(No Model.)

O. H. SHIRAS.

GAS PURIFIER AND METHOD OF REVIVIFYING IRON SPONGE.

No. 299,589. Patented June 3, 1884.

Fig. 1.

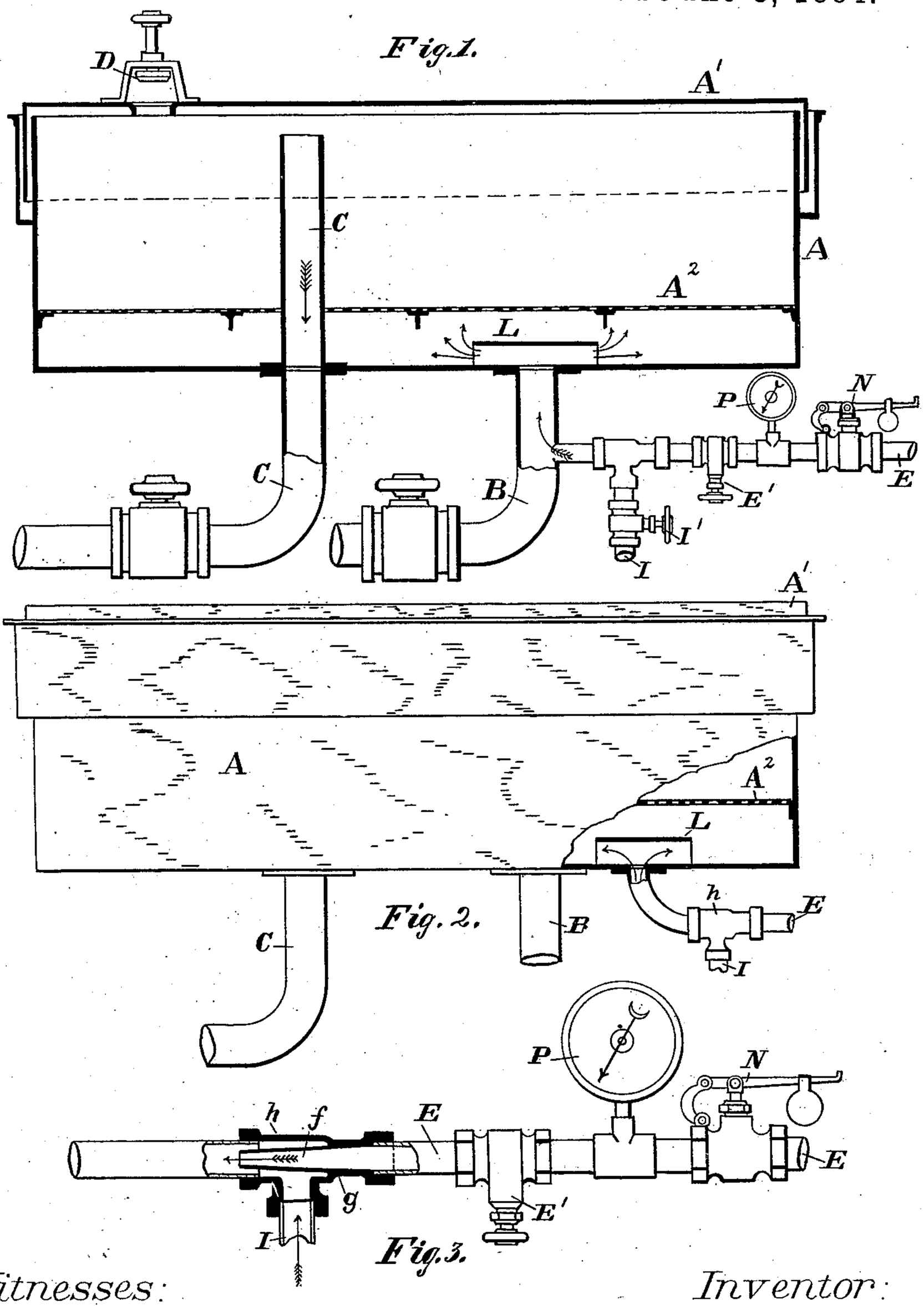

Fig. 2.

Fig. 3.

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GAS-PURIFIER AND METHOD OF REVIVIFYING IRON SPONGE.

SPECIFICATION forming part of Letters Patent No. 299,589, dated June 3, 1884.

Application filed July 19, 1883. (No model.)

To all whom it may concern:

Be it known that I, OLIVER H. SHIRAS, a citizen of the United States, residing at New Castle, in the county of Lawrence and State of Pennsylvania, have invented certain new and useful Improvements in Gas-Purifiers, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to certain improvements in gas-purifiers, and will be described, and then designated in the claims.

Figure 1 in the annexed drawings illustrates a gas-purifier box in vertical section provided with the means whereby to effect the reoxidation of the oxide while in the box. Fig. 2 shows the jet-blower and air-inlet applied directly to the purifier-box. Fig. 3 shows the steam-jet blower, partially in section, and means for regulating the temperature while the revivification is going on.

The letter A designates the purifier-box; A′, its removable cover; A^2, its trays or screens, whereon the iron sponge or other oxide rests, all of which parts may be of well-known construction. The gas-inlet pipe B and outlet-pipe C may also be arranged as usual, or in any desired way, and should be provided with valves or center seals, and a relief-valve, D, is provided on top of the cover. A steam-jet blower and an air-inlet are employed to force mixed steam and air into the purifier-box. In Fig. 1 these devices are shown applied so as to deliver into the gas-inlet pipe B; but they may be applied, as shown in Fig. 2, directly to the bottom of the box. Instead of but one blower and air-inlet, two, three, or more may be so arranged in purifier-boxes of the larger size.

The jet-blower consists of a steam-pipe, E, leading from a boiler, having a tapering nozzle, *f*, which enters a plug, *g*, in the end of a larger pipe, *h*, and projects into said larger pipe, within which is an annular space around the tapering nozzle. The steam-pipe is provided with a cock or globe-valve, E′, which controls the flow of steam. At one side of the large pipe *h*, and connecting with the annular space therein, is an inlet, I, for air. This air-inlet has a valve, I′, by which it may be closed when the gas is passing through the purifier-box. The large pipe *h* may connect, as shown in Fig. 1, with the gas-inlet pipe B, which enters the purifier-box. A metal plate, L, within the box, extends over the opening or end of the gas-inlet, and in like manner, when the air and steam pipe enters directly through the bottom of the box, as in Fig. 2, a similar plate extends over it. This plate L serves to spread or diffuse the mixed air and steam through the iron sponge or oxide of iron. By this arrangement provision is made for the entry into the bottom of the box of both steam and air. As these mixed fluids pass through the iron sponge or other oxides, a partial condensation of the moisture takes place, which, when the process has been completed, leaves the iron sponge in just the proper condition to favor the absorption by it, or combination therewith, of the ammonia, sulphur, and carbonic acid in the gas. Air alone—that is, without the steam—would leave the purifying-sponge in too dry a state for it to properly effect its office when the unpurified gas should be brought in contact with it.

A very important feature in this method of revivifying is the regulation of the temperature of the iron sponge or other oxide while it is being reoxidized. The temperature will rise when the supply of steam and air is increased, and if increased too rapidly or in too great quantity in a given time the resulting extreme high temperature is disastrous. The temperature will fall when the supply is diminished. To regulate the temperature and control the tendency to overheating of the oxide, therefore, I first exclude air from the box, save as introduced by the blower. This is effected by retaining the cover down to its usual position, and then at the same time increasing or lessening (as the case may require) the supply of steam and air. To regulate the temperature of the iron sponge while the revivifying process is going on, I employ the relief-valve D in the cover, and a steam-pressure regulator, N, which is attached to the steam-pipe E, and a gage, P, attached between the regulator and jet-blower. The regulator, having once been properly adjusted, serves to maintain the requisite steam-pressure to deliver the desired volume of steam and air into the purifier-box. The pressure of the steam

issuing from the jet-blower, being under control, may be increased or diminished as the temperature of the iron sponge requires. It will thus be seen that the pressure of the steam upon the jet-nozzle *f* determines the supply of both steam and air. It follows, then, that limiting the steam-pressure governs the temperature of the oxide.

The operation or method of revivifying and reoxidizing the iron sponge is as follows: The sponge remains confined in the box and is undisturbed, the relief valve or valves D are opened, and registering-thermometers are employed to ascertain the temperature of the issuing vapor. The gas inlet and outlet pipes are closed by the usual valves or "center seal," and the steam and air together, regulated as to quantity so as to prevent overheating, are forced through the iron sponge or other oxide, and escape through the open relief-valves charged with the impurities eliminated from the sponge or oxides. As the process of oxidation nears completion the temperature of the escaping steam and air begins to lower.

It has heretofore been proposed to prevent the heating of the iron sponge during the revivifying process by regulating the inlet of air, which method differs from mine.

Having described my invention, I claim and desire to secure by Letters Patent of the United States—

1. A gas-purifier box having a relief-valve in its cover, a steam-jet blower and an air-inlet adapted to force mixed steam and air into the box, a steam-pressure regulator attached to the steam-pipe, and a gage, as shown and described.

2. The method of regulating the temperature of the iron sponge or other oxide while undergoing reoxidation, consisting in confining the iron sponge or other oxide in a box, passing steam and air together through the mass of oxide, and increasing or diminishing the pressure of the steam as it passes into the box, as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

OLIVER H. SHIRAS.

Witnesses:
CHARLES H. SMITH,
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