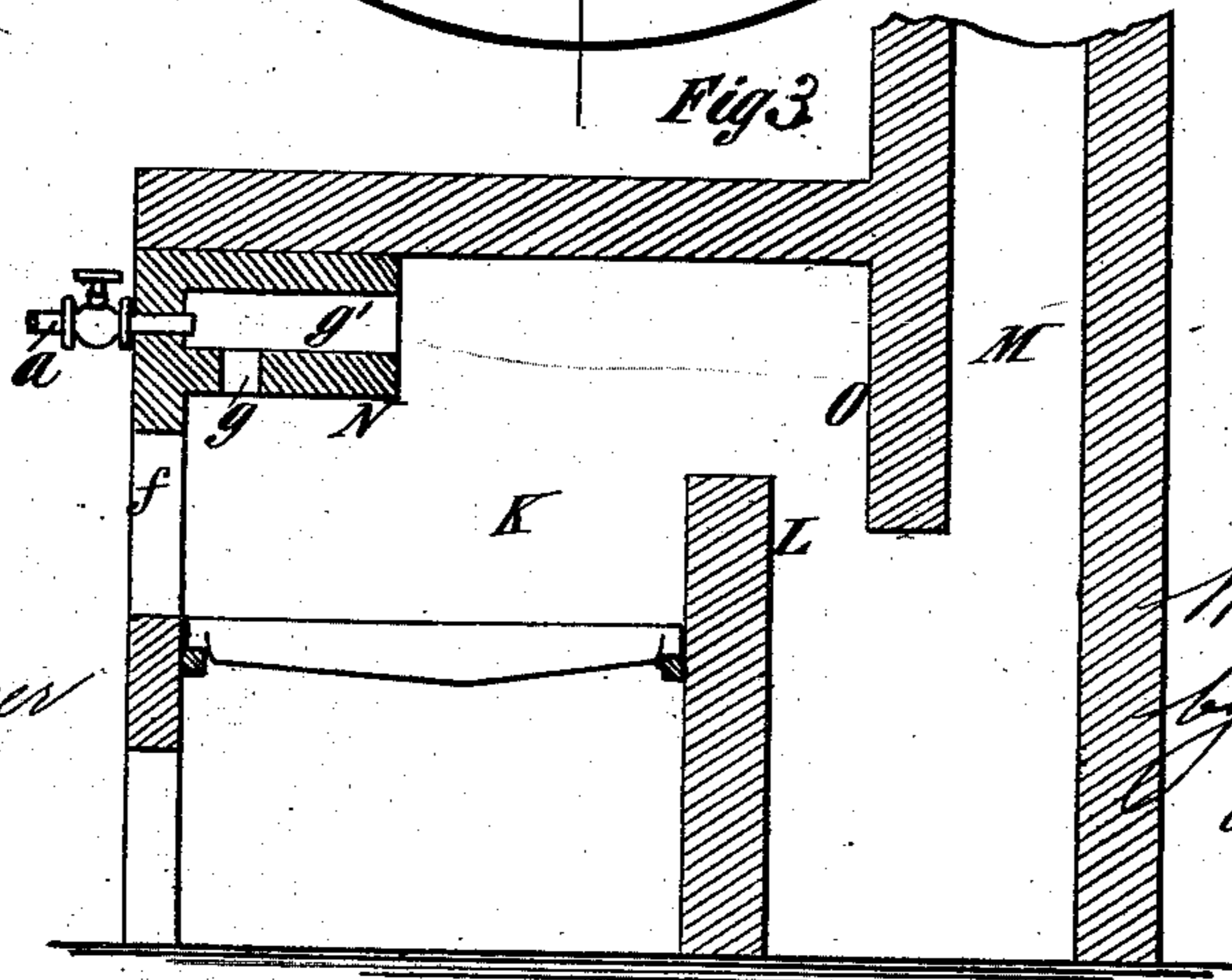
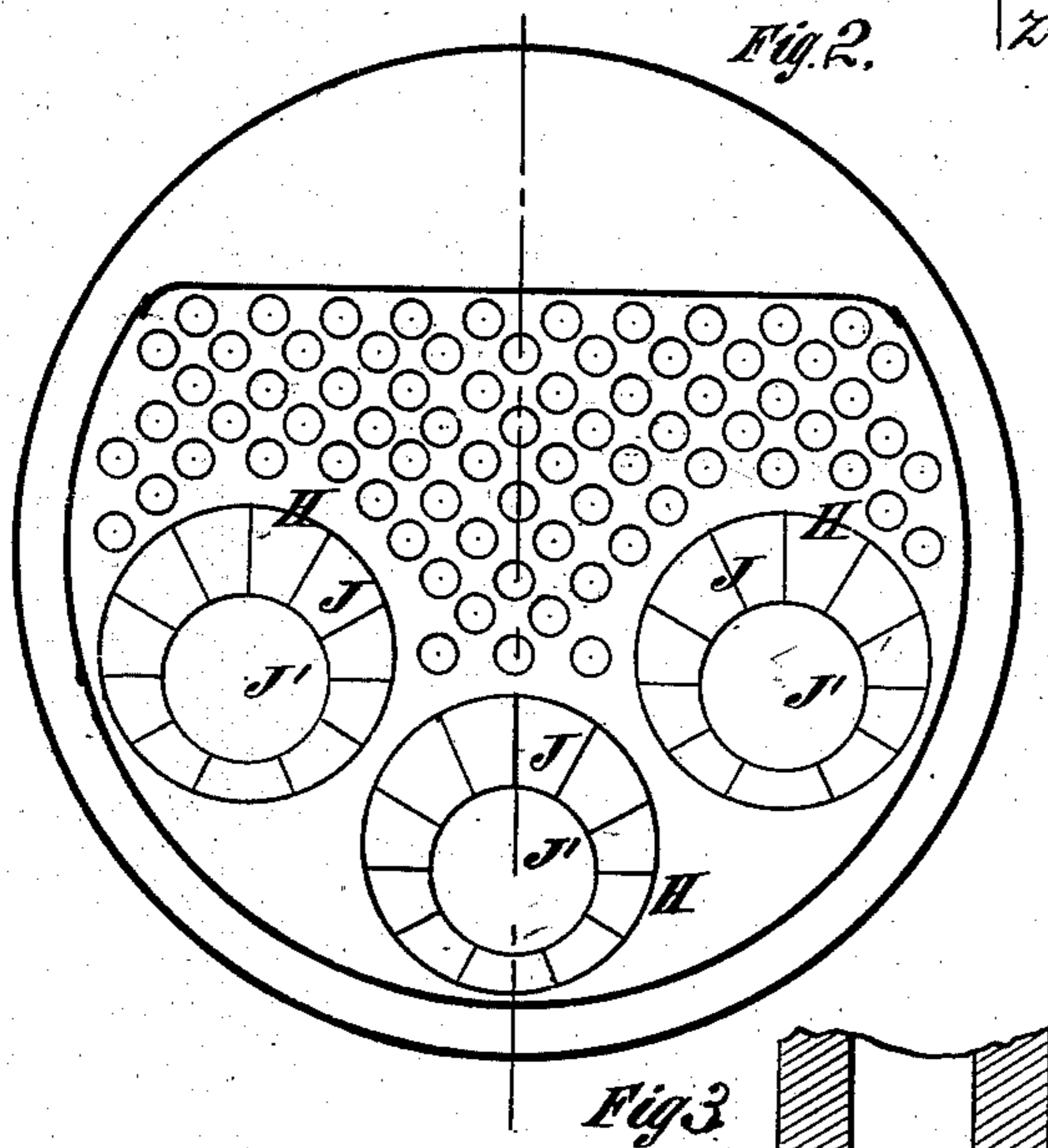
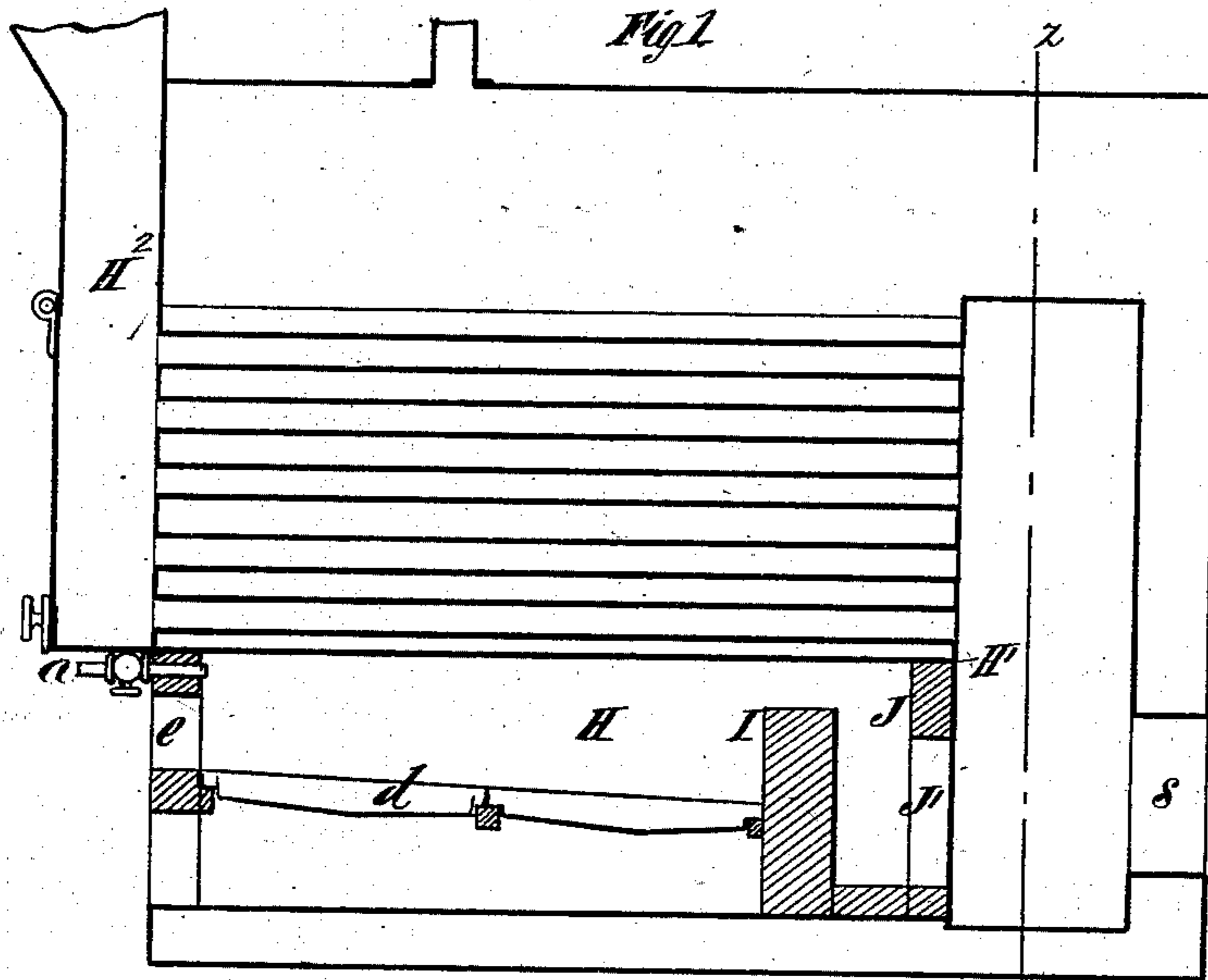


(No Model.)

W. ENNIS.
BOILER FURNACE.

No. 252,445.

Patented Jan. 17, 1882.



Witnesses
Dred Hoyer
Ed. Platzmayer

Inventor
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UNITED STATES PATENT OFFICE.

WILLIAM ENNIS, OF GLEN COVE, NEW YORK; PHEBE L. ENNIS, ADMINISTRATRIX OF SAID WM. ENNIS, DECEASED, ASSIGNOR OF ONE-THIRD TO WRIGHT DURYEA, OF SAME PLACE, AND ONE-THIRD TO WILLIAM R. TAYLOR, OF BROOKLYN, NEW YORK.

BOILER-FURNACE.

SPECIFICATION forming part of Letters Patent No. 252,445, dated January 17, 1882.

Application filed March 10, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ENNIS, of Glen Cove, in the county of Queens and State of New York, have invented certain new and useful Improvements in Boiler and other Furnaces, of which the following is a specification.

In steam-boiler furnaces steam is often supplied in moderate quantities above the grate for the purpose of being decomposed and mingled with the gaseous products of the fuel for more economical working. The steam so used, however, before it is injected into the boiler, is in many cases passed through a superheater for raising it to such a temperature that it will be more readily decomposed on entering the furnace, and even when so superheated the steam and the gaseous products of the fuel are hurried out of the furnace before they are properly mixed and in a condition to produce the most perfect and economical combustion; and the object of my invention is to dispense with a separate superheater for the steam injected into the furnace and to retain the steam and the gaseous products of the fuel in the furnace until they shall be thoroughly commingled and in a condition to combine and produce more nearly perfect combustion, and through such results to effect an economy of fuel.

To this end the invention consists in the combination, with a furnace and ordinary bridge-wall, of a hanging bridge projecting downward from the top of the furnace, behind the ordinary bridge-wall, a bridge extending across the upper front part of said furnace, forming communicating upward and rearward passages, said rearward passages being above the lower edge of said hanging bridge, and a pipe or pipes for injecting steam into said rearward passages.

The invention also consists in the combination, with a steam-boiler having one or more cylindric flues in which are furnaces and the ordinary bridge-walls, of an annular bridge fitting in each flue in rear of the ordinary bridge-wall, and having an opening which is nearer the bottom than the top thereof, and a pipe for injecting steam entering the furnace

and terminating above the top of the opening in said annular bridge.

In the accompanying drawings, Figure 3 represents a longitudinal vertical section of a furnace embodying my invention. Fig. 1 represents a longitudinal vertical section of a marine boiler embodying my invention, and Fig. 2 represents a transverse section thereof on the plane of the dotted line $z z$, Fig. 1.

Similar letters of reference designate corresponding parts in all the figures.

Referring first to Fig. 3, K designates a furnace which may be used for any kind of heating, and b designates the grate thereof. At the back end of the grate is the usual bridge-wall, L; and M designates the chimney or uptake through which the products of combustion escape.

In the front upper part of the furnace, above the fire-door f , is a bridge, N, extending transversely across the furnace, in which are formed communicating upward and rearward passages $g g'$, into the latter of which steam is injected by means of jet-pipes a . The currents of steam entering the passages g' produce a rapid rearward current of the smoke and gases in the said passages and also a continuous upward circulation through the upward passage, g . Therefore it will be seen that a continuous circulation of the hot gaseous products of combustion is obtained through the passages $g g'$, and said products of combustion are thoroughly commingled with the steam.

I do not here claim, broadly, the combination, with the furnace, of the bridge N, containing passages $g g'$, as the same forms the subject of a prior patent granted to me.

In order to prevent the commingled steam and gaseous products from escaping from the furnace over the bridge L and up the chimney M, I employ a hanging bridge, O, which depends from the top of the furnace in rear of the ordinary bridge-wall L, and preferably projects below the upper edge of the said bridge-wall.

It will be seen that that portion of the furnace above a plane coincident with the lower edge of the hanging bridge O will constitute in practical effect a chamber in which the com-

mingled steam and gaseous products of the fuel are retained over the fire until they become so highly heated that a very perfect combustion is obtained. It will be observed that
 5 nothing can escape from the furnace without passing under the hanging bridge O, and that the rearward passages *g'* and pipes *a* are above the lower edge of said bridge.

It is a known fact that every one hundred
 10 and sixty pounds of air at a temperature of about thirty-two degrees (32°) Fahrenheit contains about one pound of water, and that for every additional twenty-seven degrees (27°) of heat imparted to the air it will hold about an
 15 additional pound of water. It is also known that there is an attraction between oxygen, carbon, and hydrogen; and it is believed that the steam is first absorbed by the air and gaseous products of the fuel, on the principle of
 20 saturation, as above set forth, and this brings the gaseous products of the fuel into intimate contact with the steam under a temperature favorable to the decomposition of water, and hence the fire is supplied with oxygen under
 25 and also over the whole fire-surface of the furnace.

Referring, now, to Figs. 1 and 2, H designates the furnaces of a marine boiler of a type in common use, they being arranged in three cylindric flues.
 30

H' designates the back connection, and H² the chimney or smoke-stack.

I designates the ordinary bridge-wall at the rear of each furnace, and *d* designates the
 35 grates, and *e* the fire-doors. Just back of the bridge-wall in each furnace is an annular bridge, J, which is composed of a series of fire-brick of proper form adapted to support each other. In the bridge J is a hole, J', which is
 40 eccentric to the flue, and nearer to the bottom than the top thereof, for the purpose of making the upper and effective part of the annular bridge as deep as possible, and so retain a large volume of steam entering through the jet-pipe
 45 *a'* and gas in the furnace. The several bricks forming each bridge J may be inserted singly through a man-hole, *s*, and placed in position,

and provision is thus readily afforded for applying the bridge to boilers already in use in steamers.

In both the modifications of my invention
 50 which I have here shown it will be clearly seen that the pipes through which steam is injected into the furnace are above the lower edge of the hanging bridge, because in Fig. 1 the pas-
 55 sages *g'*, containing the pipes *a*, are above the lower edge of the bridge O; and in Figs. 1 and 2 the steam-pipe terminates above the top of the opening J' in the bridge J, and the part above said opening only is effective. There-
 60 fore, instead of the steam and gaseous products of the fuel being hurried out of the furnace, they are detained in the chamber immediately over the fire, and are there mingled and heated to such a degree that a very perfect combustion
 65 is secured and a corresponding economy of fuel.

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

1. The combination, with a furnace and ordinary bridge-wall, of a hanging bridge projecting downward from the top of the furnace, behind the ordinary bridge-wall, a bridge extending across the upper front part of the furnace, forming communicating upward and rearward passages, said rearward passages being
 75 above the lower edge of said hanging bridge, and a pipe or pipes for injecting steam into said rearward passages, substantially as and for the purpose specified.
 80

2. The combination, with a steam-boiler having one or more cylindric flues, in which are furnaces and the ordinary bridge-walls, of an annular bridge fitting in each flue in rear of the ordinary bridge-wall, and having an opening
 85 which is nearer the bottom than the top thereof, and a pipe for injecting steam entering the furnace and terminating above the top of the opening in said annular bridge, substantially as and for the purpose specified.

WILLIAM ENNIS.

Witnesses:

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