

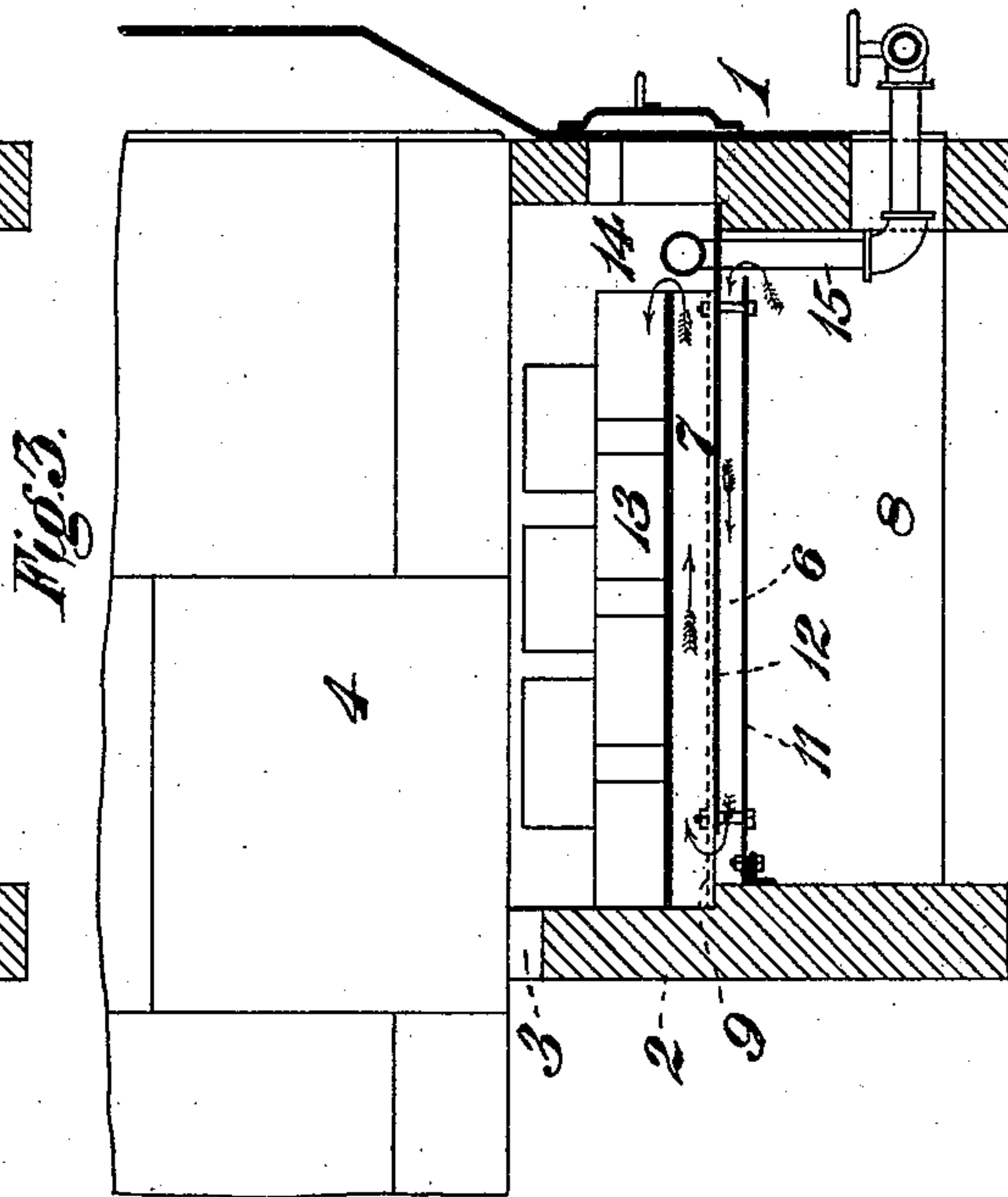
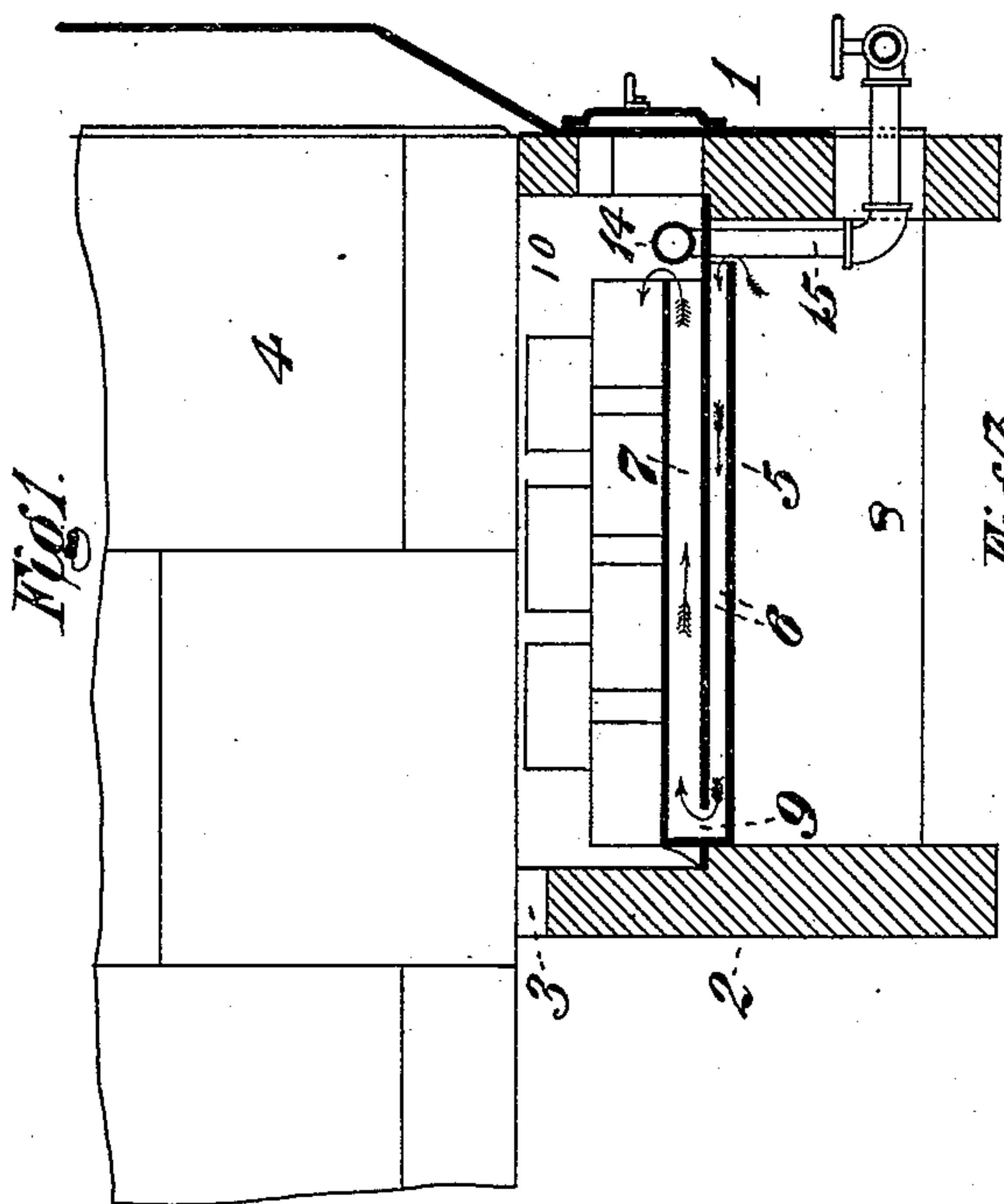
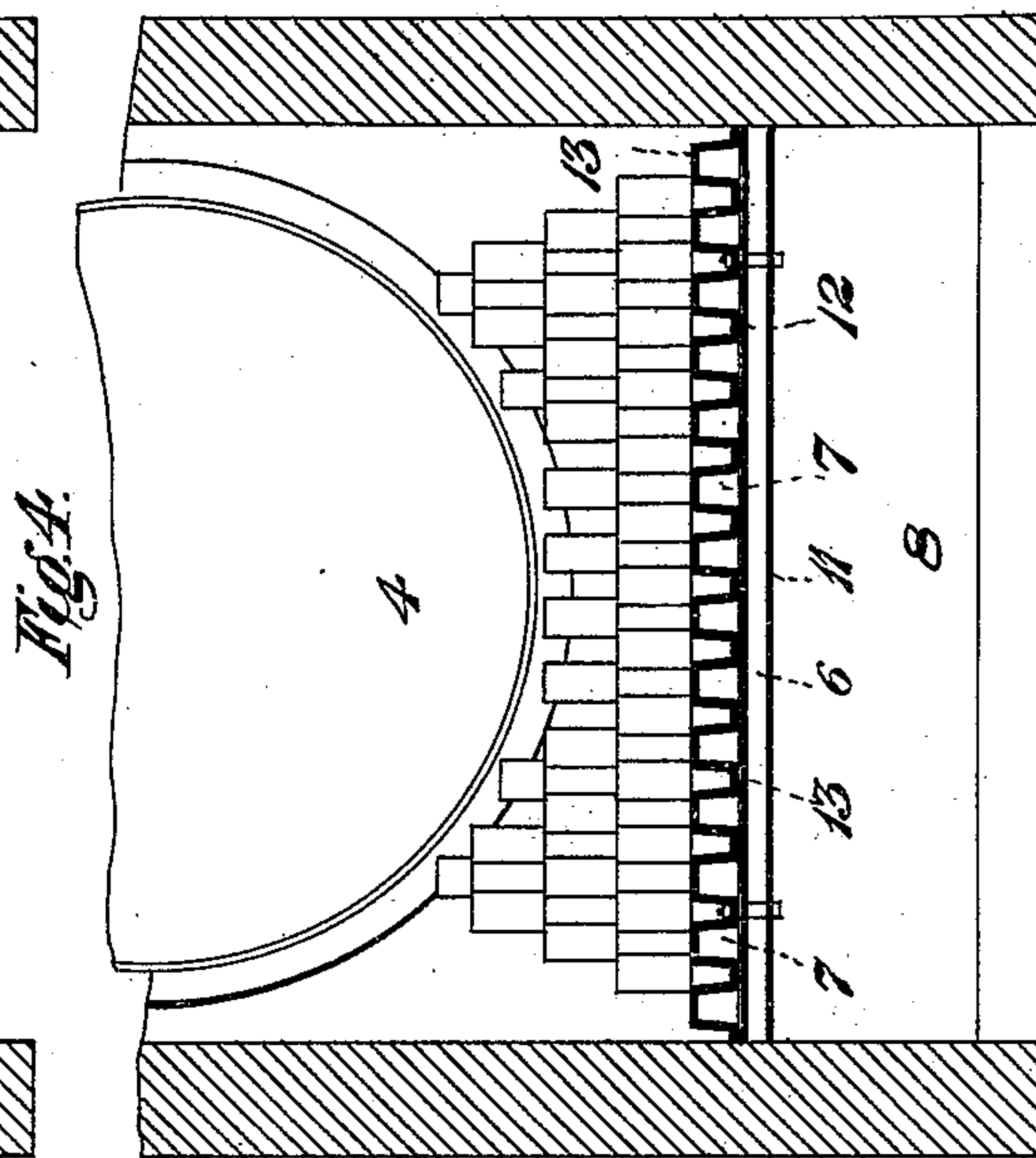
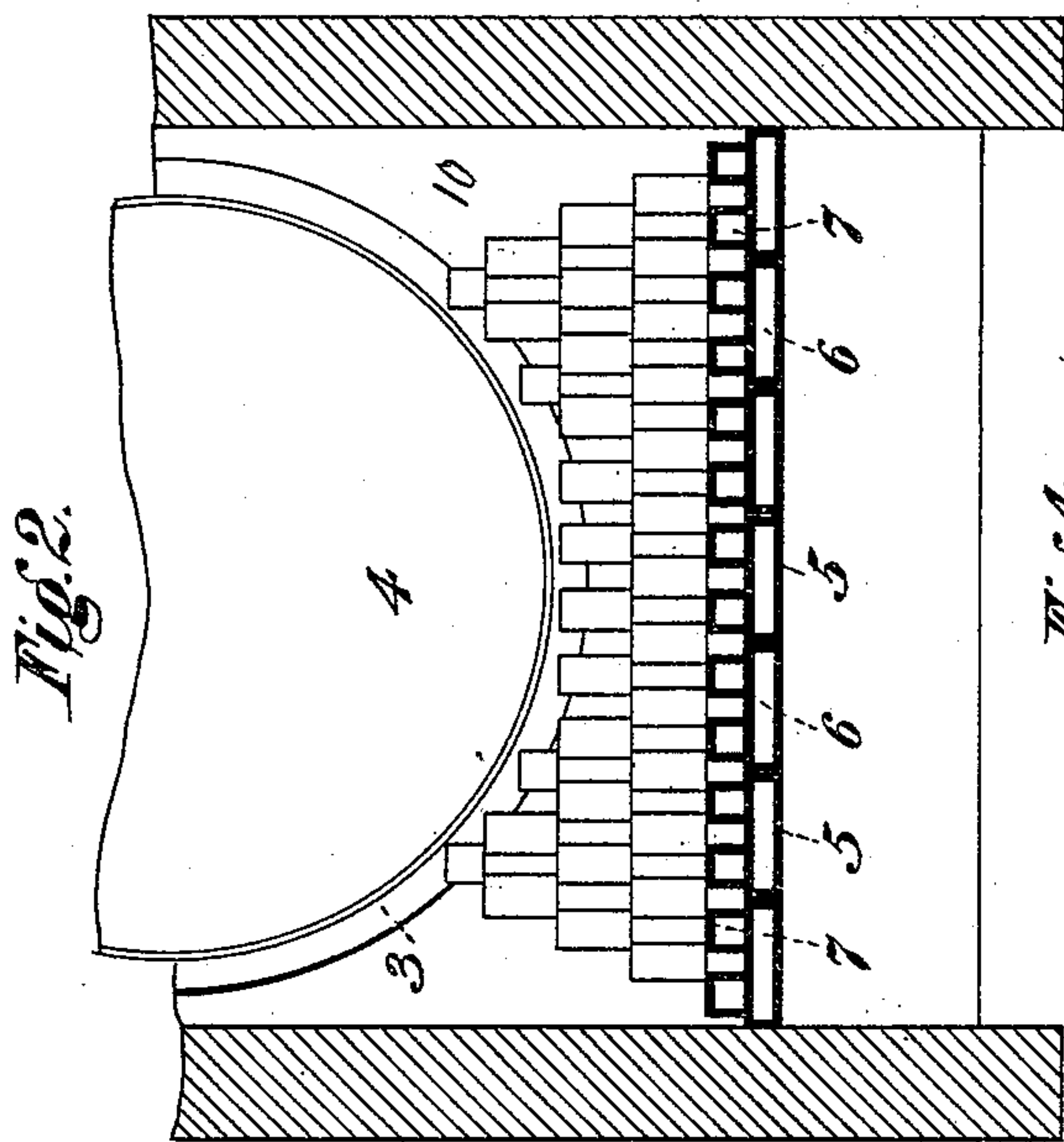
(No Model.)

2 Sheets—Sheet 1.

J. T. HAMBAY.  
GRATE BAR.

No. 330,694.

Patented Nov. 17, 1885.



WITNESSES:  
Samuel S. Walcott

C. M. Clarke

INVENTOR,

James T. Hambay

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(No Model.)

2 Sheets—Sheet 2.

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Fig. 6.

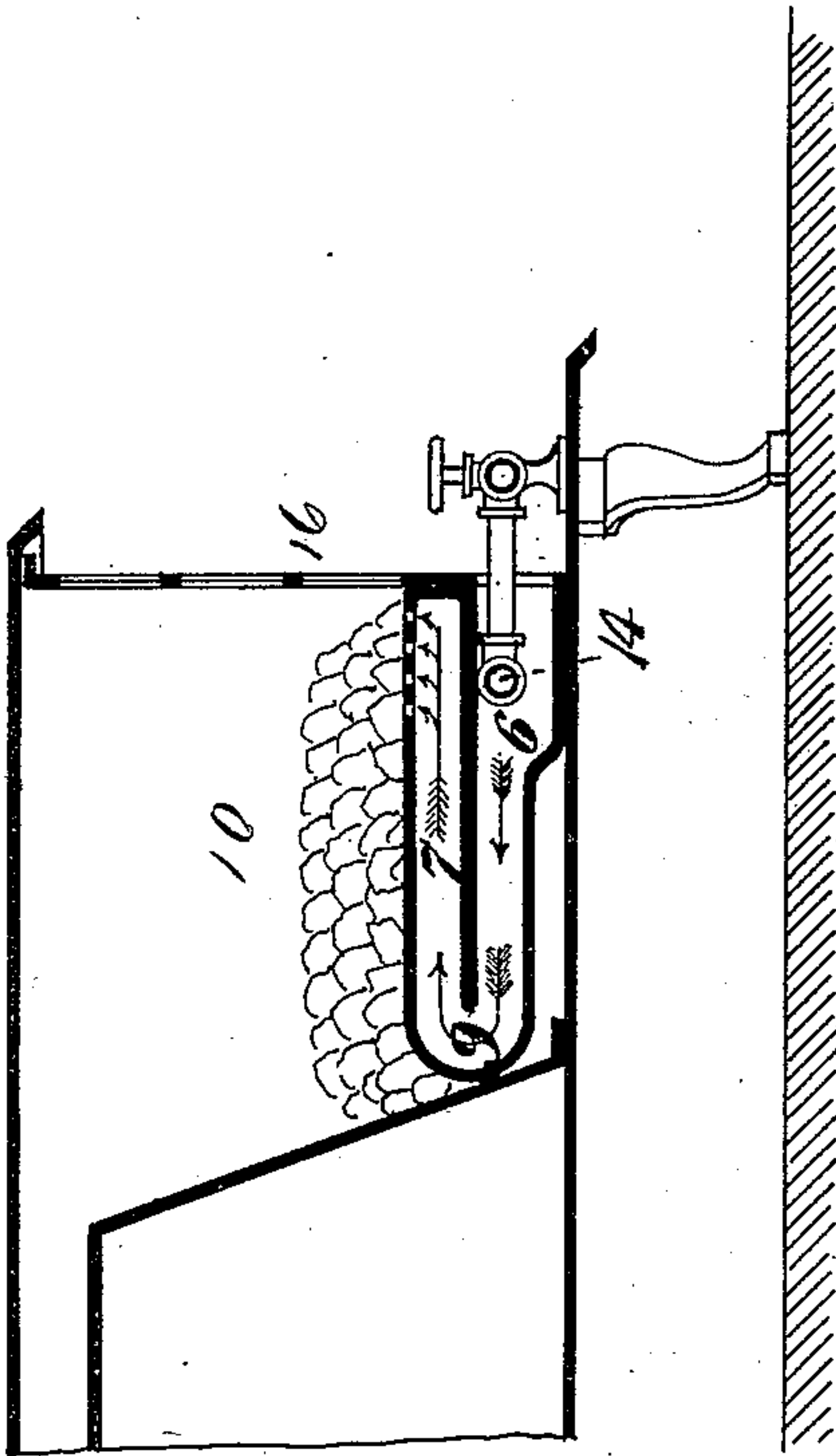


Fig. 5.

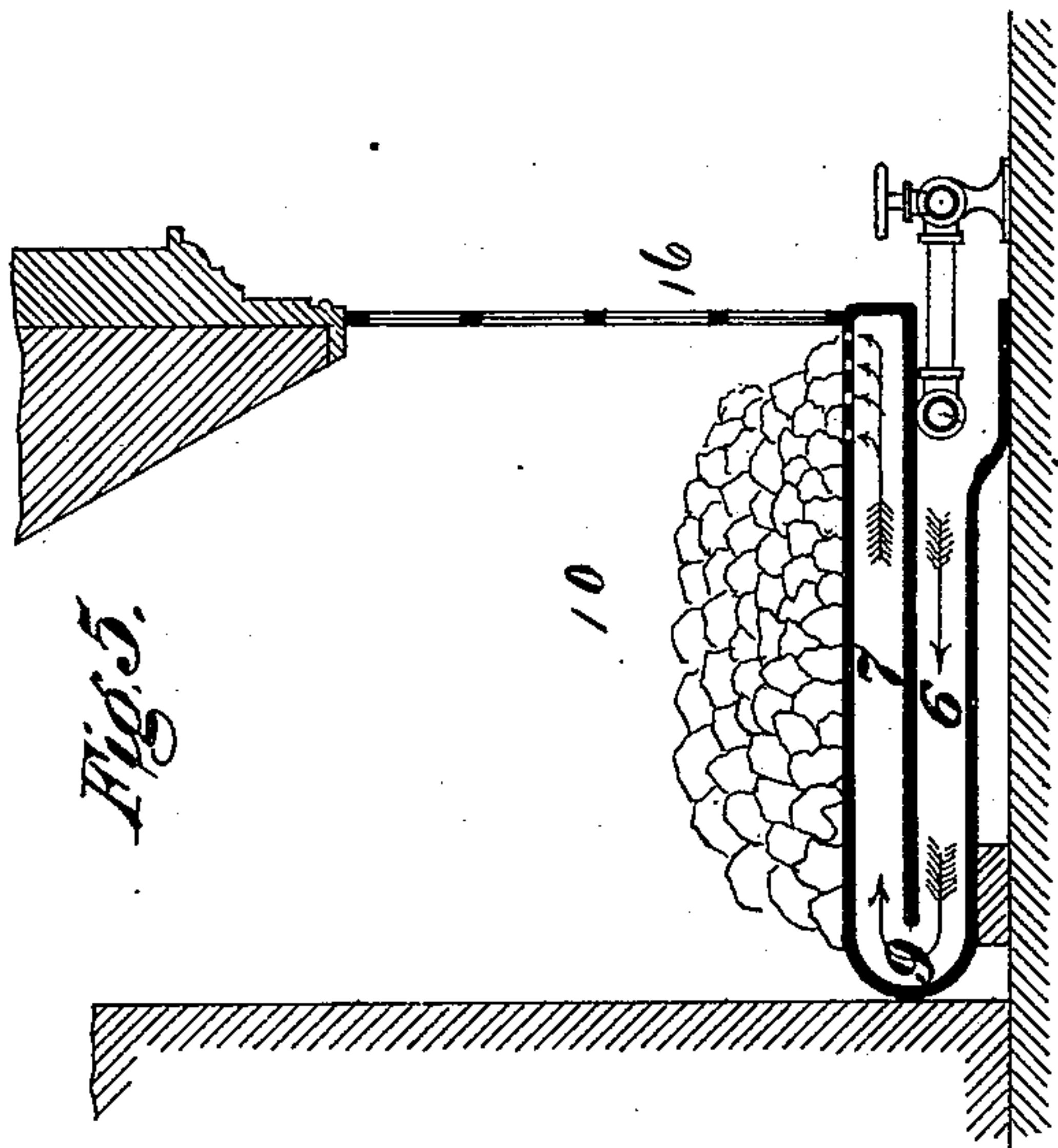
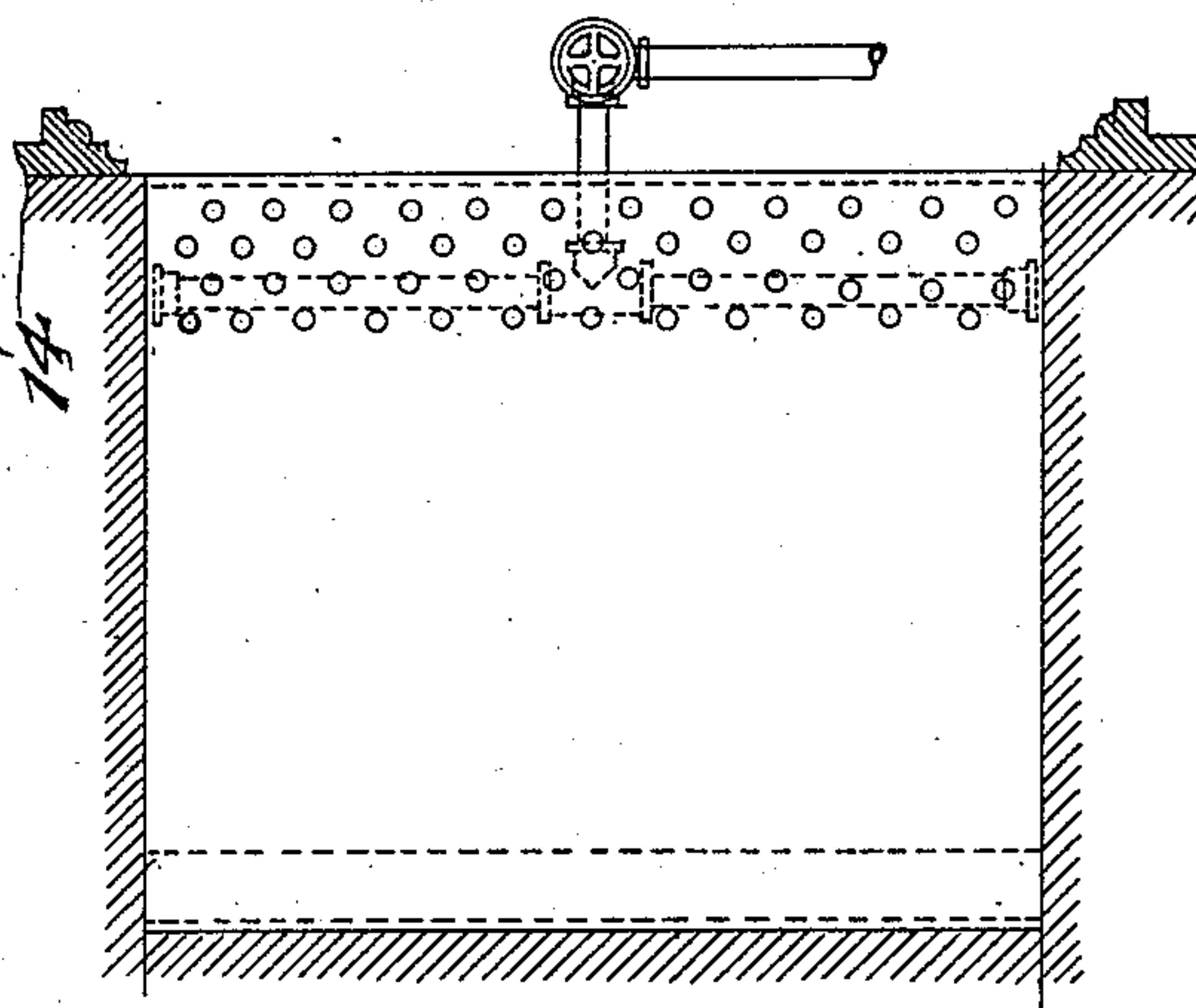


Fig. 7.



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# UNITED STATES PATENT OFFICE.

JAMES T. HAMBAY, OF PITTSBURG, PENNSYLVANIA.

## GRATE-BAR.

SPECIFICATION forming part of Letters Patent No. 330,694, dated November 17, 1885.

Application filed August 13, 1885. Serial No. 174,254. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES T. HAMBAY, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, a citizen of the United States, have invented or discovered certain new and useful Improvements in Grate-Bars, of which improvements the following is a specification.

In the accompanying drawings, which make part of this specification, Figures 1 and 2 are transverse and longitudinal sectional views of a boiler-furnace provided with my improved form of grate-bars. Figs. 3 and 4 are similar views showing a modified form of grate-bars. Figs. 5 and 6 are sectional elevations of a fire-place and a stove, respectively, provided with the improved grate-bars. Fig. 7 is a top plan view of the fire-place shown in Fig. 5.

The invention herein described relates to certain improvements in the construction of grate-bars for furnaces, stoves, and other heaters, especially adapted for use in connection with gaseous fuel, although they may be advantageously employed in connection with solid fuel; and the object of said invention is to provide a suitable supply of highly-heated air at that point where combustion occurs in the furnace, and thereby effecting a more perfect combustion without the loss of heat necessarily attendant in the use of cold air to assist in combustion; and to this end my invention consists in the construction and combination of parts, substantially in the manner hereinafter described and claimed.

In applying my invention to heating steam-boilers, the furnace of the latter is built in the usual manner, having the bridge-wall 2 and the flue 3 extending longitudinally under the boiler 4, as clearly shown; but in lieu of the ordinary grate-bars I substitute hollow bars 5, having a direct and a return air-passage, 6 and 7, as shown. The bottom of the fire-chamber may be formed of a series of independent grate-bars, each having one direct air-passage, 6, and one or more return-passages, 7, as shown in Figs. 1 and 2; or the grate-bars of the fire-chamber may be formed in single pieces provided with a direct and a series of return air-passages, as shown in Figs. 3 and 4. The grate-bars shown in Figs. 1 and 2 are preferably formed of cast-iron, the lower or direct air-passage, 6, open-

ing at the front end of the bar into the ash-pit or open space 8 under the grate-bars, and communicates at its rear end by openings 9 with the upper or return air-passages, 7, which open at the front end of the grate-bar into the front end of the fire-chamber 10; or, in lieu of the series of bars formed as above stated, the bottom of the fire-chamber may be formed of a single metal plate, 11, extending from a point near the front wall of the ash-pit to the rear wall, completely covering the pit, with the exception of a small space or slit at the front. Over this plate 11 is placed another plate, 12, but at a distance above the plate 11, said plate 12 extending from the front wall of the furnace to its rear wall, and on this plate 12 is secured the corrugated plate 13. The alternate corrugations of the plate 13, in connection with the plate 12, form the return air-passages 7, which are connected to the direct air-passage 6, formed by the plates 11 and 12 by holes or openings 9 through the plate 12. The corrugated plate 13 extends from the rear wall of the furnace to a point near the front wall, sufficient space being left between the front end of the plate 13 and the front wall to permit of the escape of air into the fire-box. In the fire-box, and immediately in front of the open ends of the return air-passages, is located a burner, 14, provided with perforations or slits for the escape of gas, and connected by a pipe, 15, to any suitable source of gas-supply. The air as it passes along the direct and return passages in the grate-bars is highly heated and combines, as it escapes from the return air-passages, with the ignited gas, thereby insuring a nearly perfect combustion without any chilling effects. By increasing the number of return air-passages a more complete and thorough heating of the air is effected and a more perfect commingling with the ignited gas.

In Figs. 5, 6, and 7 I have shown my invention applied to ordinary heating-stoves and fire-places, in which the bottom grate-bars are constructed in a manner substantially the same as that above described; but the fire-chamber of the stove or fire-place is preferably closed in by a screen, 16, as shown.

If desired, fire-bricks may be piled in open order upon the grate-bars to furnish a heating



body. The admission of air is regulated by suitable dampers in the ash-pit doors, as is customary in using solid fuel.

I do not wish to limit myself to the use of my improved grate-bars in connection with gaseous fuel, as they may be advantageously employed to increase the combustion of solid fuel.

If desired, the gas-burner 14 may be located within the front end of the direct air-passage 6, (see Figs. 5, 6, and 7,) in which case both the gas and air are mixed and heated before escaping from the return-passages into the fire-box, where combustion takes place; but I prefer to arrange the gas-burner as shown in Fig. 4, as by heating the air its specific gravity is caused to approach more nearly to that of the gas, and will therefore combine more readily therewith.

I claim herein as my invention—

1. A grate-bar for furnaces, &c., having direct and return air-passages therethrough, substantially as set forth.

2. A grate-bar for furnaces, &c., having a direct and one or more return air-passages therethrough, substantially as set forth.

3. In a boiler-furnace, the combination of a grate-bar having direct and return air-passages on opposite sides of the grate-bar, and a gas-burner located in suitable proximity to the outlets, substantially as set forth.

In testimony whereof I have hereunto set my hand.

JAMES T. HAMBAY.

Witnesses:

DARWIN S. WOLCOTT,  
FRANCIS X. BARR.