

No. 711,158.

Patented Oct. 14, 1902.

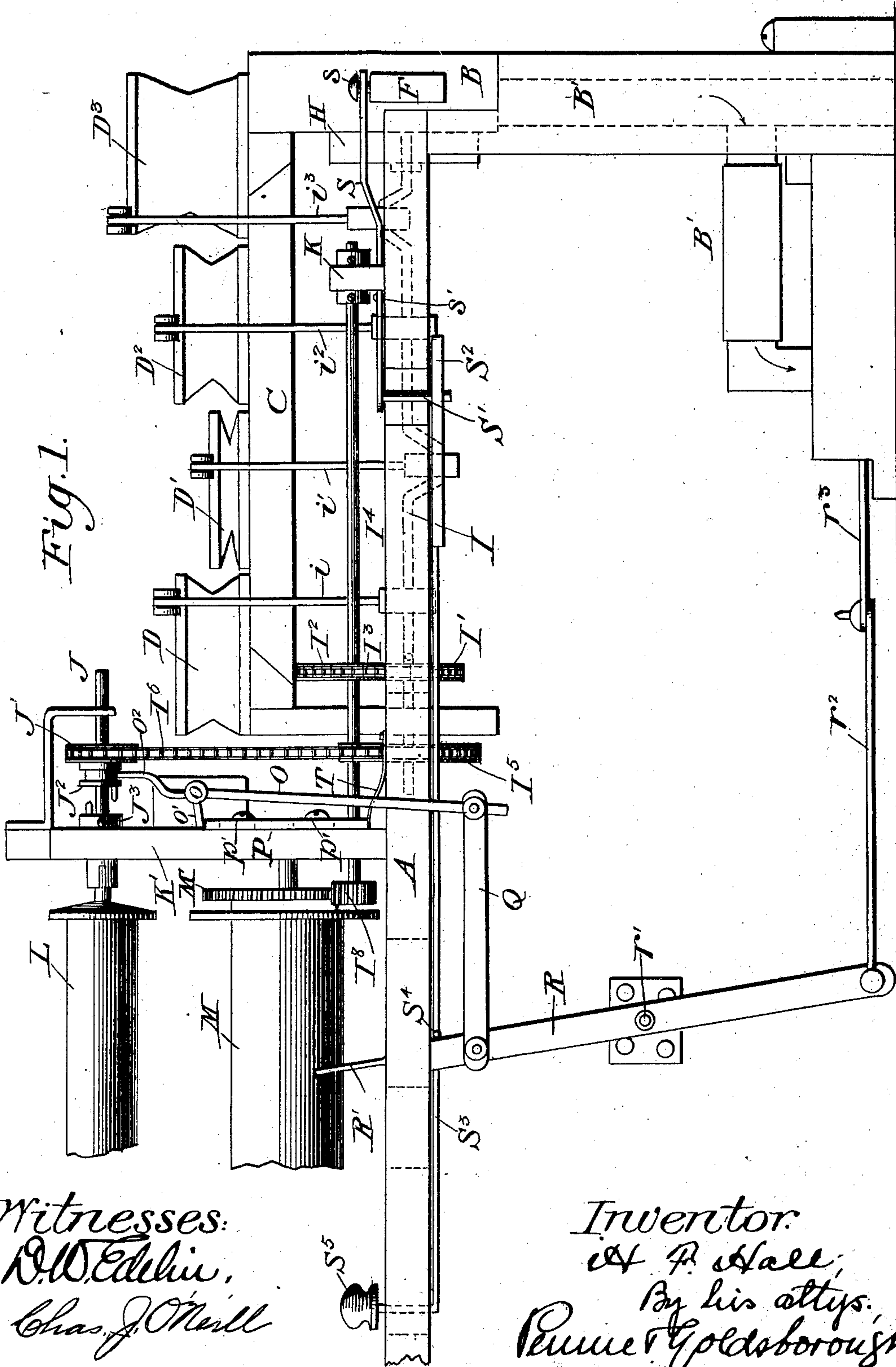
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PNEUMATIC MOTOR FOR MECHANICAL MUSICAL INSTRUMENTS.

(Application filed Sept. 12, 1901.)

(No Model.)

2 Sheets—Sheet 1.



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2 Sheets—Sheet 2.

Fig. 2.

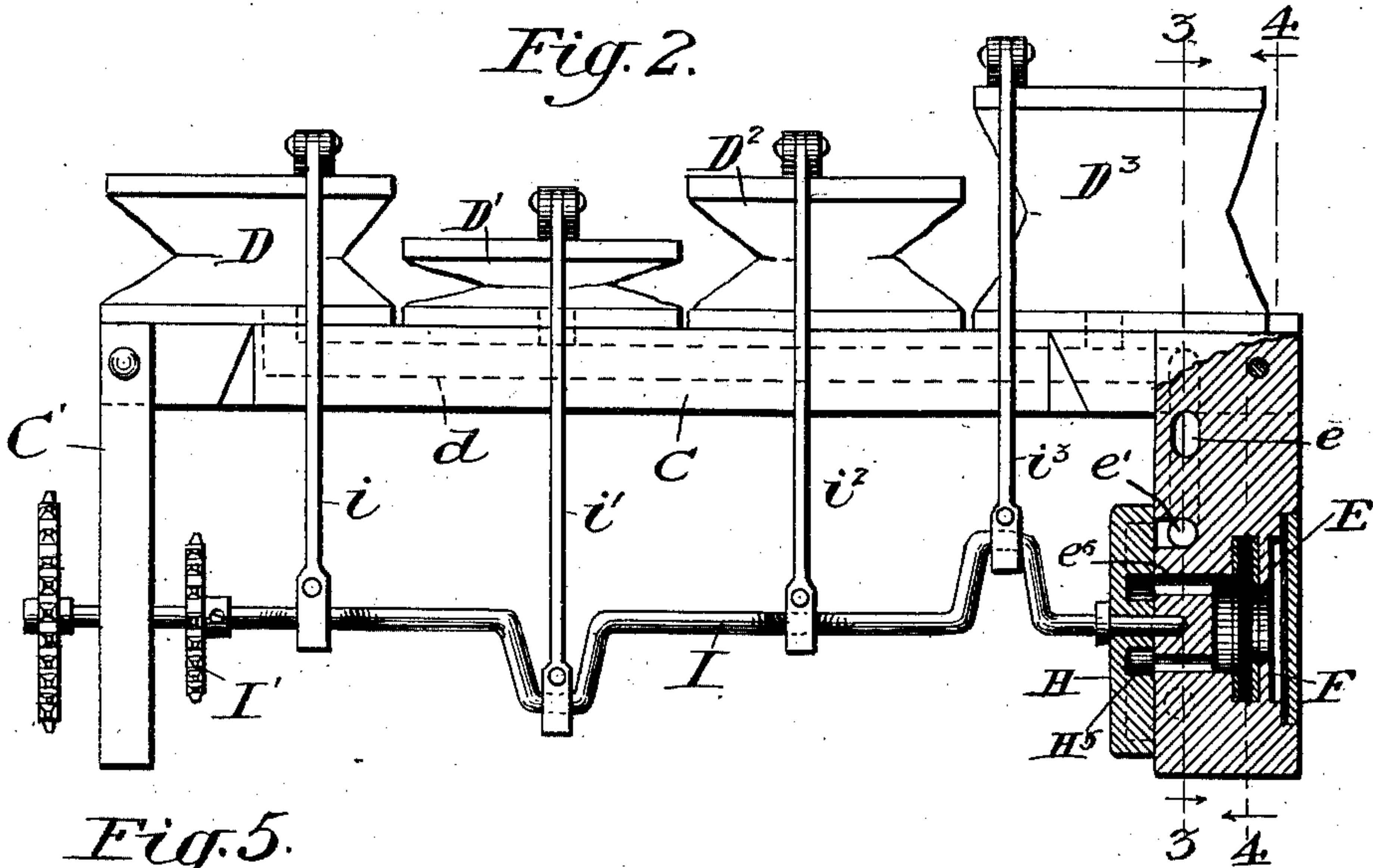


Fig. 5.

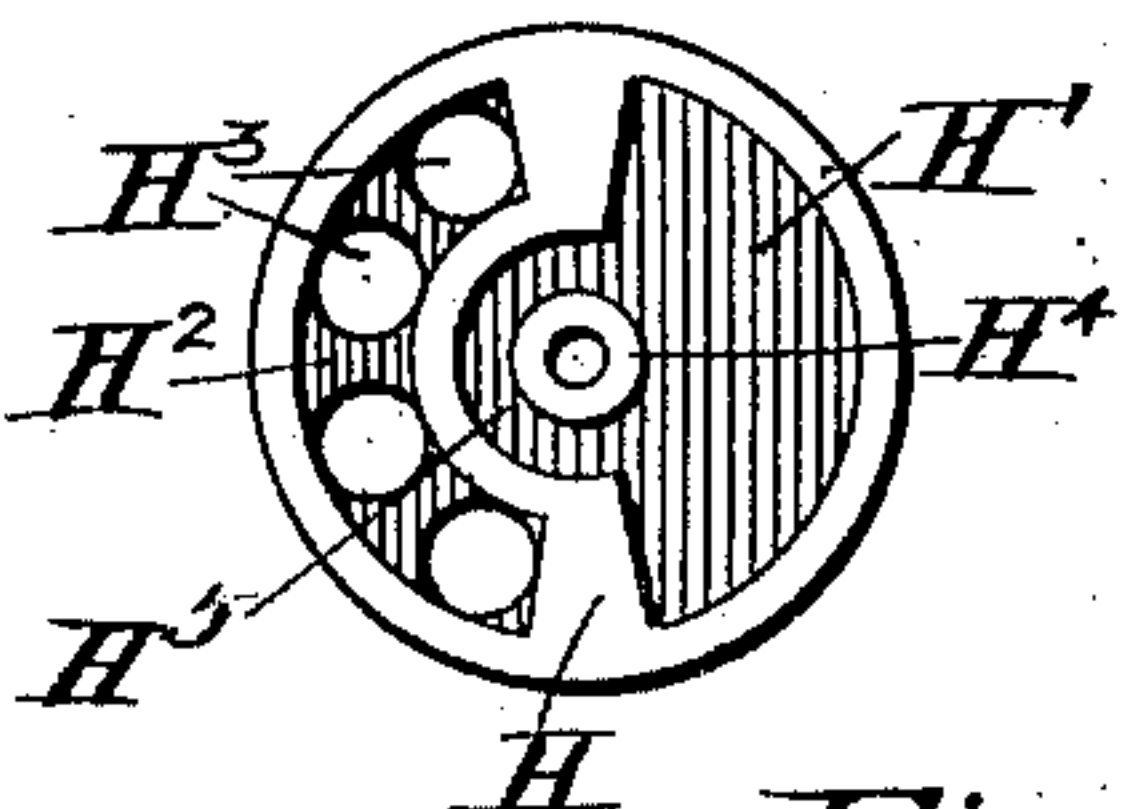


Fig. 3.

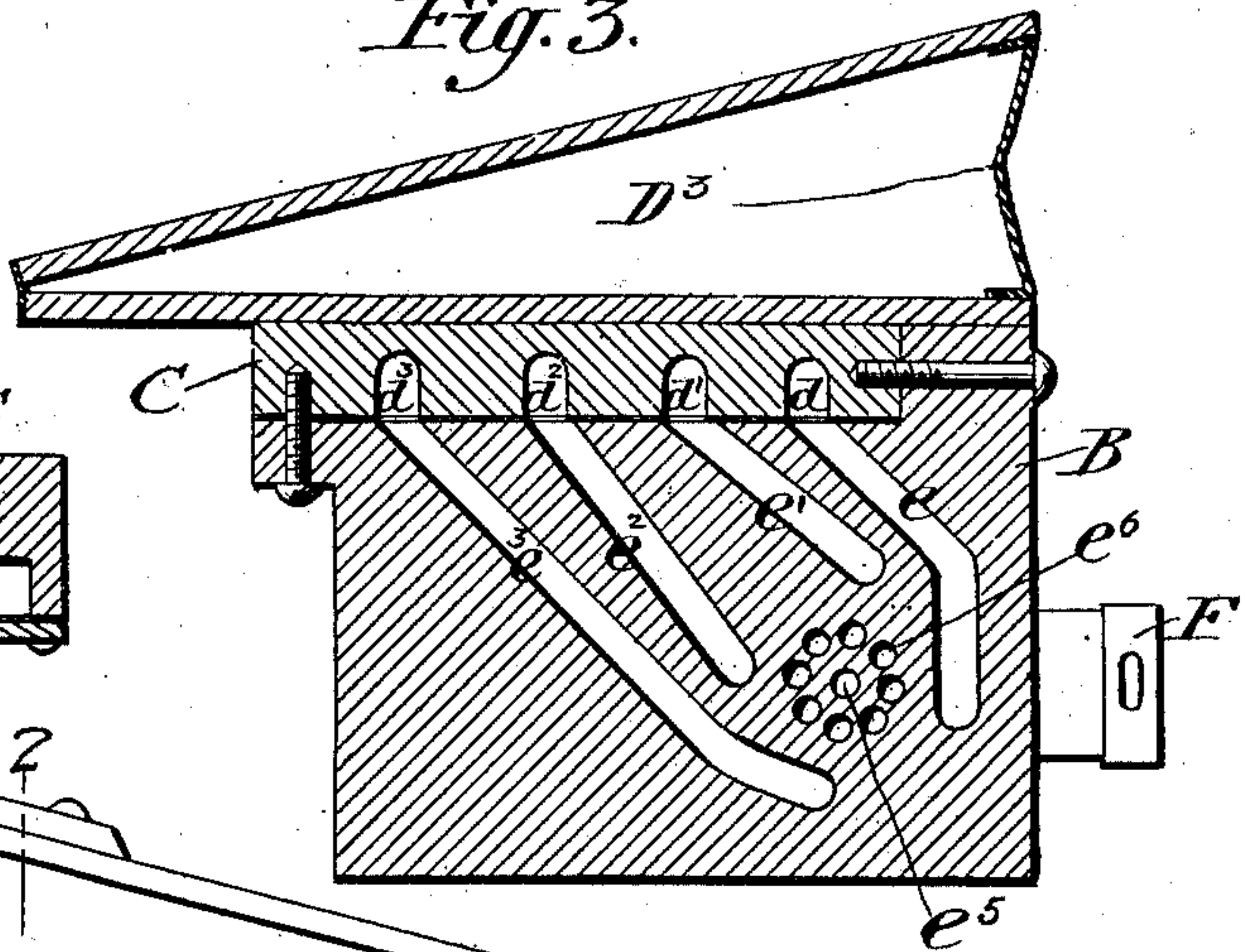


Fig. 6.

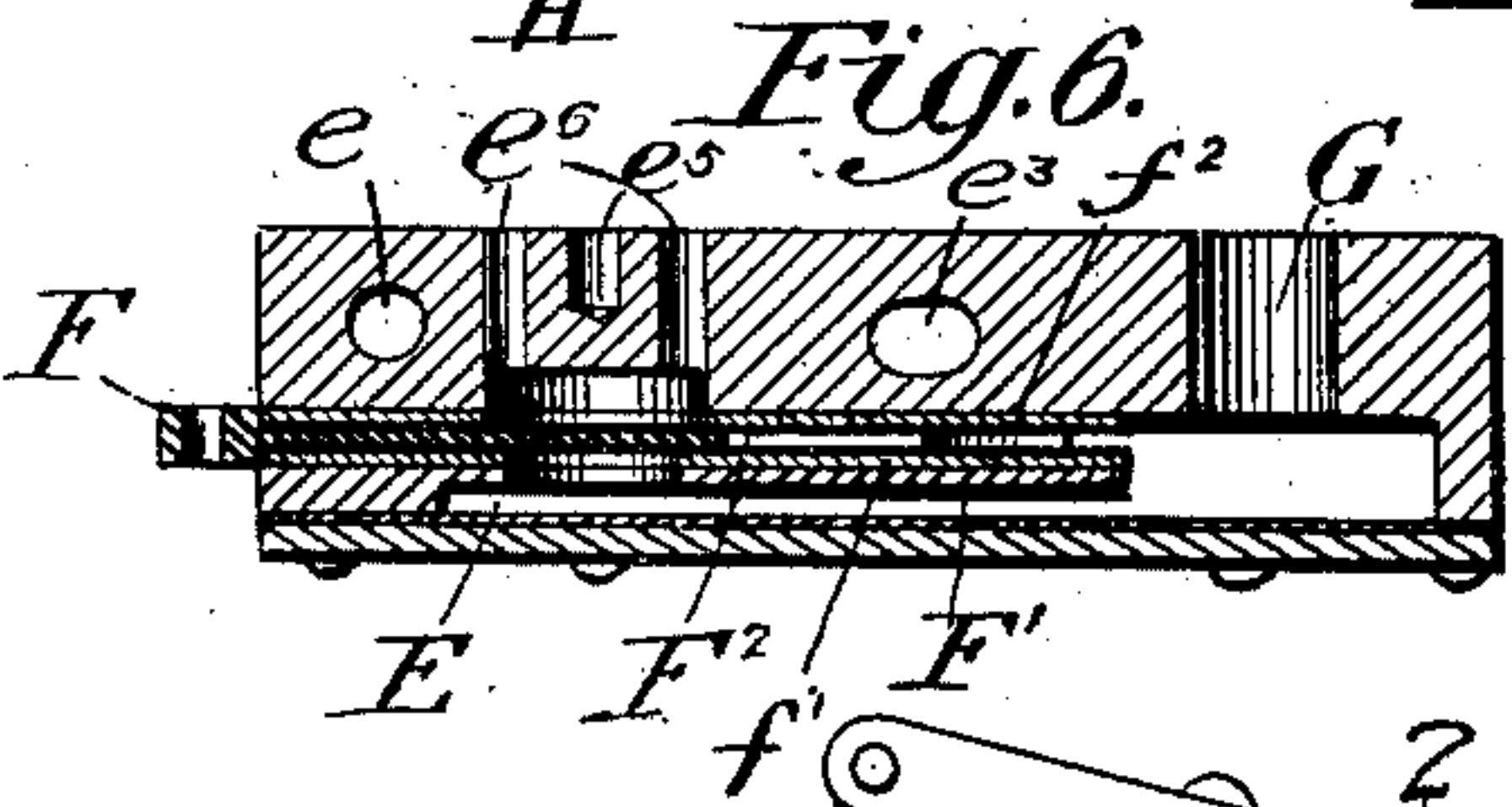
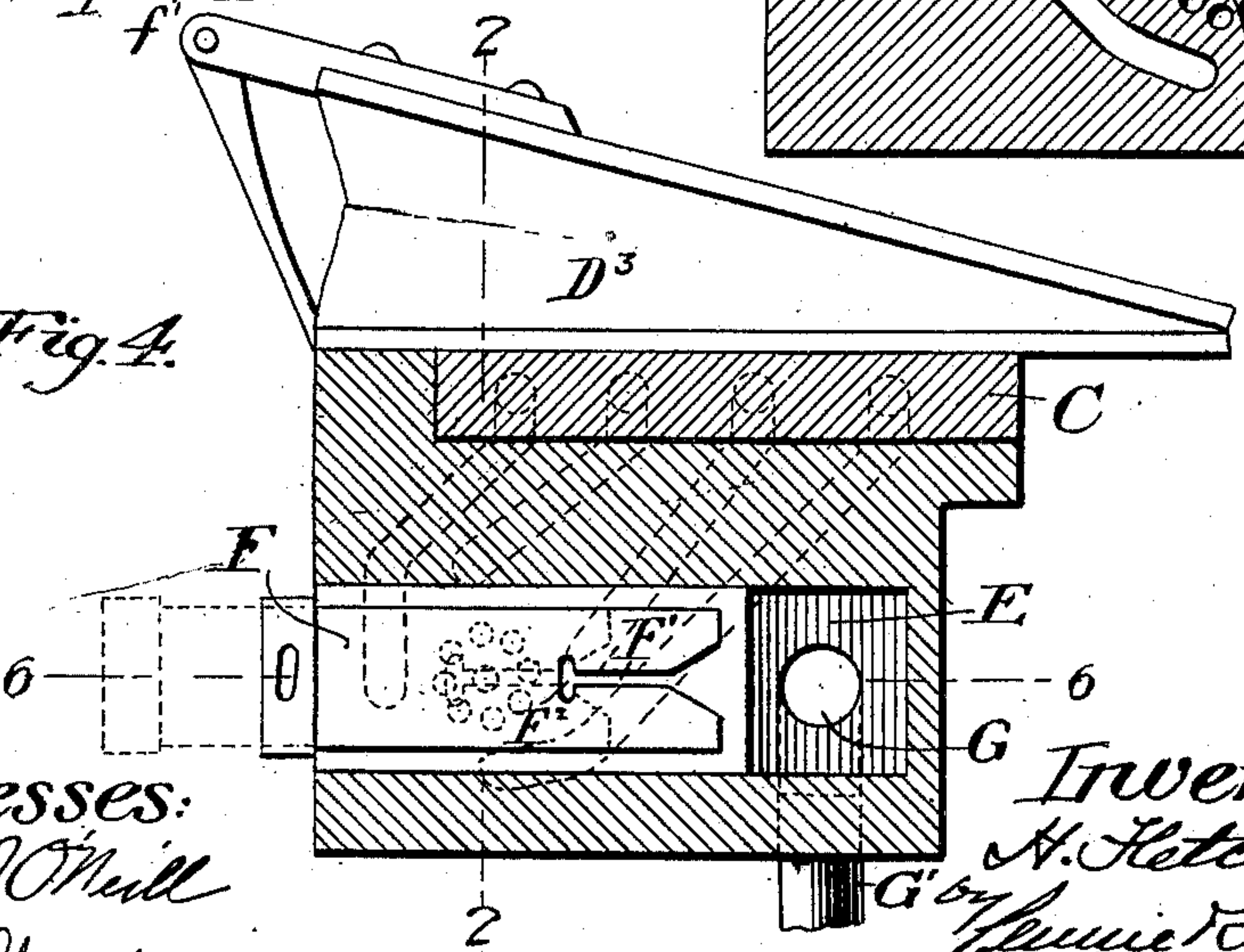


Fig. 4.



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UNITED STATES PATENT OFFICE.

HENRY FLETCHER HALL, OF CAMBRIDGE, MASSACHUSETTS.

PNEUMATIC MOTOR FOR MECHANICAL MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 711,158, dated October 14, 1902.

Application filed September 12, 1901. Serial No. 75,241. (No model.)

To all whom it may concern:

Be it known that I, HENRY FLETCHER HALL, a citizen of the United States, residing at Cambridge, county of Middlesex, and State of Massachusetts, have invented certain new and useful Improvements in Pneumatic Motors for Mechanical Musical Instruments; and I do hereby 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 pneumatic motors for mechanical musical instruments and the like, and is more particularly adapted for use in operating the music-sheet rolls of self-playing instruments.

The object of my invention is to provide a motor of the class specified having a rotary shaft connected to the several pneumatics, a rotary valve actuated by said shaft to connect the said pneumatics individually and successively with the main bellows and with the atmosphere, a graduated tempo-slide interposed between the rotary valve and the main bellows to produce even and uniform variations in the speed of the motor-shaft, a rewind mechanism for reversing the travel of the music-sheet without changing the direction of rotation of the motor, and connections between the rewind mechanism and the tempo-slide, whereby when said rewind is actuated the tempo-slide will be opened fully to drive the motor at its maximum speed to enable the rewinding to be accomplished at a greater speed than the unwinding.

The preferred form of my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a front elevation of the motor and appurtenant devices employed in connection with the music-sheet rolls of an automatic musical instrument. Fig. 2 is a front elevation, partly in section, of the motor. Figs. 3 and 4 are transverse sections on lines 3 3 and 4 4, respectively, of Fig. 2. Fig. 5 is a detail view of the rotary valve. Fig. 6 is a section on line 6 6 of Fig. 4.

Referring particularly to Fig. 1 of the drawings, A represents a shelf or support on which the motor mechanism is mounted. It is of course obvious that said shelf or support A may be attached to the instrument or appa-

ratus to be actuated by standards or brackets of any approved or convenient form. Secured adjacent to one end of the shelf A is a block B, which in turn supports a channel-block C, upon the top of which are mounted the bellows or pneumatics D, D', D², and D³. Through the body of the block C is a series of parallel channels *d*, *d'*, *d*², and *d*³, which are in communication with the corresponding pneumatics D, D', D², and D³. The block B is provided with a series of channels *e*, *e'*, *e*², and *e*³, opening into the channels *d*, *d'*, *d*², and *d*³, respectively, in the block C, and said channels *e*, *e'*, *e*², and *e*³ terminate in orifices opening through the side of the block B and circularly disposed with reference to a bearing *e*⁵, which receives the end of a crank-shaft I, said crank-shaft being journaled in an opposite standard C', which supports the block C. The block B is also provided with a circular series of small orifices *e*⁶, which are arranged concentric with the bearing *e*⁵ and between it and the terminal orifice of the channels *e*, *e'*, *e*², and *e*³. Said perforations *e*⁶ pass through the block and establish communication between the chamber H' of the valve H and the enlarged rectangular chamber E on the opposite face of the block B, which chamber is in communication with the wind chest or exhauster designed to operate the pneumatics D, D', D², and D³. The several pneumatics D, D', D², and D³ are connected with cranks on the shaft I by pitmen *i*, *i'*, *i*², and *i*³, and as said cranks are regularly disposed on the shafts in quadrature it will be seen that as each pneumatic is exhausted it will impart a rotary motion through its particular crank to the shaft. Secured to the shaft I is a circular valve H, engaging block B and having two cavities or recesses H' H² in its face, the former of which recesses is generally segmental in shape, with an annular extension H⁵, embracing the central boss H⁴ of the valve, while the latter recess H² is that of a segment of an annulus and is provided with a series of orifices H³. As the valve H rotates the larger recessed portion H' connects the channels leading to the several pneumatics D, D', D², and D³ successively with the perforations *e*⁶ and thence, by way of the chamber E and outlet G and connecting-pipe G', to the wind chest or exhauster. The function of the smaller recess

H² is to connect the pneumatics D, D', D², and D³ after they have been exhausted with the atmosphere by their respective channels *d*, *d'*, *d*², and *d*³ for the purpose of reinflating 5 said pneumatics.

For the purpose of regulating the passage of the air from the several pneumatics to the 10 exhauster I provide a tempo-regulator F, which is, in effect, a throttle-valve and which comprises a thin flat plate preferably of vul- 15 canite or indurated fiber which passes through a suitable slot in the end of block B and has an air-tight seating between two thin packing-strips *f'* *f*², which are preferably faced 20 with felt or similar material to make an air-tight joint with the slide. The valve F is provided with a perforation F², generally elliptical in form, which communicates with a gradually-flaring longitudinal perforation 25 F', as shown more particularly in Fig. 4.

Referring to Fig. 6, it will be observed that there is a slight space left between the face of the throttle-valve or tempo-slide and the 30 adjacent wall of chamber E, in which the orifices *e*⁶ terminate, and, further, that in the position shown communication is completely shut off between said channels *e*⁶ and the portion of the chamber E which communicates 35 with the outlet G. Upon withdrawing the tempo-slide the orifice or port F² will pass beyond the seating-strips *f'* *f*² and establish communication between the pneumatics and the wind-chest. Further and successive out- 40 ward movement of the slide will gradually increase the amount of the opening F', which is interposed in the path of the air from the pneumatics to the exhauster, and thereby gradually and evenly increase the speed of 45 the motor. A corresponding inward or closing movement of the slide will produce a steady and gradual reduction of the speed of the motor until the slide is fully closed, when the motor will stop.

Fixed to the shaft I is a sprocket I', which 45 is geared to a corresponding sprocket on a counter-shaft I⁴. Said shaft I⁴ is journaled at one end in a bearing K in such manner as to permit the shaft to have a slight vertical movement about said bearing K. The oppo- 50 site end of the shaft I⁴ is journaled in a sliding plate P, which is secured to the standard K' by screws P P', which engage suitable slots in said plate P. To the end of said shaft I⁴ is secured a pinion I⁸, which is normally held 55 in engagement with the driving-gear M' of the usual take-up roll M. The plate P is held in its elevated position to cause pinion I⁸ to engage gear M' by means of a flat spring T, which bears against the lower end of said 60 plate P. It will thus be apparent that as the shaft I is rotated by the successive exhaustion of the pneumatics D, D', D², and D³ it will impart a rotary movement to the shaft I⁴, which in turn actuates the take-up roll M 65 through the intermediate gearing, whereby the music-sheet is unwound from the roll L onto said roll M in the ordinary and well-

known manner. A second sprocket I⁵ is mounted upon the shaft I and is connected by a sprocket-chain I⁶ to a small sprocket- 70 wheel J', loosely mounted upon the stub-shaft J, which carries one end of the music-roll L. Secured to the face of the sprocket-wheel J' is a clutch portion J², which is adapted to engage a mating portion J³, fast to said stub- 75 shaft J. An annular recess about said clutch member J² receives the fork *o*² of a shifting lever O, which lever is pivoted at *o* to a bracket on the standard K'. Extending laterally from the lever O is a finger *o'*, which 80 engages the top of the slide P, so that when the lower end of the lever O is moved to the right the finger *o'* will force the slide P downward against the tension of spring T and dis- 85 engage the pinion I⁸ from the gear M' at the same time the clutch member J² is moved to the left into engagement with its mating member J³, and the roll L is actuated in a di- 90 rection to rewind the music-sheet. The actuating means for the shifting lever O comprises a link Q and a lever R, pivoted at 95 some appropriate point on the supporting mechanism, as at R', which lever R terminates in a thumb-piece *r*, extending above the shelf A.

For the purpose of operating the tempo- 100 slide to regulate the speed of the motor, and consequently the time of the music, I provide a bell-crank lever S, which is pivoted to the shelf A at *s'* and is connected to the tempo- 105 slide by a pin *s*. The opposite end of the bell-crank lever S is provided with a projecting pin S', which engages a slotted cam S², and said cam is reciprocated to rock the bell- 110 crank S by means of a rod S³, which terminates in a knob or handle S⁵, which is secured to the upturned end of said rod S³, which passes through a suitable slot in the shelf A. As the rod S³ is moved to the right the cam 115 S², engaging the pin S' of the bell-crank lever S, causes said lever to move the tempo-slide in a direction to open the passage between the pneumatics and the exhauster, as above described. Moving said rod in the opposite 120 direction will of course have the effect to gradually close the tempo-slide.

In order to increase the speed of the rewind mechanism over the maximum speed of the take-up roll, I employ in addition to the multiplying sprocket-gear I⁵, I⁶, and J' means for 125 fully opening the tempo-slide when the rewind mechanism is thrown into operation and at the same time establishing a connection by way of said tempo-slide between the pneu- 130 matics and the main bellows or wind-chest. At B' in Fig. 1 I have shown a passage which leads directly to the main bellows or exhauster, which passage is closed when the motor is running normally by a suitable valve connected by the rods *r*² *r*³ to the shifting 135 lever R of the rewind mechanism. On the rod S³, I provide a pin or like projection S⁴, which lies in the path of the lever in the forward movement of the latter, so that when

said lever R is shifted to throw the rewind mechanism into operation it engages the pin S⁴ and moves the rod S³ in a direction to fully open the tempo-slide and at the same time
 5 opens the valve connected to the rods r² r³, which establishes a communication through the passage B' between the pneumatics D, D', D², and D³ and the main bellows, so that the motor is driven at a highly-increased
 10 speed during the rewinding of the music-sheet.

Having thus described my invention, what I claim is—

1. In a pneumatic motor for mechanical
 15 musical instruments and the like, the combination of a main block having a series of longitudinal channels therein, a series of pneumatics mounted on one face of said block and communicating with said channels, a second
 20 block provided with a series of channels forming continuations of said longitudinal channels and terminating in ports opening in the side of said second block, a chamber in said
 25 second block connected with a wind-chest and having orifices adjacent to the said ports, and a rotary valve engaging the side of said second block to control communication between the pneumatics and the wind-chest.

2. In a pneumatic motor for mechanical
 30 musical instruments and the like, the combination of a main block having a series of longitudinal channels therein, a series of pneumatics mounted on one face of said block and communicating with said channels, a second
 35 block provided with a series of channels forming continuations of said longitudinal channels and terminating in ports opening in the side of said second block, a chamber in said second block connected with a wind-chest and
 40 having orifices adjacent to the said ports, a shaft operated by said pneumatics, and a rotary valve on said shaft engaging the side of said second block, said valve having an air-inlet and a recess to connect the respective
 45 pneumatics with the atmosphere and with the wind-chest successively.

3. In a pneumatic motor for mechanical

musical instruments and the like, the combination of a main block having a series of longitudinal channels, each opening through the
 50 top of said block at one end and through the bottom of the block at the other end, a series of pneumatics on the top of said block and communicating with the longitudinal channels, a second block secured at right angles
 55 to the main block and having a series of channels connecting with the channels in the main block and terminating in ports in the side of said second block, a shaft operated by said
 60 pneumatics and having a bearing centrally disposed with respect to said ports, said second block also having a chamber connected to a wind-chest and a series of orifices opening through its side between the shaft-bearing
 65 and the ports, and a rotary valve on said shaft engaging the side of said second block to control communication between the pneumatics and the wind-chest.

4. In a pneumatic motor for mechanical
 70 musical instruments and the like, the combination of a block having longitudinal air-passages, a series of pneumatics on one side of said block communicating with said passages, a second block having channels communicating with said passages and terminating
 75 in lateral ports in said second block, said second block also having a chamber connected to the wind-chest and opening through the second block adjacent to the said ports, a rotary shaft operatively connected with said
 80 pneumatics, a valve on said shaft having a recess and an air-inlet in its face engaging the side of said second block adapted to successively connect said pneumatics with the wind-chest and with the atmosphere, alter-
 85 nately, and a regulator-slide in said second block controlling the flow of air to said wind-chest.

In testimony whereof I affix my signature in presence of two witnesses.

H. FLETCHER HALL.

Witnesses:

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 EDWARD L. RAND.