No. 672,697. Patented Apr. 23, 1901.

A. BORDEN.

THERMOSTAT.

(Application filed Aug. 29, 1898.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

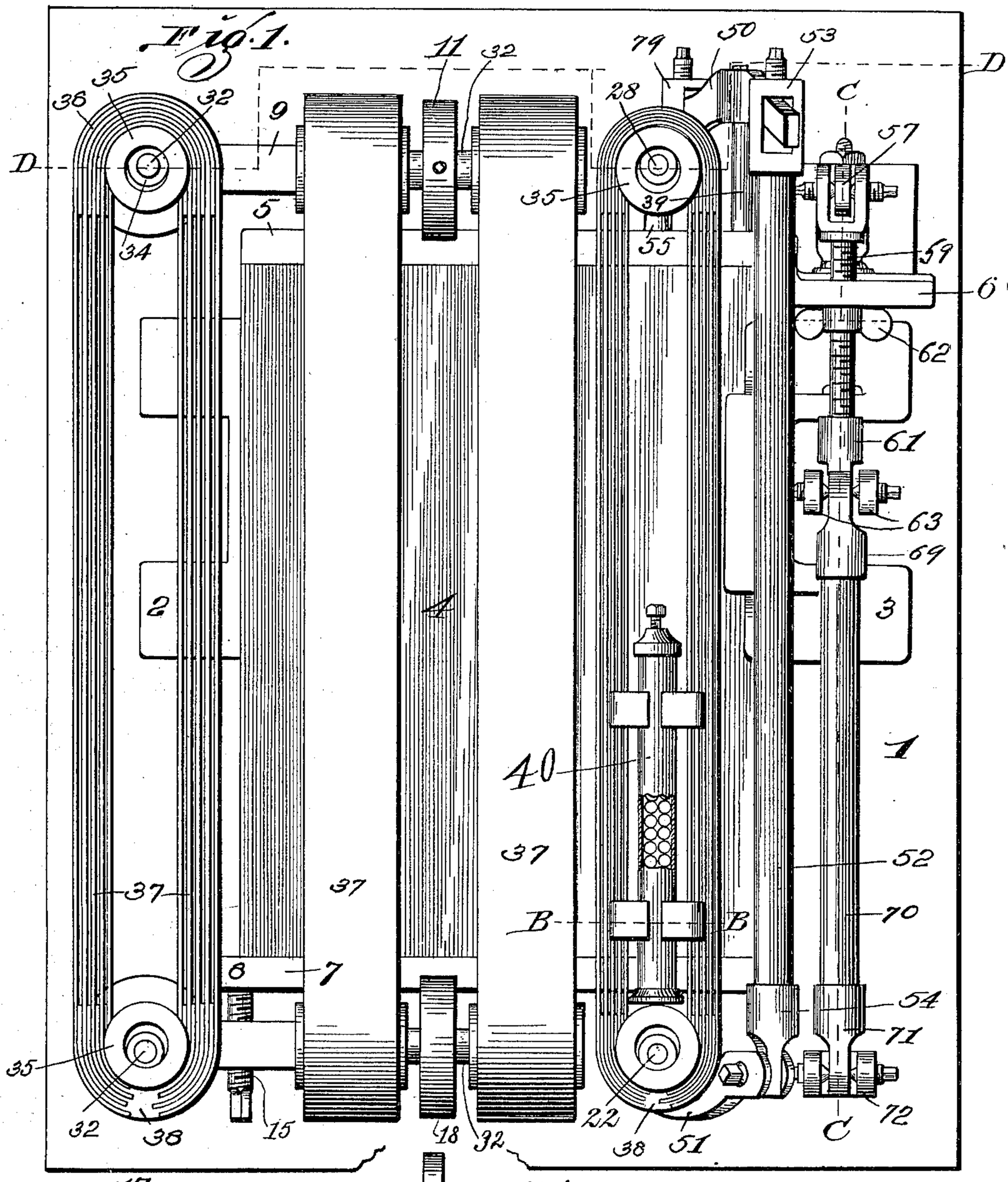


Fig. 2.

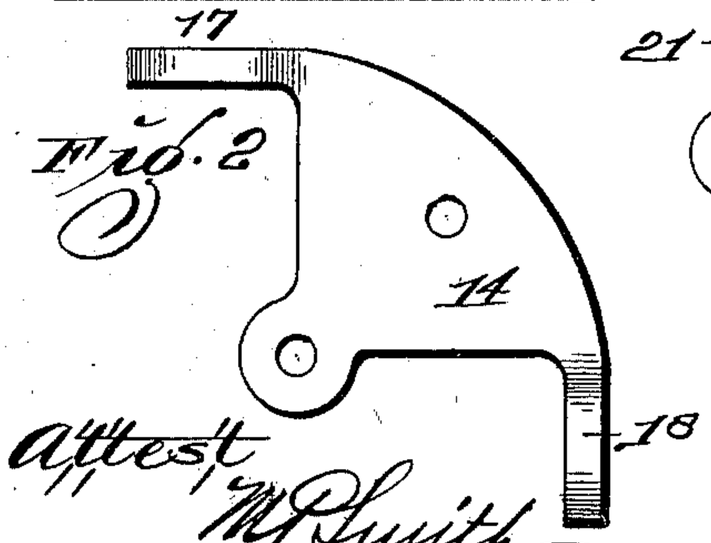


Fig. 3.

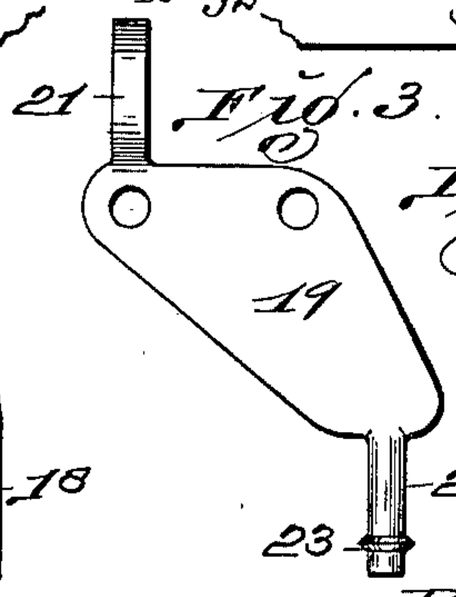
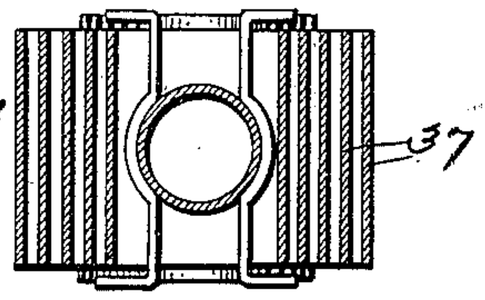


Fig. 4.



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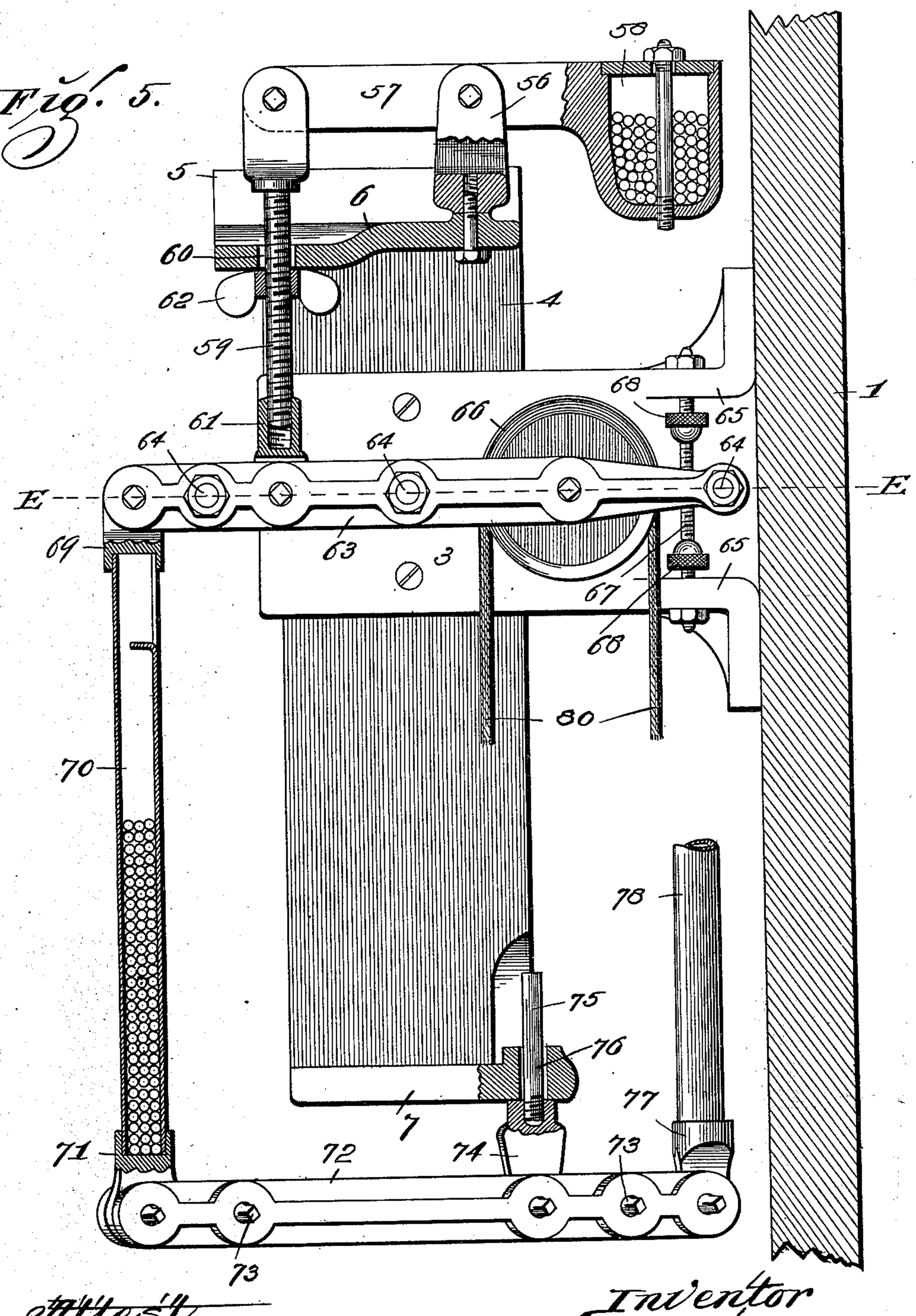
(No Model.) 4 Sheets—Sheet 2.

Fig. 5.



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(No Model.) 4 Sheets—Sheet 3.

Fig. 6.

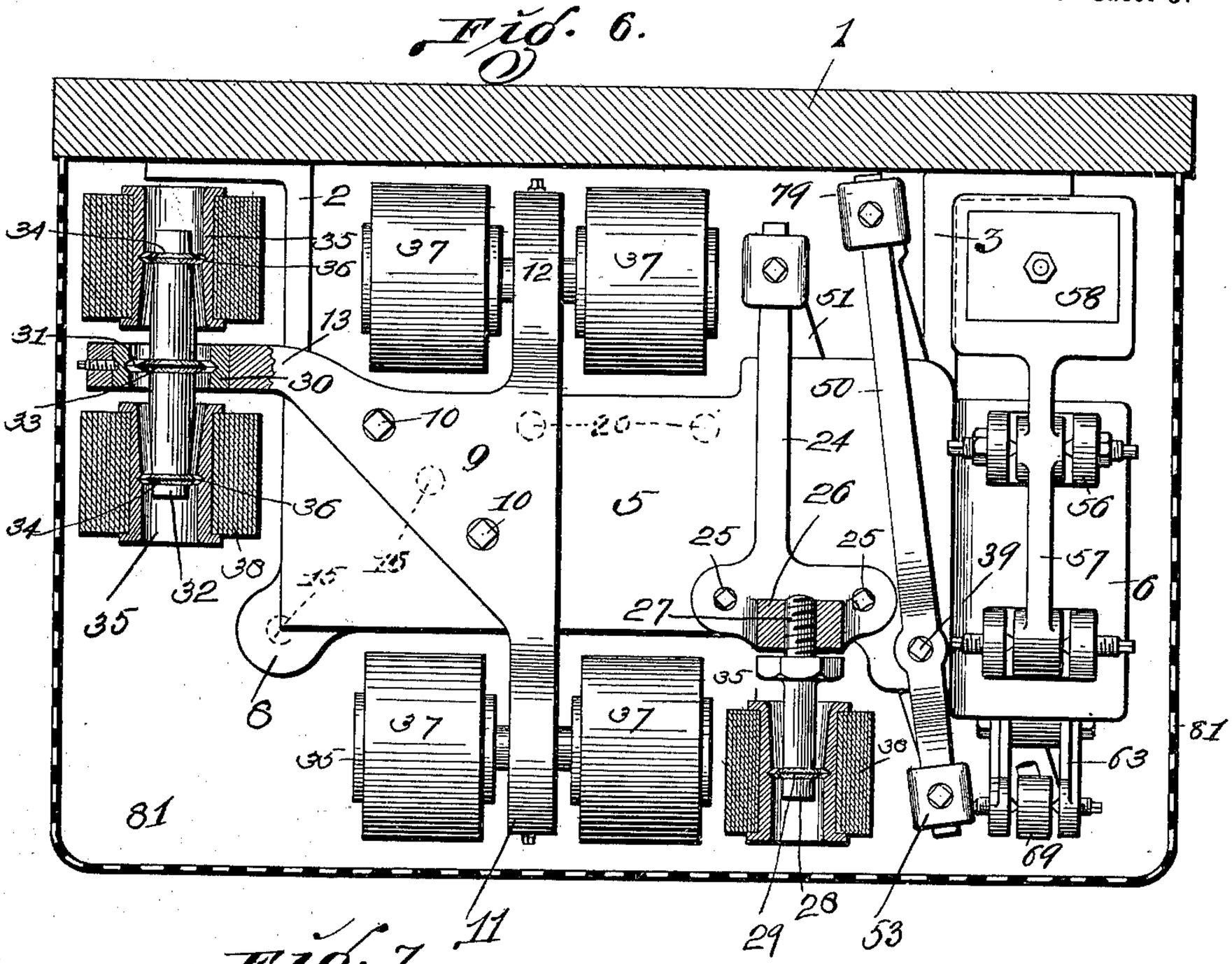

Fig. 7.

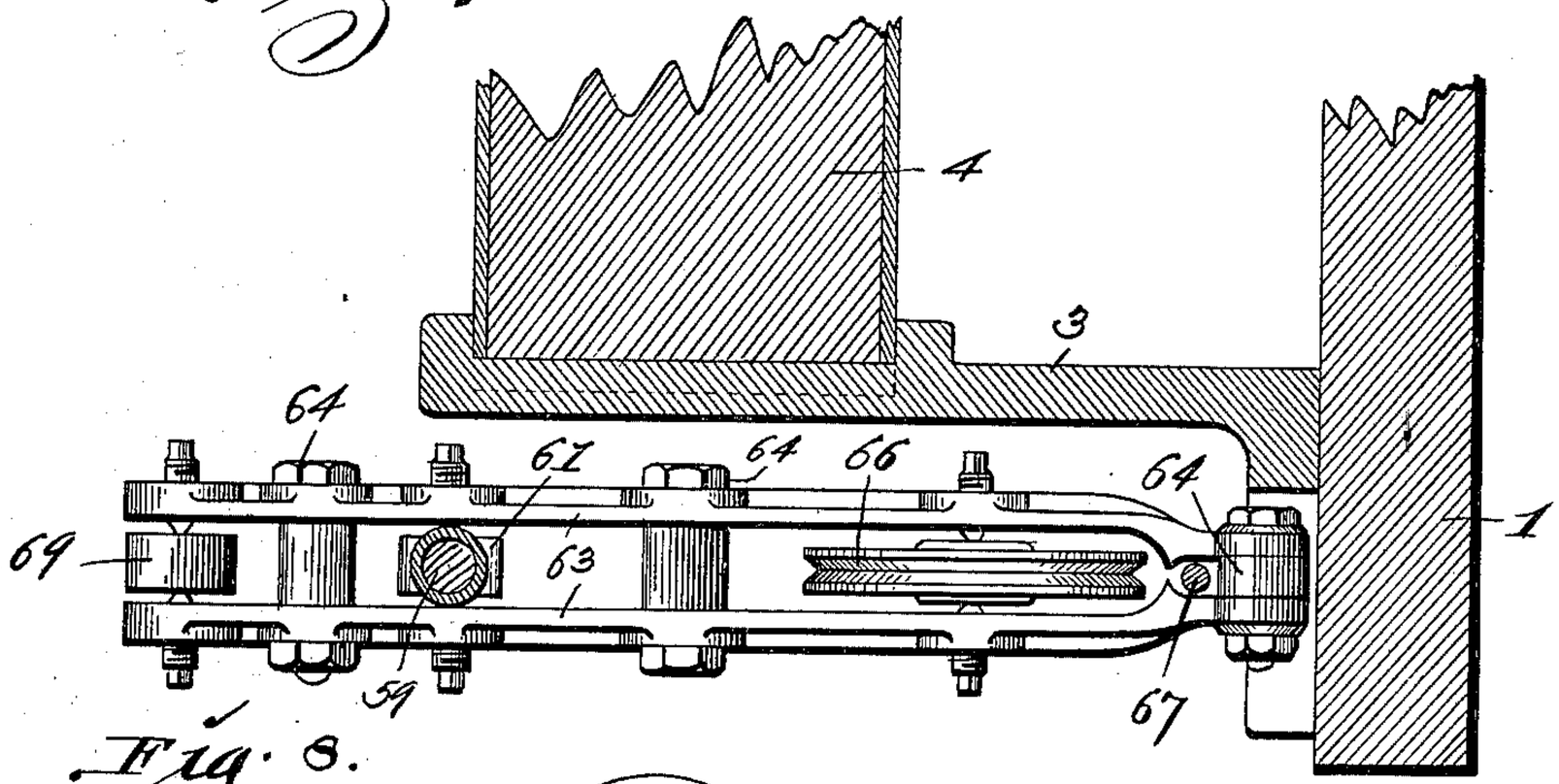

Fig. 8.

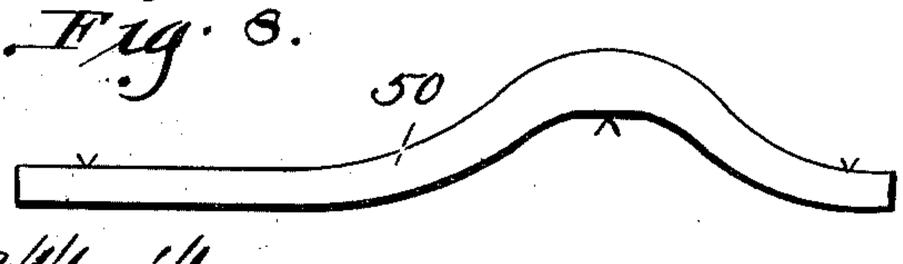

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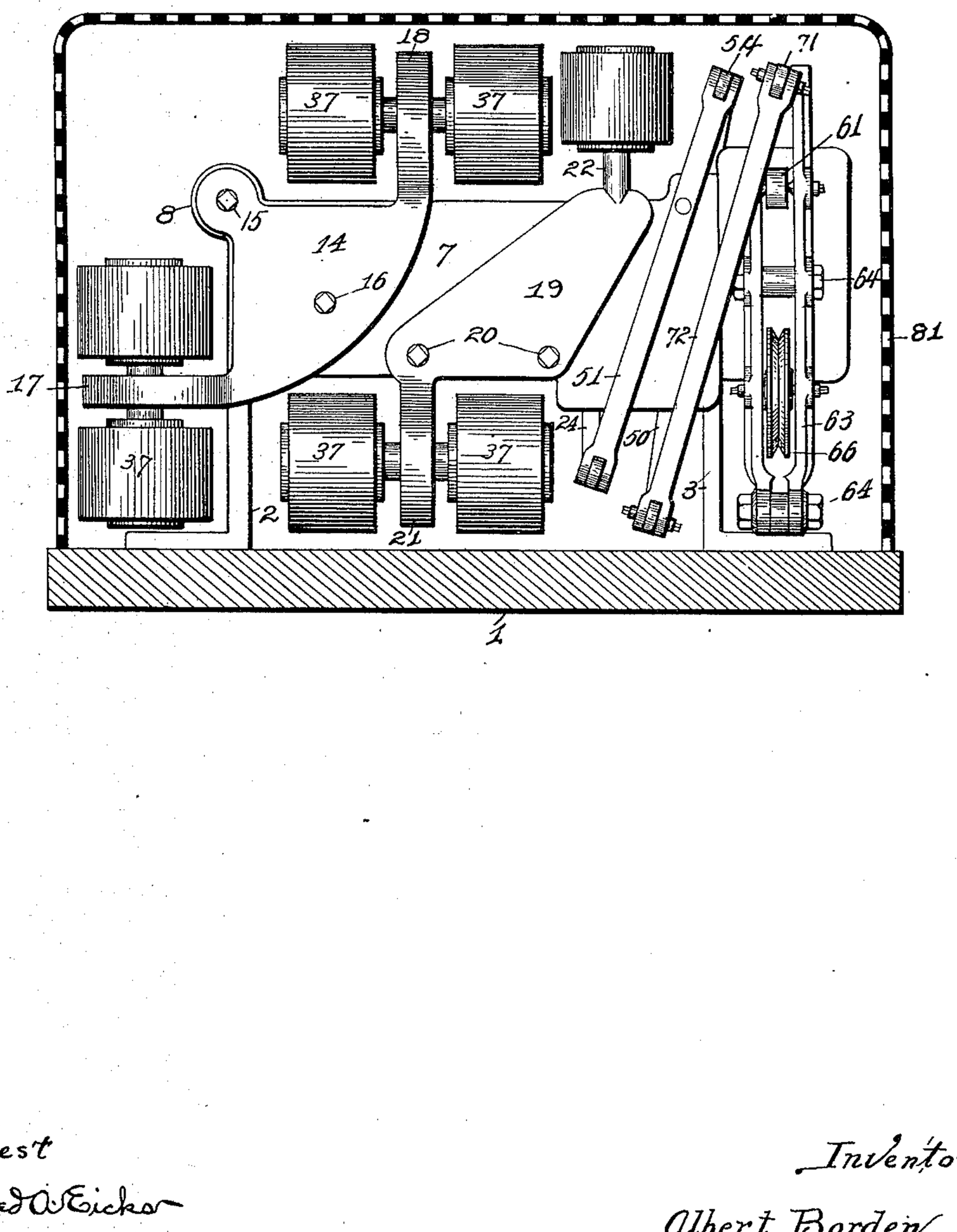
Fig. 9.



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Inventor:
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By Hydon & Longan Atty's

UNITED STATES PATENT OFFICE.

ALBERT BORDEN, OF ST. LOUIS, MISSOURI.

THERMOSTAT.

SPECIFICATION forming part of Letters Patent No. 672,697, dated April 23, 1901.

Application filed August 29, 1898. Serial No. 689,815. (No model.)

To all whom it may concern:

Be it known that I, ALBERT BORDEN, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Thermostats, of which the following is a full, clear and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to thermostats; and it consists of the novel construction, combination, and arrangement of parts hereinafter shown, described, and claimed.

Figure 1 is a front elevation of my improved thermostat, the perforated cover therefor being removed. Figs. 2 and 3 are plan views of rocking or bearing plates used underneath the body of my improved thermostat. Fig. 4 is an enlarged horizontal sectional view taken approximately on the line B B of Fig. 1. Fig. 5 is a vertical sectional view of a part of the apparatus, taken on the line C C of Fig. 1, showing more clearly how the thermostat operates the valve or damper, all other parts being omitted to avoid complication. Fig. 6 is a horizontal sectional view taken approximately on the line D D of Fig. 1. Fig. 7 is a top plan view of the operating-arm which raises or lowers the connection between the same and the valve or damper, the other parts shown being taken on the line E E of Fig. 5. Fig. 8 is a side elevation of an arched rocking bar made use of in carrying out my invention. Fig. 9 is a view corresponding to Fig. 6 and shows in plan the bottom of the thermostat.

Referring by numerals to the accompanying drawings, 1 indicates the rectangular base which carries the thermostat, and to the front face of said base, adjacent the sides thereof, are the brackets 2 and 3, between the outer ends of which is rigidly held the vertically-arranged rectangular core or block 4, preferably of wood. Rigidly secured to the top of this block 4 is a metallic plate 5, the right-hand end thereof being extended beyond the block 4, as indicated by 6, and rigidly secured to the under side of the block 4 is a metallic plate 7, the outer left-hand corner thereof being extended, as indicated by 8. A triangular bearing-plate 9 is arranged above the left-hand end of the plate 5, there being a pair of bearing-screws 10 passed through said plate 9, the lower ends of which bearing-screws may be rounded or pointed and engaged in suitably-formed depressions in the top of the plate 5. Formed integral with the ends or corners of this triangular plate 9 and in alinement with the side of said plate—that is, at right angles to the plate 5—are the arms 11 and 12, said arms being circular when viewed in side elevation, the arm 11 extending in front of the block 4 and the arm 12 extending to the rear of said block. Formed integral with and extending laterally from the remaining corner of the triangular plate 9 is an arm 13, in every way similar to the arms 11 and 12, said arm 13 extending beyond the left-hand end of the block 4 and occupying a position in alinement with the rear face of said block.

Located beneath the left-hand end of the lower plate 7 is a triangular bearing-plate 14, through which passes a pair of bearing-screws 15 and 16, the point of the bearing-screw 15 engaging in a suitably-formed depression in the face of the extended portion 8 at the corner of said plate 7, and the point of the bearing-screw 16 engaging in a suitably-formed depression in the face of the bearing-plate 7 at a point approximately midway between vertical lines drawn through the centers of the bearing-screws 10. The positions of these bearing-screws 15 and 16 relative the bearing-screws 10 are shown in dotted lines in Fig. 6. Formed integral with the remaining corners of the bearing-plate 14 are the extending arms 17 and 18, the arm 18 being in vertical alinement with the arm 11, and the arm 17 being in direct vertical alinement with the arm 13.

Arranged beneath the center of the block 4 and bearing-plate 7 is a bearing-plate 19, the same being irregular in outline, through which plate 19, adjacent the rear edge thereof, pass the bearing-screws 20, the points of which engage in suitably-formed recesses in the under side of the plate 7, and projecting from the rear side of the plate 19 is a circular arm 21, the same being in direct vertical alinement with the arm 12. Formed integral with the front of the plate 19 and projecting in front of the plate 7 is a pin 22, on the outer end of which is formed integral a flange 23, the same being triangular in cross-section.

Arranged above the plate 5, to the right-hand end of the plate 9 and at right angles to said plate 5, is a bearing-bar 24, the rear end of which projects beyond the rear side of the plate 5, the forward end of said bar 24 being provided with a pair of bearing-screws 25, the points of which engage in suitably-formed recesses in said plate 5, and formed integral with said bar 24, between said bearing-screws 25, is an upwardly-projecting lug 26. Extending transversely through the lug 26 is a screw-threaded aperture 27, in which is seated the rear end of a pin 28, that extends forwardly from the plate 5, which pin 28 is in direct alinement with the pin 22 and is provided on its outer end with a flange 29, the same being identical with the flange 23. Arranged between the projecting pins 22 and 28 and the pairs of projecting arms 11 and 18, 12 and 21, and 13 and 17 are the metallic plates or ribbons which form a part of my improved thermostat and which are affected by the atmospheric changes. As said plates or ribbons and connections are all of similar construction, I will describe but one pair.

Formed through each arm of the pairs of projecting arms just mentioned is an aperture in which is removably located a ring 30, in the inner face of which is formed a V-shaped groove 31. Extending transversely through the ring 30 is a short bar 32, with the center of which is formed integral a flange 33, the same being triangular in cross-section, which flange bears in the V-shaped groove 31, and formed on each end of the bar 32 are the triangular flanges 34. Sleeves 35, provided with flanges at each end, have V-shaped grooves 36 formed in their inner faces, midway between their ends, said sleeves being arranged upon each end of the bar 32, the triangular flanges 34 on the ends of said bar engaging in the V-shaped grooves 36 in said sleeves. Thin metallic strips or ribbons 37 have their ends seated or embedded in heads 38, of solder or analogous material, which heads are semicircular, so as to engage around the sleeves 35, and said strips or ribbons 37 are so arranged in said heads 38 as that a slight space is formed between said strips or ribbons, which space allows the air to circulate freely between all of the strips or ribbons. By this arrangement an increased area or surface of the thermostatic bands is obtained. Consequently the thermostat will act more quickly, and the efficiency thereof is greatly increased.

Located upon the pins 22 and 28 are sleeves in every way similar to the sleeves 35, and arranged upon and extending between said sleeves is a single thermostatic member constructed in every way similar to the members hereinbefore described.

Arranged above the right-hand end of the plate 5 and pivoted upon a screw 39, the point of which engages upon the top of the plate 5, adjacent the forward edge thereof, is an arched bar 50, the forward end of which projects a slight distance beyond said plate 5 and the rear end of which projects a slight distance beyond the rear edge of said plate. An arched bar 51, similar in form and size to the arched bar 50, is arranged beneath the right-hand end of the plate 7, the forward end of said bar being in direct vertical alinement with the forward end of the bar 50 and the rear end of said bar 51 being in direct vertical alinement with the rear end of the balancing-bar 24.

A tube 52 extends between the forward ends of the bars 50 and 51, the upper end of said tube being provided with a socket 53, that pivotally engages the forward end of the bar 50, the lower end of said tube 52 being provided with a bearing 54, that is pivotally engaged in the bifurcated forward end of the lower arched bar 51. A tube 55, in every way similar to the tube 52, connects the rear ends of the bars 51 and 24. Fulcrumed in a U-shaped bracket 56, that is fixed to the top and rear of the extended right-hand end of the plate 5, is a bar 57, the rear end 58 of which is weighted in any suitable manner, and to the forward end of said bar 57 is pivotally connected the upper end of a screw-threaded rod 59, that extends downwardly through an aperture 60, formed in the extended end 6 of the plate 5, the lower end of said rod 59 carrying a socket 61 and there being a winged nut 62 located upon said screw-threaded rod immediately beneath the extended end 6.

A pair of mating bars 63, held together by the bolts 64, are fulcrumed to the downwardly-pending end of the socket 61, and said bars 63 extend rearwardly toward the base 1, between the flanges 65, that are formed integral with top and outer edges of the rear end of the bracket 3, and between the rearwardly-extending portions of these bars 63 is rotatably held a grooved wheel or pulley 66. A screw-threaded rod 67 is rigidly held between the flanges 65, said rod passing between the extreme rear ends of the bars 63, and upon said rod are located adjusting-nuts 68, that limit the movement of the rear end of said bars 63.

Between the forward ends of the bars 63 is pivotally mounted a socket 69, in which is seated the upper end of a vertically-arranged tube 70. The lower end of this tube 70 is seated in the socket 71, the lower end of which is pivotally engaged between the forward ends of parallel bars 72, the same being held together by the screws 73, and said bars 72 being fulcrumed upon a downwardly-pending finger 74, which finger is provided with an upwardly-projecting pin 75, that passes through an aperture 76, formed through the rear right-hand corner of the lower plate 7. Between the rear ends of the parallel bars 72 is pivotally held the downwardly-pending end of a socket 77, in which is seated the lower end of a tube 78, the upper end of which tube is seated in a socket 79, that engages the rear end of the arched bar 50.

Passing around the grooved wheel or pulley 66 is a wire cable or flexible connection 80, that leads to the valve or other device that is operated by the thermostat.

Removably located upon the base 1 and inclosing the entire mechanism herein described is a perforated cover 81.

The operation of my improved thermostat is as follows: Assuming that the thermostat is located in a building with its connection 80 leading to the valve or damper that controls the supply of heat into said building and that the temperature within the building lowers beyond a normal point, as said temperature lowers the metallic bands or ribbons 37, in accordance with a well-known principle, will necessarily contract, and in so doing the triangular rocking plates 9, pivoted on the pivot-screws 10 10, and 14, pivoted on the pivot-screws 15 16, will rock and give according to the movement of said bands or ribbons, and the contracting movement of the thermostatic bands between said plates 9 and 14 will be transferred, through the bands 37, connecting the rod 32, positioned in the arm 12, with the rod 32, positioned in the arm 21, to the rocking plate 19, and thence through the thermostatic bands between the pins 28 and 22, which bands likewise contract with the lower temperature, to the balancing-bar 24. This contracting movement of the thermostatic bands will cause the rear end of the balancing-bar 24 to rise, and consequently the tube 55 to the rear end of the arched bar 51 will be elevated, this movement necessarily moving the forward end of said arched bar 51 and the tube 52 downwardly. This movement causes the arched bar 50 to move upon its fulcrum, which is the screw 39, and the rear end of said arched bar 50, together with the tube 78 and the rear ends of the parallel bars 72, will be elevated. As the forward ends of the parallel bars 72 are depressed the tube 70 and forward ends of the bars 63 will be drawn downwardly, fulcruming upon the lower end of the socket 61, and with this movement the grooved wheel or pulley 66, carried between the rear ends of the bars 63, will be elevated, which movement will actuate the inlet valve or damper controlling the heat-supply of the building. The weight 58 of the bar 57 is sufficient to uphold the bars 63 and the parts supported thereby and to prevent the pulley 66 from becoming lowered to allow the valve or register to open except in the manner described. The movement of the screw-threaded rod 59 is regulated by adjusting the winged nut 62 upon said rod, while the limit of movement of the rear ends of the bars 63 can be regulated by adjusting the nuts 68 upon the screw-threaded rod 67. When the temperature in the room rises, in accordance with a well-known principle, a reverse movement of the thermostatic bands and the various connections takes place, and the grooved wheel or pulley 66 lowers, which necessarily lowers the connections 80, and the inlet-valve controlling the heat-supply to the building is either partially or entirely closed.

The tube 70 may be partially filled with shot or with suitable weights, this being done to counterbalance the weight of the connections from the grooved wheel 66 to the valve or other device operated by the thermostat.

A balancing-tube 40 may be positioned upon the sleeve 35 on the pin 22, and between the thermostatic bands connecting said sleeve with the sleeve 35 on the pin 28, said tubing being filled partially or totally with shot. This would be of assistance in actuating that part of the device and causing it to open the inlet-valve.

Owing to the various counterbalances and to the peculiar positioning of the screws upon which the various balancing plates and bars fulcrum, the device acts very easily and quickly with very little friction, and by changing the weights or varying the positions of the screws the device may be very accurately adjusted and may be made to respond to a very slight variation of temperature. A thermostat so constructed possesses superior advantages in point of simplicity, durability, and general efficiency and is particularly adapted for use in connection with steam, hot-water, and hot-air heating systems in buildings; but of course it may be advantageously used for other purposes.

I claim—

1. In a device of the class described, a thermostatic member composed of a plurality of metallic strips, a means for keeping the strips separated by a slight space, and said strips being doubled and having their ends seated in solid semicircular heads, substantially as specified.

2. In a thermostat, a block, bearing-plates fulcrumed above and below said block, bars pivotally held in the outer ends of said plates, sleeves pivotally arranged upon the ends of said bars, and thermostatic members comprising doubled metallic strips, the ends of which doubled strips are seated in solid semicircular heads, which heads are loosely mounted upon the sleeves, substantially as specified.

3. In a thermostat, a block, plates mounted on the top and bottom of said block, bearing-plates fulcrumed above and below said plates, extending arms formed integral with said bearing-plates, bars pivotally held in said arms, sleeves pivotally arranged upon the outer ends of said bars, thermostatic members connecting said sleeves, and means whereby the movement of all the thermostatic members is transformed into a single positive vertical movement, substantially as specified.

4. In a thermostat, a block, plates arranged on the top and bottom of said block, bearing-plates fulcrumed upon said first-mentioned plates, transversely-apertured arms extending outwardly from the corners of said bearing-plates, removable rings located in said apertures, in the inner faces of which rings are formed V-shaped grooves, bars trans-

versely arranged through said rings, there being triangular flanges formed integral with the centers and ends of said bars, which central flanges engage in the V-shaped grooves in the rings, sleeves arranged upon the outer ends of said bars, on the inner faces of which sleeves are formed V-shaped grooves to receive the triangular flanges on the ends of the bars, and thermostatic members each composed of a plurality of metallic strips connecting said sleeves, substantially as specified.

5. In a thermostat, a block, plates arranged on the top and bottom of said block, bearing-plates fulcrumed upon said first-mentioned plates, transversely-apertured arms extending outwardly from the corners of said bearing-plates, removable rings located in said apertures, in the inner faces of which rings are formed V-shaped grooves, bars transversely arranged through said rings, there being triangular flanges formed integral with the centers and ends of said bars, which central flanges engage in the V-shaped grooves in the rings, sleeves arranged upon the outer ends of said bars, on the inner faces of which sleeves are formed V-shaped grooves to receive the triangular flanges on the ends of the bars, thermostatic members each composed of a plurality of metallic strips connecting said sleeves, a pair of suitably-arranged bars fulcrumed adjacent one end, a grooved wheel carried between the opposite ends of said bars, and a plurality of balancing-bars and connections for imparting the combined movement of the thermostatic members to the parallel bars carrying the grooved wheel, substantially as specified.

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

ALBERT BORDEN.

Witnesses:
M. P. SMITH,
JOHN C. HIGDON.