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A. W. CASH.

AUTOMATIC BELT OR MOTOR SWITCH SHIFTER.

(Application filed Oct. 13, 1898.)

(No Model.)

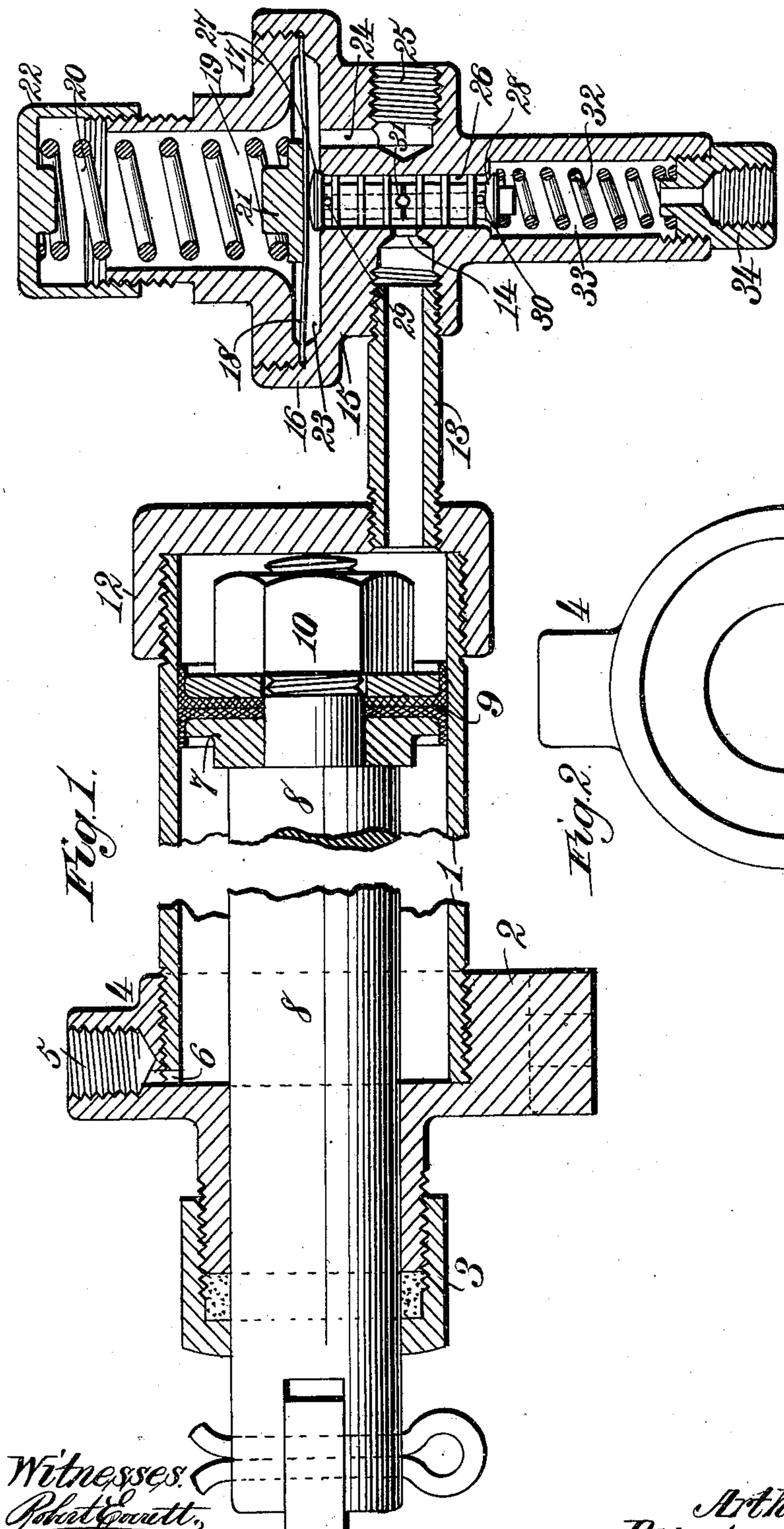

Fig. 1.

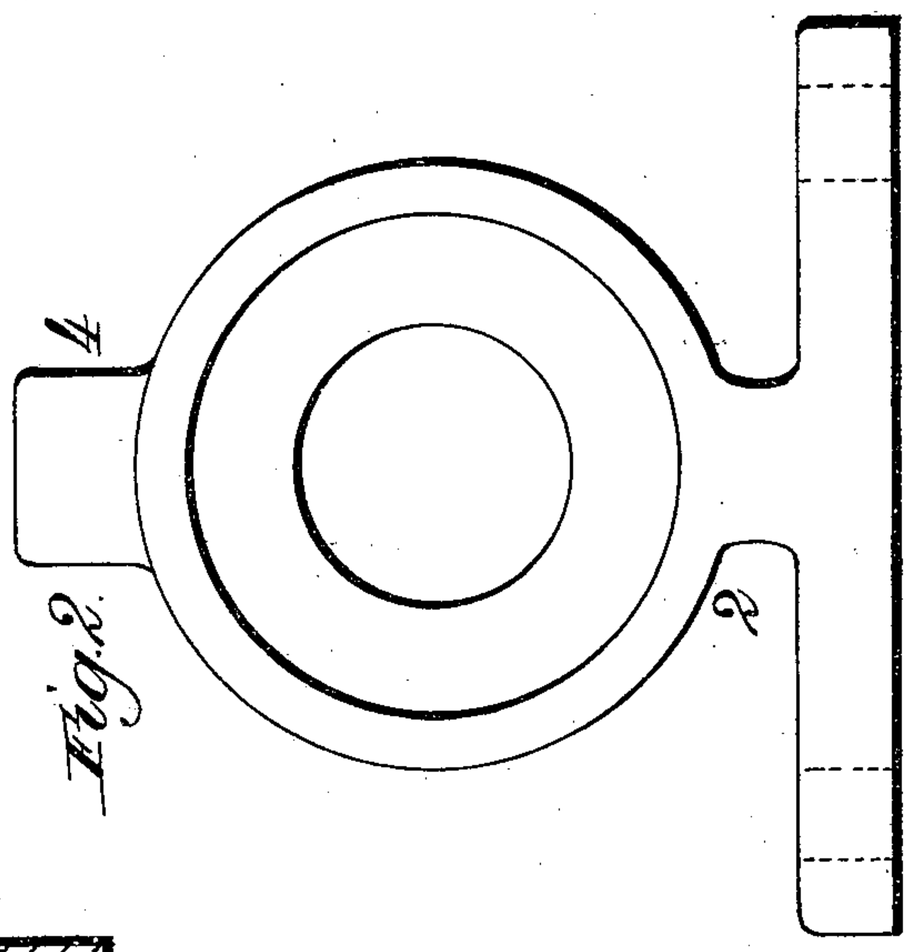

Fig. 2.

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UNITED STATES PATENT OFFICE.

ARTHUR WISE CASH, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE FOSTER ENGINEERING COMPANY, OF SAME PLACE.

AUTOMATIC BELT OR MOTOR-SWITCH SHIFTER.

SPECIFICATION forming part of Letters Patent No. 627,903, dated June 27, 1899.

Application filed October 13, 1898. Serial No. 693,445. (No model.)

To all whom it may concern.

Be it known that I, ARTHUR WISE CASH, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented new and useful Improvements in Automatic Belt or Motor-Switch Shifters, of which the following is a specification.

This invention relates to an automatic fluid-pressure-actuated belt, lever, or electric-switch shifter for starting and stopping a pump or motor and for other purposes—such, for instance, as controlling the operation of a pump for supplying fluid to a tank or reservoir in which it may be desired to maintain a standard pressure.

The invention consists in the combination, with a cylinder adapted to receive fluid-pressure from a tank or reservoir and having a differential piston to which is attached a connecting-rod for actuating a valve or a belt-shifter or a lever or switch, of an automatic fluid-pressure-controlled valve of novel construction to connect with said cylinder and tank and having a waste-passage; and the invention further consists in the features of construction and combination of parts comprised in said valve, as hereinafter described and claimed.

In the annexed drawings, illustrating the invention, Figure 1 is a longitudinal section of my improved fluid-pressure-actuated mechanism for operating a belt-shifter, lever, or switch. Fig. 2 is an end elevation of a stuffing-box and bracket.

The cylinder 1 is threaded at one end into a head or bracket 2, which is provided with a stuffing-box 3 on its outer side. On the periphery of the bracket-head there is a boss 4, through which is formed a threaded opening 5 for attachment of a pipe to connect with a fluid-pressure tank or reservoir. This opening 5 communicates with the cylinder 1 through a port or opening 6 for admitting fluid-pressure from the tank or reservoir to that side of the piston-head 7 which presents the least area or surface by reason of the piston-rod 8 being on that side and having a comparatively large diameter. The piston-head is provided with packing-rings 9 of some soft yielding material, preferably leather, and may be secured to the piston-rod by means of a nut 10 or otherwise. The piston-rod passes out through the stuffing-box 3 and has at its end a suitably-jointed connection with a connecting-rod 11, that in turn connects with the belt-shifter or the lever or switch or valve to be actuated by the movements of the piston. On the other end of the cylinder 1 there is a cap 12, that is provided with an opening into which is tapped a nipple or small pipe 13, which connects with a port 14 of a three-way automatic fluid-pressure-controlled valve 15, which communicates with the fluid-pressure tank or reservoir, as hereinafter explained.

The casing of the valve 15 comprises a cylindrical body portion having at one end a circular enlargement 16, that is screw-threaded for engagement of a cover part 17, that tightly clamps into place a flexible diaphragm 18, which divides the valve-casing into two chambers. In the chamber 19, on one side of this diaphragm, there is placed a spring 20, the thrust of which is exerted at one end against a plate or block 21, resting against the diaphragm. The other end of the spring 20 bears against a screw-cap 22, that can be adjusted to increase or decrease the compression of said spring, and thus regulate its pressure to correspond with any standard of pressure required in the fluid-pressure tank or reservoir. The chamber 23 on the other side of the diaphragm 18 communicates through a port 24 with an opening 25, that is provided in the body portion of the valve-casing for attachment of a suitable pipe to connect with the fluid-pressure reservoir or tank.

In the body portion of the valve-casing there is a central longitudinal bore that is of reduced diameter for part of its length, next to the diaphragm-chamber 23, and of enlarged diameter at the outer end of said valve-casing. The reduced portion of said bore forms a valve-chamber 26, having a valve-seat at each end. This valve-chamber 26 receives two valves 27 and 28, the stems of which abut in such manner that when one valve is closed or seated the other valve will be open. The valve-stems are tubular and fit the valve-chamber 26, except where they are circumferentially grooved on the exterior.

Each valve-stem is provided with radial holes 29 30, communicating with its hollow or tubular interior next to the valve-head, and other radial holes 31 are provided at the abutting ends of the valve-stems opposite the port 14, that communicates with the pipe 13 and connected cylinder.

The valve 27 is normally seated by the pressure of the spring 20 against the diaphragm 18, and the closing of this valve 27 forces the valve 28 open against the pressure of a spring 32, that is confined in a chamber 33, formed by the enlarged portion of the bore in the body of the valve-casing. The compression of the spring 32 is adjusted by means of a centrally-bored screw-plug 34, that is screw-threaded or otherwise adapted for attachment of a pipe through which the exhaust from the cylinder 1 is to escape.

For use in operating a belt-shifter the described mechanism is firmly secured, by means of the bracket 2, onto the countershaft frame or other suitable support in such manner that the connecting-rod 11 may readily be connected to the sliding bar that carries the belt-shipper fingers, or in the case of an electrically-driven pump the bracket 2 may be bolted to the switchboard or other suitable support in such position as will admit of connecting the rod 11 to the switch-lever, or the differential piston may be connected in any convenient manner with a valve for controlling the operation of a pump or engine. The opening 5, which leads into the cylinder 1, and the opening 25 of the automatic valve 15 are each to be connected by suitable piping to a pressure tank or reservoir into which fluid is to be forced by a pump. If it is desired to carry, say, seventy pounds pressure in the tank, the threaded cap 22 will be adjusted to give sufficient compression on the spring 20 to resist or balance seventy pounds pressure per square inch on the other side of the diaphragm 18, thus holding down said diaphragm in such position that the valve 27 will be thereby held to its seat, and this in turn holds the valve 28 open or away from its seat. Of course whatever fluid-pressure there may be in the tank or reservoir will also at all times be in that part of the cylinder 1 between its port 6 and the piston-head 7, and also on the under side of the diaphragm 18, through the opening 25 of the valve-casing. When the pressure in the tank is no more than sufficient to balance the compression of the spring 20 as adjusted by the cap 22, the piston 7 will occupy, as shown, such position as will cause the belt-shifter or the switch to permit operation of the pump for maintaining the required fluid-pressure in the tank. Now as soon as the pressure in the tank reaches a point above seventy pounds it will force the diaphragm 18 back against the pressure of the spring 20, thus permitting the valve 27 to open under the pressure exerted by the spring 32 in closing or forcing the valve 28 to its seat. Thus the valve 27 will be held open, while the valve 28 will be held closed. The fluid-pressure now enters the small radial holes 29 of the valve 27, passes through the tubular or hollow valve-stem, out through the radial holes 31, and thence through the valve-port 14 and pipe 13 into the cylinder 1 to act against the full area of the adjacent side of the piston-head 7, thereby overcoming the same pressure acting against the reduced area of the opposite face of the piston-head and so forcing the piston outward and holding it in that position until the fluid-pressure in the tank again falls to seventy pounds or below. This outward movement of the piston actuates the belt-shifter or the switch or lever or a valve (not shown) in such direction as to stop the pump. When the fluid-pressure in the tank falls to seventy pounds or less, the spring 22 will force the diaphragm 18 toward the valve 27, thereby closing said valve and holding it to its seat against the pressure of the spring 32 on the valve 28, and by thus seating the valve 27 the valve 28 will be held open, so that the pressure on the larger side of the piston 7 can flow back through the pipe 13 and valve-port 14, thence through the radial holes 31 into the hollow stem of the valve 28, and out through the radial holes 30 of said valve and through the chamber 33 to the waste-passage in the plug 34 at the end of said chamber. In the meantime the pressure in the cylinder 1 between the port 6 and piston-head 7 will force the piston back to its former position, as shown, and through this movement of the piston the belt-shifter will be actuated in such direction as to carry the driving-belt of the pump back onto the tight pulley for starting the pump or in like manner will actuate a valve or a switch or lever for a similar purpose. The same principle applies whether the motor is operating a hydraulic pump or an air pump or compressor and whether the starting and stopping are to be effected through a belt-shifter or a lever or an electric switch.

As shown, the valves 27 and 28 are of such length in their stems or abutting parts that when the one is closed against its seat the opposite valve is forced open or away from its seat a fixed distance—say one sixty-fourth of an inch. The spring 32 is held at an adjusted degree of compression by means of the screw-plug 34, and its strength and pressure should be sufficient to hold the valve 28 firmly against the valve 27 with such power as to withstand the force of the required fluid-pressure acting against the area of the valve 28 in a direction to push it outward. Thus by a proper adjustment of the springs 20 and 32 the operation of the valve 15 will be automatic and immediately sensitive to any increase of fluid-pressure in the tank or reservoir above the standard to which the spring 20 may have been adjusted.

What I claim as my invention is—

1. In a fluid-pressure-actuated belt, lever or switch shifter, the combination with a pis-

ton to be connected with a device for controlling the operation of a pump or engine to supply a pressure tank or reservoir, and a cylinder having on that side or face of said piston which is of least area a port to be connected with said pressure-reservoir, of fluid-pressure-controlled valve mechanism to be connected with the pressure-reservoir and with said cylinder on that side or face of said piston which is of larger area and comprising opposed positively seating and unseating valves arranged in such manner that the closing of either valve exerts a direct pressure to open the other, substantially as described.

2. In a fluid-pressure-actuated belt, lever or switch shifter, the combination of a piston, an inclosing cylinder having a port on that side or face of said piston which is of least area, and fluid-pressure-controlled three-way-valve mechanism adapted to communicate with said cylinder on that side or face of its piston which is of larger area and comprising opposed positively seating and unseating valves so arranged that the closing of either valve exerts a direct pressure to open the other, substantially as described.

3. In a fluid-pressure-actuated belt or switch shifter, the combination with a cylinder having a piston and provided with a port on that side or face of the piston which is of least area, of a fluid-pressure-controlled three-way-valve mechanism connected with said cylinder on that side or face of the piston which is of larger area and comprising two oppositely-seating valves arranged and opposing each other in such manner that the closing of one valve causes the other to open, substantially as described.

4. In a fluid-pressure-actuated belt or switch shifter, the combination with a cylinder having a piston and provided with a port on that side or face of the piston which is of least area, of fluid-pressure-controlled valve mechanism connected with said cylinder on that side or face of the piston which is of larger area and comprising two oppositely-seating valves arranged and opposing each other in such manner that the closing of one valve causes the other to open, and two springs forcing said valves together from opposite directions, substantially as described.

5. In a fluid-pressure-actuated belt or switch shifter, the combination with a cylinder having a piston and provided with a port on that side or face of the piston which is of least area, of fluid-pressure-controlled valve mechanism connected with said cylinder on that side or face of the piston which is of larger area and comprising two valve-seats, two oppositely-seating valves, two springs forcing said valves together from opposite directions and so adjusted that the closing of one valve will cause the other to open, a flexible diaphragm between one of said valves and its spring, means for adjusting the compression of said spring against the diaphragm, and a casing for the diaphragm and valves provided with suitable ports, substantially as described.

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

ARTHUR WISE CASH.

Witnesses:
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F. J. GREENBERG.