

G. W. PIERCE.
Fire-Extinguishers.

No. 155,335.

Patented Sept. 22, 1874.

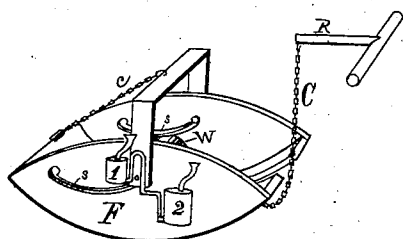


Fig. 1

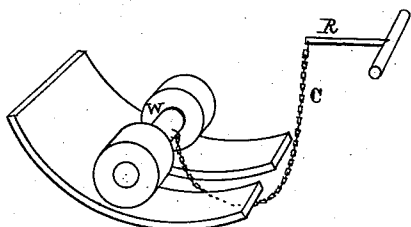


Fig. 2

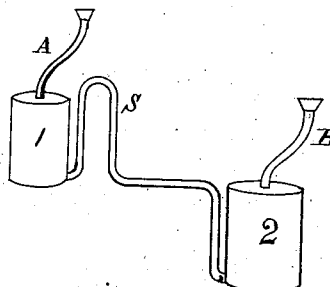


Fig. 3

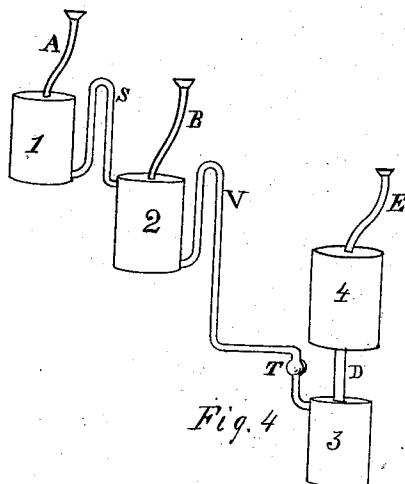


Fig. 4

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IMPROVEMENT IN FIRE-EXTINGUISHERS.

Specification forming part of Letters Patent No. **155,335**, dated September 22, 1874; application filed March 26, 1874.

To all whom it may concern:

Be it known that I, GEORGE W. PIERCE, of Boston, State of Massachusetts, have invented an Automatic Apparatus for Extinguishing Fires, giving the alarm and shutting off the water after the fire is out, of which the following is a specification:

Figure 1 represents the apparatus; Fig. 2, the same, with certain parts removed to show the weight; Fig. 3, a combination of flasks attached to the apparatus, as shown in Fig. 1; Fig. 4, another combination of flasks to be substituted for the combination shown in Fig. 3.

A cradle, F, supporting a weight, W, Fig. 1, is balanced upon pivots in line with the axis of the weight, or otherwise in a state of indifferent equilibrium. On one end of it are two flasks, Fig. 3, flask 1 being filled with mercury, and having attached to it a tube, A, which acts as a thermometer, and a siphon, S, which, at a given temperature, runs over into flask 2. Tube A, with a tunnel top for convenience of filling, is bent as in the figure, to prevent spilling, when the apparatus is reset, by tipping it back, flask 2 being provided with a similar tube, and being made larger than flask 1 to take up any additional expansion of the mercury before it boils. Until the siphon starts, the mercury in flask 1 tilts the cradle back, in which position it is held by the chain c. When it tilts forward, as the mercury runs over into flask 2 the weight W rolls off, and, being attached to a chain, C, which is fast at the other end to the handle R of a cock, opens the cock as it falls. The apparatus may be reset by hand or by a long stick with a forked end, the slot S in the ends of the cradle, Fig. 1, permitting it to be tilted back to reverse the action of the siphon, and the gap in the bottom of the cradle being intended to facilitate the replacing of the weight, and also to prevent the chain C, which is attached to the middle of the handle, from getting in the way of the weight as it rolls off. The cock having been opened in the manner above described, a stream of water is set in motion through a faucet or faucets, which may be placed in any required position, either close to the tilt or at

any distance from it, along the extension of the pipe.

A meter, attached to the pipe between the tilt and the main, which may be put out of circuit in the daytime, by turning a cock letting the water into a branch pipe running round the meter, rings a bell in front of the building or elsewhere by a revolving arm on the extension of the axis of one of the wheels of its register (or otherwise attached and moved by the meter) engaging and releasing at every revolution a spring bell-pull on a parallel axis, and at the same time may be made to run one of the rotary or other fire-alarm boxes in use, either continually or by giving a single jerk, and then letting go, as the watchman does.

Another tilting-box, after the fire is out and the thermometer has fallen to a given temperature, drops its weight, shutting off the water, and both tilts may be attached to the same cock, if desired, by making the second weight twice as heavy as the first, and setting the two handles at an obtuse angle with each other.

The operation of the after-tilt is as follows: Flasks 1 and 3, Fig. 4, being full of mercury, and flask 2 empty, the mercury in flasks 1 and 3 rises with the heat, at the beginning of the fire, in the tubes A and D and siphons S and V, and, shortly after filling the bulb T in the arm of siphon V next to flask 3, it overruns the arm of siphon S next to flask 1, driving the air up and back in the arm of siphon V next to flask 2, as flask 1 empties itself into flask 2, until the mercury stands at the same depth in each arm of siphon V below the level of the surface of the mercury in the adjoining flask. Flask 2, being larger than flask 1, cannot overflow, nor can flask 3, except into flask 4, until the mercury boils; nor can the air in siphon V expand sufficiently to escape, because it must first fill the bulb, which is at a less distance below the level of the surface of the mercury in flask 4 than the extremity of the other arm of the siphon is below the level of the surface in flask 2. The bottom of flask 4 may be made slightly sloping toward the tube D to prevent any globules of mercury which have overflowed

from flask 3 remaining in flask 4 on the subsequent shrinking of the mercury. This combination of four flasks, with the tubes and siphons above described and exhibited in the figure, is fixed to the end of the cradle, which is so balanced as to be tilted forward only by the transfer of the mercury in flask 1 into flask 4, and not to be disturbed by its intermediate transfer into flask 2.

After the fire the mercury cools in flasks 2 and 3, and in the arm of siphon V, adjoining flask 2, gradually rises above the level of the surface of the mercury in the adjoining flask until it overflows the shorter arm of siphon V, being sucked over by the fall of the mercury in the tube D, which acts as a thermometer to produce this effect at a given temperature, the bulb assisting to start the siphon V after the mercury in the shorter arm has passed the bend, by rapidly shortening the air-bubble, (which, if it kept the same vertical length, would be in a state of indifferent equilibrium during the whole time of its passage through the longer arm of the siphon after its upper end had passed the bend), and flask 2 overflows into flask 4, tilting the cradle.

The after-tilts are set, by the overflow of siphon S, Fig. 4, at the same temperature at which the tilts which open the cocks are sprung; and might be constructed, by a nice adjustment, so as to be restored to their original position by hand, or with a long stick, by tipping back to a certain point, at which both siphons run backward until S sucks only air, then bringing the box forward in position, when V empties flask 2 into flask 3.

This new pivot being determined in a particular apparatus, the two pivots might be connected by a slot on each end of the cradle, Fig. 1, like slot *s* in the figure. Otherwise the after-tilt is easily returned to its original state by drawing off, through a tap in siphon V below the bulb, or in tube D, or elsewhere, the mercury which has run over, and returning it to flask 1; and another tap at the bend of siphon S facilitates the charging and recharging of flask 1, Figs. 3 and 4, in a bath at the temperature at which it is required to overflow.

Flask 3 is charged, in the first instance, or recharged after loss by evaporation, by putting in mercury enough to fill the bulb in a bath at the temperature at which flask 1 runs over into flask 2 before this overflow takes place, and, after allowing it to take place, adding a little more, then cooling the bath to the temperature at which flask 2 is to be set to run over into flask 4, and drawing off very slowly the excess of mercury from flask 3, through the tap above mentioned, until the overflow sets in.

If siphon V is not transparent, so that the overflow is visible, an accurate balance will determine the moment of its occurrence if the apparatus is hung on a stationary hook

under the bend of siphon V, flask 1 being taken off or not, and flask 2 weighed in one pan of the balance. A bit of insulated wire, entering on each side of the bend of the siphon V, the two ends inside of the siphon-tube being opposite each other, and the outer ends connected with a battery, answers the same purpose, the circuit being closed the instant the mercury reaches the ends of the wires inside the siphon. Other methods will occur to any mechanic.

The surface of mercury exposed to the air in the apparatus before it is sprung need only be the area of the horizontal sections of the tubes and siphons. The amount used may be small; and it does not follow that the after-tilt is destroyed by the boiling of the mercury, unless a considerable proportion of the whole is boiled away, as flasks 2 and 4, from the similarity of their shape, would naturally lose equally, and the necessary equilibrium be maintained.

The tilts, flasks, tubes, and siphons may be made of iron.

Certain tilts being set to start, say, at 110° of Fahrenheit, letting the water harmlessly into the sinks, others, say, at 125°, judiciously distributed in the ceiling, the elevator-wells, scuttles, ventilation-ways, and elsewhere, the faucets having nozzles constructed, if desired, to sprinkle as large a surface as possible, and the furnaces being commanded by faucets whose tilts are far enough off to be out of the direct heat, and not liable to start prematurely, and the after-tilts likewise judiciously distributed, in corresponding positions or otherwise, along the same pipes, with an extra one, if desired, for each separate pipe nearest the outside wall—to act though all the others are destroyed—suppose a fire: At the first unusual heat the quickset-tilts drop, the meter starts, the outside bell begins to strike, and the box conveys the alarm to the central office, giving information of the particular building or particular apartment in danger. As the first flame appears, the faucets overhead, beginning with the nearest, open upon it, and if it spreads the number of streams is increased up to the limit of the stand-pipe or other supply; and if the flames are extinguished without assistance the building cools, the shut-offs drop one after another, the meter runs slower and slower, and, when the danger is past, it finally stops, the stream ceases to flow, and the bell to strike.

The reservoir may be charged with any convenient element or chemical agent, or mechanical or chemical compound, instead of water; or the extinguishing agent may be liberated by the mixture of elements or compounds which follows the opening of the pipes.

I claim—

1. The combination of flasks 1 and 2, Fig. 3, with tubes A and B and siphon S, constructed

and arranged, substantially as herein described, for the purposes set forth.

2. The combination of flasks 1, 2, 3, and 4, Fig. 4, with tubes, A, B, D, and E, siphons S and V, and bulb T, constructed and arranged, substantially as herein described, for the purposes set forth.

3. The combination of a tilting box or cradle, F, a weight, W, a chain, C, and a cock,

with either combination of flasks or any other apparatus herein described, the whole apparatus being constructed and arranged to operate substantially as herein described, for the purposes set forth.

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Witnesses:

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