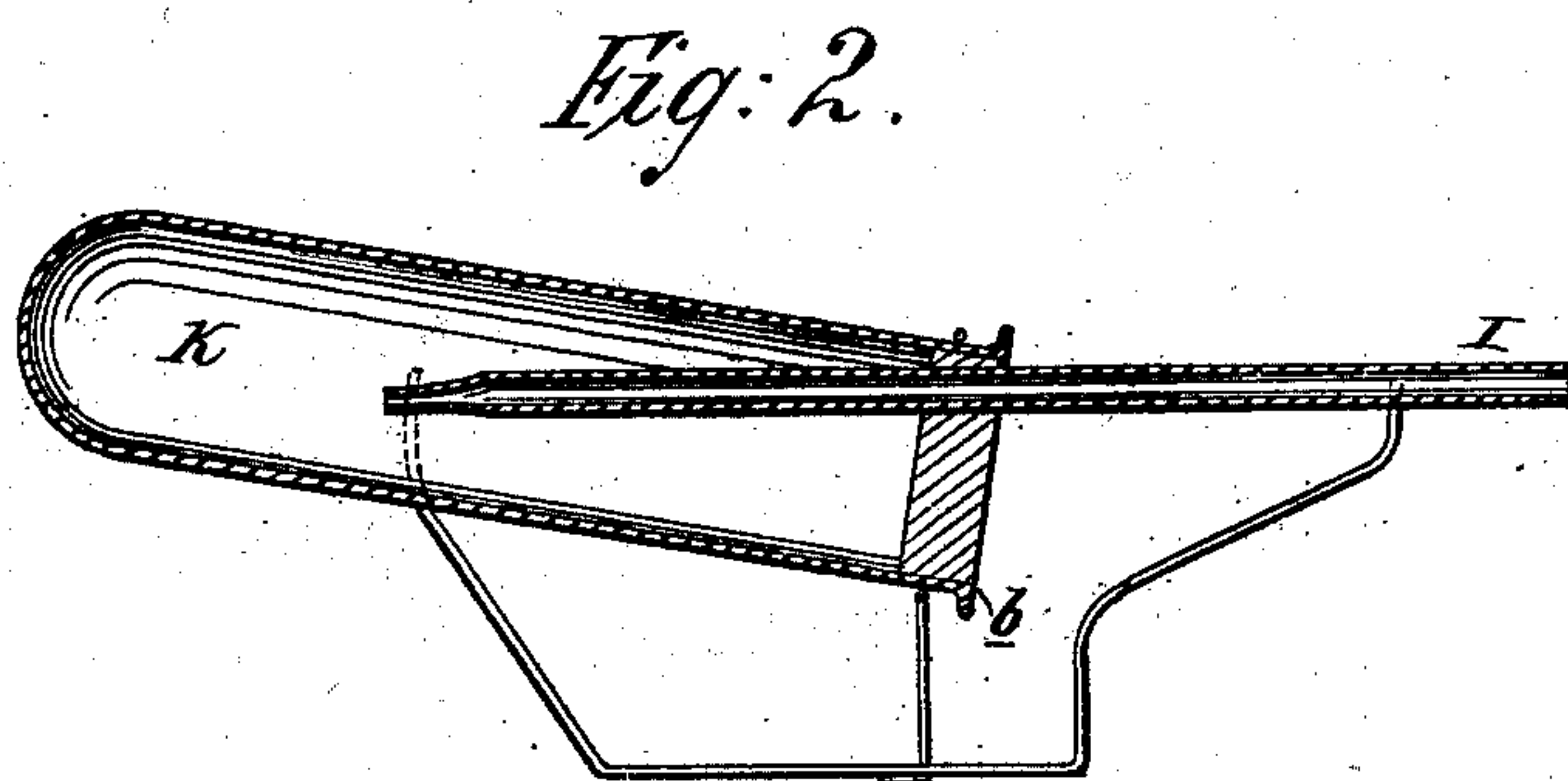
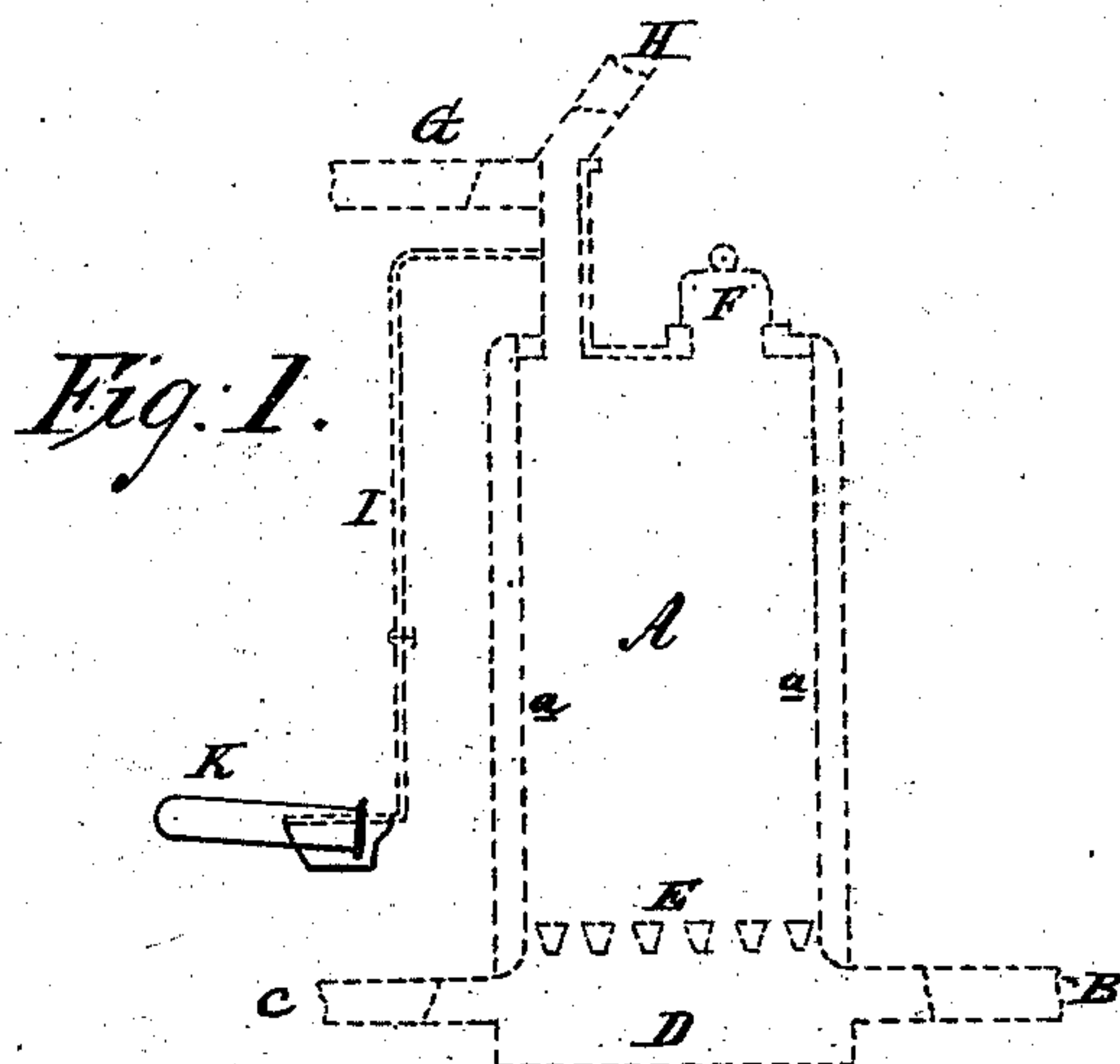


H. C. BOWEN.
Apparatus for Indicating the Action of Water-Gas
Retorts.

No. 224,865.

Patented Feb. 24, 1880.



WITNESSES:

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HENRY C. BOWEN, OF NEW YORK, N. Y.

APPARATUS FOR INDICATING THE ACTION OF WATER-GAS RETORTS.

SPECIFICATION forming part of Letters Patent No. 224,865, dated February 24, 1880.

Application filed November 18, 1879.

To all whom it may concern:

Be it known that I, HENRY C. BOWEN, of the city, county, and State of New York, have invented a new and Improved Apparatus for
5 Indicating the Action of Water-Gas Retorts, of which the following is a specification.

Figure 1 represents a sectional elevation of a retort with attached apparatus. Fig. 2 is a sectional side elevation of the apparatus.

10 Similar letters of reference indicate corresponding parts.

The object of this invention is to provide a means for determining the action and effect of steam in the retorts when manufacturing wa-
15 ter-gas.

In the manufacture of water-gas the method heretofore in general use is to charge a retort or generator with coal, then bring it to a state of incandescence by driving air through the
20 same, then to shut off the air and force steam through the said incandescent mass of coal. At this high temperature the incandescent carbon decomposes the steam, forming carbonic acid and hydrogen, and the carbonic acid, as
25 it passes farther through the mass, is itself decomposed or robbed of one equivalent of oxygen by the carbon to form carbonic oxide. The commingled carbonic oxide and hydrogen then constitute the base of the water-gas, and
30 pass out of the generator, to be subsequently carbureted by passage through a hydrocarbon, and then fixed to form a stable gas by being heated in a separate set of retorts.

In the manufacture of this mixture of car-
35 bonic oxide and hydrogen certain incidental conditions are likely to intervene, which involve a waste of fuel, loss of steam, and a contamination of the gas. In the first place, in the alternate heating of the coal by air and intro-
40 duction of steam after the steam has been on for a while, it reduces the temperature of the coal, so that the coal has not sufficient affinity to decompose the carbonic acid, and hence the wa-
45 ter-gas is contaminated with this dead gas, which can only be gotten out at great expense of subsequent purification. Furthermore, the brick lining of the retort is liable to become cracked or loose from the outer case, and thus
50 give passage to the steam without allowing it to be decomposed into carbonic oxide. Again, clinkers on the side of the retort may form, which gives large interstices for the passage

of the steam and involves the same objection, or large lumps of coal may lodge against the side of the retort, and thus leave large inter-
55 stices. Any one of these conditions is likely to allow steam to pass over with the gas, and also to contaminate the gas by carbonic acid.

The object of my invention is to provide means for enabling the operator to detect at
60 any time this passage of undecomposed steam along with the carbonic oxide and hydrogen; and to this end it consists in connecting with the discharge-pipe which carries off the said water-gases a steam-condenser, whereby the
65 condensation of steam in a cloud or its presence in condensed drops may be quickly observed, and the conditions of the retort immediately changed to prevent a continuance of the same, and save not only a waste of fuel,
70 but the expense of purification.

In the drawings, A represents a gas-retort provided with a brick lining, *a*, the shell of the retort being preferably of iron and made gas-tight. B is the air-inlet; C, the steam-in-
75 let; D, the ash-pit; E, the grate-bars; F, the charging-hole, which is kept closed except when charging coal into the retort. G is the pipe that conducts the gas from the retort A to the holder. H is a pipe that is kept open (the
80 pipe G being closed meanwhile) until the coal in the retort is in a proper state of combustion for the introduction of steam thereto. I is a pipe tapped into the gas-pipe G, and led off to any convenient place to conduct a portion
85 of the products of combustion from the retort A to the steam-condenser K, which condenser K is closed at both ends and provided with a drip-hole, *b*, at its lower end.

In practice I have found that a glass cylin-
90 der possesses advantages over other devices tried by me, for the reasons that by its use the presence of steam in the gas can be more quickly determined.

Metallic cylinders or boxes, or plates of
95 glass, metal, or other hard smooth substance of good conductive power, upon which steam will quickly condense, may, with greater or lesser success, be substituted for the glass cyl-
100 inder herein shown, in which case the drip from the cylinder would serve to give the in-
dications; but for the reasons before stated I prefer the glass cylinder.

In the manufacture of water-gas, the coal in

the retort A is brought into a high state of ignition by a blast of air introduced through the air-inlet B, the pipe H being kept open the meanwhile and the pipe G closed. Then the
 5 pipe H is closed and G opened, and the inlet B also closed, and steam then forced into the retort A through the inlet C. The cock in the pipe I is then opened, so that gas may pass into the vessel K.

10 Should the coal in the retort A be in a proper state of ignition, the brick lining tight, and the supply of steam not in excess, none of the phenomena of condensation appear in the vessel K on the introduction of the gas therein, and
 15 hence it is held that the proper action between the steam and incandescent carbon is positively indicated and that all the conditions are right. As, however, the normal action progresses and the coal becomes cooled, the
 20 steam begins to pass through undecomposed, and as it appears at the condenser it gives evidence to the operator of the need for regenerating the coal by renewing the air-blast. If, on the contrary, the lining of the retort
 25 should break or crack, so that steam could escape between the lining and the shell of the retort, and thus pass around the coal instead of through it, the immediate appearance of steam in the vessel K would indicate the fact;
 30 or should clinkers accumulate in excess on the brick lining, and thereby afford large interstices and easy passages, through which a portion of the steam could flow without passing through the burning coal, steam would appear
 35 in the test.

If the temperature of the coal be too low, or the supply of steam in excess, or if leaks occur in the brick lining—and these conditions

or some of them are of almost constant occurrence in the manufacture of water-gas—there
 40 is certain attendant waste and expense; and where hundreds of tons of coal are used daily, as in some large gas-works, this waste and expense becomes enormous. Without this test, this method of control, these causes of waste
 45 cannot be ascertained or determined in time for prompt remedy, nor indeed can the fact itself that waste is occurring be learned until it has reached alarming proportions. When, for instance, the brick lining of a retort breaks,
 50 tons of coal may be burned up without making gas, while the steam that should pass through the coal is escaping between the lining and shell of the retort, and when a number of retorts are working into the same holder
 55 this waste may continue for a long time without being discovered.

By the method and apparatus herein shown and described all the conditions and operations in a water-gas retort can be instantly
 60 and accurately determined, so that necessary corrective measure may be taken without loss of time.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—
 65

The combination, with a water-gas retort or generator, of a steam condenser or indicator connecting with the discharge-pipe of the generator, which carries off the water-gas, for the
 70 purpose of indicating the passage of undecomposed steam, substantially as described.

HENRY C. BOWEN.

Witnesses:

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