

No. 610,791.

Patented Sept. 13, 1898.

G. BEESLEY.
FURNACE.

(Application filed Oct. 13, 1897.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.

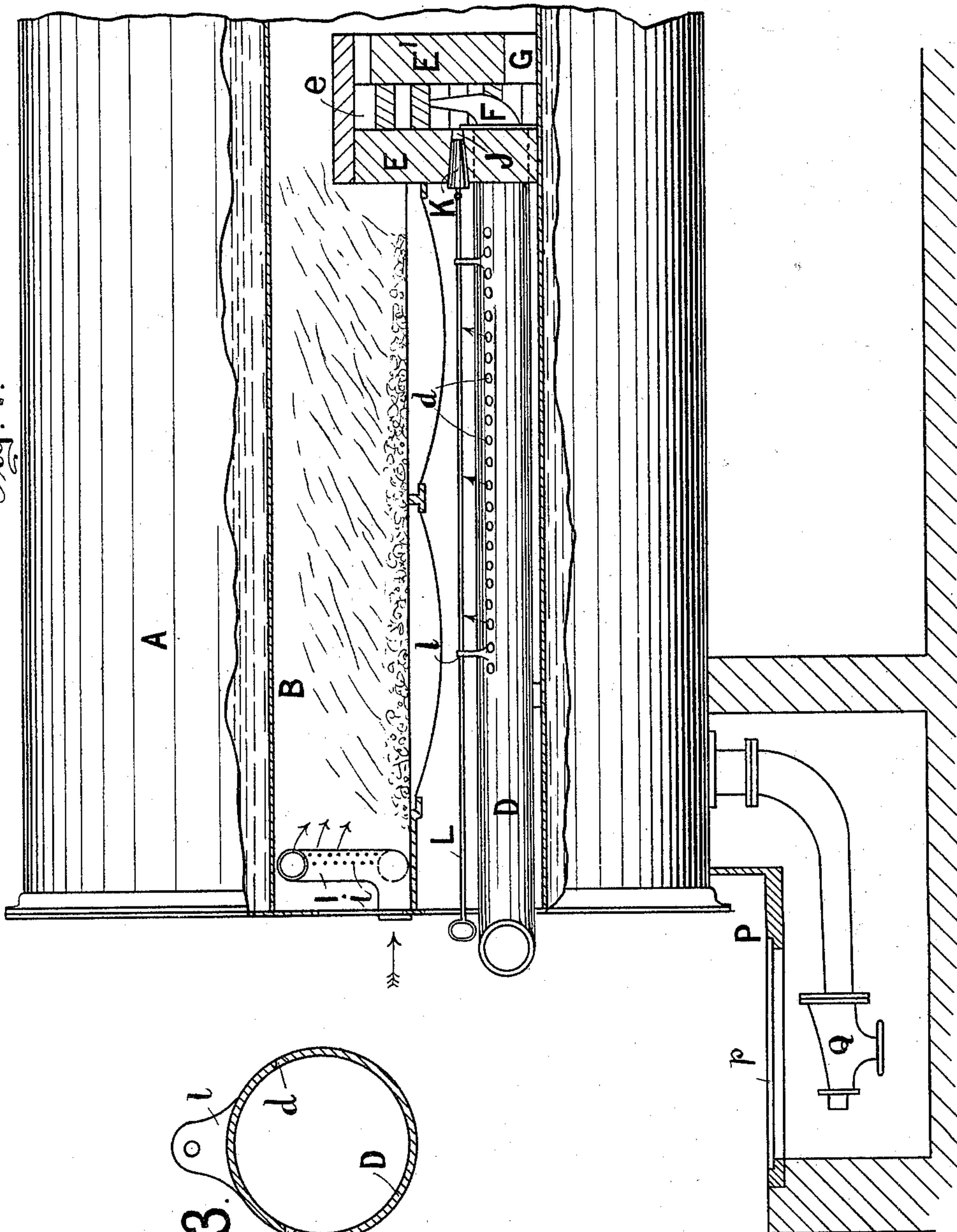


Fig. 3.

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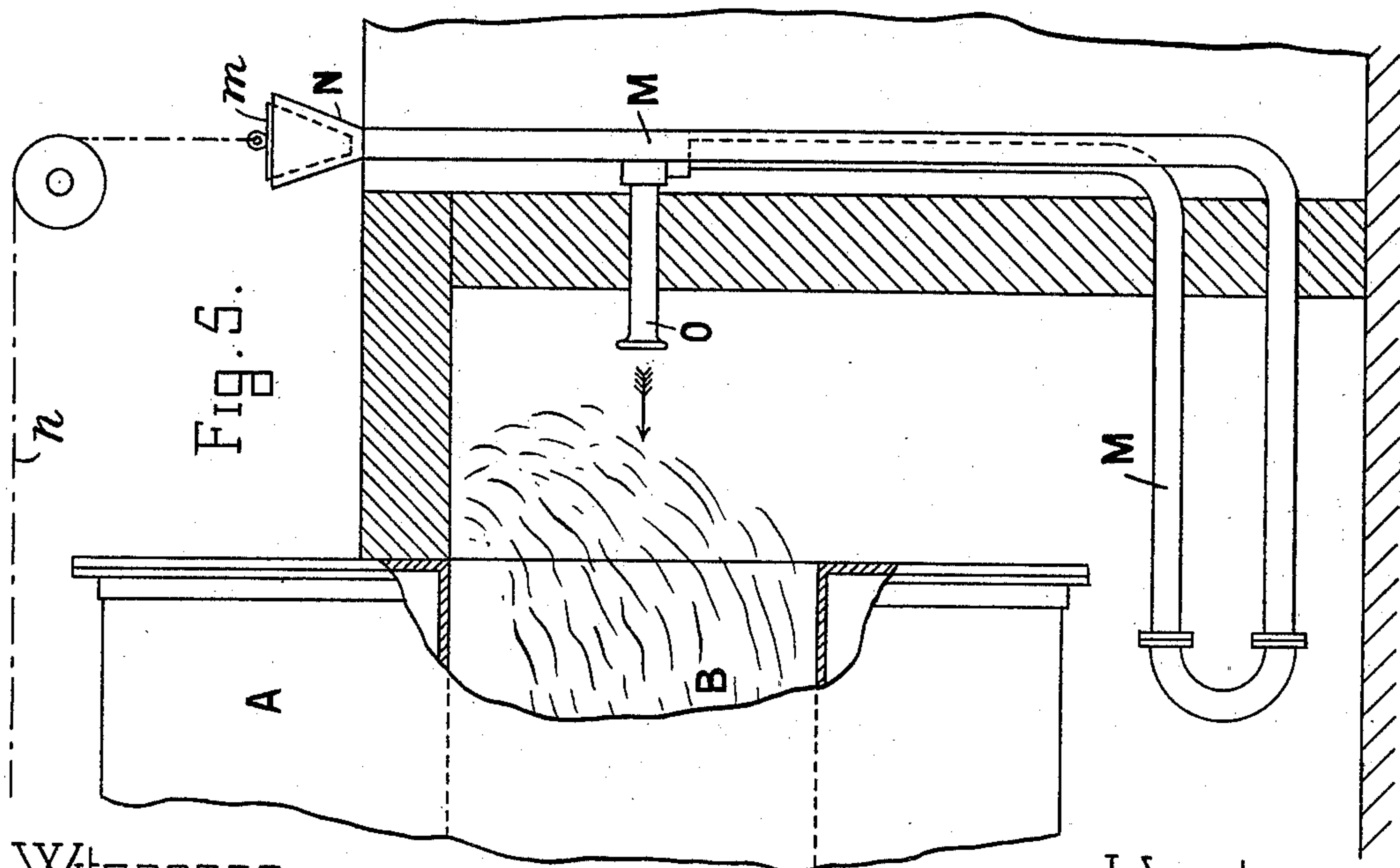
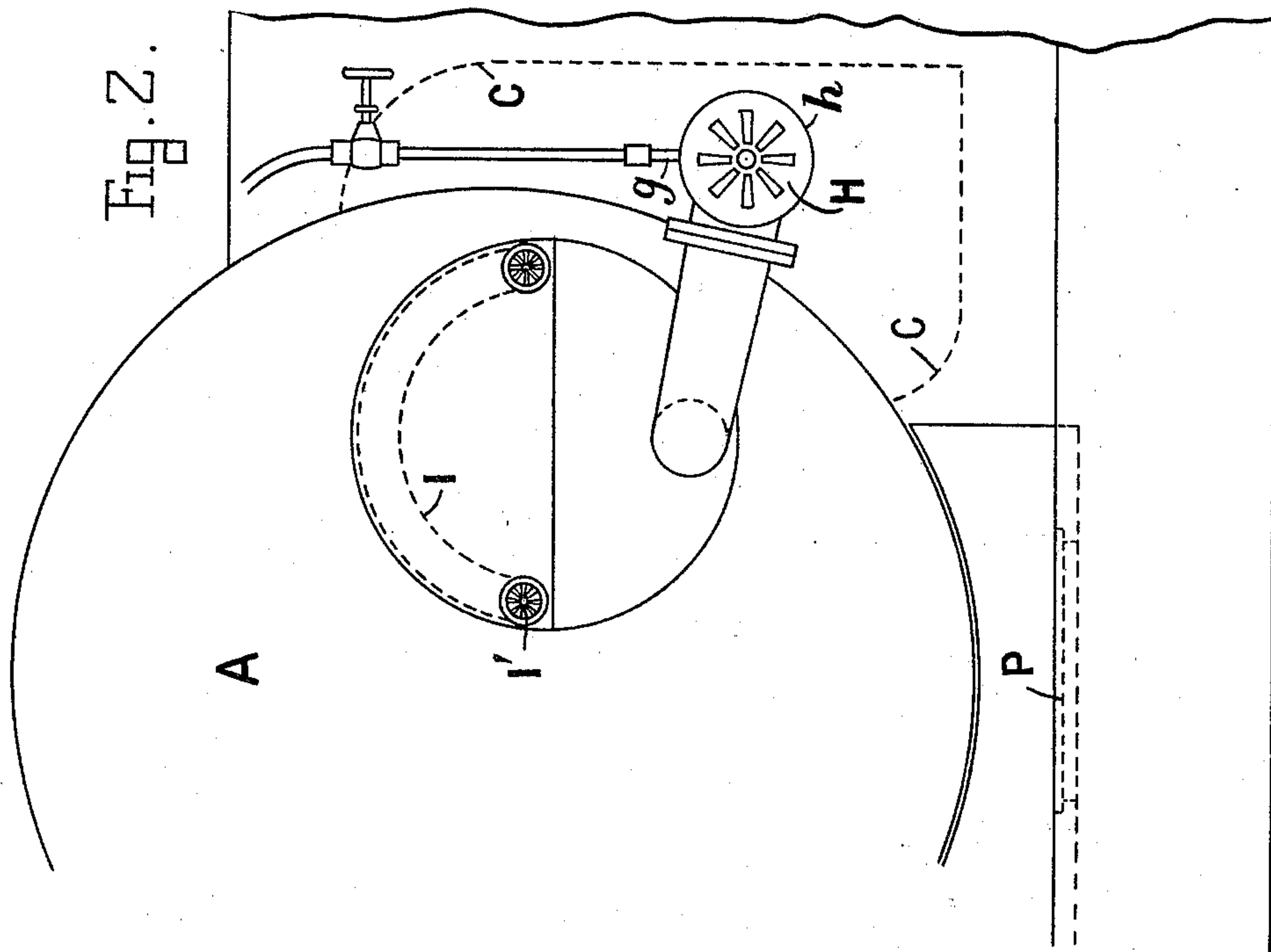
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Fig. 8.

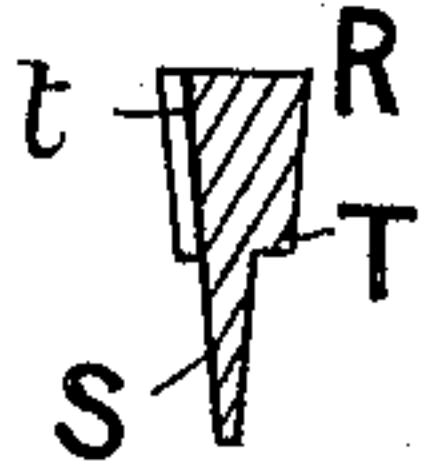


Fig. 6.

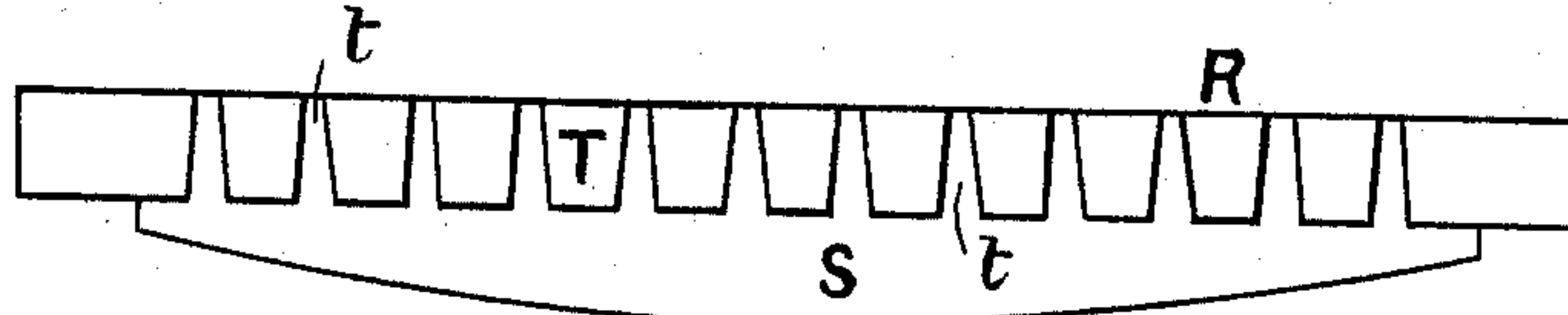


Fig. 7.

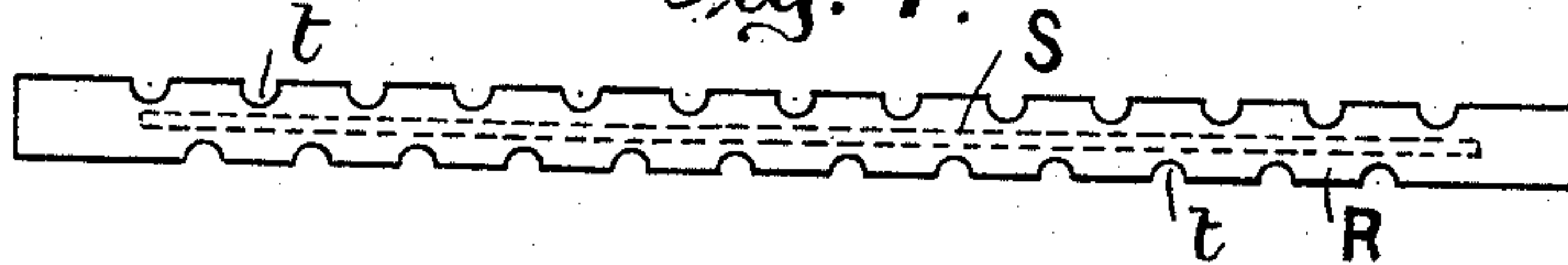
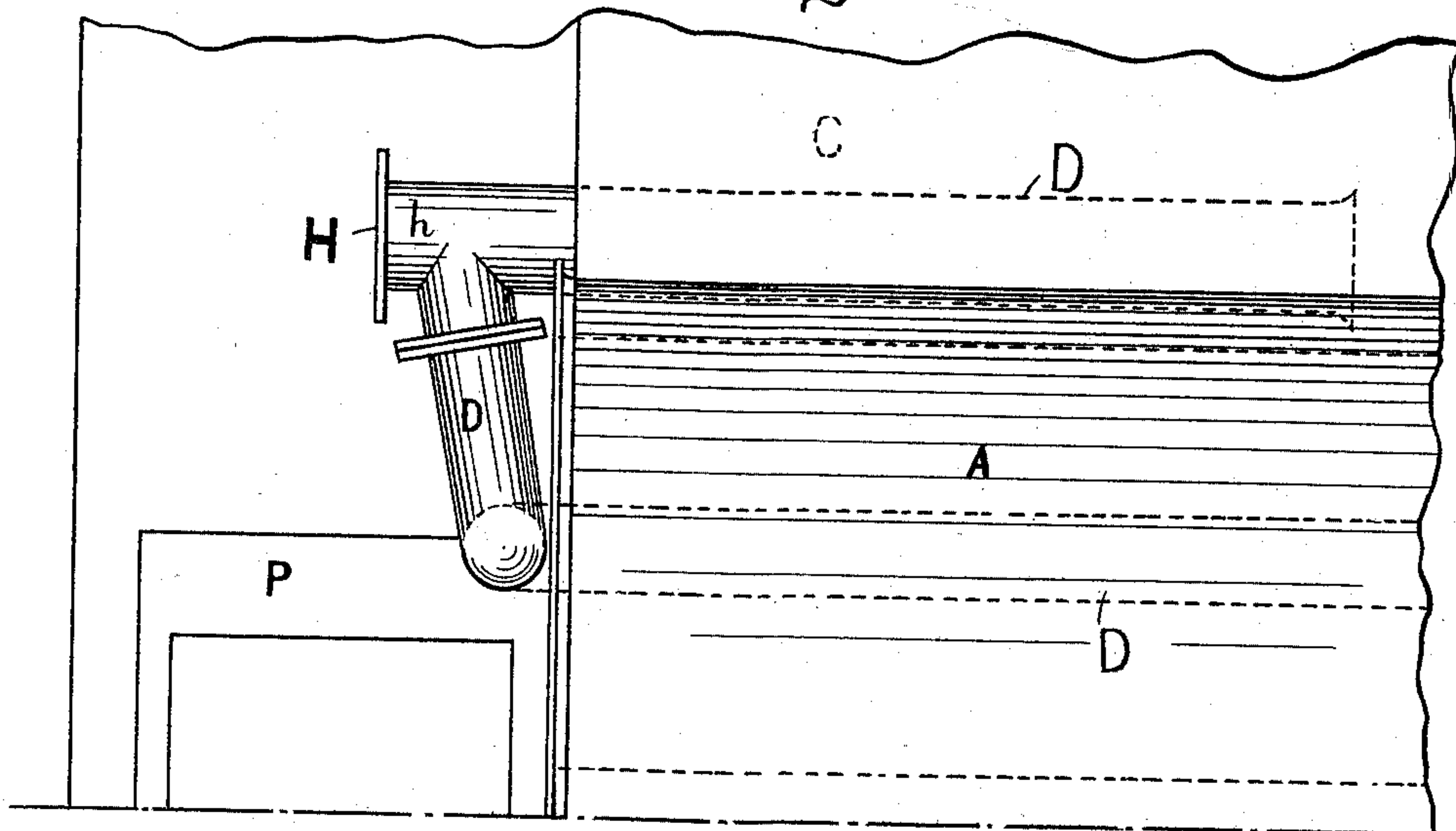


Fig. 4.



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FIG. 10.

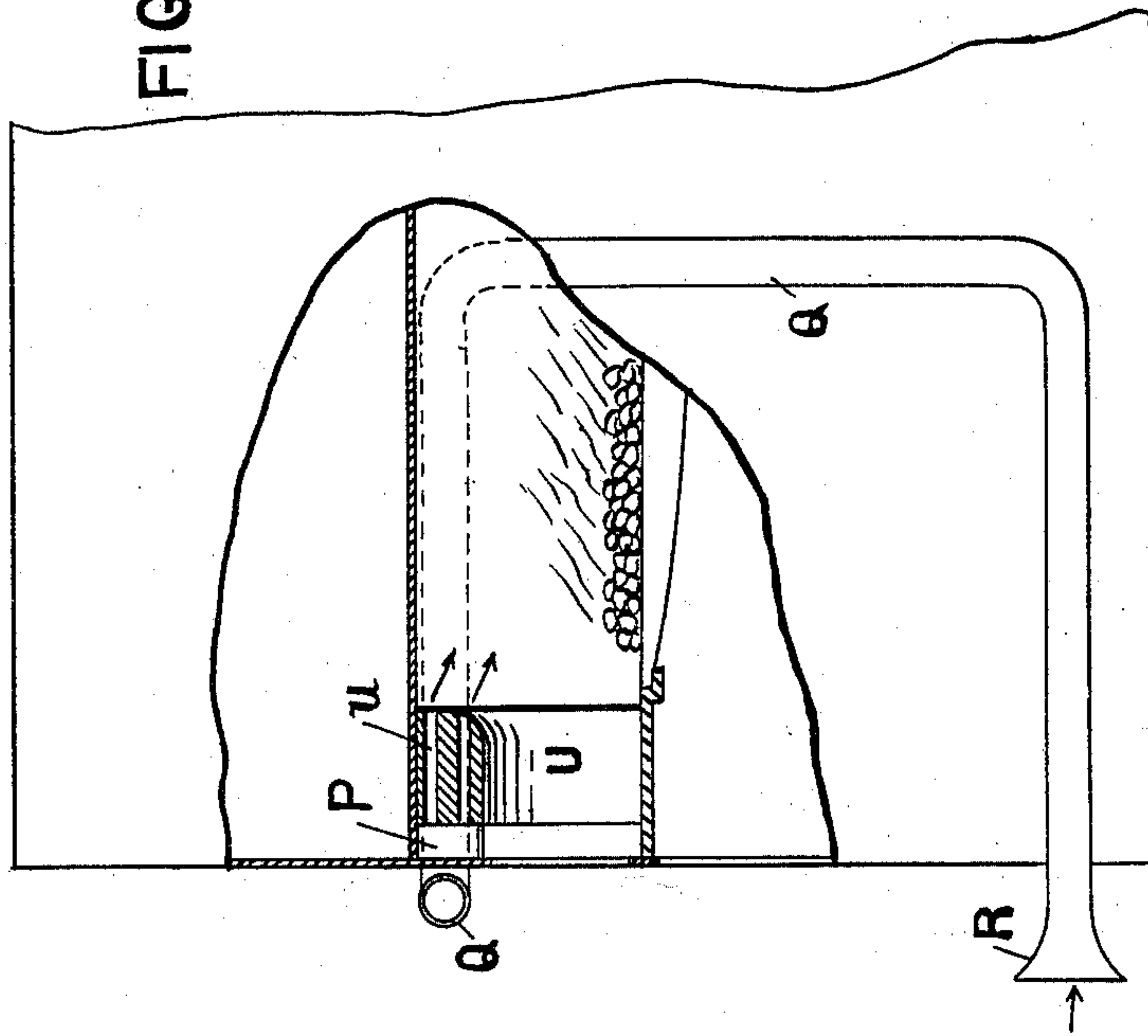
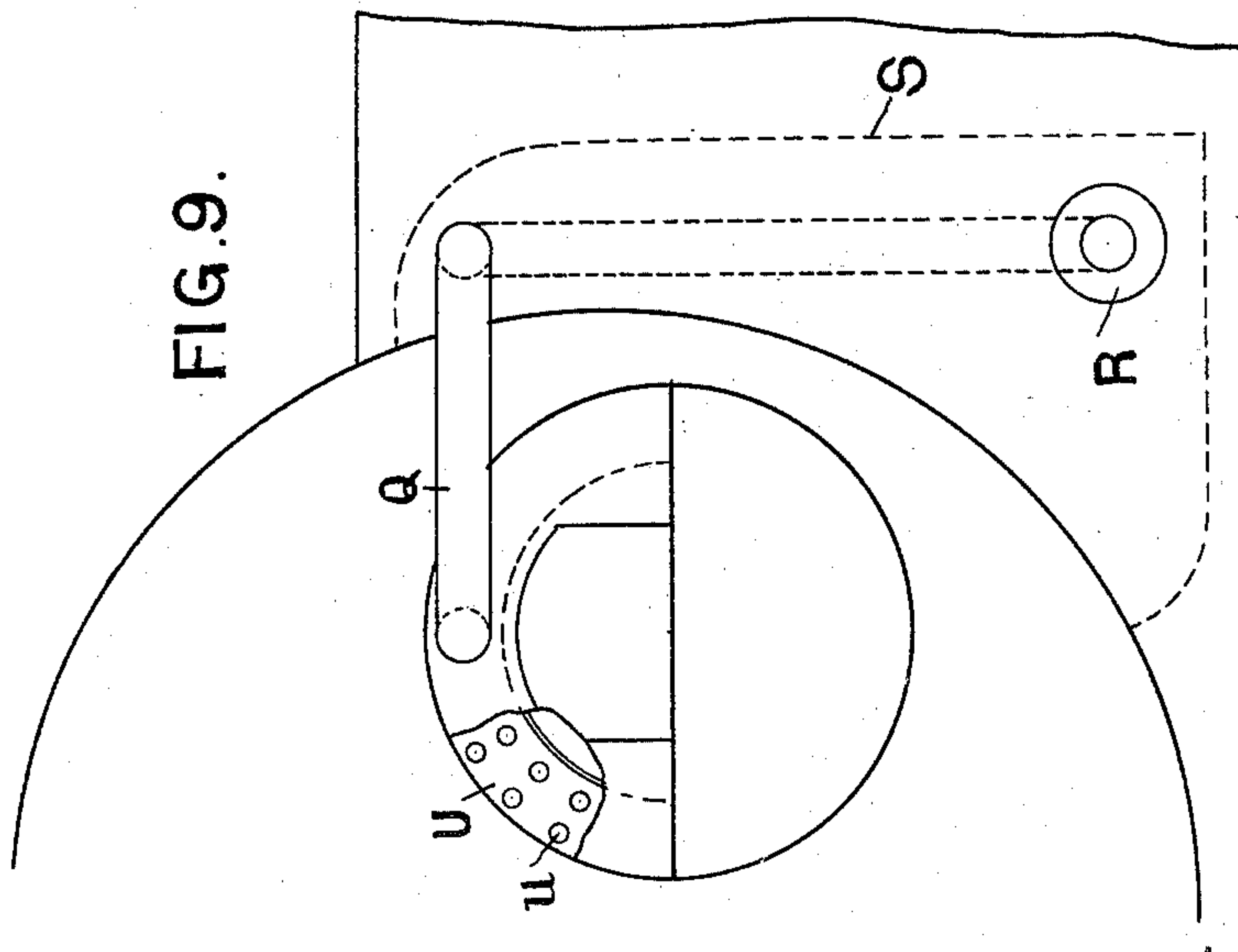


FIG. 9.



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UNITED STATES PATENT OFFICE.

GEORGE BEESLEY, OF SUTTON, ENGLAND.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 610,791, dated September 13, 1898.

Application filed October 13, 1897. Serial No. 655,051. (No model.)

To all whom it may concern:

Be it known that I, GEORGE BEESLEY, a subject of the Queen of Great Britain, residing at Sutton, near St. Helens, in the county of Lancaster, in the Kingdom of England, have invented certain new and useful Improvements in Furnaces, of which the following is a specification.

This invention has for its object a method of obtaining more perfect combustion, economy in fuel, and the prevention of smoke in the furnaces of boilers for generating steam and other furnaces or heating apparatus and also of extending the life of a portion of the boiler which is apt to decay away first of all.

The invention will be best understood by referring to the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section, of the front portion of a boiler, showing some of my improvements; Fig. 2, a front elevation thereof; Fig. 3, an enlarged cross-section of a pipe to be hereinafter described; Fig. 4, a plan view of Fig. 1; Fig. 5, a side elevation, partly in section, of the back end of a boiler, showing other improvements. Figs. 6, 7, and 8 show a side elevation, plan, and cross-section of an improved fire-bar, and Figs. 9 and 10 a front elevation and longitudinal section of another arrangement for obtaining more perfect combustion in the furnace.

Referring first to Figs. 1, 2, 3, and 4, A is the boiler, B the furnace-flue, and C the return-flue arranged in the usual manner. I have found that during the passing of the gases from the furnace through the flues they appear to stratify themselves to a considerable extent and that if from the lower portion of the front end of the return-flue a quantity of the gases is withdrawn and passed into the furnace it very greatly increases the economy of fuel. Accordingly I bring a pipe D around from the return-flue C into the ash-pit and introduce the gases through this pipe, which may be from three inches in diameter upward and perforated, as shown at *d*, Figs. 1 and 3, into the ash-pit under the fire-bars, thus bringing them again through the fire. This portion of the pipe extends the whole length of the furnace, as shown in Fig. 1, and after passing through the front portion E of

the bridge it terminates in an upwardly-turned nozzle F. The bridge is formed of two vertical walls E and E', having a space *e* between made up of open brickwork—that is, bricks placed irregularly and leaving spaces between in order to spread out or separate the gases. A loose brick may be placed at G to admit of access to the center portion for repairs or other purposes. A steam-jet *g* may be inserted in the pipe D, (see Fig. 2,) which forms an induced current and assists in the withdrawal of the gases from the flues, and, further, a regulator H may be arranged on the end *h* of the pipe D to admit air therein, if desired. The nozzle of the steam-jet *g* may be made of suitable dimensions, from one-sixteenth upward, according to the size of the boiler to which it is applied.

In order further to increase the combustion in the furnace and assist the boiler to use up these return gases, I place a tube I around the door-hole immediately below the crown of the flue. This tube extends in a semicircle, or thereabout, around the door and is provided with perforations *i*, pointing into the furnace. On the outside it may be attached by a pipe to the forced draft or to other source of compressed air or air under pressure, or in place of compressed air the air may be forced into the pipe by means of a steam-jet, or it may be simply a pipe open to the atmosphere, as shown in the drawings, and be provided with a regulator I'. Furthermore, instead of a pipe it could be a fire-brick arch suitably perforated and the air could be heated before passing into the furnace, if required.

J is a passage from the ash-pit to the space *e* between the vertical walls of the bridge, which passage or hole is preferably conical, and K is a conical plug fitting the hole and regulating the amount of air passing there-through, such regulation being performed by means of a handle and rod L, carried by brackets *l*, attached to the large pipe D. The other arrangement, which, as shown in Fig. 5, is at the back end of the boiler, consists of a pipe M, having a bell-mouth or conical chamber N open to the atmosphere. Such pipe after extending downward behind the flue-wall for a considerable distance is turned into the flue, as shown, and afterward taken

up either inside or outside the flue-wall (shown on the drawings on the outside) until it is opposite the furnace-flue B, when it is turned to point in the direction of such flue and is provided with a nozzle O. In order to regulate the amount of air drawn in through this pipe M, a plug *m* is inserted in the conical or bell-shaped mouth, such plug having a cord *n* attached, which may pass over a pulley to be operated from the front of the boiler.

Referring again to Fig. 1, P is the foot-plate, having a cut-out portion *p* fitted with a cover which can be removed to get to the blow-off cock Q. This foot-plate extends under the front of the boiler for about four and one-half inches and is then turned upward and is cut out with a circular curve, so as to fit the boiler, as shown. This plate, which is about six inches below the bottom of the boiler, prevents the accumulation of wet cinders and ashes immediately under the front of the boiler, as the stoker can get his shovel underneath the angle-iron front, and consequently can keep all accumulation of wet cinders and ashes from coming in contact with the end of the boiler.

The improved fire-bar shown in Figs. 6, 7, and 8 is constructed as follows: The top of the bar R, on which the fuel rests, is of the usual width, but in cross-section it has a slight taper inward, as shown in Fig. 8, to about half its depth, the remaining portion S of the bar being reduced in thickness to about five-sixteenths of an inch. The upper or thick portion T has slightly-tapering vertical grooves or recesses *t* at about two inches apart lengthwise of the bar. These grooves, which may be made on the angle to form squares or round, as shown on Fig. 7, are on both sides of the bar, but not opposite each other, and are of such a depth as to make the metal flush from top to bottom where the grooves occur, thus forming unobstructed passages at intervals for the air to get to the top of the bar. Consequently bars constructed according to this invention are kept cooler than those at present in use and last much longer. I make no claim for this fire-bar in the present application, as the same forms the subject-matter of another application filed by me on June 21, 1898, and serially numbered 684,079.

Referring to Figs. 9 and 10, U is an arch, of brickwork or other suitable material, inside the furnace in proximity to the door-hole, through which arch is formed a series of passages or nozzles *u* for injecting air into the fire. These passages or nozzles communicate with a hollow chamber P, also by preference semicircular in shape adjacent to the furnace-front and supplied with air by means of a pipe Q, which may lead to a forced draft or other source of air-supply, or in place of compressed air the air can be forced into this pipe by means of a steam-jet, or it may be simply a pipe open to the atmosphere, as

shown in the drawings, and terminating in a bell-mouth R. This pipe extends through the flue-wall into the flue S, by preference one of the flues at the side of the boiler, and is then given a bend and passed back again through the flue-wall near the top and in a line with the top of the arch U, or it may be kept inside the flue, if desired. In either case it communicates with the hollow chamber P. The object of passing this pipe through the flues is to heat the atmospheric air drawn into the pipe, as in Fig. 5, before it is injected into the furnace through the passages or nozzles *u* in the arch U. The pipe may be provided with any well-known means for regulating the air-supply.

I declare that what I claim is—

1. In a furnace, the combination of a pipe leading from the return-flue of the boiler to the ash-pit or furnace-flue, one portion of such pipe being perforated and extending the whole length of the furnace and passing through a portion of the bridge forming the termination of the said pipe, whereby a quantity of the gases are withdrawn from the flue and passed again into the furnace for the purposes set forth.

2. In a furnace, the combination with the return-flue of the boiler and the furnace-flue, of a pipe connecting both flues, the said pipe extending into the return-flue so as to take the lower strata of gases therefrom and direct them into the furnace-flue below the grate and a steam-jet in the said pipe for causing a circulation through the same, substantially as described.

3. In a furnace, the combination of a bridge consisting of two vertical walls, a cover, open brickwork in the space between the two walls, a pipe leading from the return-flue of the boiler and terminating in a nozzle in the space between the vertical walls of the bridge, a passage in the bridge and means for regulating the supply of air therethrough.

4. In combination with a furnace, a pipe located at the back of the boiler having one end outside the flue and open to the atmosphere and the other end inside the flue, a nozzle connected to said pipe and pointing in the direction of the furnace-flue, and means at the outer end of the said pipe for regulating the supply of air drawn in through the pipe, substantially as described.

5. In the combination with a furnace, a pipe located at the back of the furnace outside the rear wall thereof and having a loop extending through the rear wall into the furnace-flue, one end of said pipe being provided with a nozzle which extends through the rear wall opposite the end of the boiler and the other end being provided with a means for regulating the supply of air passing through the same, substantially as described.

6. The combination with the furnace-flue and return-flue of a boiler, of the pipe D, a hollow bridge, a passage J in the bridge and means for regulating the same, the semicir-

5 cular perforated tube I, the fire-bars, the pipe M at the end of the boiler and means for heating and regulating the supply of air therethrough and the foot-plate P for protecting the front of the boiler, substantially as set forth.

10 7. In a furnace, the combination of the pipe D communicating both with the furnace-flue and the return-flue, the bridge, passage J in the bridge and means for regulating it, the pipe M at the back of the boiler and the pipe Q at the front of the boiler and means for heating and regulating the supply of air therethrough, the hollow chamber P and the
15 arch U having passages *u*, substantially as described.

8. In a furnace, the combination with the return-flue of the boiler and the furnace-flue, of a pipe communicating with both and ex-

tending through the furnace-flue, the said 20 portion in the furnace-flue being provided with perforations, the open ends of the said pipe extending into a hollow bridge-wall, an opening leading from the furnace-flue into the hollow portion of the bridge-wall, and a 25 plug for regulating the said opening, the construction being such that atmospheric air may be discharged into the furnace-flue or into the combustion-chamber through the bridge-wall, substantially as described. 30

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

GEORGE BEESLEY.

Witnesses:

G. C. DYMOND,
W. H. BEESTON.