

(No Model.)

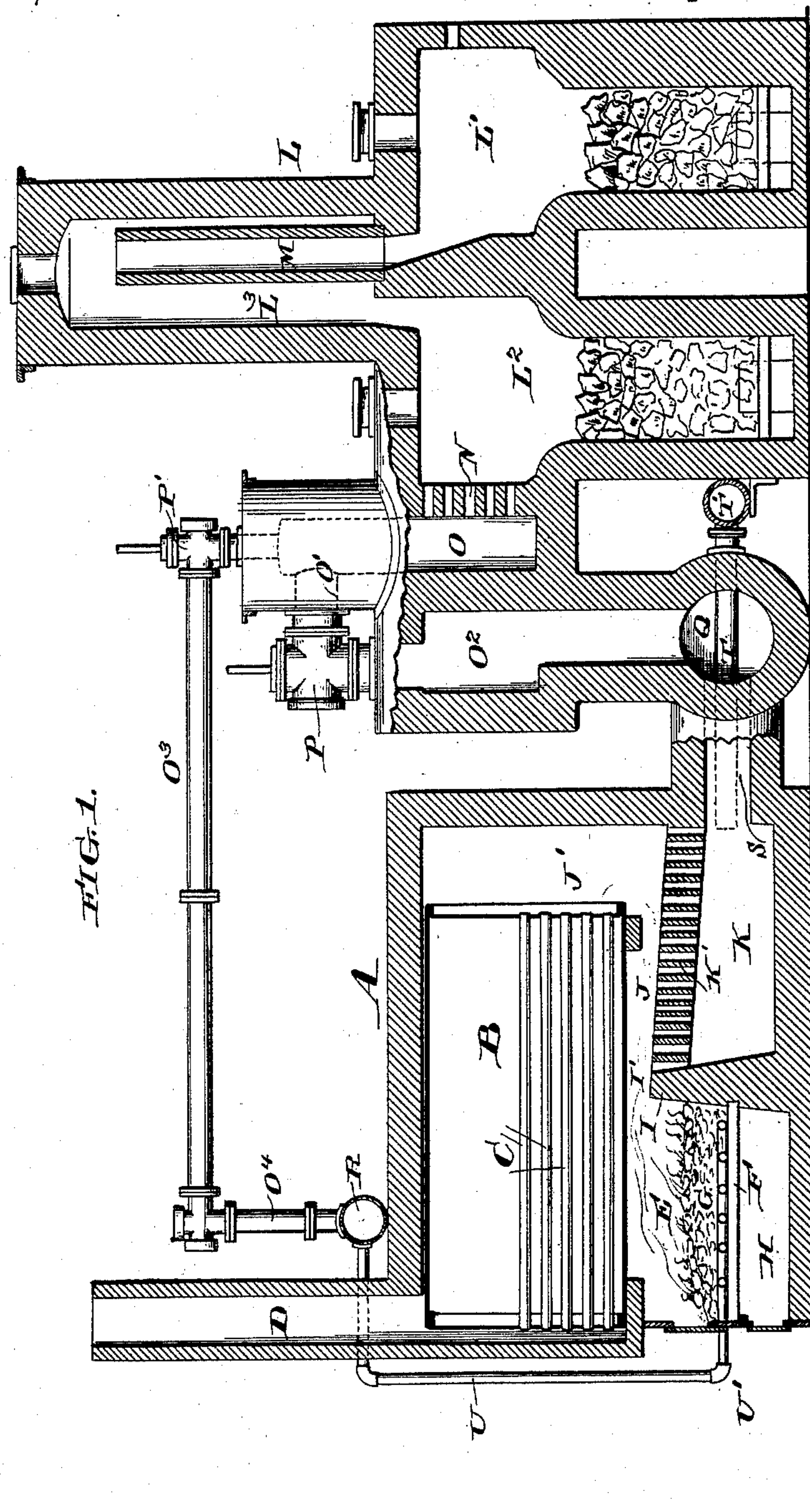
2 Sheets—Sheet 1.

J. L. HASTINGS.

APPARATUS FOR HEATING BOILERS BY GASEOUS FUEL.

No. 483,352.

Patented Sept. 27, 1892.



Witnesses:  
Henry D. Dwyer  
Jesse Keller

Inventor:  
James L. Hastings  
by his atty.  
Francis T. Chambers



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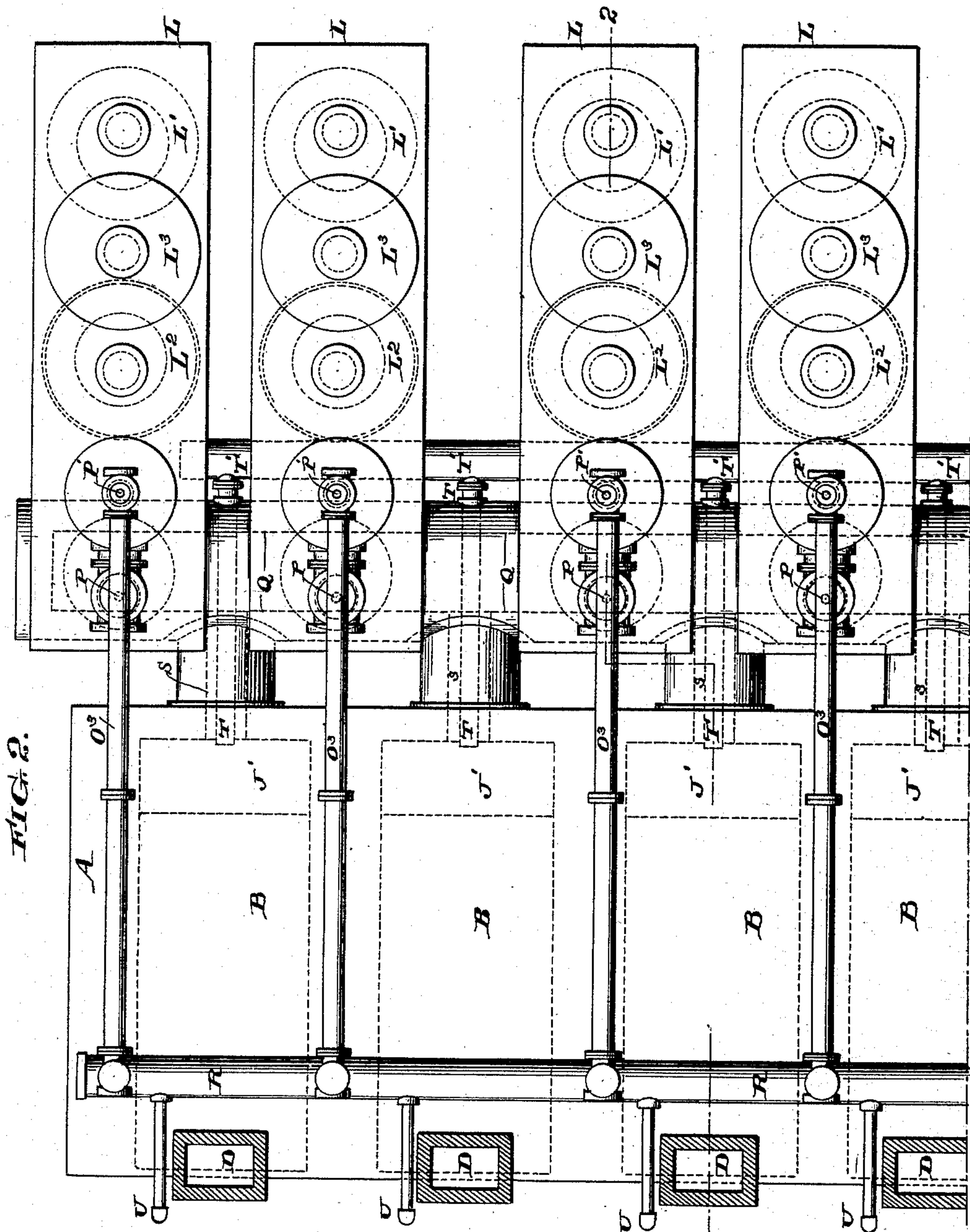
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Jesse Heller

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# UNITED STATES PATENT OFFICE.

JAMES L. HASTINGS, OF PHILADELPHIA, ASSIGNOR TO L. G. McCAULEY, OF WESTCHESTER, PENNSYLVANIA.

## APPARATUS FOR HEATING BOILERS BY GASEOUS FUEL.

SPECIFICATION forming part of Letters Patent No. 483,352, dated September 27, 1892.

Application filed April 11, 1891. Serial No. 388,478. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES L. HASTINGS, of the city and county of Philadelphia, State of Pennsylvania, have invented a certain new and useful Improvement in Apparatus for Heating Boilers by Gaseous Fuel, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to the heating of steam-boilers, and has for its object the rapid and economical generation of steam.

Particularly my invention relates to the economical use of gaseous fuel and a novel combination of water-gas generators with the boiler-furnace.

The nature of my invention will be best understood as described in connection with the drawings, in which—

Figure 1 is a sectional elevation taken on the line 1 2 of Fig. 2, and Fig. 2 a plan view showing combined batteries of boilers and gas-generators.

A indicates the masonry surrounding the boilers; B, the boilers having fire-tubes C; D, the stack; E and J, the fire-box divided into front and rear communicating chambers, as shown, by a wall or bridge I, I' indicating the passage connecting the chambers E and J.

F indicates a grate, upon which is supported a mass of fire-brick or similar material G with intercommunicating interstices.

H is a chamber beneath the grate corresponding with the ash-pit of an ordinary furnace, but used by me as a flue for the admission of air beneath the fire.

Beneath the rear fire-chamber J' is a combustion-chamber J, supported over chamber K by an arch or bridge of fire-brick or similar material K', said fire-brick being perforated, built up in checker-work or in any of the well-known plans by which communication is made through a mass of refractory material interposed between communicating chambers and used for storing heat.

J' is a flue or combustion-chamber communicating with the rear of chamber J and with the tuyeres C.

L L L, &c., indicate water-gas generators, which, as shown, are made up of two connected fire-chambers L' and L<sup>2</sup>, the connection be-

ing formed through a dome L<sup>3</sup> at their top, through which dome oil is introduced for carburetting the gas, M being an open-ended re-tort, into which the oil is allowed to fall in spray or in mass.

There is nothing in the generator shown which is new with me, and it will be understood that any of the well-known forms of water-gas-generators may be used. The generators communicate through a perforated wall N with a flue or passage O, from the top of which leads a conduit O<sup>3</sup> and from the side of which leads a conduit O', said conduit communicating with the conduit O<sup>2</sup>. Valves P and P' are provided to close either of the conduits leading from the flue O at will. The conduit O<sup>3</sup> leads through conduit O<sup>4</sup> to a receptacle R, which, it will be noticed, is common to the whole battery of generators, and from receptacle R pipes U lead into the mass of fire-brick supported in the front fire-chambers beneath each boiler. The conduits O<sup>2</sup> lead to a receiver Q, which, like the receiver R, is common to the whole battery of generators, and from receiver Q conduits or passages S lead to the combustion-chambers K at the rear of each boiler.

T' is an air-flue kept supplied by a blower, (not shown in the drawings,) and T T, &c., are pipes leading from conduit T' through receiver Q and passages S to chamber K.

The receiver R may be of any desired size, according as it is desired to store gas or not and is kept full of water-gas, the valves P' being opened and the valves P closed in each receiver that is making water-gas. The receiver Q, on the other hand, is kept full of producer gas, the valves P' being closed and the valves P opened, which connect with each generator which is making producer gas in the process of blowing up preparatory to a run of water-gas. Where a number of generators are used, it is advisable that the receptacles R and Q should be comparatively smaller, so that the gases will pass rapidly through them to the points of combustion, losing but little heat on their way, and for the purpose of economizing heat I consider it advisable to line the conduits through which the water-gas passes with fire-brick, as indicated in the drawings, and to pass the air-blast pipes T



through the receiver and the passages S, so that the air will be heated by the coming in contact with the producer-gas in chamber K.

I prefer in all cases to use both water and fuel gas in the way indicated in the drawings; but it is, I believe, novel and a feature of some value to supply the fire-chamber of a steam-boiler furnace with gas and air introduced both in front of and behind a bridge-wall dividing the fire-chamber, as indicated, and especially to introduce the gas-supply at the rear of the fire-box first into a combustion-chamber, where it is supplied with air and ignited, and thence through perforated brick-work into the fire-chamber proper, situated above the combustion-chamber and forming a part or continuation of the front fire-chamber. The best results are, however, obtained by using water-gas in the front fire-chamber and producer gas in the combustion-chamber beneath the rear fire-chamber.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a water-gas generator, a receptacle for water-gas, and a receptacle for producer-gas communicating with the take-off of the generator, valves for closing the connection to either receptacle at will, a boiler, a fire-box extending beneath the boiler and separated into front and rear communicating chambers by a bridge, connections from the water-gas receiver to the front

chamber, and connections from the producer-gas to the rear chamber.

2. The combination of a water-gas generator, a receptacle for water-gas, and a receptacle for producer-gas communicating with the take-off of the generator, valves for closing the connection to either receptacle at will, a boiler, a fire-box extending beneath the boiler and separated into front and rear communicating chambers by a bridge, a combustion-chamber situated beneath the rear fire-box chamber and communicating therewith through checkered fire-brick or its equivalent, connections from the water-gas receiver to the front chamber, and connections from the producer-gas receiver to the combustion-chamber.

3. The combination of a series of water-gas generators, a common water-gas receptacle and a common producer-gas receptacle, conduits leading from each generator to each receptacle, valves in said conduits, whereby they can be closed at will, one or more boilers, fire-boxes extending beneath said boilers and divided into front and rear communicating chambers by a bridge, conduits leading from the water-gas receptacle to the front fire-chambers, and conduits leading from the producer-gas receptacle to the rear fire-chamber.

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Witnesses:

W. E. GRAY,  
T. B. JAMISON.