connections made in any preferred manner.

When the shovel is to be advanced into any particular oven, the controller 90 is operated so that the motor 59 will cause the shovel and its pusher to be advanced into the oven far enough to receive a load of coke. Upon reversing the direction of the motor the shovel and pusher are retracted together until the pusher is stopped by the engagement of the shoulders 79 with the stops 89, as has been described, and continued rearward movement of the shovel while the pusher remains stationary results in the coke being deposited upon the conveyer 93, the receiving portion of which travels in a plane below the path of movement of the carriage of the apparatus. From said conveyer the coke is deposited onto the delivery-conveyer 122, the outer end of which may extend over a platform-car, or through the door of a box-car, or over a wagon, or to any suitable point of final delivery of the coke, so far as the apparatus forming the subject-matter of this application may deliver the coke. When on the reverse motion of the shovel or the forward motion thereof into the oven, the pusher remains stationary for a while owing to its being held by the stop or locking-pin 86. When said pin is released, due to the action of the tongue 83, both the pusher and the shovel advance together until the shovel takes a new charge or load of coke. The shovel is held from any rotary movement, owing to the guideway formed for its handle in the frame 49, and therefore there is no liability of the shovel spilling any of the coke on its outward movement.

It is to be understood that, in practice, the bearings along which the shovel handle slides, and in fact all bearings, have adjustable caps so constructed that they may be adjusted to take up wear.

Instead of employing the rack 68 and the pinion 67 and the connections described for swinging the shovel frame about its pivot by power from the motor 59, I may adjust said frame by hand. In Figs. 14, 15, and 16 I have illustrated means for doing this. In said figures, the shovel frame 49 is shown as provided with a swiveled yoke 133 in which is fitted a nut 134. Secured to the frame or platform of the machine is an upright or

standard 135 and to the latter is swiveled a post 136 having a bearing 137 at its upper end for one end of a screw 138 the other end of which passes through the nut 134. The screw is held from longitudinal movement by suitable means such as collars pinned to it each side of the bearing 137 and when said screw is rotated it acts through the nut 134 and yoke 133 to swing or adjust the shovel frame 49 about the axis of the pivot socket which is indicated by dotted lines 52 in Fig. 14.

Secured to the frame or platform of the machine are two other uprights or standards 139, 140 having bearings at their upper ends for a shaft 141 having a hand-wheel 142. An endless belt or chain 143 connects pulleys or sprockets 144 one of which is secured to the end of shaft 141 and the other to the end of screw 138. By manipulating the hand-wheel 142, the screw 138 may be rotated through the connections described, to adjust the shovel frame in a horizontal plane about the center 52 to vary the angle of operation of the shovel in an oven, in a manner that will be readily understood.

I claim:—

1. A coke-drawing machine comprising in its construction a shovel, a pusher located in said shovel, means for causing a relative movement of said shovel and pusher, and means for advancing the shovel into a coke oven and withdrawing it therefrom.

2. A coke-drawing machine comprising in its construction a shovel, a pusher therein, means for causing a relative movement of said pusher and shovel, means for reciprocating said shovel and pusher to and from a coke oven, and means for varying the angle at which said shovel and pusher enter an oven.

3. A coke-drawing machine comprising in its construction a shovel having a flat bottom, means for reciprocating the shovel, and a pusher in said shovel, means being provided whereby the pusher will remain stationary during a portion of the endwise movement of the shovel.

4. A coke-drawing machine comprising in its construction a shovel, a pusher, means whereby said shovel and pusher may be reciprocated, and means for preventing any turning movement of said shovel.

5. A coke-drawing machine comprising in its construction a frame having a vertical pivot whereby said frame may be swung in a substantially horizontal plane, a shovel having a handle passing through said frame, the construction being such as to prevent movement of said shovel relatively to the frame in any direction other than a reciprocating one, a pusher mounted to move longitudinally of the shovel, and means for actuating said shovel and pusher.

6. A coke-drawing machine comprising in its construction a shovel having a flat bottom and mounted so as to be advanced and retracted without rotation, a pusher mounted in the shovel and power mechanism for actuating the shovel.

7. A coke-drawing machine comprising in its construction a shovel having a flat bottom and mounted so as to be advanced and retracted without rotation, a pusher mounted in the shovel, and power mechanism for actuating the shovel, means being provided for holding the pusher stationary during a portion of the movement of the shovel.

8. A coke-drawing machine comprising in its construction a reciprocating shovel, a pusher mounted therein, means for advancing and retracting the shovel, and a stop for holding the pusher stationary during the last portion of the retraction of the shovel.

9. A coke-drawing machine comprising in its construction a shovel having a handle formed with a recess in one side, a pusher having a handle fitted in the recess of the shovel handle, means for advancing and retracting the shovel, and a stop for holding the pusher stationary during a portion of the retraction of the shovel.

10. A coke-drawing machine comprising in its construction a shovel and a pusher located therein, means for advancing and retracting the shovel, a conveyer movable in a path under the shovel, and means for holding the pusher stationary while the shovel is moving over said conveyer.

11. A coke-drawing machine comprising in its construction a shovel and a pusher located therein, means for advancing and retracting the shovel, a conveyer movable in a path under the shovel, and means for holding the pusher stationary while the shovel is moving over said conveyer, a second conveyer being mounted to receive the coke from the first-mentioned conveyer.

12. A coke-drawing machine comprising in its construction a shovel and a pusher located therein, means for advancing and retracting the shovel, a conveyer movable in a path under the shovel and in a direction substantially at a right angle to the path of movement of the shovel when moving to or from an oven, means for holding the pusher stationary while the shovel is moved over said conveyer, and a second conveyer mounted at an angle to the first-mentioned conveyer and adapted to receive coke therefrom, said second conveyer having means whereby the height of its delivery end may be varied.

In testimony whereof I have affixed my signature, in presence of two witnesses.

FREDERICK D. BUFFUM.

Witnesses:
H. F. WOODBURN,
E. N. SNITJER.