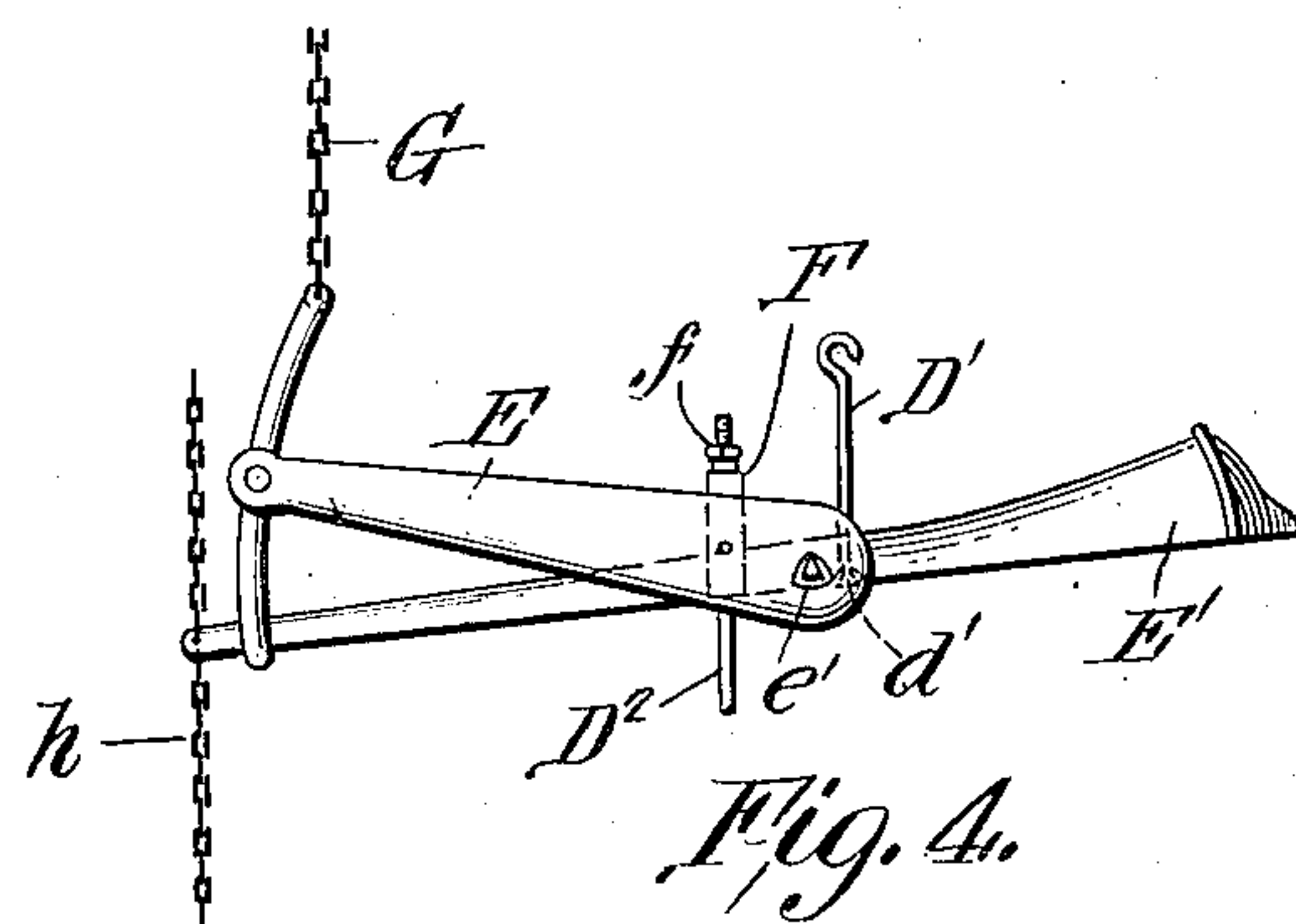
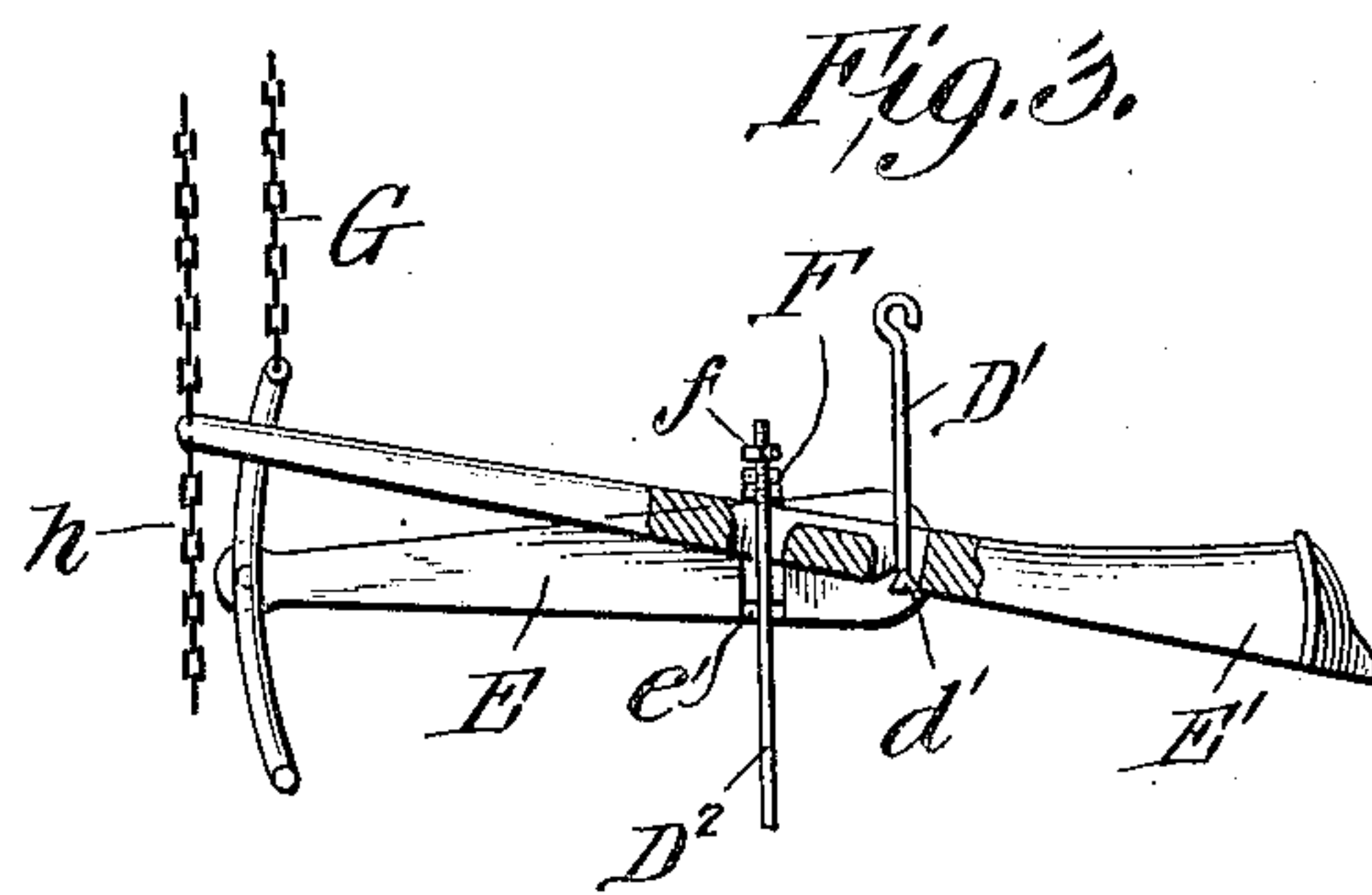
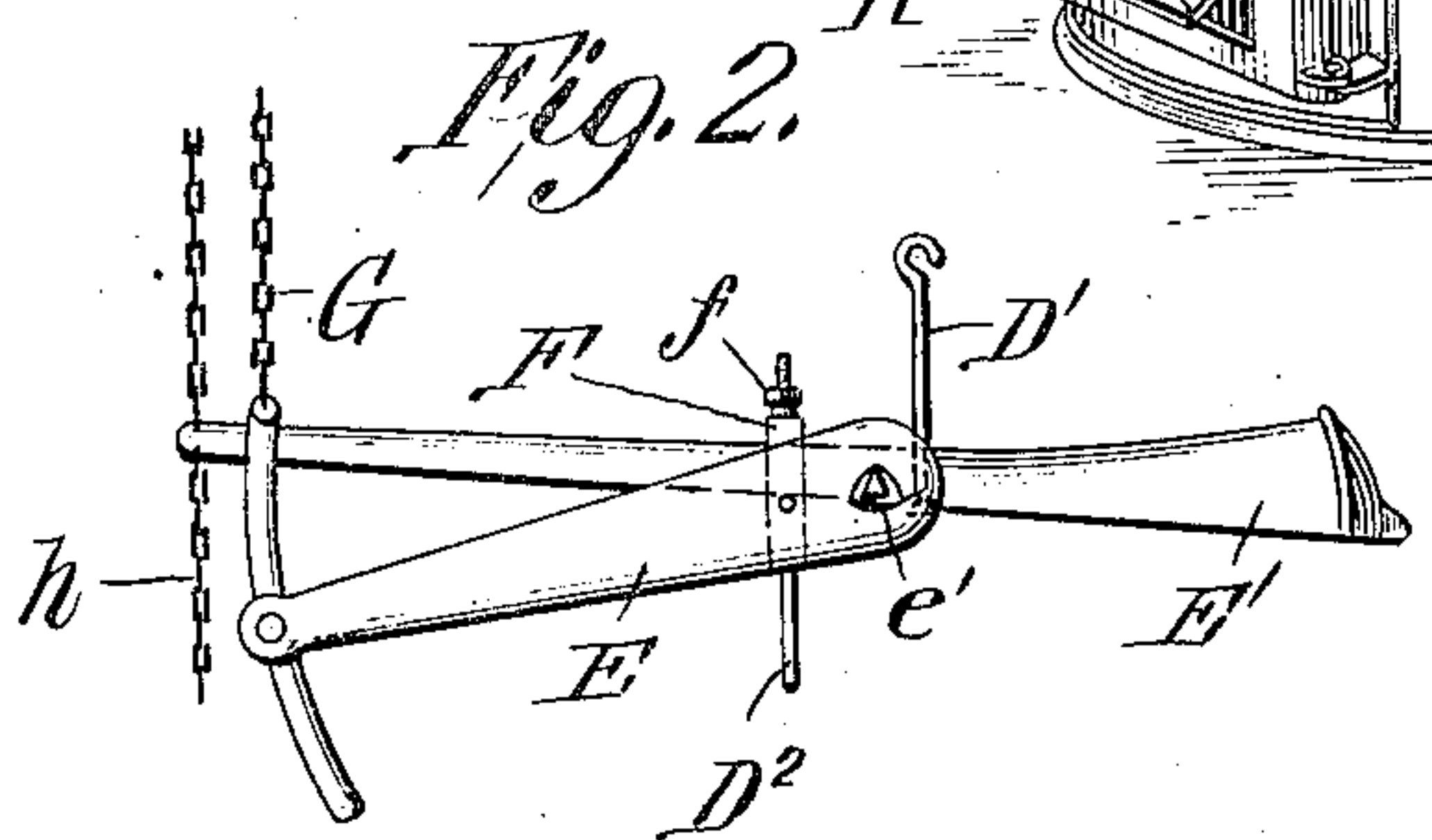
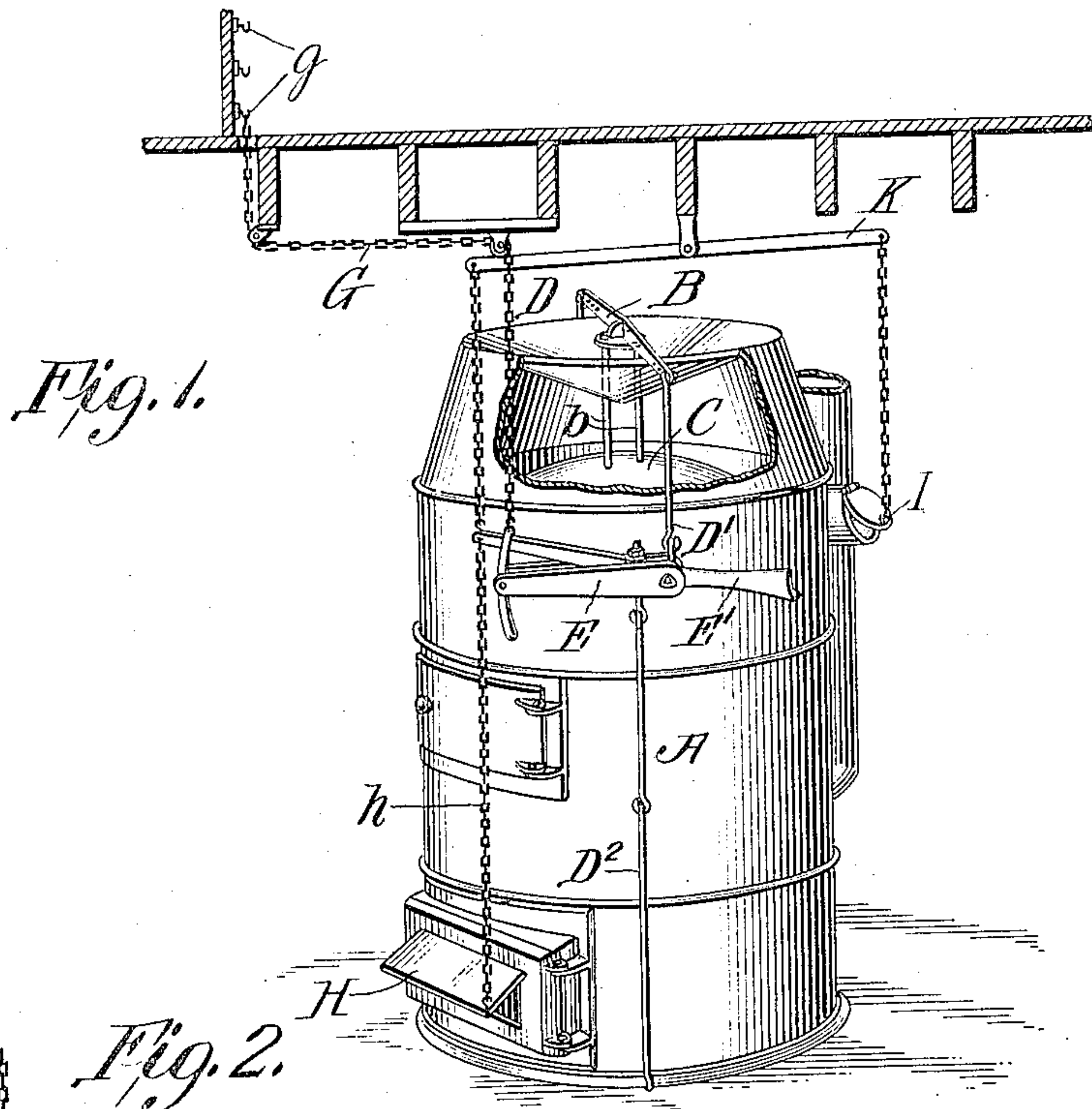


M. J. FARQUHAR.
HEAT REGULATOR.
APPLICATION FILED NOV. 16, 1906.

934,598.

Patented Sept. 21, 1909.



Witnesses

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MILTON J. FARQUHAR, OF WILMINGTON, OHIO.

HEAT-REGULATOR.

934,598.

Specification of Letters Patent. Patented Sept. 21, 1909.

Application filed November 16, 1906. Serial No. 343,744.

To all whom it may concern:

Be it known that I, MILTON J. FARQUHAR, a citizen of the United States, residing at Wilmington, in the county of Clinton and State of Ohio, have invented certain new and useful Improvements in Heat-Regulators; 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 governors for automatically controlling the fire in hot air furnaces and other heating apparatus; and its primary objects are to provide efficient and reliable means for regulating the heat of the furnace by the expansion and contraction of the fire-box; to adapt such means to be readily applied to furnaces of ordinary construction now in common use, and of different lengths, sizes and shapes; to provide efficient and reliable means of adjustment by which the regulating devices will become operative at different temperatures, in order that any desired temperature may be maintained during cold, or moderately cold, or mild weather, and means for effecting the desired adjustment either in the furnace room or from a room above or adjoining or outside of the room in which the furnace is located.

Automatically acting heat regulating devices for stoves or other heaters have heretofore been employed in which the opening or closing of a damper or draft valve is effected by the expansion and contraction of the body of the heater, but such devices as ordinarily constructed have been found to be more or less objectionable and unreliable in practical use, either by reason of some inherent imperfection, or the lack of proper provision for adjustment, and their liability to get out of order.

My invention is designed especially to improve this class of devices, and to eliminate or reduce to a minimum the chances of failure or the element of unreliability, and to produce an automatic governor or heat-regulating device that may be relied upon under all circumstances in any kind of weather to operate at the desired time and in the desired manner, for cooling off the furnace or heater when it becomes too hot, and for increasing the heat when it becomes too cool, so that a uniform temperature may

be maintained at all times in the room or building to be heated, whether in very cold, or moderately cold, or mild weather; the regulating devices being under the control of a person located in a room above or adjoining or remote from the furnace-room or apartment in which the heating apparatus is located.

The invention will first be hereinafter more particularly described, with reference to the accompanying drawings, which form a part of this specification, and then pointed out in the claims at the end of the description.

In said drawings, which illustrate a preferred form of embodiment of the invention applied to a furnace of ordinary construction, Figure 1 represents a perspective view of a furnace having my improved governor or heat regulating devices applied thereto and a section through the floor of a room above the furnace to illustrate the connections for adjusting the regulating devices from a room above the furnace-room. Fig. 2 is a side elevation of the adjusting and valve-actuating levers detached from the furnace, illustrating the adjusting lever lowered to loosen the tension on and lengthen the adjusting rods connecting the movable lever with the furnace base. Fig. 3 is a vertical sectional elevation of the parts shown in Fig. 2, and Fig. 4 is a side elevation of the lever-mechanism shown in Fig. 2, illustrating the adjusting lever raised to shorten the adjusting rods.

In the drawings, in which the same reference letters or figures are used to designate corresponding parts in different views, A denotes the metal body or casing which surrounds and incloses the fire-box of an ordinary furnace and which may be provided with the usual draft flues and swinging doors and dampers or draft valves, arranged in any desired manner, according to the character of the furnace or heater and the desires of the maker or user.

As illustrated, the top of the fire-box C, which is inclosed within the body or casing A, forms a rest for the supporting rods or legs *b*, of a cross-bar B, which is adapted to be moved upwardly by the fire-box when the latter is expanded and to descend when the fire-box contracts. The ends of the movable bar B are connected with the base portion of the casing or heater by adjusting

rods or devices which preferably consist of separable sections or links of different lengths, in order that one section may be removed and another substituted to vary the length of the adjusting rods in accordance with the length or height of the furnace to which they are to be applied and to adapt the devices for use on furnaces or heaters of different lengths and sizes, and also for varying the distance between the movable bar and the lower ends of the adjusting rods to suit different requirements in actual use. The adjusting rods may consist of several sections having hook and eye connections between adjoining sections, the lower section being firmly secured to the base portion of the casing or heater and the upper section having a hook engaging an aperture in the movable bar or cross-bar B at the upper part of the apparatus; a series of such apertures being preferably provided at each end of the movable bar to adapt the governor or heat-regulating devices to be applied to furnaces of different widths.

In Fig. 1 of the drawings, the rods at one side are of course concealed behind the heater, except at their upper end, denoted by the letter D.

At the opposite or near side of the furnace the adjusting rods may consist of upper and lower divisions, denoted respectively by the letters D' and D², connecting the base portion of the furnace with the movable bar B by means of pivotal connections with the adjusting lever E and the valve-actuating device or lever E', so arranged as to form an offset in the adjusting rods at the point of connection between the same and the levers and thus provide a readily extensible connection between the movable bar and the base of the furnace that may be lengthened or shortened as desired, to adapt the valve-actuating device or lever E' to actuate the valves at any given degree of heat. As shown, the upper section of the adjusting rods D² is passed through an aperture in a stirrup F and has a nut f screwed on its projecting end. The length of the adjusting rod may be increased or diminished by screwing or unscrewing said nut.

The stirrup F is fitted between the two members of the adjusting lever E and has pintles or studs e projecting from opposite sides thereof through apertures in said members to form a pivotal connection between said parts on which the lever E is fulcrumed. The short arm of the adjusting lever E has a fulcrum-bearing at e' upon the valve-actuating lever E' so that any upward pull upon the adjusting lever E will take up slack in the adjusting rods until they are taut and if the tension upon the rods is increased sufficiently to lift the weight the long arm of the valve-actuating lever E' will be lowered, while a reverse movement will

loosen the tension upon the adjusting rods and allow the long arm of the valve-actuating lever to be raised by the weight of its shorter heavier or weighted arm. The fulcrums and the weight of the longer and shorter arms of the two levers E and E' are so arranged and proportioned that during the greater range of movement of the adjusting lever the valve-actuating lever will remain stationary, without changing the position of the check or draft valve or valves connected therewith, but beyond a certain limit, on the ascending movement, when a point is reached at which the adjusting rods are taut, any further upward movement of the long arm of the adjusting lever will throw down the long arm of the valve-actuating lever E' and actuate the draft or check valve or valves or permit the latter to close by gravity. But the position of the valve or valves to be operated will not ordinarily be affected by the movements of the adjusting lever E, which is designed primarily as a means for readily and quickly adjusting the length of the connection between the base of the furnace and the movable bar B, to adapt the valve-actuating device or lever E' to actuate the valve or valves at different temperatures; a lower temperature being adapted to act upon the valve-actuating lever when said connections are shortened, and a higher temperature being required when said connections are lengthened. Thus the regulating devices may be so adjusted as to adapt the furnace or heating apparatus to maintain a uniform temperature in the building or room to be heated in all kinds of weather; a high degree of heat being desirable in cold weather, and a lower degree in less cold or mild weather.

The upper division D' of the adjusting rods forming the offset connection between the base of the furnace and the movable bar B has preferably a fulcrum-piece d' on the lower end of the lower section of said upper division, on which the actuating lever E' is fulcrumed and may rock, for the purpose of opening or closing, as the case may be, the valve or valves with which said lever E' may be connected, when the lever E' is operated by the upward movement of the movable bar B due to the expansion of the fire-box. For the purpose of manipulating the adjusting lever E from a room above or adjoining or outside of the room in which the furnace or heating apparatus is located, I may provide a chain G extending from the long arm of the adjusting lever E, over suitable pulleys or sheaves, if desired, through an opening in the wall or floor of the building into the room from which it is desired to adjust the heat-regulating devices; a series of hooks as at g, being provided for engagement with a link of the chain to sustain the adjusting lever in any desired position. Other flexible

connections may be employed for this purpose though a chain is preferable, and the pulleys may be dispensed with or not according to the location of the furnace and the requirements of the use to which the device is to be put.

The described heat-regulating and adjusting devices are admirably adapted for connection in various ways with the draft valves or dampers controlling the openings in the heat-flues or passages leading into and out of the furnace. In the arrangement shown a draft valve H, adapted to close by gravity, is connected by a chain or cord *h* with the long arm of the valve-actuating lever E', so that when the heat of the furnace causes the fire-box to expand the cross-bar or part B will be moved upward, rocking the lever E' upon its pivot and allowing the draft valve to gradually close by gravity, and as the furnace cools off the fire-box will contract, allowing the movable bar to descend, whereupon the weighted or heavier arm of the valve-actuating lever will raise the draft valve, thus increasing the draft and allowing the fire to burn more readily until the desired temperature is attained, when the reverse operation will be repeated. To open a damper as at I, at the same time that the draft valve H is closed, or vice versa, a rocking bar K pivotally supported intermediate its ends above the furnace may be connected at one end by a chain or other suitable flexible device with the damper I and at the other end with the long arm of the valve-actuating lever E', so that when the long arm of the actuating lever is moved upward, allowing the draft valve to close the damper will be raised or opened, and vice versa. The damper and draft valve are preferably allowed to close by gravity, but if desired they may be closed by the positive action of the lever and allowed to open by gravity, or suitable connections may be provided to adapt either or both valves to be operated by the positive movement of the lever in either or both directions.

By arranging the flexible connections between the base of the furnace and the movable bar thereon on the outside of the casing inclosing the fire-box, in the preferred construction shown in the drawings, all liability of heating said connections is avoided, so that the movements of the draft-valves or dampers will be effected by the expansion of the fire-box only, unaffected by any expansion of the adjusting devices or flexible connections for operating the same.

Various changes may be made in the general construction and arrangement of parts without departing from the spirit or scope of my invention, for example, the flexible connection between the movable bar and base of the heater at the side opposite the valve-actuating device E' may be dispensed with,

and it will be understood that my invention is not limited to the specific construction or arrangement of parts shown and described.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a heating apparatus an expansible fire-box and draft flues connected therewith, in combination with a draft valve, mechanism for operating said valve supported by and actuated through the expansion of the fire-box, and means adapted to be operated from a point outside of the room in which the apparatus is located for adjusting said mechanism without affecting the position of the valve to adapt the same to actuate the valve at different temperatures.

2. In combination with a heating apparatus having an expansible fire-box, means adapted to be moved by the expansion of the fire-box, flexible connections between said movable means and the base portion of the heater having upper and lower divisions arranged in different vertical planes, a valve-actuating rocking lever fulcrumed upon one of said divisions and connected with the other so as to form a connecting link between the two divisions, and means for lengthening and shortening said flexible connections at will so as to render the valve-actuating lever active at different temperatures.

3. In a heating apparatus, means adapted to be moved by the expansion of the fire-box, a lever having an arm connected with a draft valve for actuating the latter when the lever is rocked; and flexible connections between said movable means and the base of the heater having upper and lower divisions arranged in different vertical planes, said lever being fulcrumed on one of said divisions and connected with the other so as to form a connecting link between the two divisions, and means for varying the length of said flexible connections without affecting the position of said lever or the valve connected therewith so as to vary the degree of heat at which the valve will be actuated.

4. In a heating apparatus, an expansible fire-box and draft valve operating mechanism combined with a device supported by and adapted to be moved by the expansion and contraction of the fire-box, and means controlled from a point outside of the room in which the heater is located for adjusting said valve operating mechanism without affecting the position of the valve to vary the degree of heat required to affect the valve.

5. In a heating apparatus, the combination with an expansible fire-box of a movable bar mounted on and actuated by the expansion of the fire-box, connections between said bar and a draft-valve whereby the latter will be actuated when the fire-box is expanded, and means controlled from a point outside of the room containing the

heater for increasing and decreasing the length of said connections at will without affecting the position of the valve to vary the temperature at which the valve will be operated.

6. A heat-regulating device comprising, in combination with a fire-box, a bar adapted to be moved by the expansion of the fire-box, flexible connections between said bar and the base of the heater, a valve-actuating lever fulcrumed on said flexible connections and adapted to be rocked by the movement of said bar so as to actuate the valve, and a second lever also fulcrumed on said connections and having a bearing on said valve-actuating lever intermediate the fulcrums of the two levers, whereby the length of said connections may be increased or diminished by the movement of said second lever, and means for securing said second lever in different positions.

7. A heat-regulating device comprising, in combination with a fire-box, a movable bar actuated by the expansion of the fire-box, flexible connections between said bar and the base of the heater, a valve-actuating lever having its fulcrum on said flexible connections and adapted to be rocked by the movement of said bar for actuating the valves, an adjusting lever fulcrumed on said connections and having a bearing on the valve-actuating lever intermediate said fulcrums, for varying the length of said connections to adapt the valve to be actuated at different temperatures, and means outside of the furnace-room for manipulating and securing said adjusting lever in different positions.

8. In a heating apparatus, means adapted to be moved by the expansion of the fire-box and flexible connections between said movable means and the lower portion of the heater, in combination with a lever fulcrumed on and suspended by one division of said connections and having an arm connected with a draft-valve, a second lever fulcrumed on another division of said flexible connections and having a bearing on the suspended lever between the two fulcrums, whereby the movement of said second lever will vary the length of said flexible connections and adapt the suspended lever to actuate the valve at different temperatures.

9. In a heat regulating apparatus, means adapted to be moved by the expansion of the fire-box and flexible connections between said movable means and the lower portion of the heater, in combination with a valve-actuating lever and an adjusting lever each fulcrumed upon said connections but in different vertical planes, one arm of the adjusting lever having a bearing on the valve-actuating lever between their fulcrums and the latter lever having an arm connected with a draft-valve so that the latter will

be actuated through said connections as the temperature varies, the movement of the adjusting lever being adapted to vary the length of said connections to adapt the valve-actuating lever to move the valve at different temperatures.

10. In a heating apparatus, means adapted to be raised by the expansion of the fire-box and flexible connections between said movable means and the lower portion of the heater, in combination with a lever fulcrumed on and suspended by said connections, said lever having one arm weighted and another arm connected with a draft-valve, a second lever having its fulcrum on said flexible connections in a different vertical plane from that of the suspended lever and also having a bearing on the suspended lever, and means for securing said second lever in different positions, whereby the movement of said second lever will vary the length of said flexible connections and adapt the suspended lever to actuate the valve at different temperatures.

11. In combination with a heater having an expansible fire-box, a part adapted to be raised by the expansion of the fire-box, intermediately divided flexible connections between said part and the lower portion of the heater, a valve-controlling device connecting the divided portions of said connections and adapted to be actuated thereby for opening or closing a valve as the fire-box expands or contracts, and means for varying the length of said connections to adapt the valve-actuating device to actuate the valve at different temperatures.

12. A heat regulating mechanism comprising a part adapted to be supported upon and raised by the expansion of the fire-box of a heater, a valve actuating device suspended from said part at one side of the heater, flexible connections between said part and the base of the heater having portions thereof arranged in different vertical planes and connected by said valve-actuating device, draft-valve connections with said valve-actuating device, and means for varying the length of said flexible connections to adapt the valve-actuating device to operate at different temperatures.

13. In a heating apparatus having an expansible fire-box, a draft-valve and damper, a rocking bar and connections between the same and said valve and damper whereby the valve will be opened and the damper closed, or vice versa, when the bar is rocked, and means actuated by the expansion of the fire-box for rocking said bar, said means consisting of a part adapted to be raised by the expansion of the fire-box and flexible connections between said part and a lower portion of the heater, said flexible connections having a lever fulcrumed thereon weighted at one end and having its other

end operatively connected with said rocking bar, whereby the latter will be rocked through said flexible connections by the expansion of the fire-box and actuate the valve and damper.

14. In a heating apparatus having an expansible fire-box, a draft-valve and damper, a rocking bar over the heater, flexible connections between the said bar and said valve and damper, and means actuated by the expansion of the fire-box for rocking said bar and thereby opening or closing said valve and simultaneously closing or opening said damper, said means consisting of a part adapted to be raised by the expansion of the fire-box and flexible connections between said part and a lower portion of the heater, said flexible connections having a device fulcrumed thereon and actuated thereby for rocking said bar, and means for varying the length of said flexible connections so as to vary the degree of heat at which the bar will be rocked.

15. In a heater, the combination of an expansible fire-box, having a part thereon adapted to be raised when it expands, tie-rods or other suitable tension-connections between said part and lower portion of the heater and arranged to be tensioned by the expansion of the fire-box, said connections being intermediately divided, and a valve-controlling device arranged between and attached to the adjacent ends of the divided connections and actuated thereby to close or open a valve as the fire-box expands or contracts.

16. A heat regulating mechanism comprising a part adapted to be supported upon and raised by the expansion of the fire-box of a heater, flexible connections between said part and the base of the heater having portions thereof arranged in different vertical planes, a valve-actuating device fulcrumed upon and connecting adjacent end-portions of said flexible connections, draft-valve connections

with said valve-actuating device, and means controlled from a point remote from the heater for varying the length of said flexible connections to adapt the valve-actuating device to operate at different temperatures. 50

17. A heat regulating mechanism, comprising a part adapted to be moved by the expansion of the fire-box of a heater, for opening or closing a valve or valves, a valve-actuating device connected with a valve and with said movable part and actuated by the latter, suitable connections between said device and said movable part and between said device and a fixed part of the heater whereby said device and through it the valve will be actuated when said part is moved, and means for varying the length of said connections without changing the position of the valve, thereby varying the degree of heat and expansion of the fire-box required to actuate the valve. 60 65

18. A heat regulating mechanism, comprising a part adapted to be moved by the expansion of the fire-box of a heater, for opening or closing a valve or valves, a valve-actuating device connected with a valve and with said movable part and actuated by the latter, suitable connections between said device and said movable part and between said device and a fixed part of the heater whereby said device and through it the valve will be actuated when said part is moved, and means controlled from a point remote from the heater for varying the length of said connections without changing the position of the valve, thereby varying the degree of heat and expansion of the fire-box required to actuate the valve. 70 75 80

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

MILTON J. FARQUHAR.

Witnesses:

LEVI MILLS,
LESTER SPOHR.