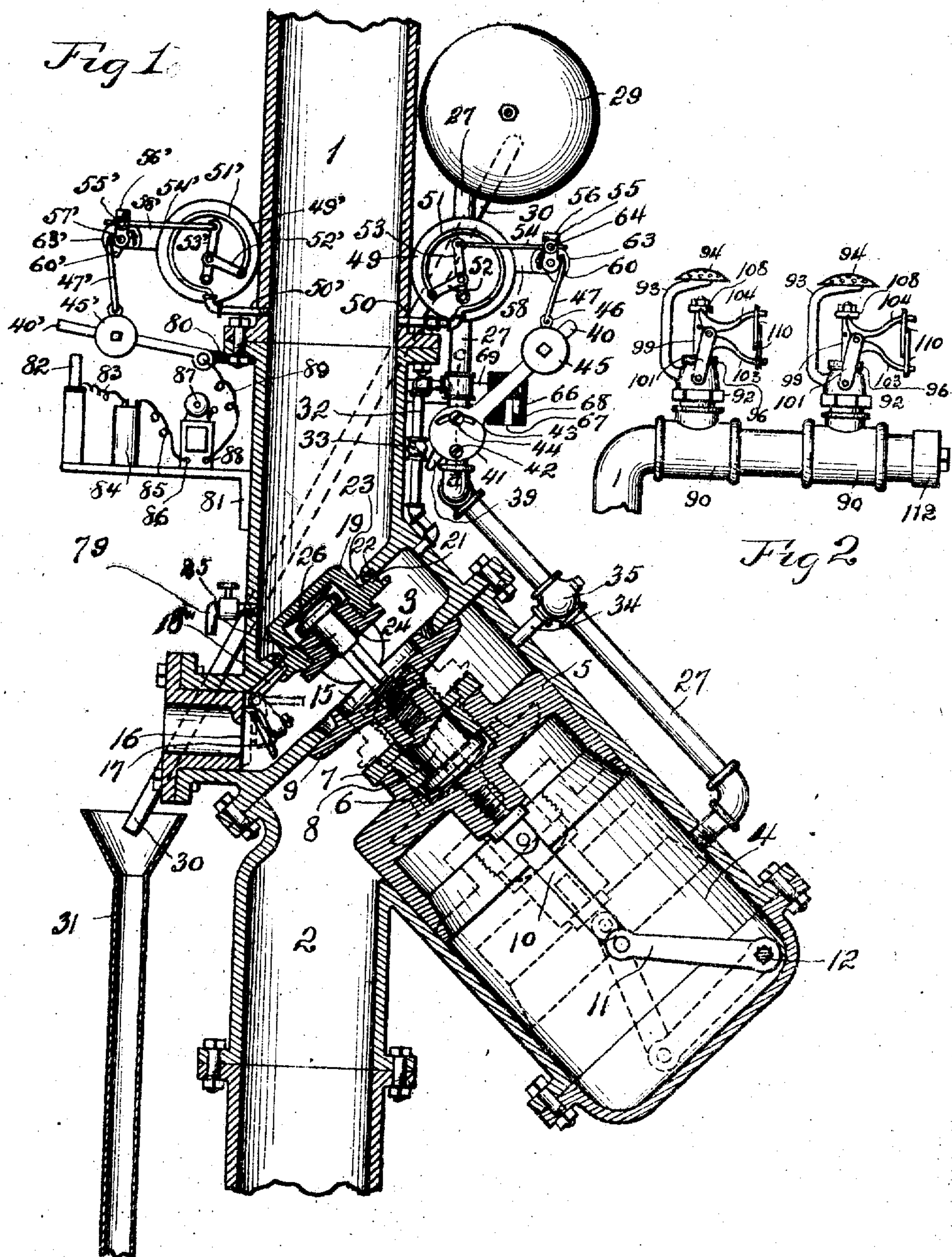


No. 881,271.

T. H. WALKER.
FIRE PROTECTIVE SYSTEM.
APPLICATION FILED JULY 8, 1907.

PATENTED MAR. 10, 1908.

3 SHEETS—SHEET 1.



WITNESSES:

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3 SHEETS—SHEET 2.

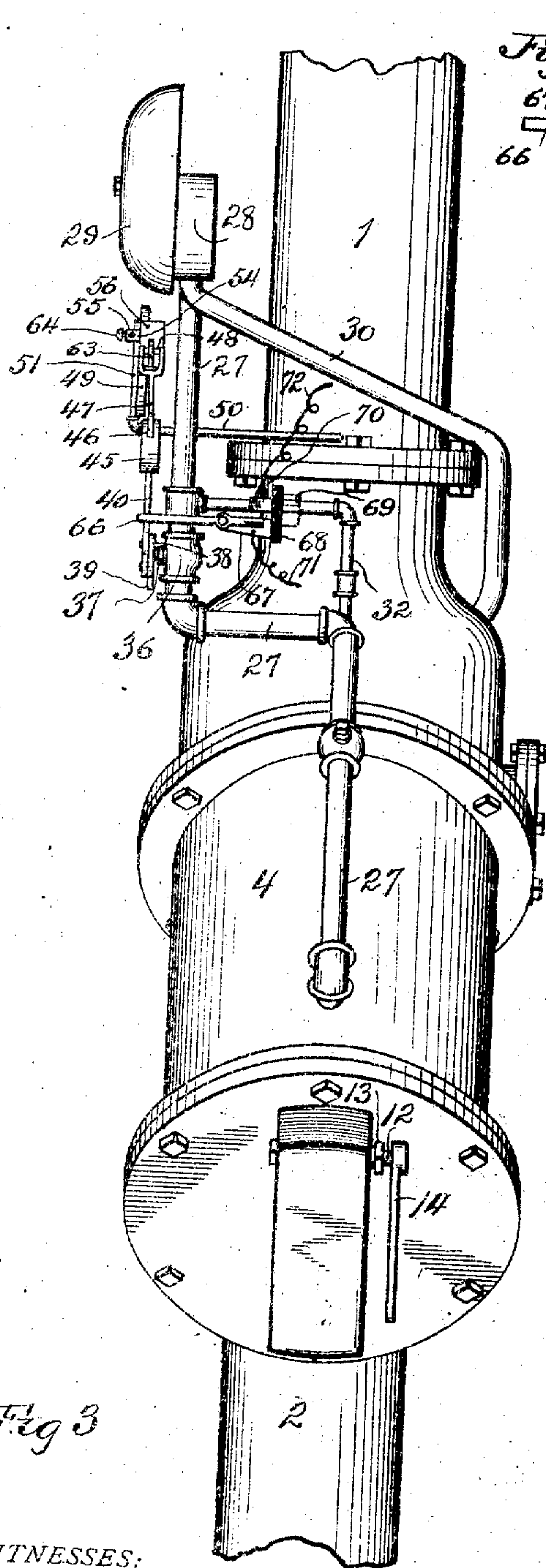


Fig 3

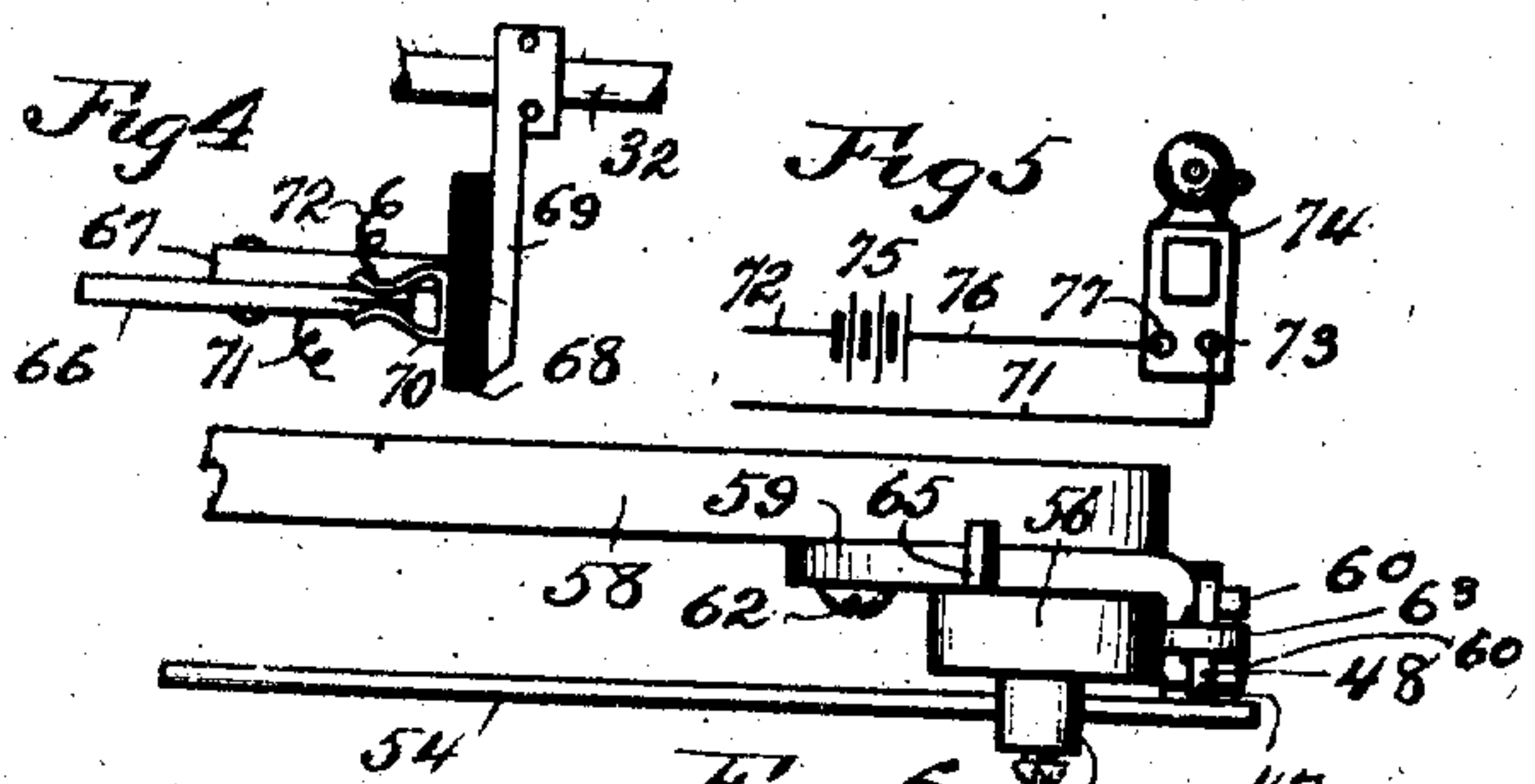


Fig 4

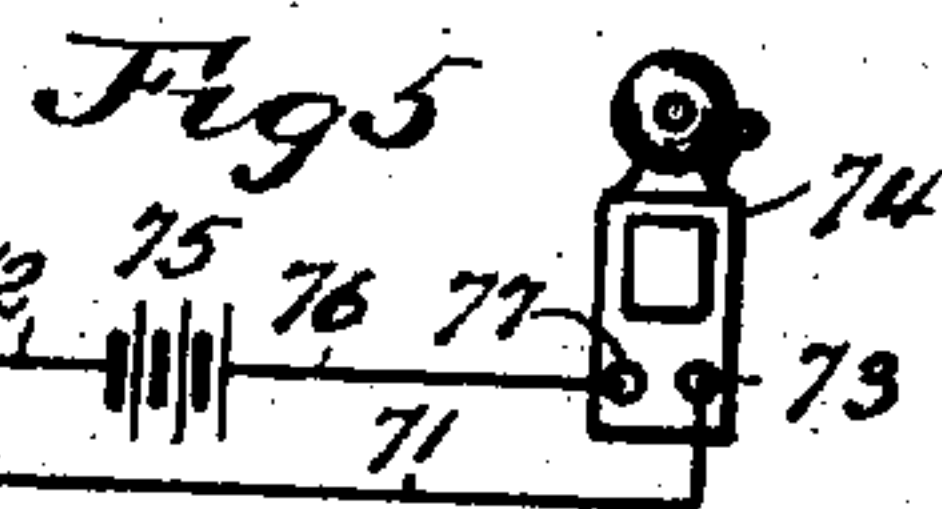


Fig 5

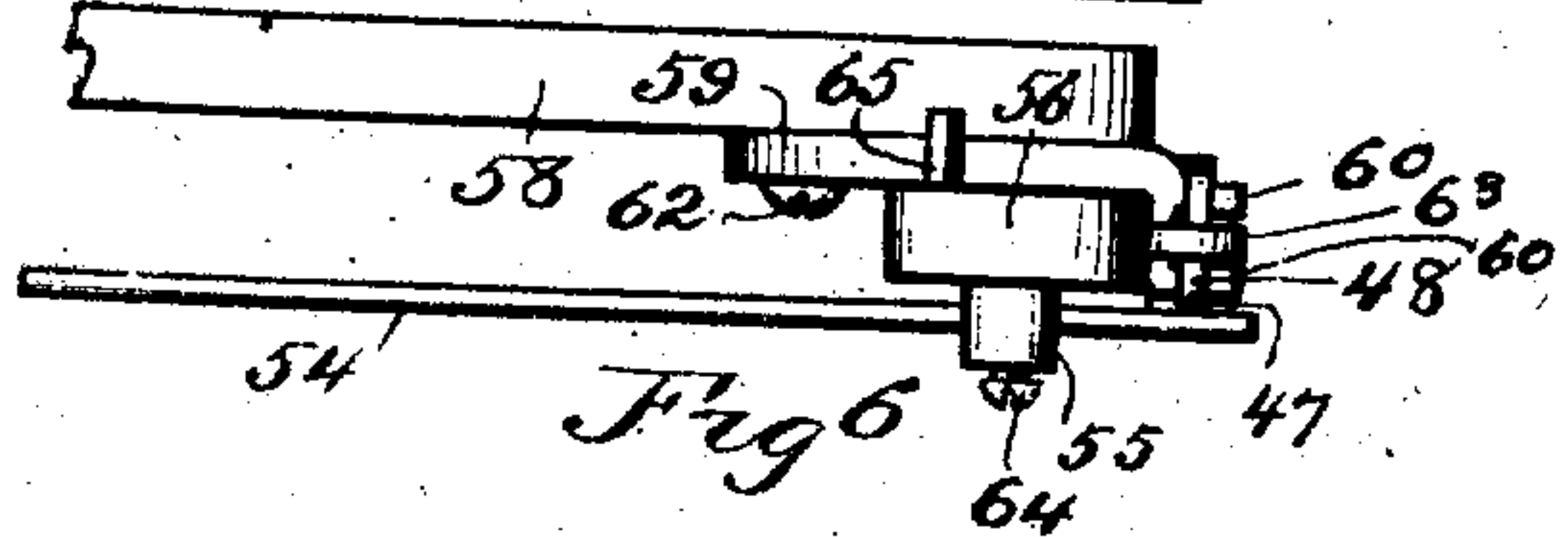


Fig 6

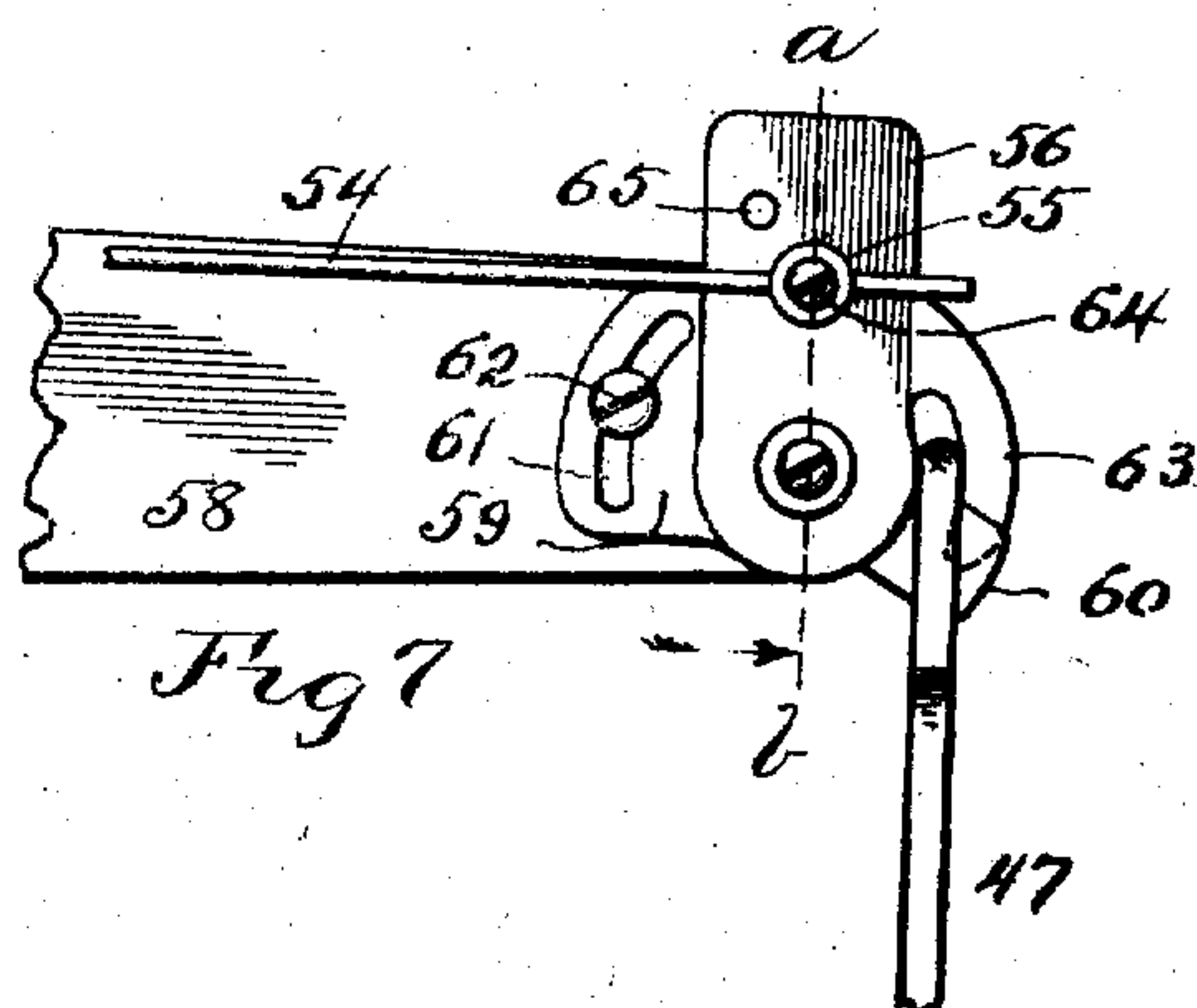


Fig 7

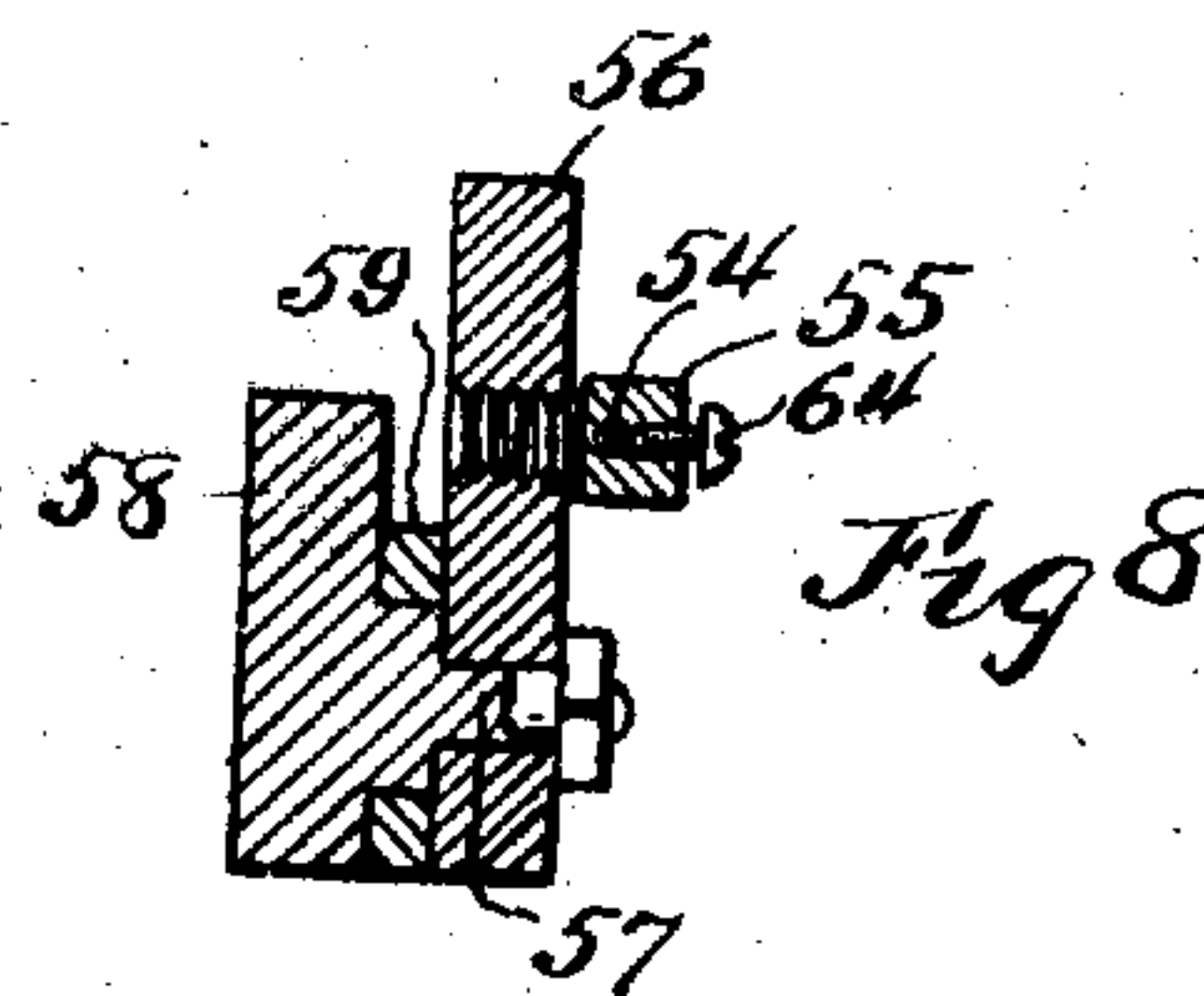


Fig 8

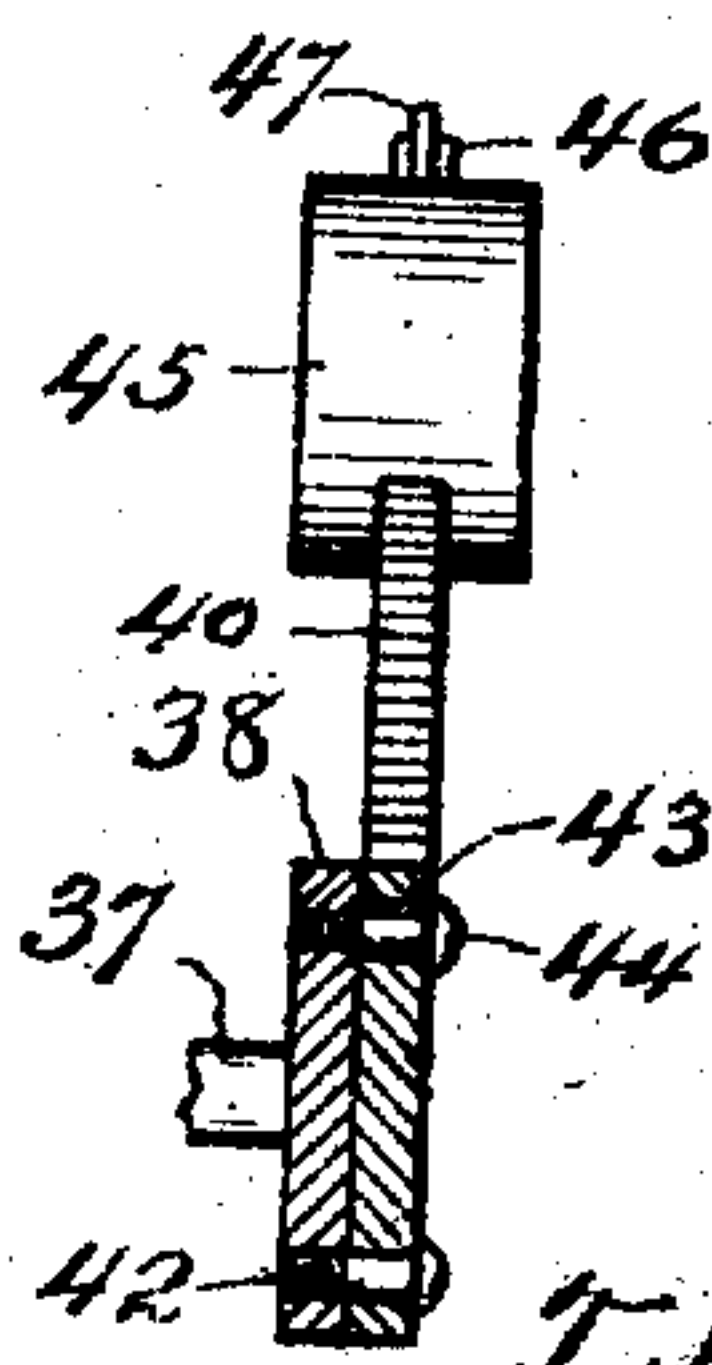


Fig 9

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3 SHEETS—SHEET 3.

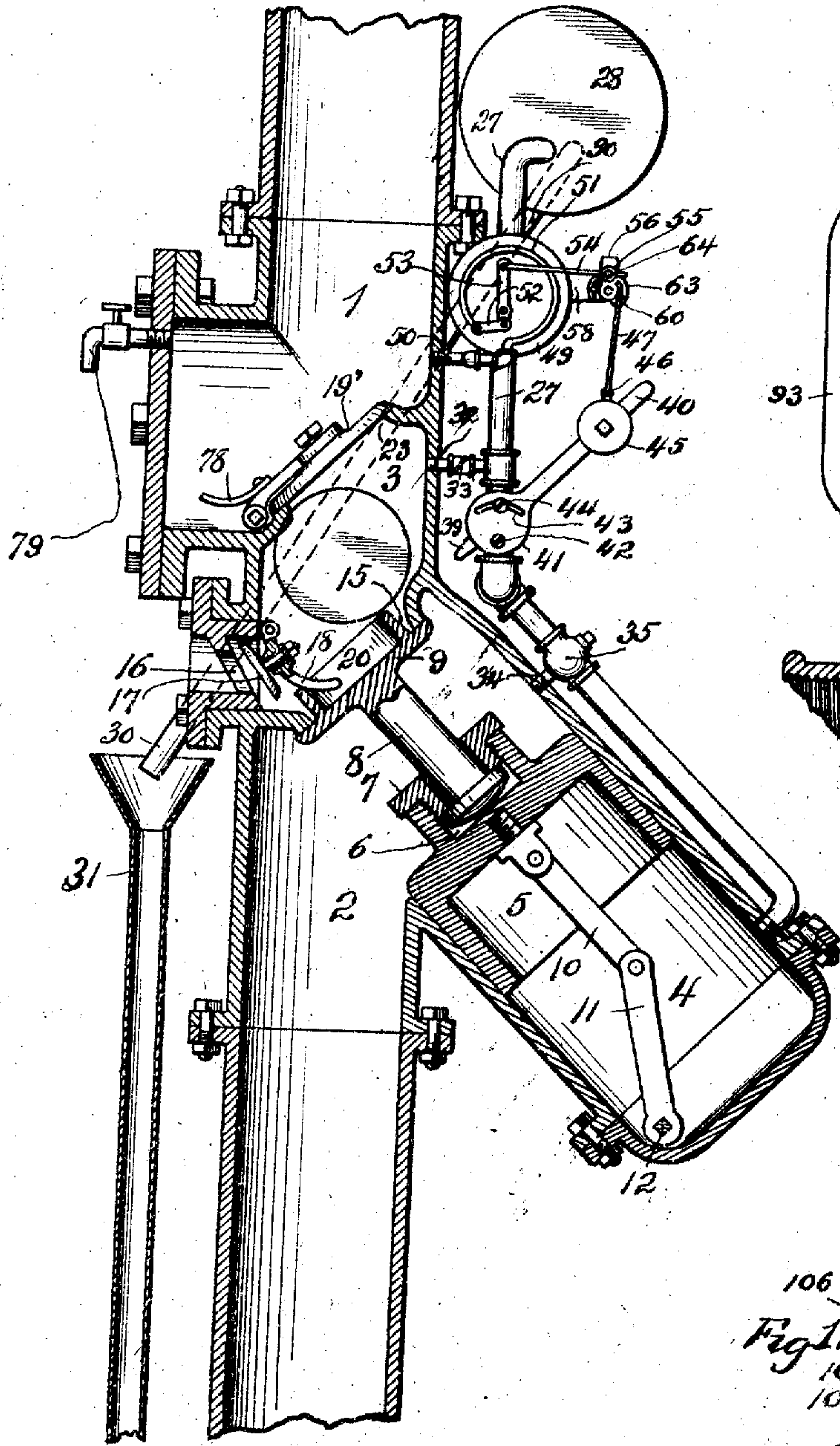


Fig 10

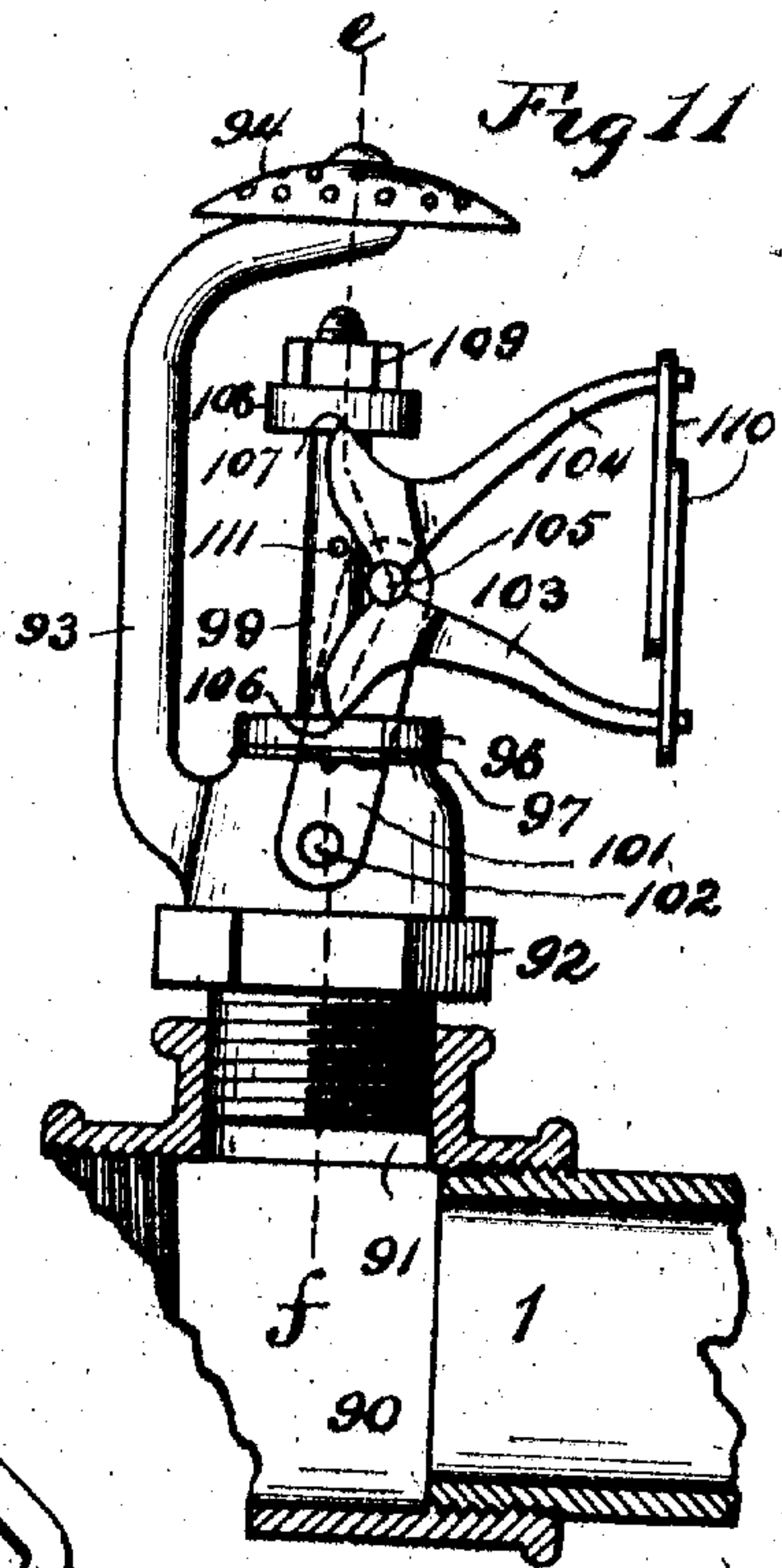


Fig 11

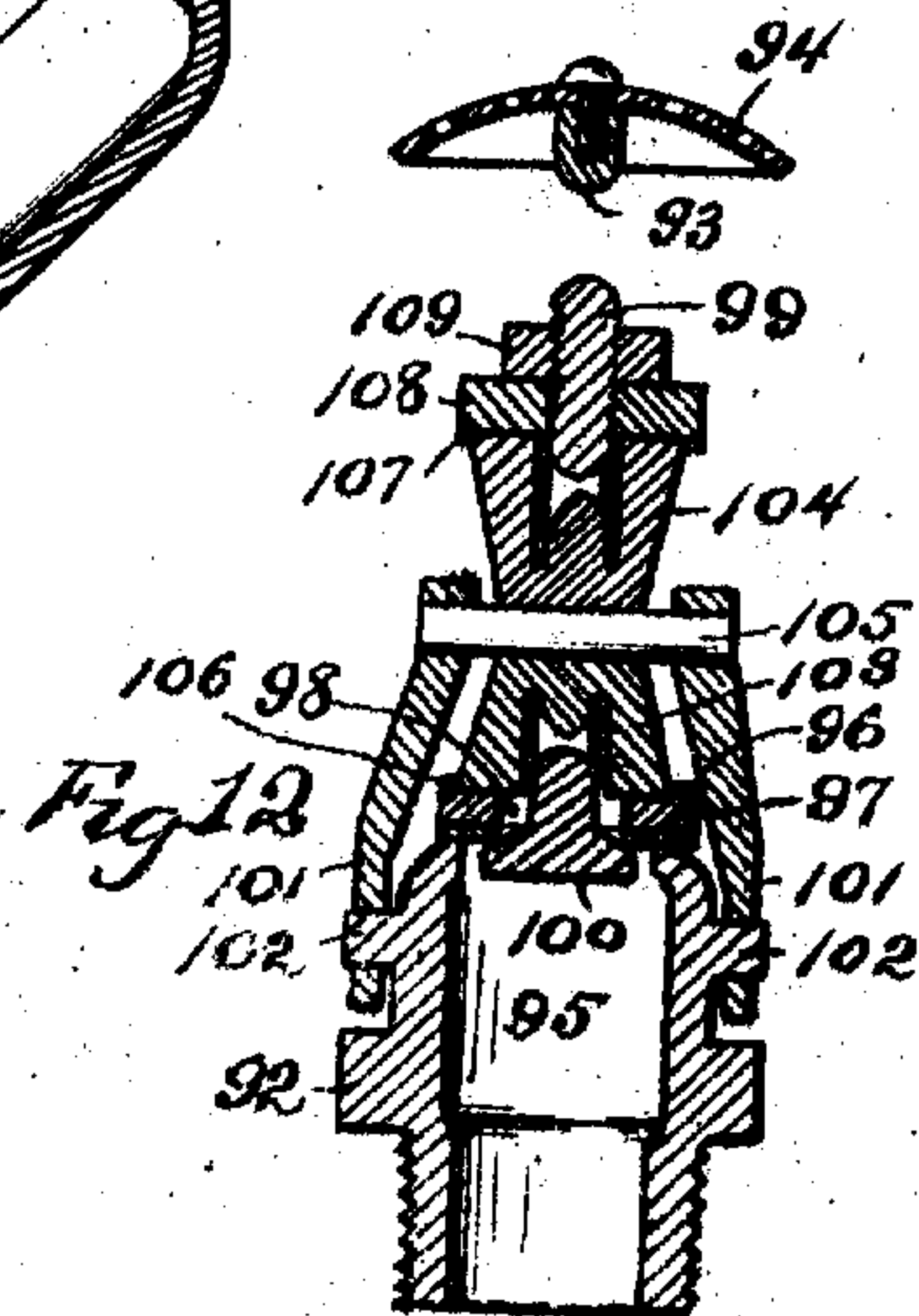


Fig 12

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UNITED STATES PATENT OFFICE.

THOMAS H. WALKER, OF KANSAS CITY, MISSOURI.

FIRE-PROTECTIVE SYSTEM.

No. 881,271.

Specification of Letters Patent.

Patented March 10, 1908.

Application filed July 8, 1907. Serial No. 382,731.

To all whom it may concern:

Be it known that I, THOMAS H. WALKER, a citizen of the United States, residing in Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Fire-Protective Systems, of which the following is a specification.

My invention relates to improvements in fire protective systems.

The object of my invention is to provide mechanism for automatically extinguishing fires and which will be prompt and effective in operation and not liable to get out of order.

My invention relates to fire protective systems in which a water main is provided with a number of spraying devices, normally held inoperative by heat controlled means.

My invention provides a water main having a passage connecting two chambers, one of which normally contains water under pressure, the other normally containing a fluid, such as air, and provided with discharge openings in which are mounted the heat controlled spraying devices, said passage being closed at its ends by two valves, a piston being employed in the water containing chamber for actuating one of the valves, the movement of the piston being controlled by mechanism actuated by the variation of pressure in the air containing chamber.

The novel features of my invention are hereinafter fully described and claimed.

In the accompanying drawings which illustrate my invention—Figure 1 is a vertical sectional view of a portion of the water main showing the two chambers, the intermediate connecting passage and some of the parts connected therewith. Fig. 2 is a side elevation view of a portion of the water main, showing two spraying devices attached thereto. Fig. 3 is an elevation view of what is shown in Fig. 1, the view being taken at right angles to the view shown in Fig. 1. Fig. 4 is a top detail view of one of the electrical circuit controlling devices. Fig. 5 is a diagrammatic view of a portion of the circuit in which the device shown in Fig. 4 is located. Fig. 6 is a top view and Fig. 7 a side elevation of the mechanism employed to support the lever which is employed to open the by pass valve. Fig. 8 is a vertical sectional view taken on the dotted line *a—b* of Fig. 7. Fig. 9 is a vertical sectional view taken on the dotted line *c—d* of Fig. 1. Fig. 10 is a vertical sectional view of a modified form of my

invention. Fig. 11 is a side elevation view of an improved form of spraying device, of my invention, adapted to be employed with a system which uses air at either greater or less than atmospheric pressure for automatically turning the water into the pipe to which the sprinklers are attached. In this view a portion of the sprinkler device is broken away and the main is shown in vertical section. Fig. 12 is a vertical sectional view taken on the dotted line *e—f* of Fig. 11.

Similar characters of reference denote similar parts.

Referring to the drawings, the water main comprises the principal part, 1 denoting the chamber for containing a fluid, such as air, 2 the chamber which contains the water under pressure, and 3 an intermediate chamber or passage, the ends of which connect respectively with the chambers 1 and 2. In the form of my invention illustrated in Figs. 1 and 3, and which is the preferable form of my invention, the chamber 1 contains a fluid, such as air, which is normally at a pressure less than atmospheric. In the modified form of my invention, shown in Fig. 10, the chamber 1 contains a fluid such as air, which is normally under pressure greater than atmospheric pressure.

In both forms of my invention the chamber 2 is provided with a preferably, downwardly inclined cylindrical portion or pocket 4, in which is reciprocally mounted a piston 5, the position of which in the pocket 4 is determined by the relative pressure at opposite ends of the piston. The upper end of the piston 5 is provided with a screw threaded recess 6, in which is fitted a collar 7 which encircles a valve stem 8, provided on the lower side of a valve 9 which normally closes the lower end of the passage 3. To the lower end of the piston 5 is pivoted the upper end of a link 10, the lower end of which is pivotally connected to a crank 11 secured on the inner end of a transverse rock shaft 12, which extends through an opening provided in the side wall of the pocket 4, in which is mounted a packing ring 13 that encircles the shaft 12. To the outer end of the shaft 12 is secured a lever 14, shown in Fig. 3, which by swinging in the proper direction will rock the shaft 12 so as to force the piston 5 and valve 9 upward to the position shown in Figs. 1 and 10, in which position the valve 9 will rest against an annular seat encircling the opening 15, provided at the lower end of the pas-

sage 3. Intermediate the upper and lower ends of the passage 3 is an outlet 16, adapted to be closed by a valve 17, pivotally supported upon the inner side of the passage 1. In the form of my invention shown in Fig. 1, the valve 17 is provided with an inwardly extending arm 18' adapted to be engaged by the periphery of a valve 19 and forced to the position shown in Fig. 1, in which the valve 17 is swung away from the outlet 16 to permit the escape of water, which may be in the passage 3. In the form shown in Fig. 10 a curved arm 18 is provided on the valve 17 said curved arm being engaged, when the valve 9 is seated, by an annular flange 20, projecting upwardly from the valve 9 into the passage 3, and holding the valve 17 open when the valve 9 is seated but permitting the said valve to close when the piston 5 moves downward and draws with it the valve 9.

In the form of my invention illustrated in Fig. 1, the valve 19 is in the form of an inverted cup having a lateral annular flange 21 adapted, when the valve is in the closed position, to rest on an annular seat 22, which encircles the opening 23 at the upper end of the passage 3. The valve 19 is screw threaded on its interior and has fitted therein an externally screw threaded ring 24 which encircles a valve stem 25, the upper end of which is provided with a head to prevent the withdrawal of the stem 25 from the ring 24, said head resting preferably against the convex side of a curved spring plate 26, the ends of which bear against the valve 19. The lower end of the stem 25 is screw threaded and fitted in a screw threaded opening provided centrally in the upper end of the stem 8. The stem 8 is also provided with a head which is engaged by the lower end of the ring 7, which prevents the stem 8 from being withdrawn. The stems 8 and 25 are preferably loosely mounted in the rings 7 and 24 so that the valves 9 and 19 will readily seat themselves.

In assembling the parts the lever 14 is first swung so as to force the valve 9 to its seat, as already described, after which the stem 25, which is provided with a squared portion within the passage 3, and below the ring 24, is gripped and rotated in a direction such that the stem 25 will be moved lengthwise upwardly until it has forced the valve 19 against the seat 22.

In both forms of my invention the pocket 4 is connected to a by pass at both ends of the piston 5 so that the water may pass in the pocket from the upper side of the piston 5 to the lower side thereof so as to have water pressure against the lower end of said piston. The by pass discharges outside the chamber 2 and is controlled by a valve which, when opened, permits the water to escape from that portion of the pocket below the piston 5. The by pass comprises preferably the fol-

lowing described parts:—A water conductor 27 has one end connected to the pocket 4, at a point which is below the piston 5 when the piston is raised, but which, as is shown in Fig. 1, is closed by the piston 5 when the piston is in its lowermost position, said position being indicated by dotted lines in the said figure. The conductor 27 discharges at its upper end into the casing 28 of an ordinary hydraulic alarm having a gong 29, which casing is connected by a discharge pipe 30 which empties into a waste pipe 31. The alarm device just referred to is of the ordinary type and its specific construction is not a part of my invention, and therefore needs no description.

Connected with the conductor 27 is another conductor 32 which discharges into the passage 3. The conductor 32 is provided with a check valve 33 of the ordinary type, which permits the water to run into passage 3, but will not permit back flow from said passage through conductor 32. A conductor 34 connects with the pocket 4 at a point above the upper end of movement of the piston 5 and also with a valve 35 inserted in the conductor 27, and by means of which valve the flow from the pocket through conductor 34 may be regulated. In conductor 27 intermediate the valve 35 and the point of connection with conductor 32 is an ordinary shut off valve 36 having a horizontal stem 37 secured at its outer end to the center of a vertically disposed disk 38. The disk 38 is provided with a lateral peripheral projection 39 by which the valve stem 37 may be rotated to close the valve.

The valve stem 37 may be rotated automatically to the open position by the following described mechanism.

A lever 40 is provided at its lower end with a disk like enlargement 41 pivoted eccentrically by means of a screw or pin 42 to the disk 38. The enlarged end of lever 40 is provided with a slot 43 disposed concentrically with the pin or screw 42, and has projecting through it a pin or screw 44 by which the valve stem 37 is turned to the open position when the lever 40 falls, as described herein-after. On the lever 40 is a weight 45 provided with an eye 46 in which is secured the lower end of a hook 47 the upper end of which is bifurcated and provided with a horizontal portion 48 connecting the upper ends of the arms of the hook 47. A vertical circular plate 49 is secured at its lower edge to a horizontal conductor 50, one end of which is secured in a hole provided in the side of the chamber 1, the other end having secured in it one open end of a partly circular expandible tube 51, the other end of which is closed and has connected to it one end of a link 52 pivotally connected to a lever 53, pivoted to the plate 49 and having pivoted to it one end of a horizontal rod 54. The other end of the

rod 54 is longitudinally adjustable in a transverse hole provided in the head of a pin or screw 55 pivotally secured to a plate 56, pivotally mounted, as shown in Figs. 6, 7 and 8, on a horizontal stud 57 on a projection 58 extending laterally from the plate 49. Encircling an enlarged portion of the stud 57, intermediate the plate 56 and the projection 58, is a plate 59 having two projections 60 each having an inclined upper edge on which the transverse portion 48 of the hook 47 normally rests. The plate 59 is preferably provided with a slot 61 through which extends a screw 62 which is secured to the projection 58. By loosening the screw 62 the plate 59 may be swung on the stud 57 to the proper position for receiving the upper end of the supporting hook 47, after which the screw 62 is turned so that its head binds against the plate 59 and secures the plate in the position to which it has been adjusted. The plate 56 is provided with a downwardly curved arm 63 normally disposed between the lugs or projections 60 of the plate 59, and having its lower end disposed outside the transverse portion 48 of the hook 47, said lower end extending below the inclined upper edges of the lugs 60, and thereby normally retaining the hook on said lugs, and thus sustaining the weight 45 on the lever 40.

The outer end of the screw or pin 55 is provided with an axial screw threaded hole which intersects the transverse hole in said screw or pin and has fitted therein a screw 64 adapted to bear against the rod 54 so as to secure the rod in position relative to the plate 56. The plate 56 is provided with means for limiting its movement, comprising a pin 65 secured to the said plate and extending over the upper edge of the projection 58.

The valve releasing or opening mechanism just described operates as follows:—When the pressure rises above the normal in the chamber 1, the expansible tube 51 is expanded, thus swinging the lever 53, by means of the link 52, so as to draw the rod 54 toward the chamber 1, and thereby swinging the upper end of the plate 56 toward the chamber 1 and withdrawing the arm 63 of said plate from between the lugs 60 and above the upper transverse portion 48 of the hook 47. The hook 47, thus being released, permits the weight 45 to swing the lever downward. The lever 40 in falling strikes with a blow the pin or screw 44 in the disk 38, thereby causing the disk 38 to turn and rotate the valve stem 37 so as to open the valve attached thereto. The long curved slot 43 in the lever 40 permits the lever to swing like a pendulum, after falling as above described, without shutting the valve or turning it partly off.

The above description relates to the form of my invention shown in Fig. 1. In the form shown in Fig. 10, the operation differs in that an increase of pressure causes the by

pass valve 36 to open in the form shown in Fig. 1, while in the form shown in Fig. 10 the said valve is caused to be opened by a decrease of pressure in chamber 1. This effect is obtained by pivoting the link 52 to the lever 53 below the lever's pivotal connection with the plate 49, instead of pivoting the link to the lever 53 above the lever's pivotal point, as is the case with the form shown in Fig. 1. It will therefore be obvious that a contraction of the curved expansible tube 51 will swing the upper end of the lever 53 toward the chamber 1, in the form shown in Fig. 10, the same as would expansion of said curved tube 51 in the form shown in Fig. 1. Therefore, when the pressure in chamber 1, in the form shown in Fig. 10, becomes sufficiently reduced, the contraction of the tube 51 will swing the lever 53 so as to swing the rod 54 and plate 56 to a position in which the arm 63 of said plate will be released from the hook 47, and the weight 45 will swing the lever 40 so as to open the valve 36.

In both forms of invention shown in Figs. 1 and 10, when the valve 36 is opened, as above described, the piston 5 will lower in the pocket 4 and move the valve 9 to the open position. This result is accomplished as follows. With the parts as shown in Figs. 1 and 10 there is a water pressure above and below the piston 5, the lower end having a larger area exposed to the water pressure the valve 9 will be held seated as long as this condition exists. When the valve 36 is opened, either by an increase of pressure, as in the form shown in Fig. 1, or by a reduction of pressure, as in the form shown in Fig. 10, water will pass from the pocket 4 through the conductor 27 from that part of the pocket 4 which is below the piston 5. The water passing therefrom through conductor 27 will divide, part of it passing by the conductor 32 into the passage 3, and a small portion passing into the casing 28, causing the gong 29 to sound an alarm, and then escaping from the casing 28 by conductor 30 is discharged into the waste pipe 31.

When the pressure below the piston 5 is reduced to less than the pressure above the piston, the piston 5 will lower in the pocket 4 thus opening the valve 9 and permitting the water to pass from chamber 2 into passage 3. So far the operation of both forms of the invention shown in Figs. 1 and 10 is alike, with the single exception that in the form shown in Fig. 1 increase of pressure in chamber 1 actuates the valve releasing mechanism, while in the form shown in Fig. 10 decrease of pressure in chamber 1 effects the same result.

Referring now to Fig. 1 for a description of the remaining portion of the operation as effected in that form of my invention, it will be observed that the valve 19 is connected by the stem 25 with the valve 9, and when said valve 9 is lowered by the downward

movement of the piston 5, as already described, the valve 19 will be withdrawn from its seat 22, and in its downward movement will permit the valve 17 to close by gravity.

5 The passage 3 will now be in communication with both chambers 1 and 2 so that the water can pass from chamber 2 through passage 3 into chamber 1 from which it can escape by the discharge openings, as herein-
10 after described. The valve 17 being closed no water can pass through the outlet 16 and the only water wasted will be the small amount required to operate the gong 29.

When the lever 40 falls it will strike and
15 swing downward a lever 66, shown in Figs. 3 and 4, which lever is pivoted to a plate 67 secured upon a block of insulation 68 which is supported by a plate 69 carried by the conductor 32. The lever 66 in being swung
20 downward by the lever 40 is forced between and against a spring U shaped contact plate 70 insulated from the plate 67 and supported by the insulation block 68. The plates 67 and 70 are connected respectively to conductors 71 and 72 which in turn are connected
25 one to one binding post 73 of an alarm bell 74 of the ordinary electro magnetic type, and one to one pole of a battery 75, the other pole of which is connected by an electric conductor 76 to the other binding post 77 of the
30 electric bell 74. The circuit thus being completed, the bell 74 will ring until the lever 66 is swung back to the position shown in Fig. 1, in which position the lever 66 and contact
35 plate 70 are separated and the circuit is broken. The electric alarm mechanism just described and shown in Fig. 1 may also be employed in connection with the form shown in Fig. 10.

40 As shown in Fig. 10, the opening 23 at the end of passage 3 is normally closed by a valve 19' hinged in chamber 1 and normally resting by gravity upon a seat encircling said opening 23. In this form of my invention,
45 when the piston 5 lowers and lowers the valve 9, as already described, the valve 17 will fall and close the outlet 16. The water will enter from chamber 3 into passage 23 and the pressure of said water will force the valve
50 19' upward to the open position, thus permitting the water to enter chamber 1.

When it is desired to shut off the water from chamber 1 and replace the parts again in the operative position shown in Figs. 1 and
55 10, the lever 40 is swung to the position shown in said figures, and the hook 47 engaged with the lugs 60, and so held until the arm 63 enters between the lugs 60 and embraces the transverse portion 48 of the hook
60 47. This will occur in the form shown in Fig. 1 when the partial vacuum formed in chamber 1 is of sufficiently low pressure. It will occur in the form shown in Fig. 10 when sufficient air has been pumped into
65 chamber 1 to create the required pressure.

After the hook has been so positioned, the valve 36 is closed by turning the disk 38 by means of the lug 39 to a position in which the valve will be closed, or to the position shown in Figs. 1 and 10.

The valve 36 being closed no water can be discharged from the pocket 4 through the by pass past the valve 36. The water entering conductor 27 through conductor 34 past
70 valve 35 will pass by conductor 27 into pocket 4 below the piston, thereby increasing the pressure below the piston so that it may be readily raised to the position shown in Figs. 1 and 10 by swinging the lever 14 in
75 the proper direction as already described. The valve 9 being closed no water will enter the passage 3, and such water as may remain in said passage will be discharged through outlet 16 as the valve 17 is raised by valve 9
80 when said valve 9 is moved to the closed position. At the same time valve 19 in form shown in Fig. 1 will be closed. In the form shown in Fig. 10 the valve 19' is provided with a projection, preferably a spring or resilient projection 78 which prevents this valve
85 from remaining open after valve 9 has been closed. Valve 19' will thus close by gravity.

In each form of my invention the chamber 1 is provided with a draw off cock 79 disposed at the lower end of said chamber, so that
90 when the valves 19 and 19' are closed the water remaining in chamber 1 may be drawn off. Such draw off cock may also be employed to fasten a pump thereto for the purpose, in the form shown in Fig. 1, of pumping
95 out a part of the air to produce a partial vacuum, or in the form shown in Fig. 10, for the purpose of pumping air into chamber 1.

The mechanism for operating or releasing lever 40, shown in Fig. 1, may be adjusted to
100 release said lever at different degrees of pressure in chamber 1, by loosening the screw 64 and then swinging the plate 56 to the right or left, to the right for a higher pressure and to the left for a lower operative pressure. The
105 screw 64 is then secured against the rod 54.

In Fig. 1 I have illustrated an alarm device for notifying the operator when the pressure in chamber 1 is getting too high, by reason of leakage into the chamber of air
110 from the atmosphere. This mechanism is shown in Fig. 1 to the left of chamber 1 and opposite the mechanism for controlling lever 40. For this mechanism another conductor 50' is attached at one end to chamber 1 and
115 at the other end to another expansible tube 51', closed at its opposite end, the closed end having also connected to it one end of a link 52' pivoted to a lever 53' above the pivotal connection of said lever with a circular plate 49' secured to the conductor 50'. A rod 54' is connected to lever 53' and extends through a hole in a pin or screw 55' pivoted to plate 56' which is pivoted to a stud 57' of a lug 58' on plate 49'. Plate 56' has an arm 63' which
120
125
130

secures the upper end of hook 47' on two lugs 60', between which the arm 63' enters. The hook 47' has its lower end engaged with a weight 46' mounted on a lever 40' which is pivoted to a block of insulating material 80 secured to the outer side of chamber 1. On bracket 81 secured to chamber 1 below the lever 40' is a contact plate 82 upon which the lever 40' falls when released from its support. A conductor 83 connects said contact plate 82 with one pole of a battery 84, the other pole of which is connected by conductor 85 with one binding post 86 of an electric alarm bell 87, the other binding post 88 of which is connected by a conductor 89 with the lever 40'.

The adjustment of the rod 54' is such that the arm 63' will be swung so as to release the hook 47' at a lower pressure in the chamber 1 than is required to release hook 47' from the arm 63'. When the bell 87 rings, the operator pumps air out of the chamber 1 so as to regain the partial vacuum desired to be maintained.

The sprinkler device illustrated in Figs. 11 and 12 is adapted for use in connection with either form of my invention. It is provided with a closure for the discharge opening of chamber 1 that, when released by sufficient heat, will permit air to enter or discharge from chamber 1; for the purpose of increasing or decreasing the pressure in said chamber so as to actuate the mechanism which normally disconnects chambers 1 and 2.

Referring to Figs. 11 and 12, it will be noted that chamber 1 is provided with T joints 93 each having a threaded discharge opening 91 in which is fitted the threaded base 92 of an automatic sprinkler device. Said base is provided with an upwardly extending arm 93 to the upper end of which is secured centrally the usual concavo-convex perforated deflecting disk 94, the center of which is located in the axial line of the discharge opening 95 of the base 92. Said discharge opening 95 is normally covered with an inwardly or outwardly opening closure comprising a horizontal disk valve 96 which rests upon an annular gasket 97 encircling the discharge opening 95 and resting upon the base 92. The disk valve 96 is provided with a central opening 98 in which is disposed a vertical valve stem 99 extending upwardly from a valve 100 disposed below the disk valve 96 and normally resting against the lower side of the gasket 97. To retain the valves 96 and 100 in the closed positions shown in Figs. 11 and 12, the following described mechanism is employed. An inverted U-shaped bail has the lower ends of its arms 101 pivoted respectively on two projections 102 disposed diametrically opposite on the periphery of the base 92.

Two reversely disposed bell crank levers 103 and 104 are disposed one above and one

below the transverse portion 105 of the U-shaped bail, said levers having each a recess fitted to said transverse portion 105. The inner ends of the levers 103 and 104 are bifurcated, the bifurcated portions embracing opposite sides of the valve stem 99. The bifurcated ends of the lever 103 extend downward and are fitted in diametrical grooves in the upper side of the disk valve 96, said grooves being denoted by 106. The bifurcated ends of lever 104 extend upwardly from the bail and are located in diametrical grooves 107 in the lower side of a washer 108, said washer encircling the valve stem 99 and bearing at its upper side against a nut 109 fitted on the threaded upper end of the stem 99. Two vertical plates 110 are provided with transverse openings through which respectively extend the outer ends of the levers 103 and 104. Said outer ends of said levers are forced toward each other until the bifurcated ends of the levers force the valves 96 and 100 tightly against their seats on the gasket 97, the plates 110 being soldered together, as shown in Fig. 11, with some solder fusible at the degree of heat at which it is desired to release the valves 96 and 100.

The operation of this sprinkler mechanism is as follows:—If a fire occurs in proximity to the plates 110, when the heat becomes sufficient, the solder holding said plates will fuse, the plates will be released, thus releasing the levers 103 and 104, which, with the bail comprising the arms 101 and horizontal portion 105, will fall, the transverse portion 105 being disposed at one side of the axis of the stem 99. The valve stem 99 will thus be free to move downward, and the valve 96 will be free to move upward. If the pressure system, shown in Fig. 10, is the one employed, the air pressure in chamber 1 will blow off the valve 96 together with the valve 100 and stem 99, thereby permitting the air in said chamber to escape until the pressure becomes sufficiently reduced to actuate the mechanism controlling the opening of the valve 9. When this mechanism is actuated, as already described, the water will pass from chamber 1, through passage 3, into chamber 1 and from chamber 1 will be discharged through discharge opening 95 against the deflecting disk 94, which will spray the water in all directions.

If the system employed be the partial vacuum system, shown in Fig. 1, when the bail and levers 103 and 104 fall, gravity and external air pressure will force the valve 100 and its stem 99 downward through the hole 98, and air will enter the chamber 1 through the discharge opening 95 and hole 98 of valve 96 until sufficient pressure has accumulated in chamber 1 to actuate the mechanism controlling the opening of valves 9 and 19. When said valves open the water from chamber 2 will pass into chamber 1 and will be dis-

charged therefrom through the discharge opening 95 and against the deflecting disk 94, the water and air pressure removing the valves 96 and 100. Valve stem 99 is preferably provided with a transverse hole 111 to receive a nail or rod so that the stem may be held from rotation, when it is desired to turn the nut 109 so as to increase the pressure of the levers 103 and 104 against portion 105, and against valve 96 and washer 108. As shown in Fig. 2 chamber 1, at its upper end, is provided with a cap 112 for closing the end of the water main. Chamber 2 is connected at its lower end with a water supply pipe not shown.

Having thus described my invention what I claim and desire to secure by Letters Patent, is:—

1. In a fire protective system, the combination with a water main having two chambers and a passage connecting said chambers, one chamber having a cylinder closed at one end and communicating at the other end with said chamber, of a valve normally disconnecting said passage from one of said chambers, a piston movable lengthwise in said cylinder, means connected with the piston for actuating said valve, a by pass connected with said passage and with the cylinder chamber at opposite ends of said piston, and means actuated by variation of pressure in the other chamber for controlling the flow of water through said by pass.

2. In a fire protective system, the combination with a water main having two chambers and a passage connecting said chambers, one chamber containing a partial vacuum, the other chamber having a cylindrical portion closed at one end and communicating at the other end with the said chamber, of a valve for disconnecting said passage from one of said chambers, a piston mounted in said cylindrical portion, means connected with the piston for actuating said valve, a by pass connected with said passage and with said cylindrical portion at opposite ends of said piston, and means actuated by increase of pressure in the partial vacuum chamber for controlling the flow of water through said by pass.

3. In a fire protective system, the combination with a water main having two chambers and a passage connecting said chambers, one chamber normally containing a partial vacuum and the other chamber having normally water therein under pressure, of a valve disconnecting said passage from one of said chambers, a piston mounted in said water containing chamber, means connected with the piston for actuating said valve, a by pass connected with said passage and to the water containing chamber at opposite ends of said piston, and means regulatable to operate at different pressures and actuated by increase of pressure in the partial vacuum

chamber for controlling the flow of water through said by pass.

4. In a fire protective system, the combination with a water main, having two chambers and a passage connecting them, one chamber normally containing air, the other chamber normally containing water under pressure, of a piston mounted in the latter chamber said chamber being closed at one end of the piston, a by pass connecting with said passage and with the water chamber at opposite ends of said piston, a valve controlling the flow of water through the by pass to said passage, means actuated by variation of pressure in the air chamber for controlling the opening of said valve, two valves respectively controlling communication between said two chambers and said passage, one of said two valves being actuated by said piston, said passage having an outlet, and a valve controlling said outlet and movable to the open position by one of said two valves.

5. In a fire protective system, the combination with a water main having a chamber normally containing water under pressure and provided with a pocket, an air containing chamber and a passage connecting said two chambers, said passage having an outlet intermediate its ends, of a valve for closing said outlet, two valves for respectively closing the ends of said passage, a piston reciprocative in said pocket and controlling the movement of one of said two valves, a by pass connected with said passage and with said pocket at opposite ends of said piston, a valve in said by pass for controlling the flow of water therethrough into said passage, and means actuated by a variation in pressure in the air containing chamber for controlling the opening of said by pass valve.

6. In a fire protective system, the combination with a water main having two chambers and a passage connecting them, said passage having an outlet intermediate its ends, of a valve controlling said outlet, two valves for respectively closing the ends of said passage, a piston reciprocative in one chamber for controlling the movement of one of said two valves, said piston controlling also the movement of said outlet valve, and means actuated by variation of pressure in the chamber not containing the piston for controlling the movement of said piston.

7. In a fire protective system, the combination with a water main having two chambers and a passage connecting them, said two chambers containing respectively water under pressure and air having a pressure normally lower than atmospheric pressure, the air containing chamber having a discharge opening, of heat controlled means for closing said discharge opening, two valves for respectively closing the ends of said passage, a piston mounted in said water containing chamber and controlling the movement

of one of said two valves and controlled in its movement by the water pressure in its chamber, and means actuated by increase of pressure in the air containing chamber for controlling the movement of said piston.

8. In a fire protective system, the combination with a water main having two chambers and a passage connecting them and respectively normally containing in said two chambers water under pressure and air, the air containing chamber having a discharge opening, of heat controlled means for closing said discharge opening, two valves for respectively closing the ends of said passage, a piston mounted in said water containing chamber and controlling the movement of one of said two valves, the said chamber at one end of the piston being closed, a by pass connected to the water containing chamber at opposite ends of said piston and discharging outside of the water containing chamber, a valve normally preventing the discharge from the water containing chamber through said by pass, and means actuated by variation in pressure in the air containing chamber for controlling the opening of said by pass valve.

9. In a fire protective system, the combination with a water main having two chambers and a passage connecting them, one chamber containing air and the other water under pressure, the air containing chamber having a discharge opening, of heat controlled means for closing said discharge opening, two valves for respectively closing the ends of said passage, a piston mounted in the water containing chamber and controlling the movement of one of said two valves, the water containing chamber being closed at one end of said piston, a by pass connected to the water containing chamber at opposite ends of said piston and discharging outside the said chamber, a valve controlling the discharge from said by pass, said passage having an outlet intermediate its ends, a valve controlling said outlet, and means actuated by variation of pressure in the air containing chamber for controlling the opening of said by pass valve.

10. In a fire protective system, the combination with a chamber for containing water under pressure and having an outlet, of a valve for closing said outlet, a piston reciprocative in said chamber, the chamber being closed at one end of said piston, said piston controlling the movement of said valve, a by pass connected to said chamber at opposite ends of said piston and discharging outside of said chamber a valve for controlling said discharge, means actuated by air pressure for controlling the movement of said by pass

valve, and manually operated means for moving said piston to force the valve in said chamber to the closed position.

11. In a fire protective system, the combination with a chamber for containing water under pressure and having an outlet, of a valve for closing said outlet, a piston reciprocative in said chamber, the chamber being closed at one end of the piston, said piston controlling the movement of said valve, a by pass connected to said chamber at opposite ends of said piston and discharging outside said chamber, a valve controlling the discharge of water from said by pass, and means actuated by air pressure for controlling the opening of said by pass valve.

12. In a fire protective system, the combination with a chamber for containing water under pressure and having an outlet, of a valve for closing said outlet, a piston controlling said valve and reciprocative in said chamber which is closed at one end of said piston, a by pass connected to said chamber at opposite ends of said piston and discharging outside of said chamber, a valve in said by pass for preventing discharge therethrough from said chamber, and an alarm device actuated when said by pass valve is in the open position.

13. In a fire protective system, the combination with a water main having a passage provided with two seats and having a chamber for containing water under pressure connected with said passage, of two valves for respectively engaging said seats at the ends of said passage, adjustable connecting means by which said valves may be adjusted toward and from each other, and a piston reciprocative in said chamber and controlling the movement of said valves.

14. In a fire protective system, the combination with a chamber having an outlet opening, of a valve for closing said opening, a piston for controlling the movement of said valve and reciprocative in said chamber, which is closed at one end of said piston, a by pass connected to said chamber at opposite ends of said piston and discharging outside said chamber, a valve in said by pass for preventing discharge therefrom, and manually operated means for moving said piston so as to force the valve in said chamber to the closed position.

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

THOMAS H. WALKER.

Witnesses:

E. B. HOUSE,
WARREN D. HOUSE.