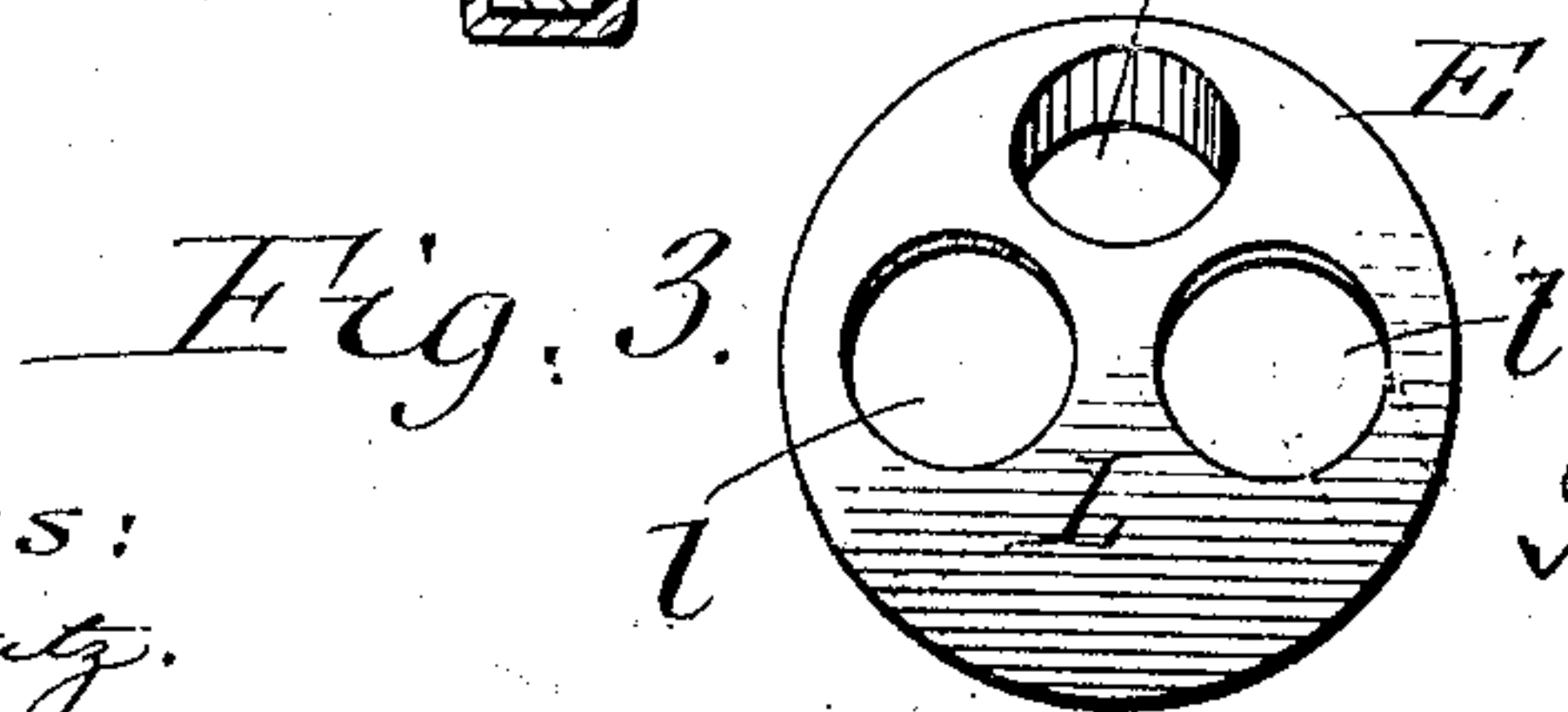
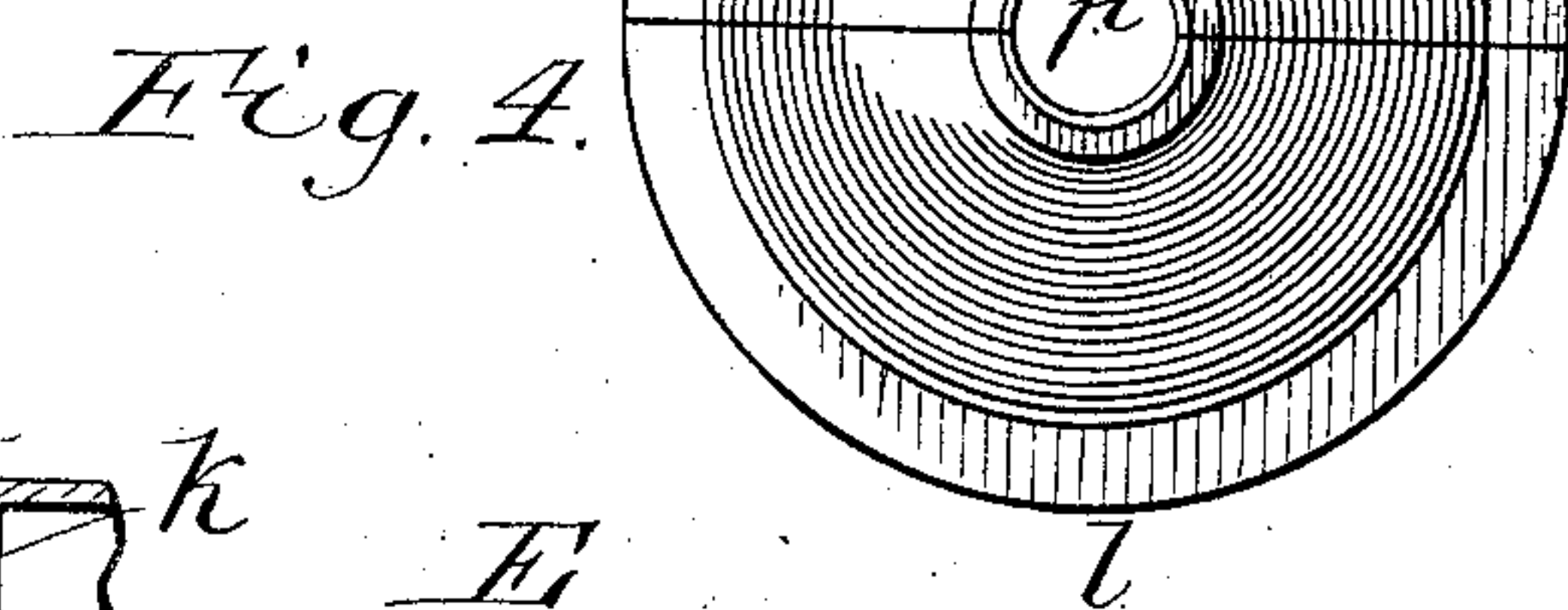
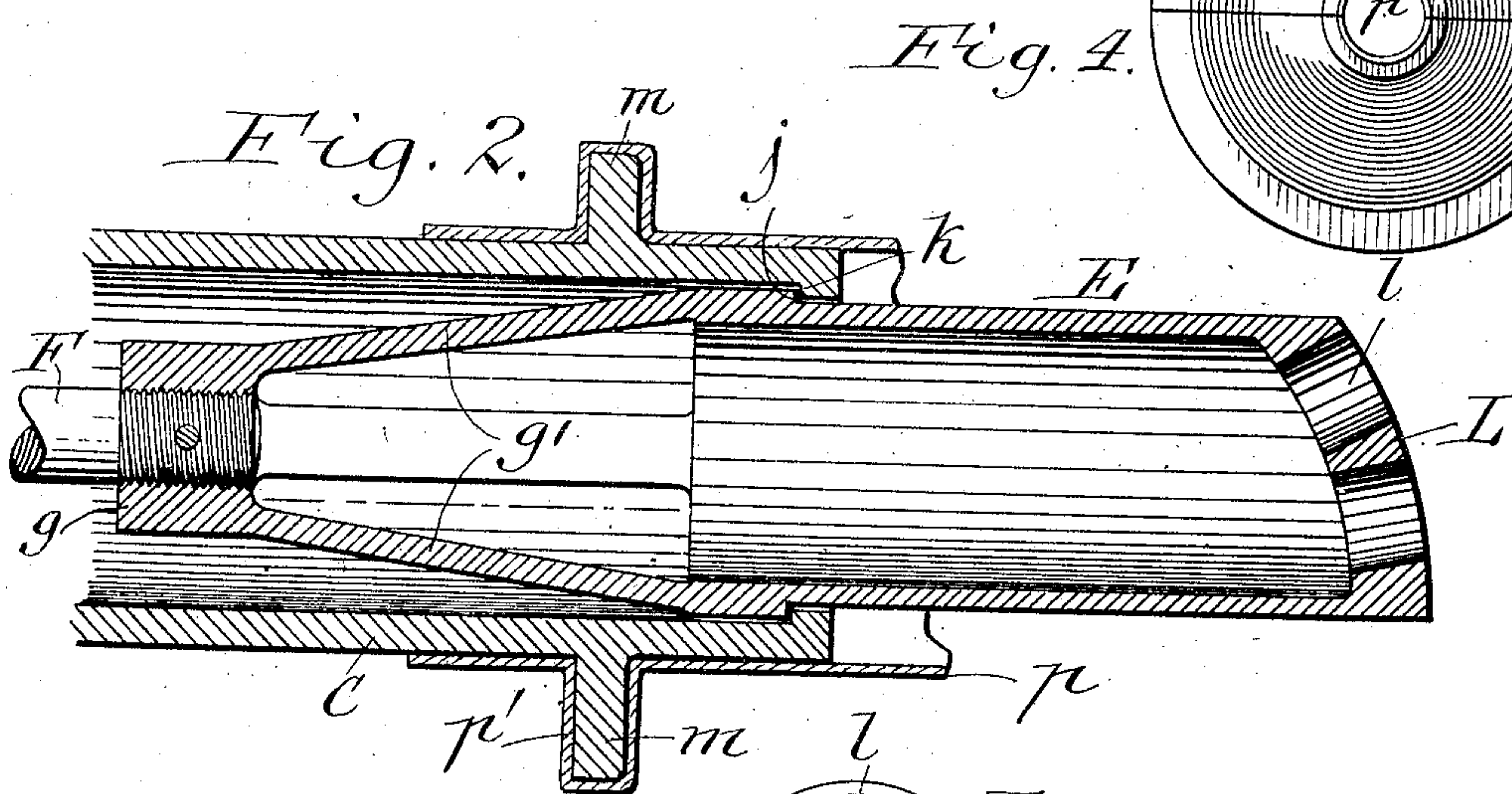
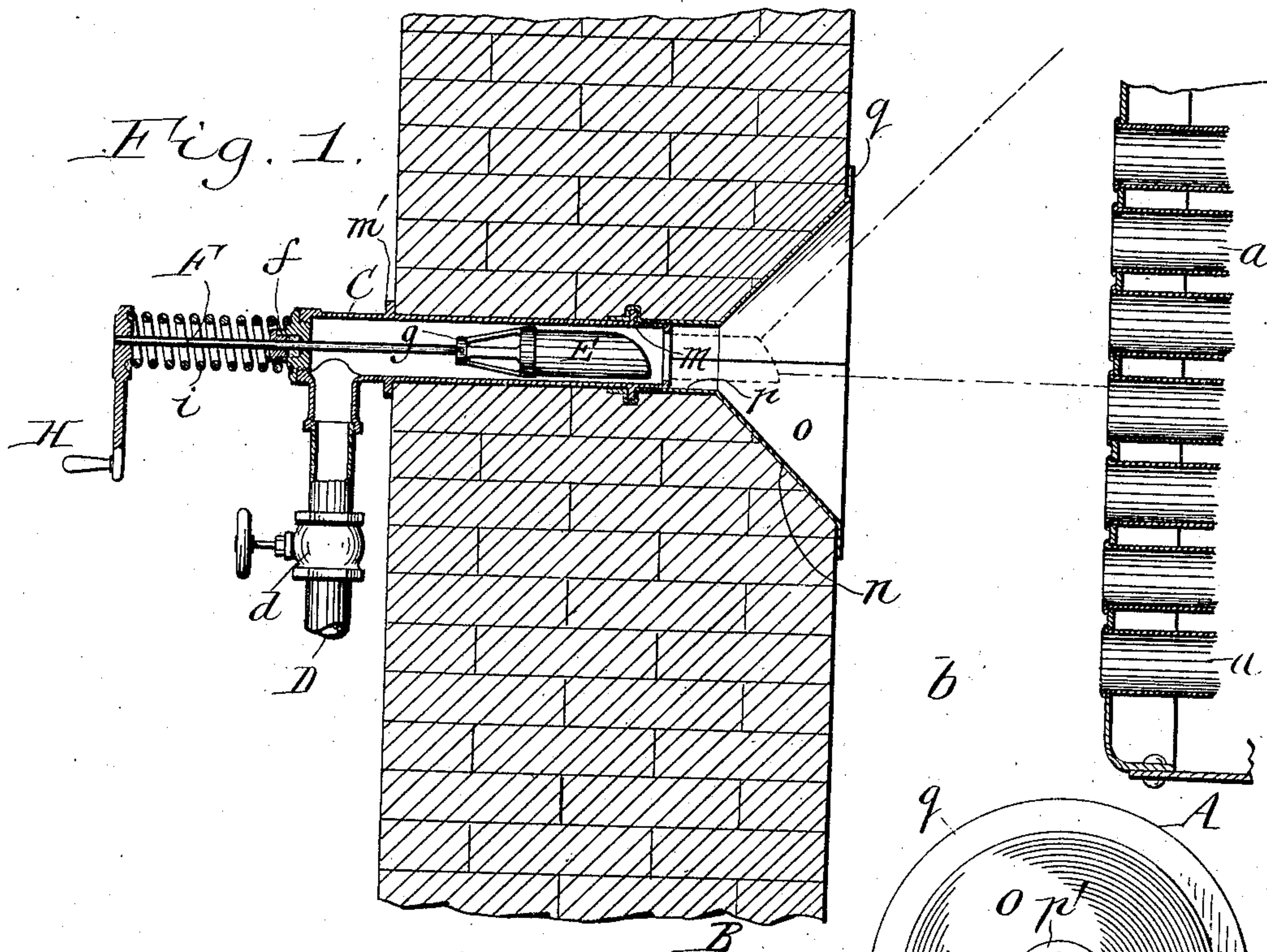


No. 845,083.

PATENTED FEB. 26, 1907.

R. HERMAN.
BOILER TUBE CLEANER.
APPLICATION FILED DEC. 22, 1905.



Witnesses:
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UNITED STATES PATENT OFFICE.

RAPHAEL HERMAN, OF DETROIT, MICHIGAN.

BOILER-TUBE CLEANER.

No. 845,083.

Specification of Letters Patent.

Patented Feb. 26, 1907.

Application filed December 22, 1905. Serial No. 292,895.

To all whom it may concern:

Be it known that I, RAPHAEL HERMAN, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a new and useful Improvement in Boiler-Tube Cleaners, of which the following is a specification.

This invention relates to that type of steam-boiler tube or flue cleaners which deliver a blast of steam through the flues for removing the soot therefrom and carrying the same out through the chimney. Boiler-tube cleaners of this character are shown in United States Letters Patent No. 720,252, dated February 10, 1905, and No. 793,834, dated June 13, 1905.

The object of this invention is to simplify and improve the construction, reduce the cost, and also increase the efficiency of this style of tube-cleaner.

In the accompanying drawings, Figure 1 is a fragmentary longitudinal sectional elevation of the rear part of a stationary boiler provided with my improved tube-cleaner. Fig. 2 is a fragmentary longitudinal section, on an enlarged scale, of the nozzle and the adjacent part of the casing of my cleaner. Fig. 3 is a front view of the nozzle. Fig. 4 is a detached view of the head.

Similar letters of reference indicate corresponding parts throughout the several views.

A represents the rear part of a stationary boiler, *a* its horizontal flues or tubes, and B the brick wall arranged in rear of the boiler and separated therefrom by an intervening smoke-box or combustion-chamber *b*.

C represents the stationary casing or tubular shell of the tube-cleaner, which is arranged horizontally in an opening extending through the rear wall B and opening at its inner end into the combustion-chamber opposite the center of the flue area. Near its outer end the casing is provided with a lateral branch, which is connected with a steam-supply pipe D, containing a hand-valve *d*.

E represents a nozzle of cylindrical form which is arranged in the inner part of the casing and through which the steam is delivered into the boiler-tubes. This nozzle is capable of reciprocating in the casing for moving its front or discharge end beyond the casing while in use or retracting the same within the casing, so that it will not be burned while not in use. The nozzle is also capable of rotation in the casing, so as to direct the steam

issuing from the front end successively into all of the flues.

F represents a stem, rod, or bar whereby the nozzle is shifted. This rod is arranged axially in the casing and passes through a stuffing-box *f* at the front end thereof. At its inner end the shifting-rod F is connected by a screw-joint or otherwise with the hub *g* of a spider or bridge, the arms *g'* of which connect said hub with the inner or rear end of the nozzle.

The nozzle is rotated by a crank or handle II, secured to the outer end of the shifting-rod, and the same is normally held in its retracted or inoperative position by means of a spring *i*, surrounding the shifting-rod and bearing at its opposite ends against said stuffing-box and handle. The forward movement of the nozzle is limited by an external shoulder *j* thereon engaging with an internal shoulder *k* in the bore of the casing.

In the use of the tube-cleaner the valve *d* is opened, causing the incoming steam by impinging against the head L at the front end of the nozzle to automatically project the same into its foremost or operative position, as indicated by dotted lines in Fig. 1, and directing the steam issuing from the outlet-openings in said head into the adjacent boiler-tubes.

The nozzle and the head and spider at its opposite ends are formed integrally, preferably by casting them in one piece, as shown, thereby simplifying the construction, reducing the cost of manufacture, and avoiding liability of parts becoming loose and impairing the working of the cleaner.

Upon closing the valve *d* and shutting off the supply of steam the nozzle, which is now relieved from forward pressure, is retracted automatically by the spring *i* into its rearmost position, as shown in full lines in Fig. 1, in which it is protected from the destructive effects of the heat in the combustion-chamber.

The steam-outlet is at the front end of the nozzle, as heretofore constructed, consisted of an eccentric opening or radial slot formed in the head of the nozzle, whereby the steam-jet is concentrated upon a number of flues at a time, and all of the flues can be successively operated upon by rotating the nozzle. In practice it has been found that this construction does not spread the steam over a sufficiently large area at one time, nor is the effect of all of the parts of the steam-jet on

the flues or tubes uniform, so that some of the flues are not cleaned as thoroughly as others. To overcome this difficulty, the head *L* of the nozzle is provided with a plurality of jet openings or apertures *l*, which are all arranged obliquely to the axis of the nozzle and in position to deliver the jets of steam toward one side of its center. These jet-apertures are preferably of cylindrical form, and have their axes arranged at different angles which diverge forwardly, so that each jet will cover a certain flue area independent of the other jets, thereby causing the several jets to direct the steam at a uniform pressure over the flues which are under operation and effectually cleaning the same. In order to maintain this uniformity in the pressure of the steam delivered by the several jet-openings, the length of these openings must be the same, and the inlet and outlet ends of each opening must be substantially at right angles to the axis of the opening. To secure this result, while retaining the jet-apertures at different angles, the head *L* of the nozzles is curved or inclined backwardly from one side to the other, so that it is oblique to the axis of the nozzle, and the head is made of uniform thickness. As shown in Fig. 2, those openings which are nearly parallel with the axis of the nozzle are arranged in the foremost part of the head, while the opening arranged at the greatest angle to the axis of the nozzle is arranged in the rearmost part of the head.

For the purpose of holding the shell securely against axial or lengthwise displacement in the opening of the rear wall of the combustion-chamber the shell is provided near its front end with an external projection *m*, having preferably the form of an annular flange. This flange is embedded or built into the brickwork of said rear wall, forming an anchor which effectually retains the shell in place. In addition to the anchoring-flange *m* the shell is provided with the usual external annular flange *m'* near its rear or outer end, which is fitted against the outer side of said wall.

When the combustion-chamber is comparatively deep, the front end of the shell may be arranged flush with the inner side of the rear wall of the combustion-chamber and still permit the nozzle when projected and rotated to reach over the entire tube area. When, however, the combustion-chamber is very narrow, such an arrangement of the shell is not permissible, because under these conditions the nozzle when projected would be so near the rear end of the boiler that the angle at which the steam issues from the jet-openings of the nozzle would not reach the outermost tubes.

In order to compensate for the narrowness of the combustion-chamber and enable all of the flues to be reached by the steam-jets,

the shell of the cleaners is secured in the wall opening with the inner end thereof arranged outwardly beyond the inner side of the wall and at the base of a recess *n* in said wall. This recess is conical and flares inwardly or forwardly from the front end of the shell to the inner side of the wall. In order to produce a finish of their recess and sustain the brickwork around the same, as well as directing any stray steam toward the flues, this recess is lined by a conical guard or hood *o*, having a collar *p* at its inner or small end which surrounds the front end of the shell, and an annular groove or channel *p'*, fitting around the anchor *m*, while its outer or larger end is provided with an annular flange *q*, which is fitted against the inner side of the rear wall of the combustion-chamber, as shown in Fig. 1. The hood is preferably divided diametrically into two sections to permit of applying its grooved collar to the flange *m* of the shell.

I claim as my invention—

1. A boiler-tube cleaner comprising a nozzle having an oblique head and an outlet-opening in said head, substantially as set forth.

2. A boiler-tube cleaner comprising a nozzle having a transversely curved or inclined head at its front end and a plurality of outlet-openings in said head which are arranged at an angle to the axis of the nozzle, substantially as set forth.

3. A boiler-tube cleaner comprising a nozzle having a head at its front end which curves or inclines rearwardly from one side of the nozzle to the other, and having a plurality of openings arranged in said head and diverging forwardly, substantially as set forth.

4. A boiler-tube cleaner comprising a nozzle having a head at its front end which curves or inclines rearwardly from one side of the nozzle to the other, said head being of uniform thickness and provided with a plurality of cylindrical outlet-openings the axes of which diverge forwardly, substantially as set forth.

5. A boiler-tube cleaner comprising a stationary tubular shell, a tubular nozzle capable of longitudinal and rotary movement in said shell and provided with a discharge-opening, and means for operating said nozzle, substantially as set forth.

6. A boiler-tube cleaner comprising a stationary tubular shell, a tubular nozzle capable of longitudinal and rotary movement in said shell and provided at its front end with a head having a discharge-opening, and an operating-rod connected with the rear end of said nozzle, substantially as set forth.

7. A boiler-tube cleaner comprising a tubular shell or casing adapted to be arranged in an opening in the rear wall of a combustion-chamber and having an external projection which is adapted to be anchored in

said wall, and a discharge-nozzle communicating with said shell, substantially as set forth.

5 8. A boiler-tube cleaner comprising a tubular shell or casing adapted to be arranged in an opening in the rear wall of a combustion-chamber and having an annular external flange which is adapted to be anchored in said wall, and a discharge-nozzle communicating with said shell, substantially as set forth.

15 9. A boiler-tube cleaner comprising a tubular shell or casing adapted to be fitted in an opening in the rear wall of a combustion-chamber, a discharge-nozzle communicating with said shell and a diametrically-divided conical hood arranged in the conical inner end of said opening and having a collar surrounding said casing, and an annular flange arranged on said casing engaging with an annular groove in the collar of said hood, substantially as set forth.

25 10. A boiler-tube cleaner comprising a tubular shell or casing adapted to be fitted in an opening in the rear wall of a combustion-chamber, a discharge-nozzle communicating with said shell and a conical guard or hood surrounding the front end of said shell and fitted in a correspondingly-shaped recess on the inner side of said wall, substantially as set forth.

11. A boiler-tube cleaner comprising a tubular shell or casing adapted to be arranged in an opening in the rear wall of a combustion-chamber and having an external flange anchored in said wall, a discharge-nozzle communicating with said shell, and a conical hood or guard arranged in a correspondingly-shaped recess on the inner side of said wall and provided with a central collar which is mounted on the shell in front of said annular flange, substantially as set forth.

12. A boiler-tube cleaner comprising a tubular shell or casing adapted to be arranged in an opening in the rear wall of a combustion-chamber and having an annular external flange which is adapted to be anchored in said wall, a discharge-nozzle communicating with said shell, and a diametrically-divided hood having a conical inner portion which fits a correspondingly-shaped recess on the inner side of said wall and a cylindrical inner portion surrounding said shell and having a channel which receives said flange, substantially as set forth.

Witness my hand this 9th day of December, 1905.

RAPHAEL HERMAN.

Witnesses:

J. C. BILLINGHAM,
FRED G. DEWEY.