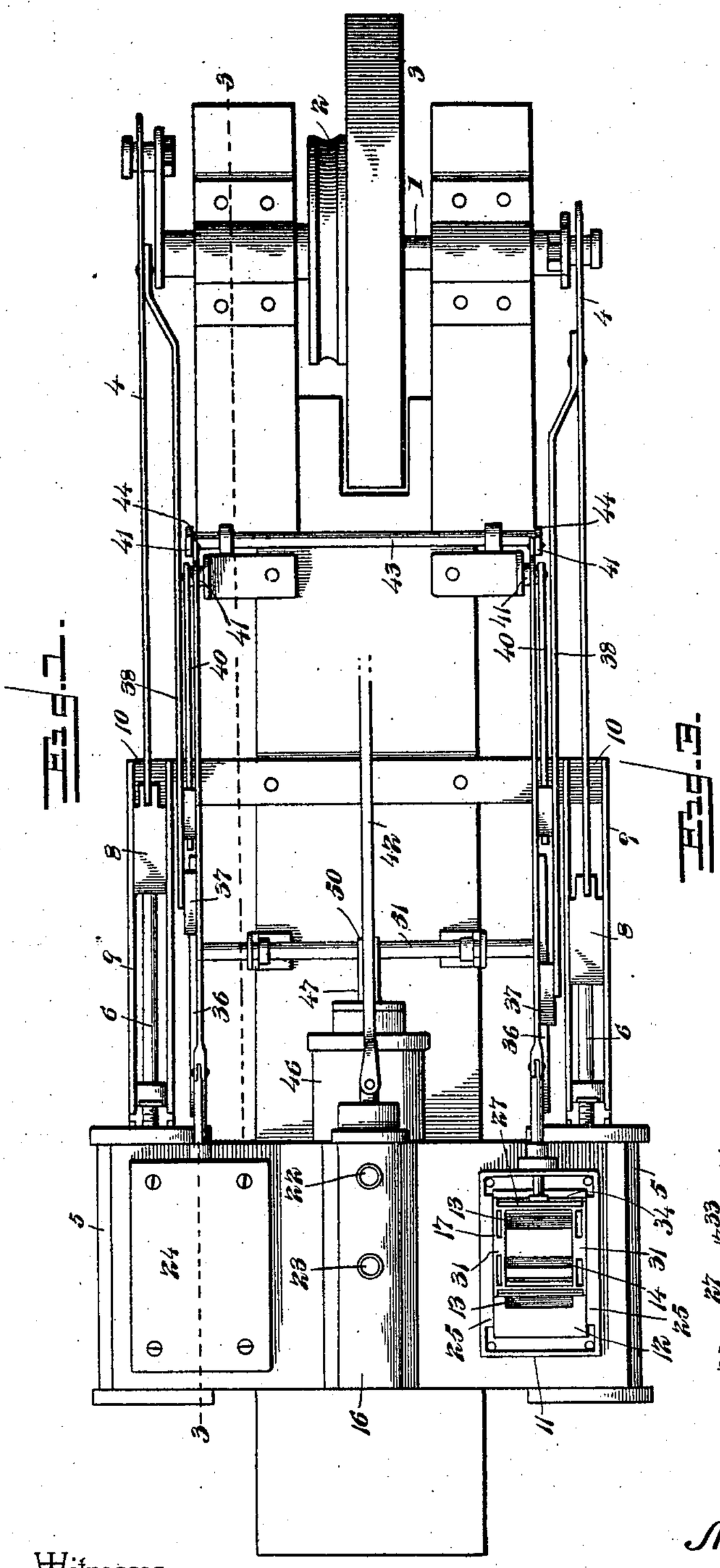
(No Model.) 3 Sheets—Sheet 1.

N. SHANNON.

ENGINE.

No. 574,457. Patented Jan. 5, 1897.



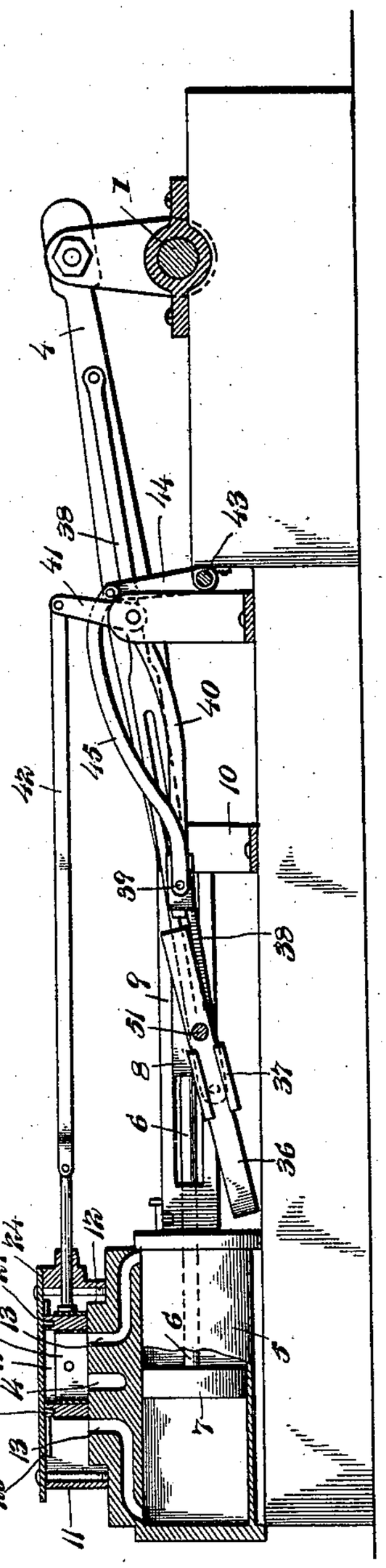


Fig. 1.

Fig. 2.

Witnesses

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(No Model.) 3 Sheets—Sheet 2.

N. SHANNON.

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FIG. 1.

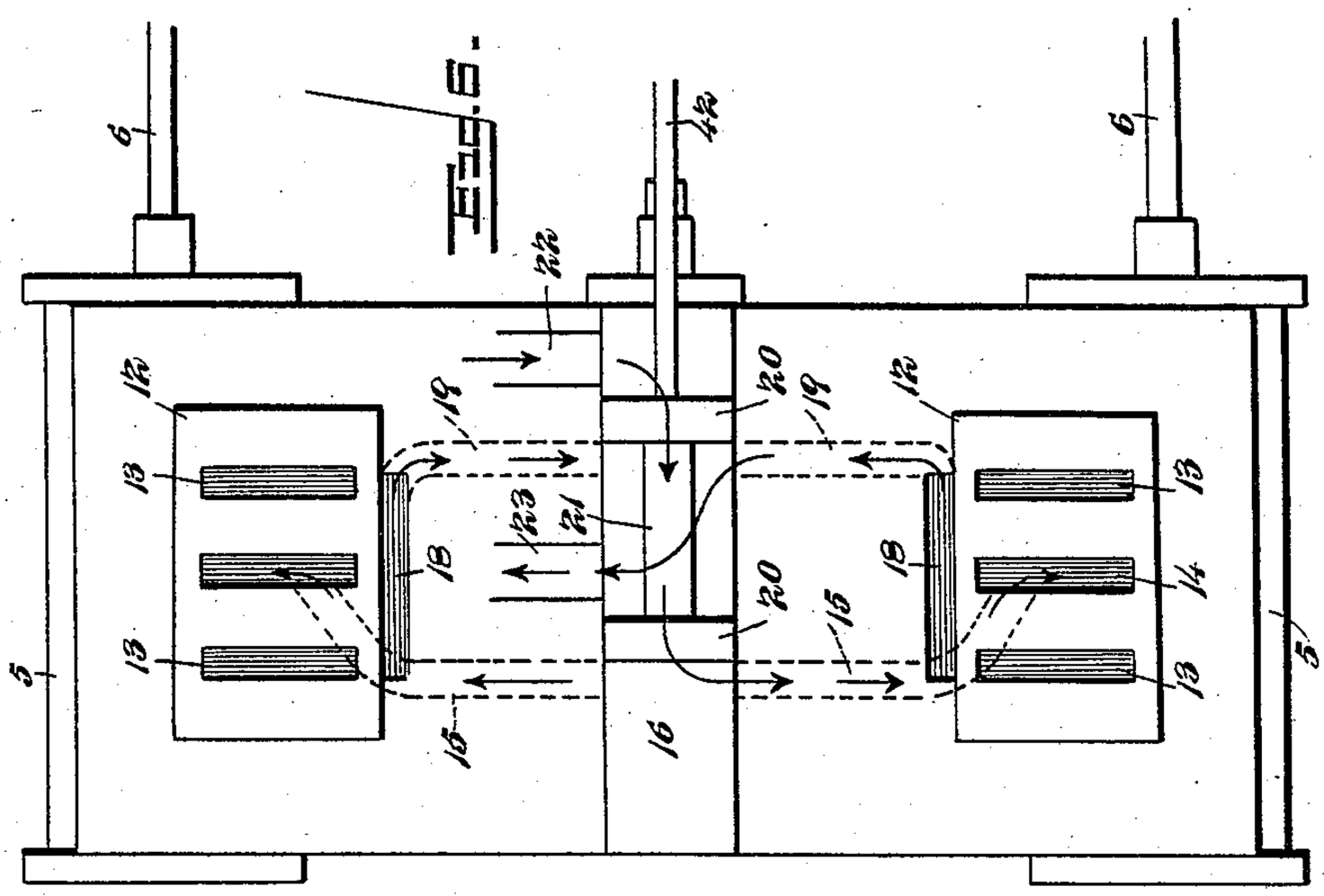


FIG. 2.

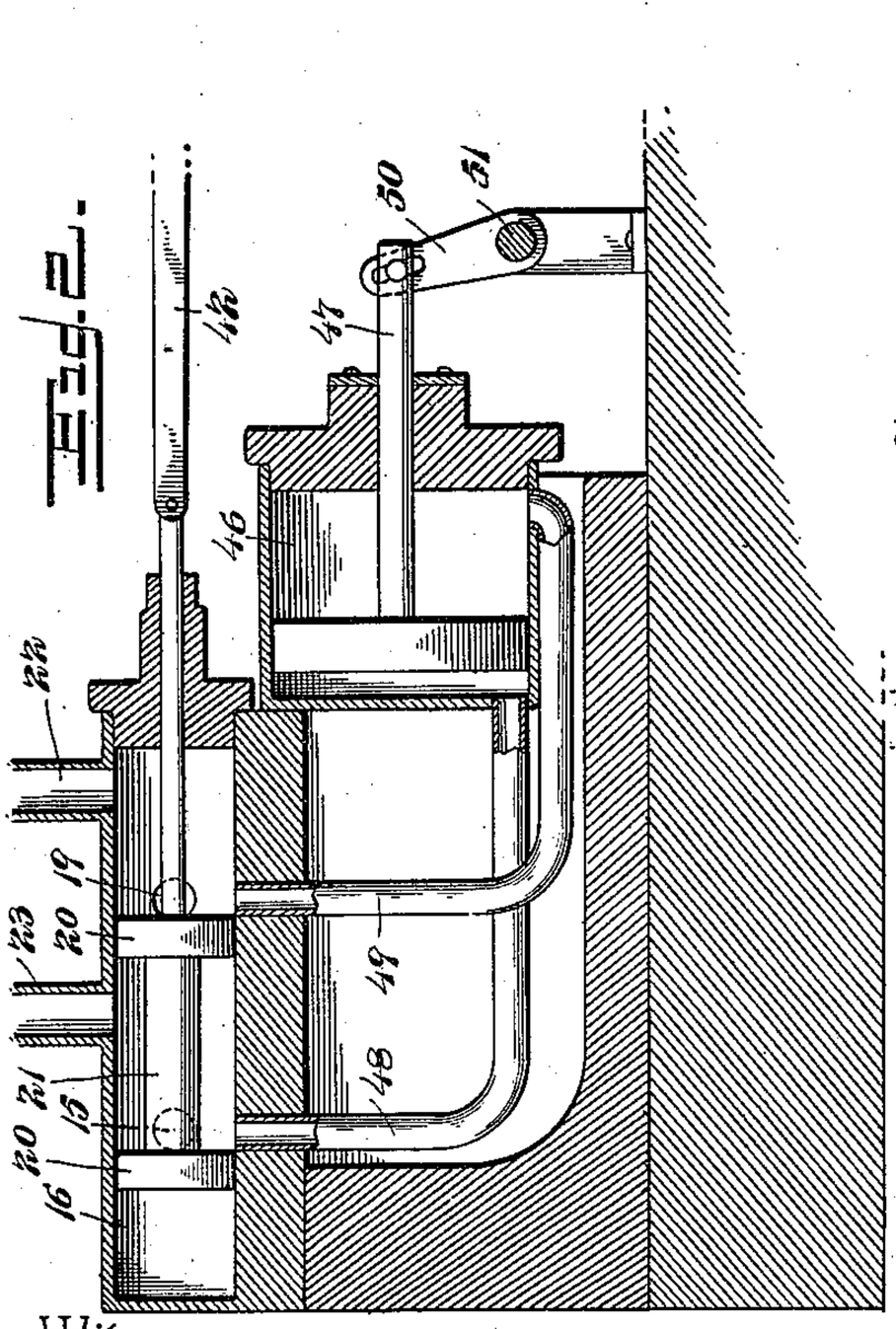
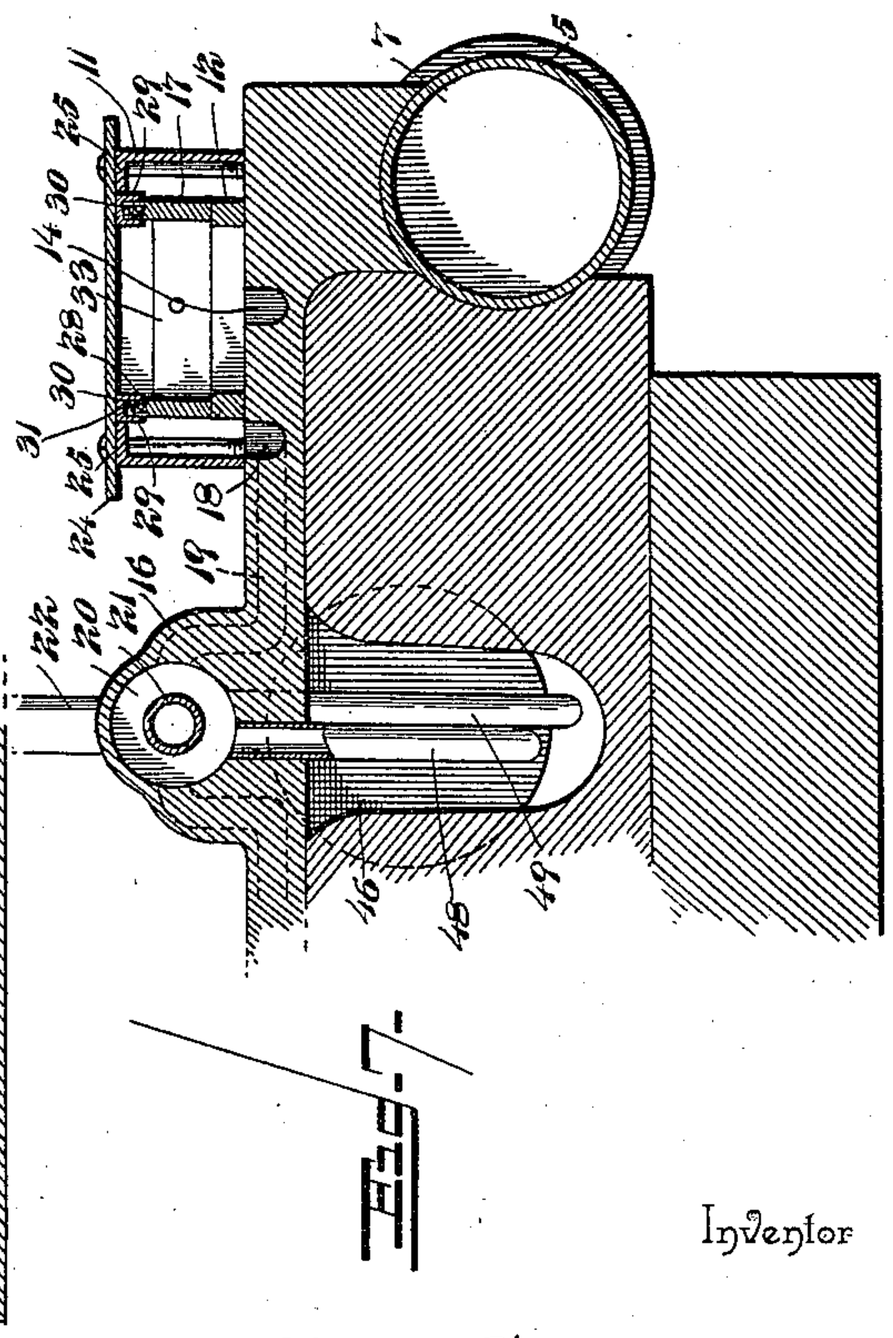


FIG. 3.



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(No Model.) 3 Sheets—Sheet 3.

N. SHANNON.

ENGINE.

No. 574,457. Patented Jan. 5, 1897.

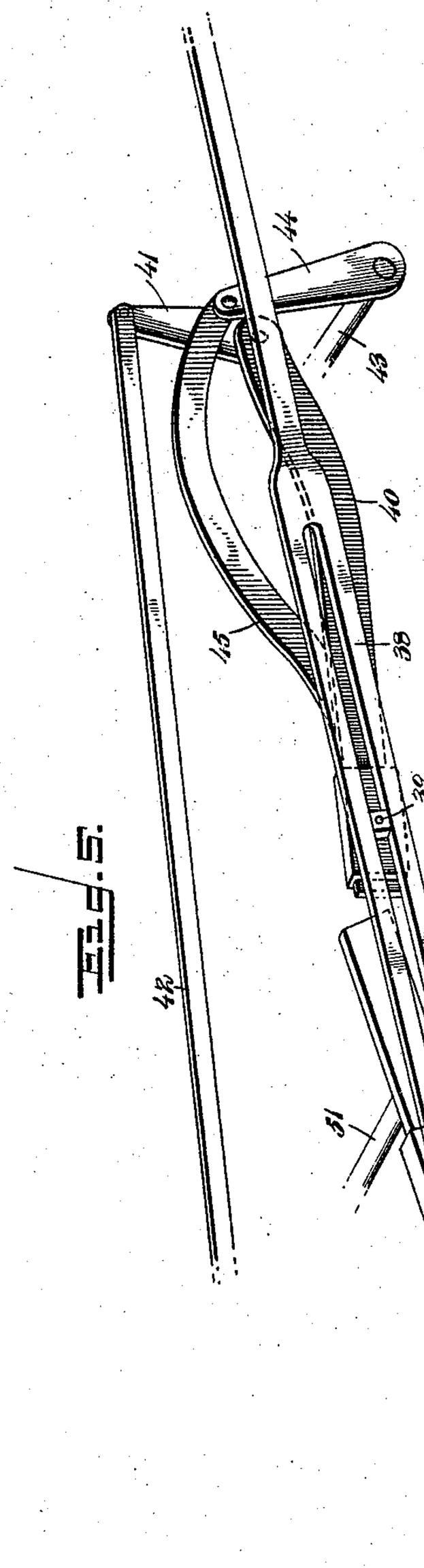

FIG. 5.

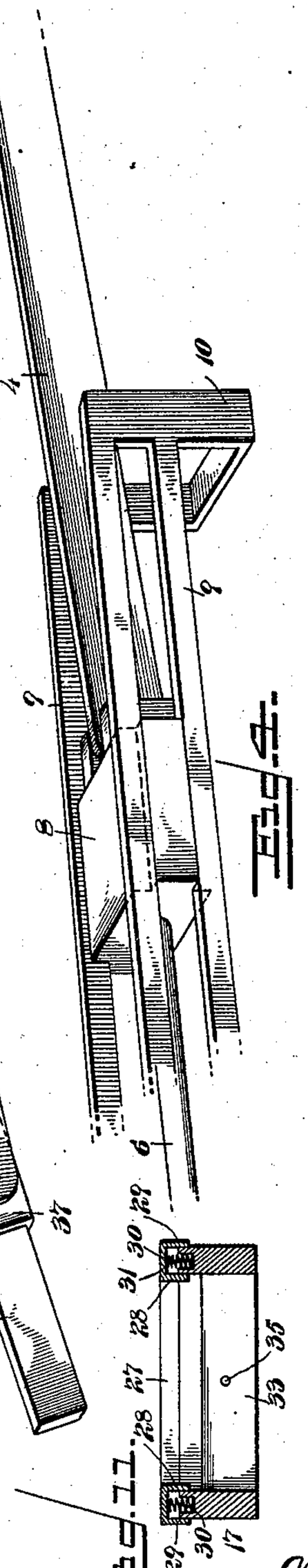

FIG. 4.

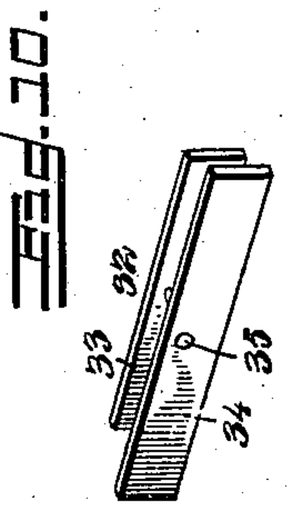

FIG. 6.

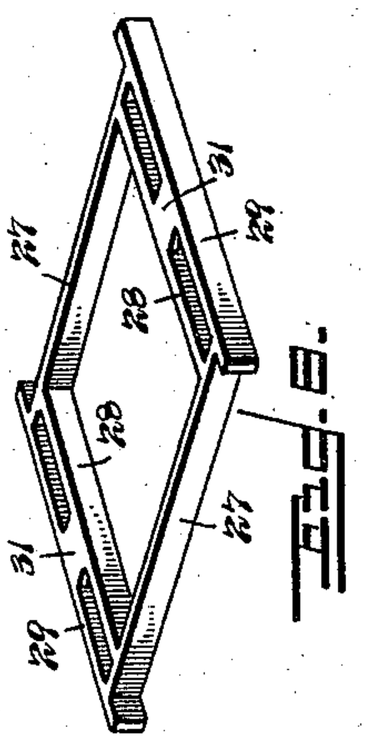

FIG. 8.

FIG. 7.

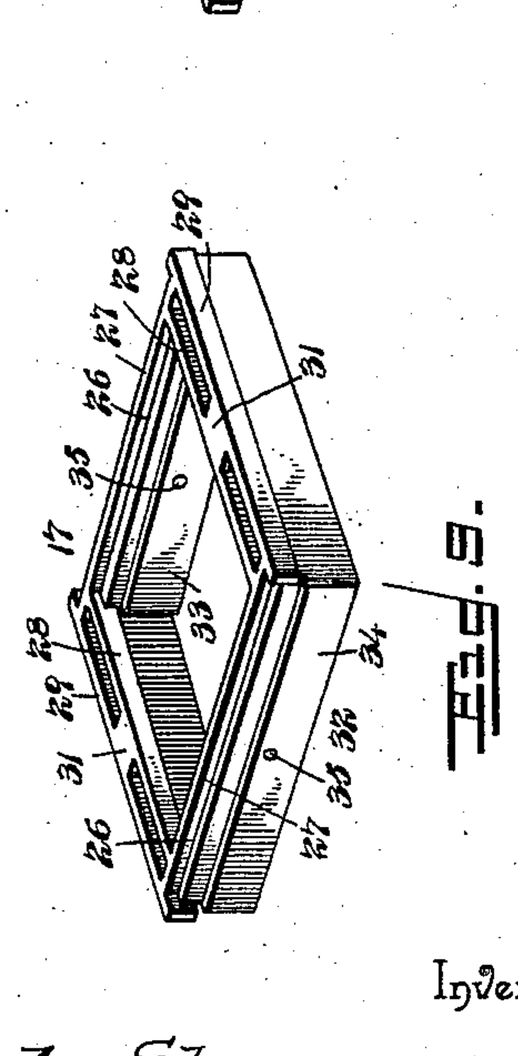

FIG. 9.

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UNITED STATES PATENT OFFICE.

NEELY SHANNON, OF HUNTSVILLE, ALABAMA, ASSIGNOR OF FORTY-NINE ONE-HUNDREDTHS TO J. H. LANDMAN, OF SAME PLACE.

ENGINE.

SPECIFICATION forming part of Letters Patent No. 574,457, dated January 5, 1897.

Application filed January 16, 1896. Serial No. 575,800. (No model.)

To all whom it may concern:

Be it known that I, NEELY SHANNON, a citizen of the United States, residing at Huntsville, in the county of Madison and State of Alabama, have invented a new and useful Direct-Acting Fluid-Pressure Engine, of which the following is a specification.

My invention relates to direct-acting fluid-pressure engines, and has for its object to provide an improved construction of valve mechanism for controlling the length of stroke and the lead of the valves, to provide means for reversing an engine by changing the course of the fluid agent, the lead of the valves being automatically reversed from inside to outside, and vice versa, and, furthermore, to provide a simple and efficient form of valve especially adapted for use in connection with the improved engine.

Further objects and advantages of this invention will appear in the following description, and the novel features thereof will be particularly pointed out in the appended claims.

In the drawings, Figure 1 is a plan view showing one of the valve-chambers with the cap-plate removed. Fig. 2 is a longitudinal section of the throttle-valve casing and reversing-cylinder. Fig. 3 is a longitudinal section on the line 3 3 of Fig. 1 through one of the slide-valve casings, showing the valve-gear in elevation. Fig. 4 is a detail view in perspective of the piston cross-head and the means for guiding the same. Fig. 5 is a similar view of a portion of the valve mechanism detached. Fig. 6 is a diagrammatic view showing the slide-valve casings and throttle-valve casings and indicating in dotted lines the run of the channels connecting the same. Fig. 7 is a transverse section of one of the slide-valve casings. Fig. 8 is a detail view in perspective of one of the slide-valves. Fig. 9 is a similar view of the upper packing-strip. Fig. 10 is a similar view of one of the lower packing-strips. Fig. 11 is a transverse section of the valve.

Similar numerals of reference indicate corresponding parts in all the figures of the drawings.

In the drawings I have illustrated duplicate double-acting engines arranged to communicate motion to a common shaft 1, which is provided with a belt-pulley 2 and a fly-wheel 3, said shaft having cranks to which are connected the pitmen 4. Inasmuch as the two engines illustrated are identical in construction it will be necessary to specifically describe only one.

5 represents a cylinder in which operates a piston 6, and connected to the piston-head 7 is a cross-head 8. This cross-head is mounted in guides 9, consisting of parallel bars secured at one end to the cylinder-head and at the other end to supporting-brackets 10.

Steam is fed to the cylinder through the slide-valve casing 11, in the valve-seat 12 of which are formed the cylinder-ports 13 and the intermediate steam-port 14. The steam-port communicates by means of a channel 15 with the throttle-valve casing 16 outside of the path of the throttle-valve arranged therein. Also communicating with the slide-valve casing outside of the hollow slide-valve 17 is a port 18, which also communicates by means of a channel 19 with the throttle-valve casing.

For the purpose of clearness in description I will term the intermediate port 14 the "inside" and the port 18 the "outside" inlet-ports, the former being arranged permanently between the ends or within the cavity of the hollow slide-valve, while the latter is arranged outside of the same. The throttle-valve consists of spaced heads 20, connected by a tube 21, whereby communication is established in all positions of the throttle-valve between the spaces at the opposite ends thereof. The space between the heads 20 is, however, out of communication with the terminal spaces of the throttle-valve casing. The position of the steam-supply pipe 22 is such as to insure its communication with the terminal chambers of the throttle-valve casing in all positions of the valve, and the exhaust-port 23 is in such a position as to insure its communication with the intermediate chamber of the throttle-valve casing or the space between the heads of the throttle-valve in all positions of the latter. The relative disposition of the points of communication of the channels 15 and 19 with the throttle-valve casing are such, however, as to provide for arranging either of said channels in communication with the intermediate chamber of the casing. Hence live

steam may be fed through either of these channels and admitted to the slide-valve casing through either the inside or the outside steam-port. In other words, the ports 14 and 18 may be interchangeably used for supply and exhaust steam, and hence the motion of the engine may be reversed by simply changing the position of the throttle-valve.

The slide-valve casing is so constructed that the cap-plate 24 thereof is arranged in contact with and forms the upper side of the hollow valve 17, said valve consisting of a hollow square, while the valve-seat forms the bottom thereof, and in order to allow free communication of fluid between the spaces at opposite ends of the valve to balance the same and provide for communication with the outside port 18 the casing is provided with side guides 25. The casing preferably comprises a rectangular shell forming side and end walls which rest at their lower edges upon the valve-seat, the upper edges of said walls being extended inwardly to form the guides 25. The bolts by which the cap-plate is secured in place extend through the shell at the intersections of the side and end walls to prevent vibration or displacement thereof, whereby the shell of the casing is separate from the seat and is held in place by the same bolts which secure the cap-plate, while the inturned upper edges of the side walls of the shell form lateral guides for the hollow valve, which is open at its top and bottom for closure, respectively, by the cap-plate and valve-seat. The upper surfaces of opposite sides of the valve 17 are channeled, as shown at 26, to receive the opposite sides 27 of the packing-frame, said sides 27 being terminally connected by the inner and outer guide-bars 28 and 29, which are arranged, respectively, in contact with the inner and outer surfaces of the ends of the valve. Thus the packing-frame is constructed in a single piece, and in order to hold it in steam-tight contact with the under surface of the cap-plate the springs 30 are arranged under cross-pieces 31 at the ends of the frame. In order to insure suitable contact with the valve-seat and compensate for inequalities therein, I employ pivotal or rocking packing-strips 32, each consisting of an inner arm 33 and an outer arm 34, connected at their centers by a pivot-pin 35, which is mounted in the frame of the valve.

Mounted upon a guide 36 is a slide 37, to which is pivotally connected one end of an arm 38, carried by the pitman, and said arm has a sliding connection with an arm 39 of a lever 40, the other arm of said lever being connected by means of a link 41 with the valve-stem 42. The arm 38 is thus connected at one end to a slide adapted to reciprocate upon a suitable guide and is pivotally connected at the other end to the engine-pitman near its point of connection with the driven shaft, and hence the oscillatory movement of said arm causes a corresponding movement of the lever, by which reciprocatory movement is communicated to the valve-stem. The slotted connection between the arm 38 and the lever allows free reciprocatory movement of the former. In practice I form the sliding connection between said arm and lever by means of an adjustable block mounted to slide upon the lever, whereby the connection between the arm and the lever may be arranged at different distances from the fulcrum of the pitman. It is obvious that the farther said connection is moved from the fulcrum of the pitman the longer will be the strokes of the valve. In order to provide for the adjustment of this pivotal point of connection, I employ a rock-shaft 43, having an arm 44, connected by means of a link 45 with said block.

When the engine is running light and with a full stroke, there is no lead to the slide-valve, and when it is desired to cause or increase the lead the block should be moved to reduce the throw or amplitude of vibration of the valve, or toward the guide 36.

Inasmuch as I have provided means for reversing the direction of feeding the steam or other agent to the slide-valve casing, to reverse the engine it is obvious that means must be provided for varying the lead of this valve to suit the port through which the live steam is fed, or, in other words, to change the lead from inside to outside, and vice versa. The means which I have shown in the drawings for accomplishing this purpose embody the above-mentioned guide 36, which is angularly adjustable to change the direction of its inclination. When inclined in one direction, the lead is inside, and when inclined in the other direction the lead is outside. In order to avoid manually adjusting this guide, however, I employ a reversing-cylinder 46, in which is arranged a piston 47, said reversing-cylinder being in communication at opposite sides of the plane of the piston with the throttle-valve casing by means of conductors 48 and 49. This construction is such as to provide for the movement of the piston in the reversing-cylinder to one position or the other, according to the position of the throttle-valve, said piston being maintained at a given position until the position of the throttle-valve is reversed. To the stem of the piston arranged in the reversing-cylinder is connected a crank 50 of a rock-shaft 51, by which the guide 36 is carried, and hence when the direction of steam is reversed by changing the position of the throttle-valve the live steam immediately reverses the position of the piston in the reversing-cylinder and alters the inclination of the guide to change the lead from inside to outside, or vice versa.

In describing this portion of the construction I have used expressions indicating the change of lead of the slide-valve from inside to outside; but it is obvious that when the point of connection between the arm 38 and the lever which communicates motion to the slide-valve stem is at the limit of its move-

ment toward the point of maximum vibration of the pitman there will be no lead. In other words, the existence of lead is controlled solely by the point of connection of said arm and lever; but in order to insure the lead occurring at the proper side of the cylinder-ports to suit the path of the steam at any given adjustment of the throttle-valve I have devised the above-described means for reversing the inclination of the guide by which one end of said arm is carried.

In practice various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of this invention.

Having described my invention, what I claim is—

1. The combination of a slide-valve casing having a seat provided with ports, a rectangular shell removably fitted upon the seat and open top and bottom whereby the seat closes the lower side thereof, and a cap-plate closing the upper side of the shell and secured in place by bolts extending through the shell, and a slide-valve of rectangular construction having open upper and lower sides closed, respectively, by the cap-plate and seat and of less width than the casing to allow an exterior steam-port in the valve-seat to open outside of the valve, the side walls of the shell being provided with inwardly-extending flanges forming guides which bear against the sides of the slide-valve, and the bolts which secure the cap-plate being extended through the shell in the angles formed by the intersections of the side and end walls thereof, substantially as specified.

2. A slide-valve constructed to form a hollow square, a packing-frame corresponding in plan with the valve and provided at opposite sides with bars countersunk in the face of the valve and at the other opposite sides with parallel bars arranged in contact with the inner and outer surfaces of the valve, and resilient means for extending said frame, substantially as specified.

3. A hollow slide-valve provided with opposite pivotal packing-strips mounted to rock upon the valve, substantially as specified.

4. A hollow slide-valve having opposite parallel sides, and packing-strips each comprising parallel bars or members arranged contiguous to the opposite faces of one of the sides of the valve and connected at intermediate points by a transverse pin mounted in said side of the valve, substantially as specified.

5. The combination with a valve for controlling cylinder-ports, and means for admitting "live" motive agent to the valve-casing either between or beyond the cylinder-ports, of valve-operating mechanism including a rocking lever operatively connected with the valve, a pivotal connection between said lever and a reciprocatory member, as a pitman, and means for varying the point of connection of said lever with the reciprocatory member, substantially as specified.

6. The combination with a valve for controlling cylinder-ports, and means for admitting live motive agent to the valve-casing either between or beyond the cylinder-ports, of valve-operating mechanism including a rocking lever operatively connected with the valve, an oscillatory arm adapted to receive motion from a pitman and having a pivotal connection with said lever, and means for varying the point of pivotal connection to vary the throw of the lever, substantially as specified.

7. The combination with a valve for controlling cylinder-ports, and means for admitting live motive agent to the valve-casing either between or beyond the cylinder-ports, of valve-operating mechanism including a rocking lever operatively connected with the valve, an oscillatory arm provided at one end with a slide operating upon a stationary guide and connected at the other end to a reciprocatory and oscillatory member, as a pitman, and means for pivotally connecting said lever to the arm and varying the point of connection to vary the throw of the lever, substantially as specified.

8. The combination with a valve for controlling cylinder-ports, and means for admitting live motive agent to the valve-casing either between or beyond the cylinder-ports, of valve-operating mechanism including an oscillatory arm connected at one end to an oscillatory and reciprocatory member, as a pitman, a guide carrying a slide connected to the other end of said arm, a rocking lever operatively connected with said valve and pivotally connected to the arm, and means for adjusting the guide to vary the path of the slide carried thereby, substantially as specified.

9. The combination with a valve for controlling cylinder-ports, and means for admitting live motive agent to the valve-casing either between or beyond the cylinder-ports, of valve-operating mechanism including a rocking lever operatively connected with the valve, an oscillatory arm connected at one end to a pitman, an adjustable guide, a slide mounted upon said guide and connected to the other end of the arm, connections between the rocking lever and the arm, and mechanism controlled by means for admitting motive agent to the valve-casing for reversing the position of the guide, substantially as specified.

10. The combination with a valve for controlling cylinder-ports, and means for admitting live motive agent to the valve-casing either between or beyond the cylinder-ports, of valve-operating mechanism including an oscillatory arm connected to a moving part, as a pitman, and operatively connected with the valve, an adjustable guide for the other end of said arm and adapted to be reversed to correspond with the point of admitting live motive agent to the valve-casing, and a pis-

ton adapted to be exposed to pressure upon one face or the other according to the point of admitting motive agent, said piston being operatively connected with the guide, substantially as specified.

11. The combination with a valve for controlling cylinder-ports, and means for admitting live motive agent to the valve-casing either between or outside of the cylinder-ports, said means including a throttle-valve, of valve-operating mechanism including an oscillatory arm adapted to receive motion from the moving part, as a pitman, and operatively connected with said valve, a reversible guide for the other end of the arm, a rock-shaft carrying said guide, and a piston arranged in the cylinder in communication upon opposite sides of the plane of the piston with the casing of said throttle-valve, whereby motive agent is admitted to said cylinder upon one side or the other of the piston according to the position of the throttle-valve, the piston being operatively connected with said rock-shaft, substantially as specified.

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

NEELY SHANNON.

Witnesses:
J. H. LANDMAN,
SAMUEL C. SMITH.