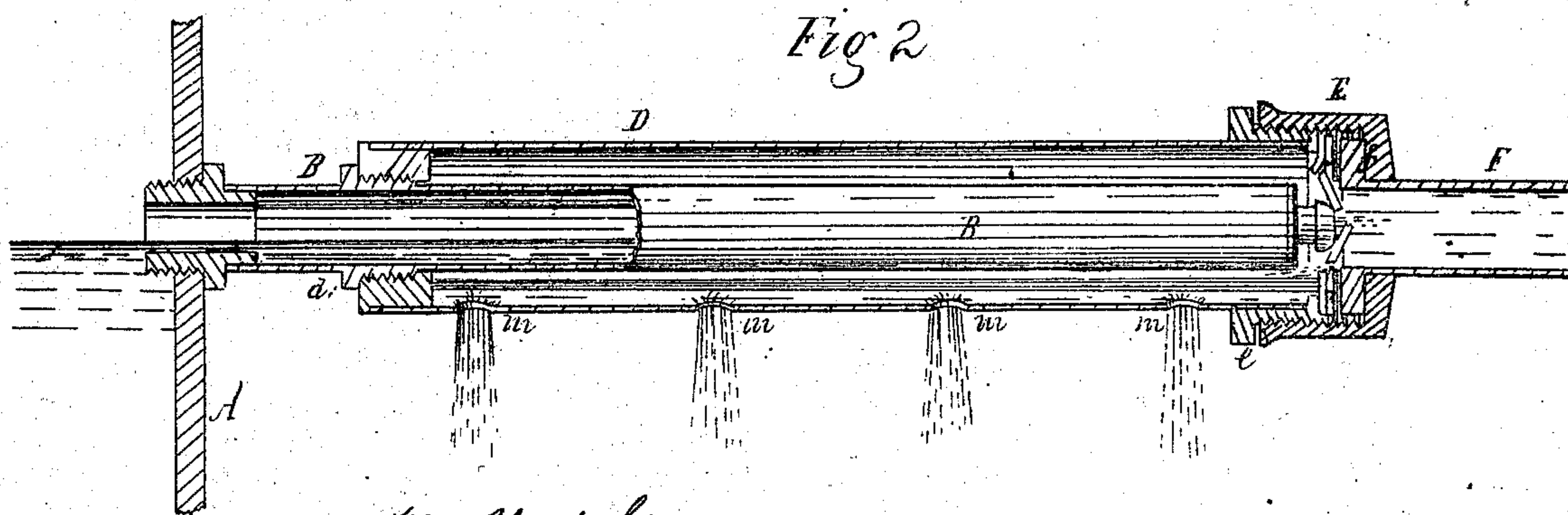
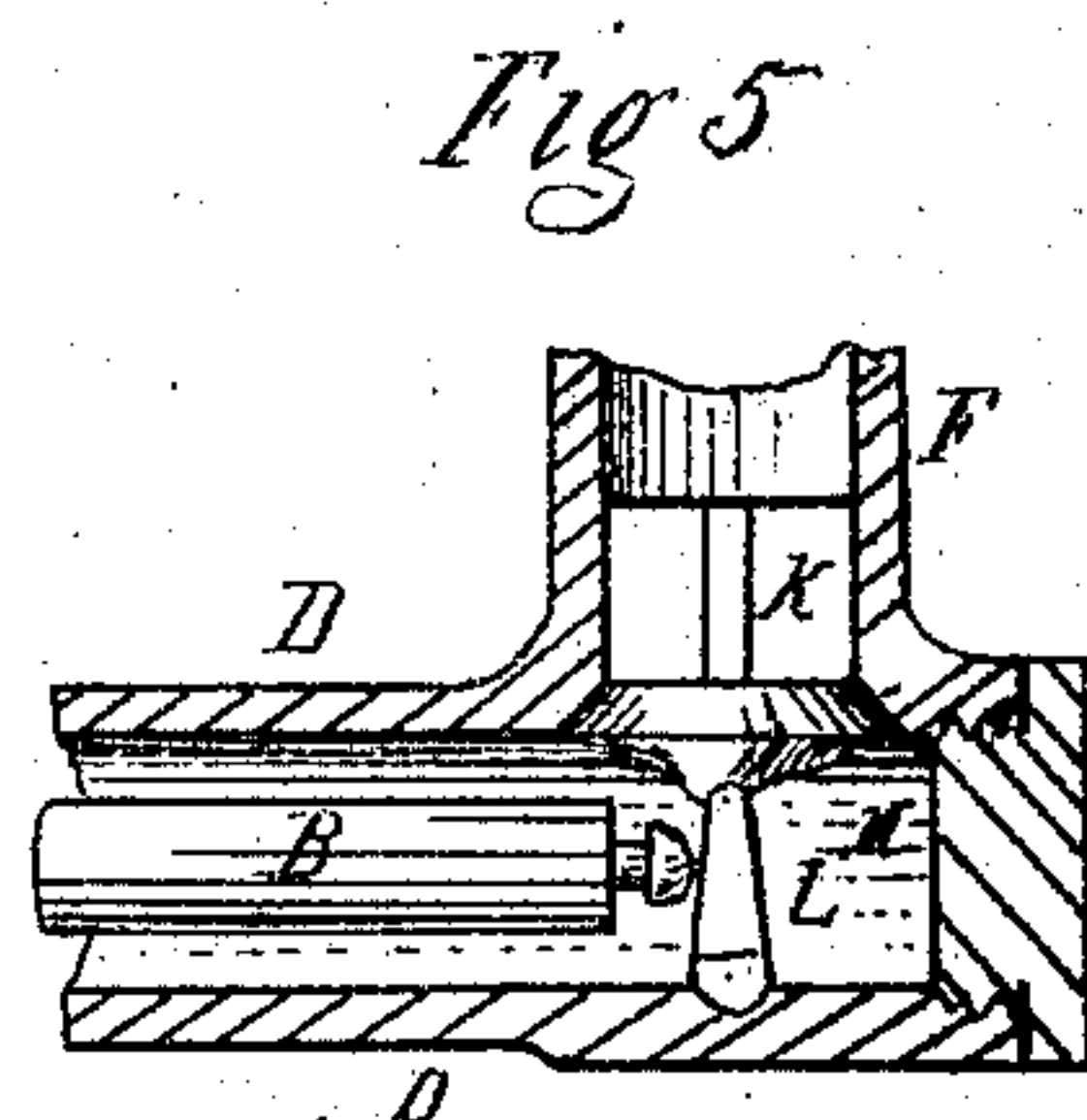
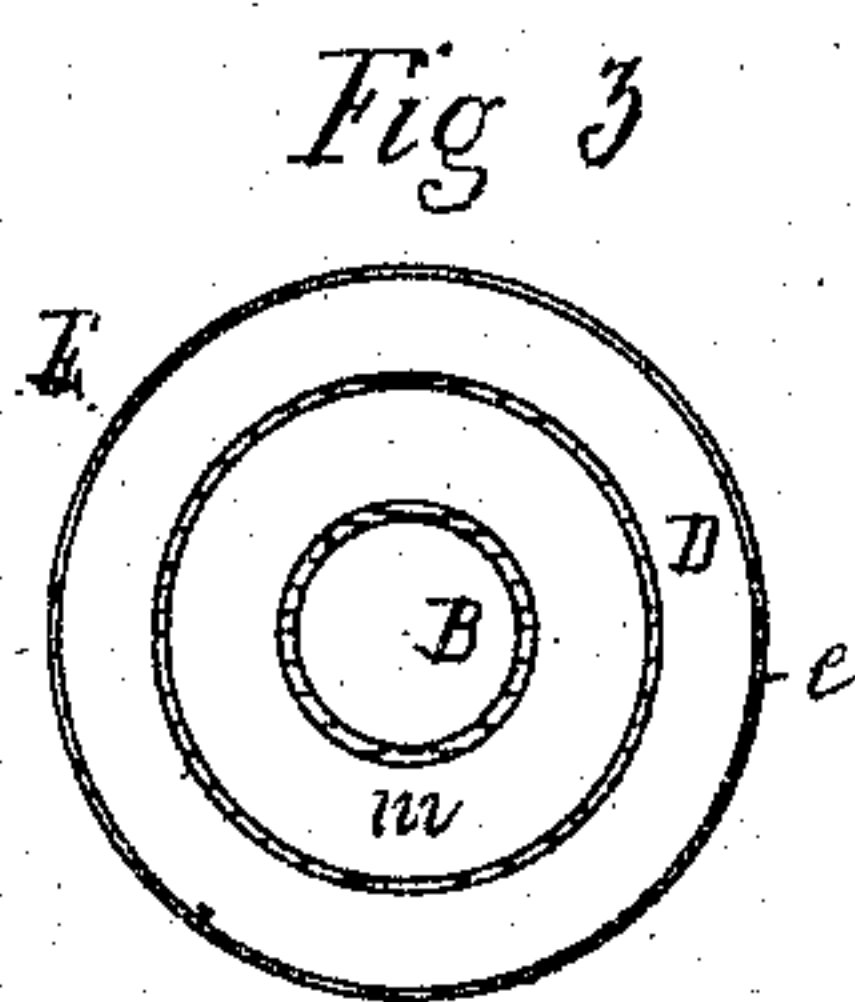
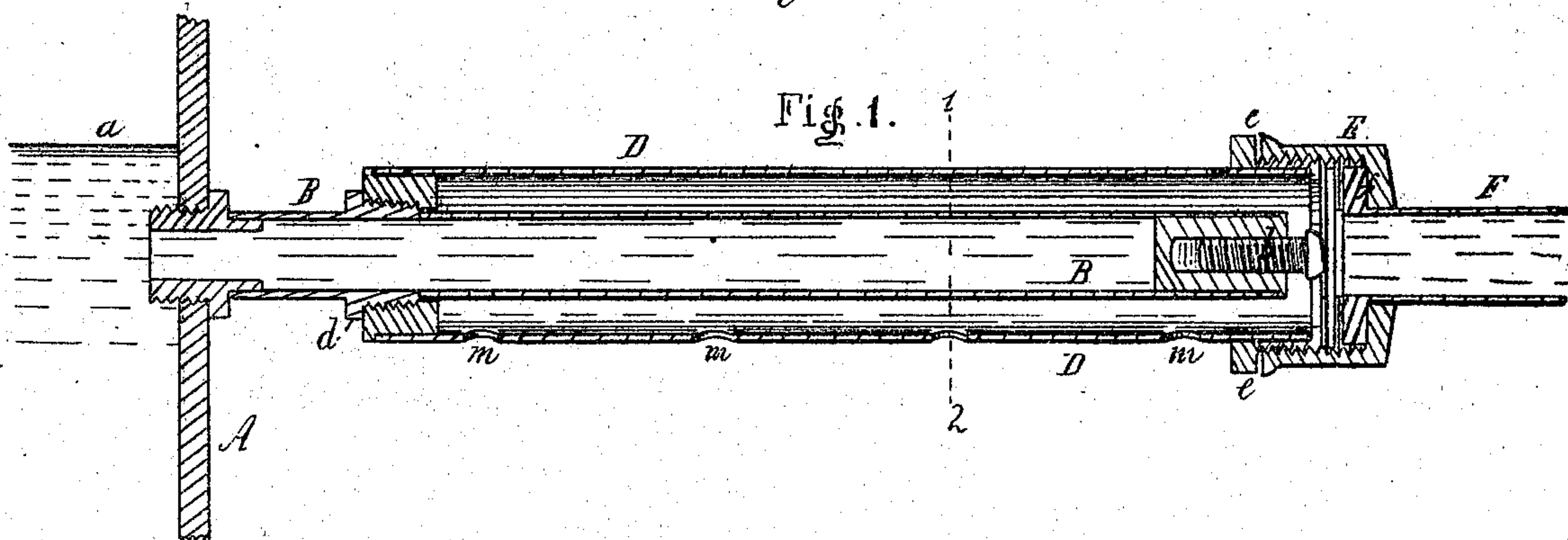
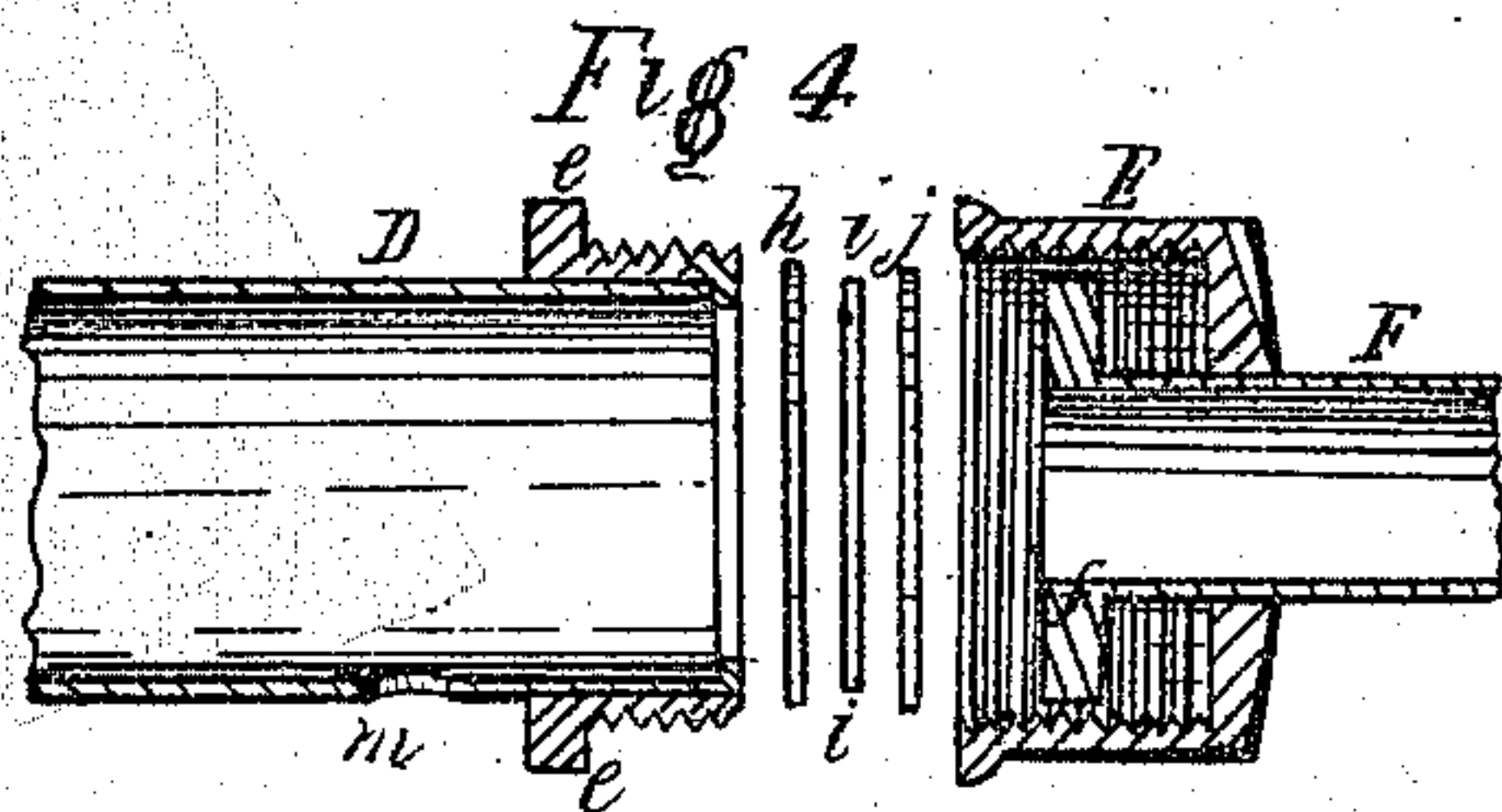


J. Harrison Jr.
 Low-Water Detector.
 N^o 75754 Patented Mar. 24, 1868.



Witnesses *Wm. Wat. Stul.*
J. Parker

Inventor J. Harrison Jr.
 By his attorney
H. C. Cowson

United States Patent Office.

JOSEPH HARRISON, JR., OF PHILADELPHIA, PENNSYLVANIA.

Letters Patent No. 75,754, dated March 24, 1868.

IMPROVEMENT IN LOW-WATER DETECTORS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOSEPH HARRISON, Jr., of Philadelphia, State of Pennsylvania, have invented an improved Safety-Apparatus for Steam-Boilers; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention consists of a tube, communicating at one end with a steam-boiler; and closed at the opposite end, in combination with a pipe communicating with a reservoir or other supply of water under pressure, and a disk of glass, or its equivalent, which, on being acted upon by the tube, expanding, when steam is admitted to it, will release the water and permit the same to flow on to the ignited fuel in the fireplace.

In order to enable others skilled in the art to make and use my invention, I will now proceed to describe its construction and operation, reference being had to the accompanying drawing, which forms a part of this specification, and in which—

Figures 1 and 2 are sectional views illustrating one modification of my safety-apparatus for steam-boilers.

Figure 3, a transverse section on the line 1-2, fig. 1.

Figure 4, sections of parts of the apparatus detached from each other.

Figure 5 represents a modification of part of my invention.

Similar letters refer to similar parts throughout the several views.

On reference to figs. 1, 2, 3, and 4, A represents part of the front plate of a steam-boiler, and the line *a* the proper water-level in the same. Into the front of the boiler is screwed a tube, B, in the closed end of which is an adjustable set-screw, *b*, referred to hereafter. A larger tube, D, surrounds the tube B, and is at one end screwed to a collar, *d*, on the latter; the opposite end being open and projecting into a cap, E, between which and a collar, *e*, on the tube, intervenes a suitable packing. A pipe, F, passes through a central opening in the cap E, against the inside of which the flange *f* of the pipe bears. Between the end of the tube D and the flange *f* of the pipe F intervenes the ring *h* of gum-elastic, the disk *i* of glass, and a second gum ring, *j*, so that, on screwing the cap tight to its place, the glass will be securely confined between the gum rings, which, with the glass, close the outer end of the tube D.

In applying the above-described instrument to a steam-boiler, the tube B is screwed into the plate A of the same, at such a point below the proper water-line *a* that steam cannot gain access to the tube until the water has become too low. The screw B is then so adjusted that, when the cap E is screwed tight to the end of the external tube D, the glass disk shall be free from contact with the head of the screw, but in proximity thereto.

The pipe F communicates with a hydrant, or with a reservoir or cistern, so that there shall be a constant supply of water, under pressure, ready to rush into the annular space between the tubes D and B the moment the glass disk is broken.

As long as a proper quantity of water remains in the boiler, there is little or no change in the temperature in the internal tube B, which must be less than that of the steam in the boiler; consequently there can be no such expansion of the tube B as will cause the head of the set-screw *b* to come in contact with the glass; but when the water becomes so low that steam will gain access to the internal tube, (see fig. 2,) and displace the water, or a portion of the water therein, the temperature of the tube will increase without a corresponding increase in the temperature of the exposed outer tube D; consequently the inner tube will expand, and its screw *b* will fracture the glass and permit the water to rush from the pipe F into the annular space between the two tubes, from which space it can be directed through openings *m m*, and through suitable ducts or channels to the fireplace above the fuel.

With the exception of the well-known fusible plug, the objections to which will be referred to hereafter, low-water indicators have generally been so contrived that their duty is limited to the sounding of a whistle or other alarm as a warning of the condition of the boiler to the attendant engineer, who may not be at hand to apply the proper remedies with the promptitude necessary to prevent dangerous results. The above-described instrument, however, at once, and without the aid of the engineer, extinguishes the fire the moment the water becomes low, while the stoppage of the engine, and the unusual noise caused by the jets of water playing on to the fuel, will be warning sufficient to the engineer that his services are required.

The fusible plug, above-referred to, has been found to be inefficient in many cases, and it has the further

objection of permitting the small amount of water which remains in the boiler to escape for the purpose of extinguishing the fire when the water is low.

Another advantage of my invention is, that it may be so constructed as to be free from cocks and other external appliances, which are common to many low-water indicators, and which may be tampered with or negligently operated by the attendant so as to render the instrument useless.

In my invention, after the set-screw has been once adjusted, and the cap applied by responsible parties, the efficiency of the instrument cannot be impaired unless the cap be detached, and even this may be suitably locked, and the instrument thereby placed entirely beyond the control of the engineer.

In order to increase the efficiency of the instrument as a safety-apparatus, I, in some cases, combine it with appliances by which the grate-bars of the furnace, together with the fuel, will be precipitated into the ash-pit when the water becomes too low. A mode of accomplishing this result is shown by fig. 4, where G represents the fireplace, H the ash-pit, and I one of the bearers for the grate-bars. Each bearer is supported at one end on an arm, *k*; both arms being secured to a shaft, *n*, from which projects an arm, *p*, the latter supporting a vessel, *q*, into which a stream of water flows from the instrument when the glass breaks; the weight of the water in the vessel eventually depressing the latter, and moving the supporting-arms *k* from the bearers, so that the bars and fuel will be precipitated into the ash-pit as the streams of water play on to the fire.

It is not essential that glass should be used to exclude the water, as other friable material may be employed, or a disk of thin metal, sufficient to withstand the pressure of water, but easily penetrated by a puncturing termination of the expansion-tube, may be used. It is important, however, that the water should escape suddenly, and in sufficient quantities, when the expansion-tube performs its duty. The sudden escape of the water may be effected through the medium of a valve, and by the action of the expansion-tube. An instance of such an arrangement is illustrated in fig. 6, where F represents the water-supply pipe closed by a valve, K, which is held up to its place by a dog, L, the lower end of the latter resting within a casing, M, at the end of the tube D.

When the tube B expands, its outer end comes in contact with the dog, and moves the same away from the valve, which, deprived of its support, falls into the casing M, and permits the water from the supply-pipe to rush into the tube D, and thence to the fireplace, the valve being elevated and the supporting-dog replaced after the instrument has performed its duty.

I claim as my invention, and desire to secure by Letters Patent—

A tube B, communicating at one end with a steam-boiler, and closed at the opposite end, in combination with the water-supply pipe F, and the disk *i* of glass, or any equivalent to the same, the whole being constructed and operating substantially as and for the purpose herein set forth.

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

JOSEPH HARRISON, JR.

Witnesses :

H. HOWSON,
JOHN WHITE.