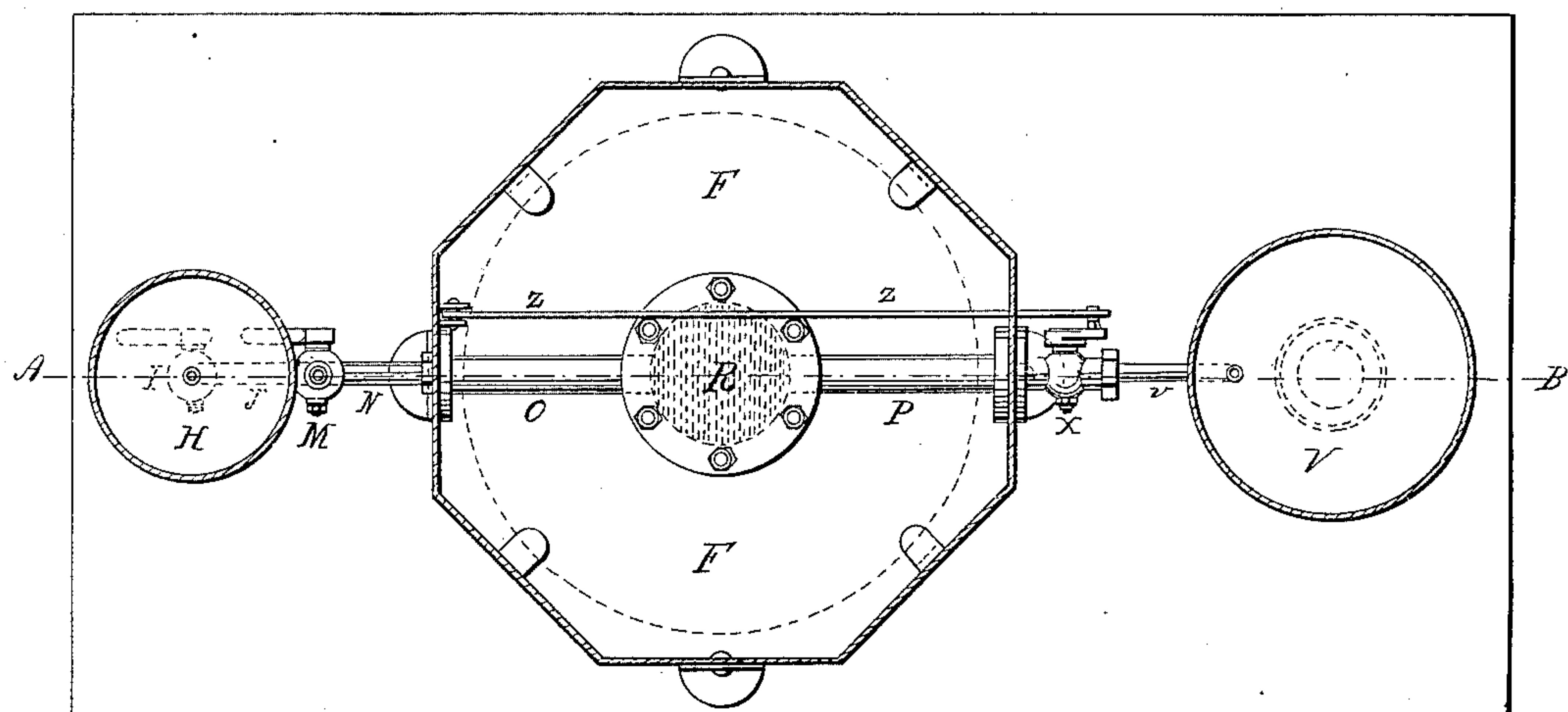
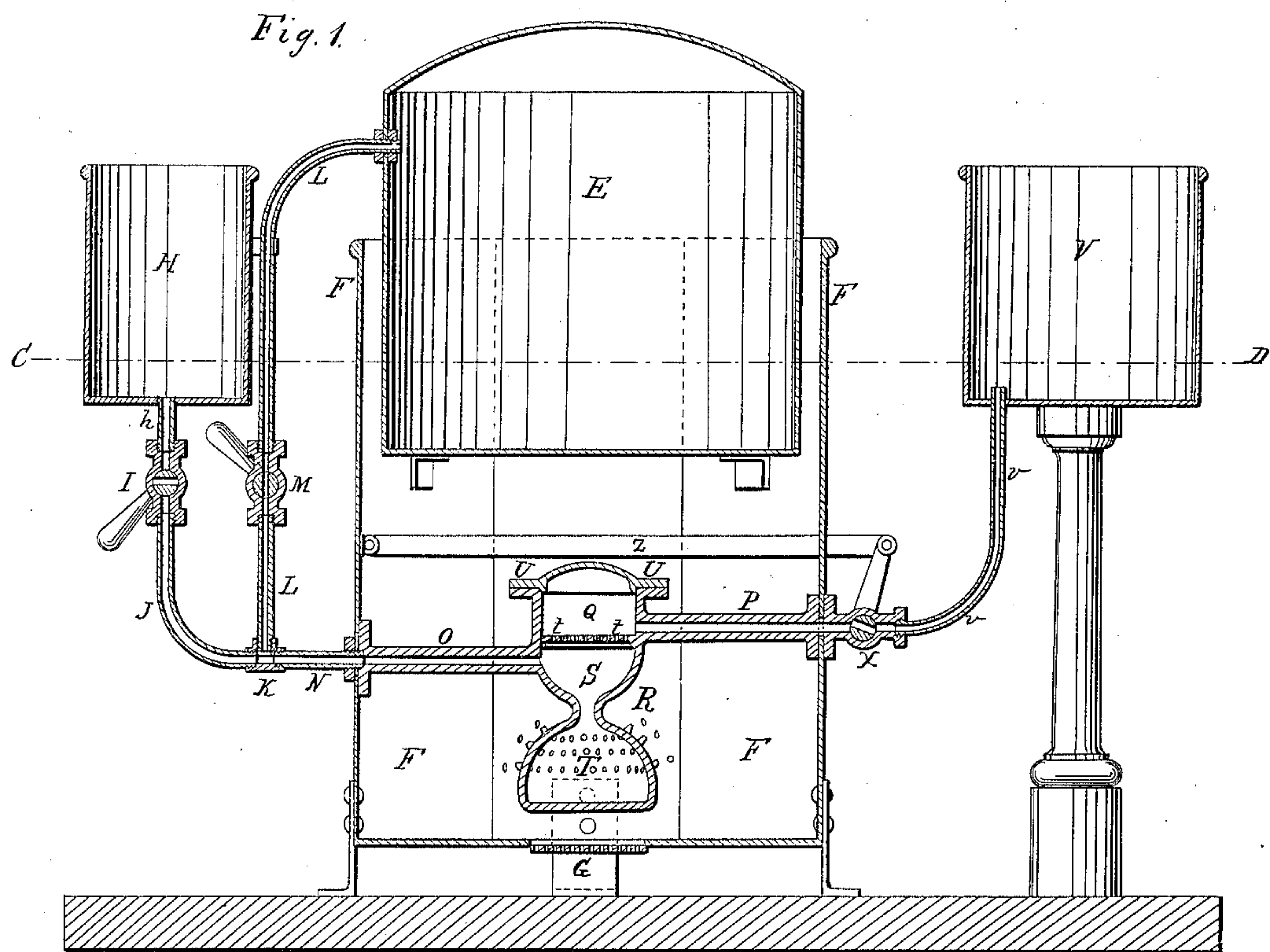


*A. J. Works,*  
*Burning Hydrocarbon.*  
*N<sup>o</sup> 57,429.                      Patented Aug 21, 1866.*



*Witnesses;*  
*Mary L. Works*  
*Wm. L. Works*

*Inventor;*  
*A. J. Works.*



# UNITED STATES PATENT OFFICE.

A. J. WORKS, OF FAIR HAVEN, CONNECTICUT.

## IMPROVED APPARATUS FOR BURNING LIQUID HYDROCARBONS.

Specification forming part of Letters Patent No. 57,429, dated August 21, 1866.

*To all whom it may concern:*

Be it known that I, A. J. WORKS, of the city of Fair Haven, in the county of New Haven and State of Connecticut, have invented a new and useful Apparatus for Using Liquid Hydrocarbons as Fuel, more especially designed for the purpose of raising steam in steam-engines, but adaptable to any purpose where other fuels are used; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 is a sectional view, in elevation, through the line A B of Fig. 2, and Fig. 2 is a sectional view, in plan, through the line C D of Fig. 1, with the boiler E removed.

My invention consists in an apparatus so constructed as to allow the liquid hydrocarbons which are to be used as fuel to be brought, when in a state of vapor, in contact with steam heated to such degree that part of the carbon of the liquid hydrocarbon will act on the water and decompose the same, thereby producing a large quantity of hydrogen gas, which, being ignited and burning with the excess of liquid hydrocarbon vapors, will produce an intense heat.

I am aware that other patented apparatus use a mixture of liquid hydrocarbon and steam as fuel, and therefore I do not claim to have invented this mixture; but the apparatus they use are, in my opinion, open to many objections, and therefore are not introduced largely. A careful study of the phenomena which take place when hydrocarbons are decomposed by water at a high temperature, and also a thorough practice in the manufacture of gas from the dry distillation of vegetable and mineral substances, have led me to the invention of the apparatus which I will describe.

E is a steam-boiler of ordinary construction, which, in the model and drawings, has been made of the simplest known shape, as it is only for the sake of illustration. F is the furnace or fire-box of the boiler E, either of masonry or iron, as the case may be. G is the grate. H is an elevated reservoir containing water. This reservoir is provided with a pipe, h, and a stop-cock, I, to which is fixed a pipe, J, which screws into the T gas-fitting K. L

is a steam-pipe, having a stop-cock, M, and also screwed into the T K. N is a small pipe, screwed at one end into the T K and at the other end into the cast-iron pipe O. R is the gas-generator, composed of five distinct departments, to wit: the pipe P, where the liquid hydrocarbons are evaporated; the pipe O, where the steam is superheated; the chamber Q, where the vapors of hydrocarbon are expanded by heat; the chamber S, where the oil-vapors receive the proper quantity of heated steam, and the retort T, where the decomposition of the hydrocarbons takes place, and from which the mixture of gas and hydrocarbon vapors is expelled through the burners o o o o o, to be ignited and produce heat. t t is a perforated plate, used for the purpose of dividing the vapors of hydrocarbons as they enter the chamber S. U U is a lid, which is jointed and bolted firmly, so as to securely close the gas-generating apparatus. V is the elevated reservoir for the oil or other hydrocarbons. This reservoir is kept at a certain distance from the fire to avoid accidents. It is provided with a pipe, v v, and with a stop-cock, X, which is governed and controlled by a pyrodynamic bar, Z, so arranged as to act on the stop-cock X and regulate the amount of oil admitted into the gas-generating apparatus R in an automatic manner.

Operation: The cocks I, M, and X being closed and the reservoirs V and H being filled with oil and with water, a small fire is lighted on the grate G. When the heat of the apparatus R is sufficient the cock X is lightly opened, and as soon as flames make their appearance at the burners o o o o the cock I is also opened, gradually at first, and until it is evident, by the blowing of the burners, that there is enough water admitted in S and T to furnish the required quantity of steam. The cock I is now left stationary at that point, and the cock X is gradually and carefully opened wider, observing all the time the flame issuing from the burners o o o, until it appears of the proper intensity of color. If too much oil is admitted, the flame will be red and smoky; if too little, it becomes blue and spare, hovering away from the burners o o o o. A medium is to be attained where the flame produces the greater heat. When the blaze is as it should be, the

regulating-bar Z or any other pyrodynamic apparatus is securely attached to the lever of the cock X, and the apparatus may be considered in operation.

In furnaces where the heat is to be used for any other purpose than for raising steam the apparatus has, of course, no boiler E and no pipe L, cock M, &c., unless a steam-boiler is at hand and it is thought advisable to take steam from it, when the proper pipes and cocks will be put. When no steam-boiler is used the operation continues all the time with the cock I partly open, and the water is used instead of steam; but in all cases where the heat is used for raising steam it is thought advisable to use steam from the boiler and dispense with the use of water except for starting the operation.

The fire upon the grate G is, of course, allowed to go out as soon as the apparatus is in full operation.

What I claim as my invention is—

1. The apparatus R, when composed of three departments, Q, S, and T, with its branch pipes, one above and the other below the perforated plates *t t'*.

2. The reservoir H, pipe *h*, cock I, and pipe J.

3. The pyrodynamic apparatus Z, in connection with the cock X, for the purpose specified.

A. J. WORKS. [L. S.]

Witnesses:

HENRY R. BARNES,  
MARY L. WORKS.