

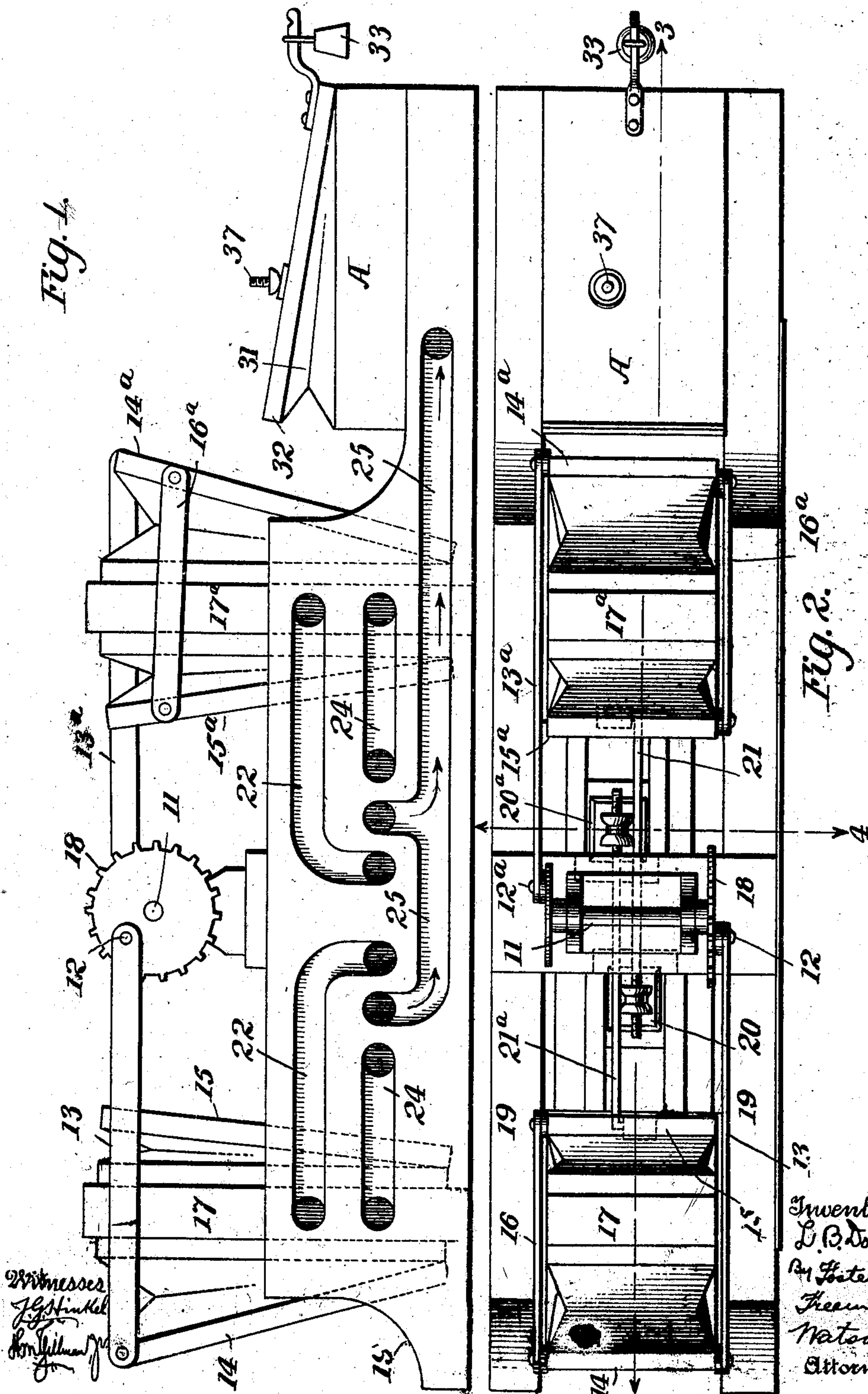
No. 881,885.

L. B. DOMAN.  
AIR MOTOR.

PATENTED MAR. 10, 1908.

APPLICATION FILED MAY 19, 1904.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2

Fig. 3.

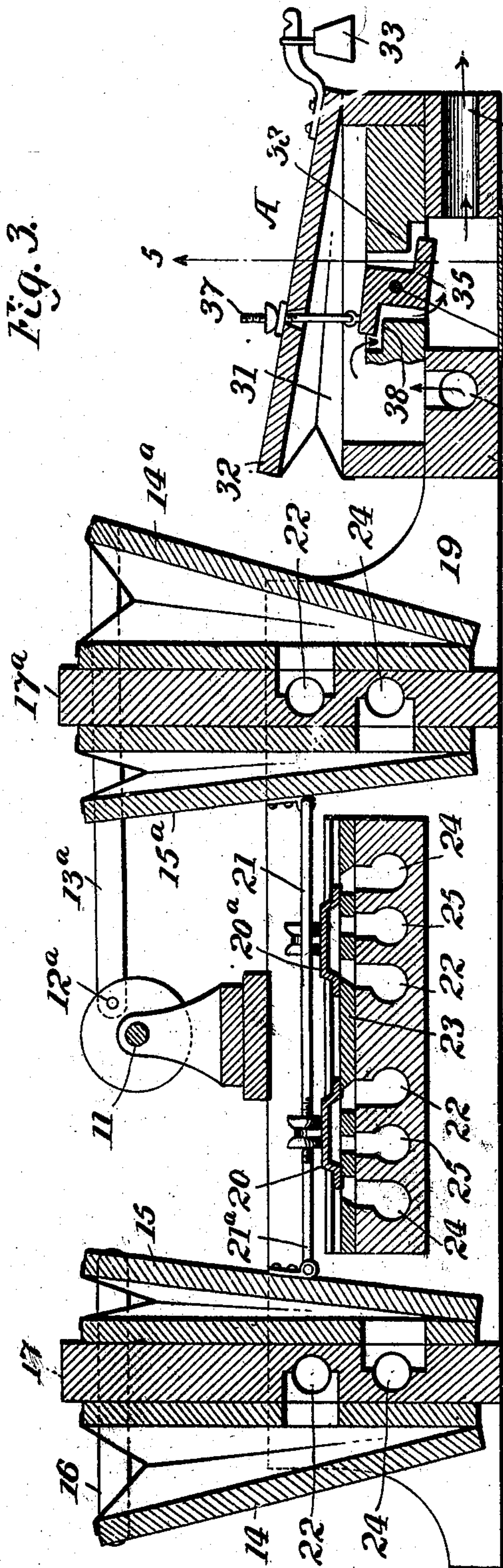


Fig. 5.

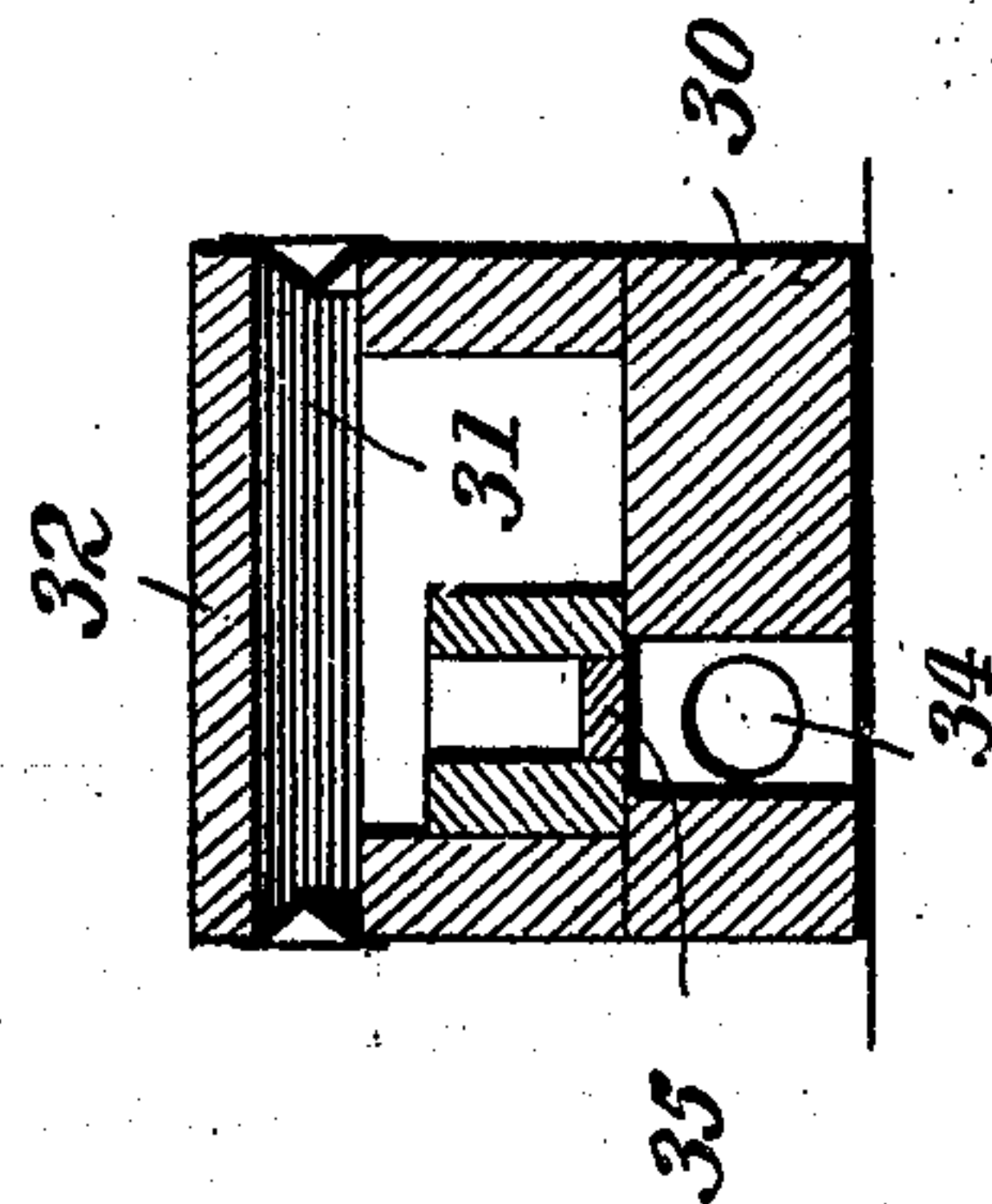
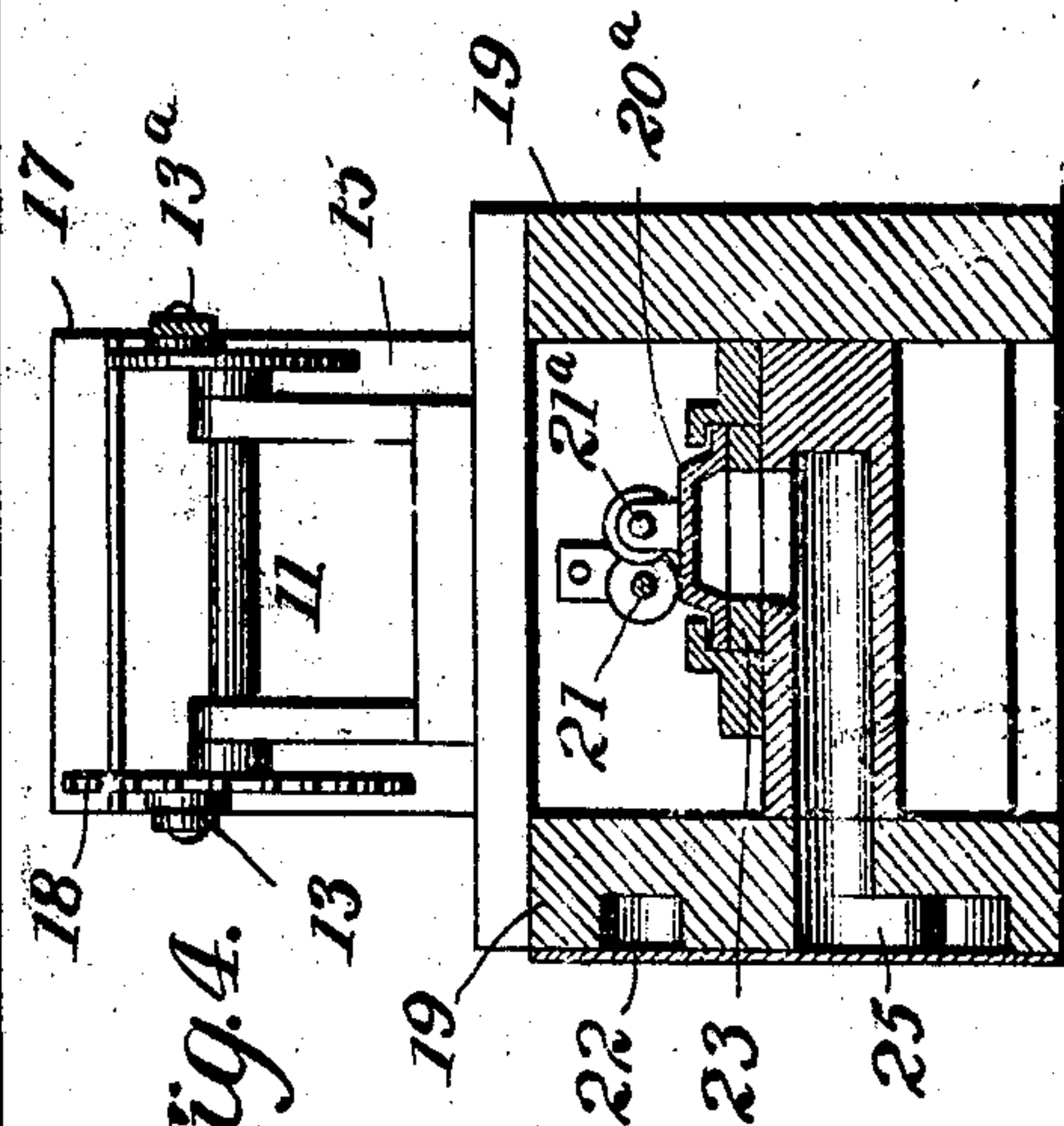


Fig. 4.



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# UNITED STATES PATENT OFFICE.

LEWIS BENJ. DOMAN, OF ELBRIDGE, NEW YORK, ASSIGNOR TO AMPHION PIANO-PLAYER COMPANY, OF ELBRIDGE, NEW YORK, A CORPORATION OF NEW YORK.

## AIR-MOTOR.

No. 881,885.

Specification of Letters Patent.

Patented March 10, 1908.

Application filed May 19, 1904. Serial No. 208,703.

*To all whom it may concern:*

Be it known that I, LEWIS B. DOMAN, a citizen of the United States, residing at Elbridge, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Air-Motors, of which the following is a specification—

This invention relates to air motors, such as are commonly employed in mechanical piano players and other musical instruments to produce rotary motion from the reciprocating motion of one or more bellows or pneumatics. The motor is preferably operated by atmospheric pressure, the pneumatics being connected with an exhausting apparatus by means of suitable valved passages.

The invention will be described with reference to the accompanying drawing, in which,

Figure 1 is a side elevation of the motor, including the speed regulator or governor, the side plate which closes the air passages being omitted; Fig. 2 is a plan view of the same complete with side plate; Fig. 3 is a longitudinal central section on the line 3—3 of Fig. 2; Fig. 4 is a vertical section on the line 4—4 of Fig. 2, and Fig. 5 is a section on the line 5—5 of Fig. 3;

Referring to the drawing, 11 indicates the crank shaft of the motor, 12—12<sup>a</sup> a pair of crank pins 90 degrees apart mounted on cranks or crank disks upon the shaft 11; 13—13<sup>a</sup> are pitmen connecting the crank pins respectively with the movable parts of pneumatics 14 and 14<sup>a</sup>. The pneumatics 14 and 14<sup>a</sup> are respectively connected to pneumatics 15 and 15<sup>a</sup> by links or connecting rods 16 and 16<sup>a</sup>. The pneumatics 14 and 15 are arranged back to back on a block 17 and the second pair of pneumatics are likewise arranged on a block 17<sup>a</sup>. The motor shaft 11 may be provided with a sprocket wheel 18 or other suitable means for transmitting motion to operate the roll of perforated paper, or for other purposes.

The general arrangement is preferably shown in Figs. 1 and 2; the uprights 17—17<sup>a</sup> being supported on a base 19 and the pneumatics being arranged back to back upon the uprights. The shaft is arranged transversely of the base midway between the pneumatics, and each crank pin is connected with an outer or movable board of one of the outer pneumatics, thus permitting of the use of a pitman of maximum length and reducing the angularity of its movement to a mini-

mum. Each pair of pneumatics imparts to its pitman positive movement in two directions thus giving the shaft 11 four impulses during each revolution.

The air passages to and from the pneumatics 14 and 15 are controlled by a slide valve 20 which is connected by a link 21 with the movable board of the pneumatic 15<sup>a</sup> and the valve 20<sup>a</sup> controlling the passage of air to and from the pneumatics 14<sup>a</sup>, 15<sup>a</sup> is connected with the movable board of the pneumatic 15 by a link or connecting rod 21<sup>a</sup>. The supply and exhaust passages for the pneumatics 14 and 15 are duplicates for the pneumatics 14<sup>a</sup>, 15<sup>a</sup> and the former only need be described in detail.

A passage 22 leads from the interior of the pneumatic 14 through the upright 17 and the base 19 and communicates with an opening in the plate or seat 23 upon which the slide valve 20 operates, Figs. 1 and 3. Likewise a passage 24 leads from the interior of pneumatic 15 to a port in the valve seat 23. A third or exhaust port in the valve seat 23, which is arranged between the ports 22 and 24, communicates with a passage 25 leading to a pressure regulating or governor device A which is hereinafter described. The slide valve 20 is of sufficient length to cover two of the ports at a time and it is provided with a passage by means of which the two ports covered by it are placed in communication, as is common in some well known forms of steam engines, this valve being sometimes termed a "D-valve". As the valve is reciprocated it alternately covers and uncovers the ports of passages 22 and 24, placing each of said passages alternately in communication with the atmosphere and with the exhaust port 25 which is in communication with an exhaust pump or other vacuum producing means. When one of the pneumatics is in communication with the atmosphere, the opposing pneumatic is in communication with the exhaust passage; hence the latter is collapsed with considerable force due to the atmospheric pressure on it and the former is opened by means of the connecting rod 16 between them. When the valve 20 moves to the other extreme, the conditions of the pneumatics 14, 15, are reversed, the pneumatic 14 being collapsed by the atmospheric pressure and the pneumatic 15 expanded and inflated through its passage 24 which is open to the atmosphere. These



movements of the pneumatics 14, 15, reciprocate the pitman 13. In like manner the pitman 13<sup>a</sup> is reciprocated by the pneumatics 14<sup>a</sup> and 15<sup>a</sup>. The setting of the cranks at 90 degrees apart insures the proper movement of the valves at the proper time.

The valve arrangement is "duplex", the pneumatic 15 operating the valve for the pneumatics 14<sup>a</sup> and 15<sup>a</sup> and the pneumatic 15<sup>a</sup> operating the valve for the pneumatics 14 and 15. The motor therefore has no dead points or dead centers and it always starts when a partial vacuum is created in the exhaust passage 25.

It will be evident that the construction and arrangement of this motor is simple and compact and comparatively cheap. The movable boards of the pneumatics 15, 15<sup>a</sup>, are each hinged at one end and have a maximum movement at the other end. At a certain intermediate point between the ends the movement is equal to the desired movement of the valve which is connected to the board and to simplify the construction and prevent any tendency of the links 21 and 21<sup>a</sup> to raise their valves the valve seat is so elevated that substantially horizontal connections may be made between the valves and the movable boards of the pneumatics 15, 15<sup>a</sup>. This arrangement of valve connections is very simple and satisfactory. Each valve is connected to its rod by adjusting means so that it may be properly set with relation to the ports with which it coöperates. The speed of the motor depends upon the degree of vacuum in the passage 25 and by governing the pressure in this passage the speed may be rendered practically uniform. The governor will now be described.

The exhaust passage 25 communicates through passage in the base block 30 of the regulator A with the interior of a pneumatic 31 arranged on said base. The upper or movable board 32 of the pneumatic is connected with a weight 33 (a spring might be used) which constantly tends to raise it and distend the pneumatic. The interior of the pneumatic 31 communicates with the vacuum producing means by the valved passage 34. In this passage is a balanced valve 35 which is centrally pivoted at 36 and connected with the movable board of the pneumatic 31 by an adjustable link 37. The valve 35 is preferably Z-shaped as shown, the upper and lower arms of the "Z" fitting seats 38 when the valve is closed.

The operation of the pressure regulator is as follows. The weight 33 tends to open the pneumatic 31 and the vacuum within tends to close it. The parts are normally adjusted so that the valve 35 will permit of the passage of the amount of air necessary

to run the motor at the desired speed with a given degree of vacuum in the passage 34. Should the vacuum become increased in the passage 34, that is, should the pressure decrease, the pressure in the pneumatic 31 will immediately decrease, correspondingly and the pneumatic will collapse more or less depending on the amount of decrease in internal pressure. This will close or partially close the valve 35. As soon as the pressure again increases in the pneumatic 31, by reason of air received from the motor, the valve 35 will be automatically opened. It will be apparent that the apparatus described will form a governor for the motor, regulating the pressure in the motor exhaust passage and rendering the same practically uniform regardless of variations in the pressure in the passage 34 leading to the exhaust means. By increasing the power which tends to open the pneumatic 31 and the valve 35, the motor will be subjected to a lower pressure in its exhaust passage and its speed correspondingly increased. This variation may be caused by increasing the weight 33 or its leverage, or the tension of a spring which may be substituted for the weight.

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

1. In an air motor, the combination of a crank shaft, pneumatics on opposite sides of said crank shaft, pitmen connecting the pneumatics with the crank shaft, valves controlling the passage of air to and from the pneumatics, each valve being connected directly to a part of the movable board of one of the pneumatics having a movement substantially equal to the throw of the valve, whereby direct connections between the pneumatics and the valves are permitted.

2. In an air motor, the combination with the crank shaft, of a plurality of pairs of pneumatics arranged on opposite sides of said shaft, connections between said pneumatics and the shaft for driving the latter, and slide valves controlling the passage of air to and from the pneumatics, said slide valves being connected directly to the movable boards of the pneumatics and arranged between parts of said movable boards having a movement substantially equal to the throw of the valves, whereby direct connections between the pneumatics and the valves are permitted.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

LEWIS BENJ. DOMAN.

Witnesses:

GEO. T. LANABEE,  
NETTIE A. BIBBEUS.