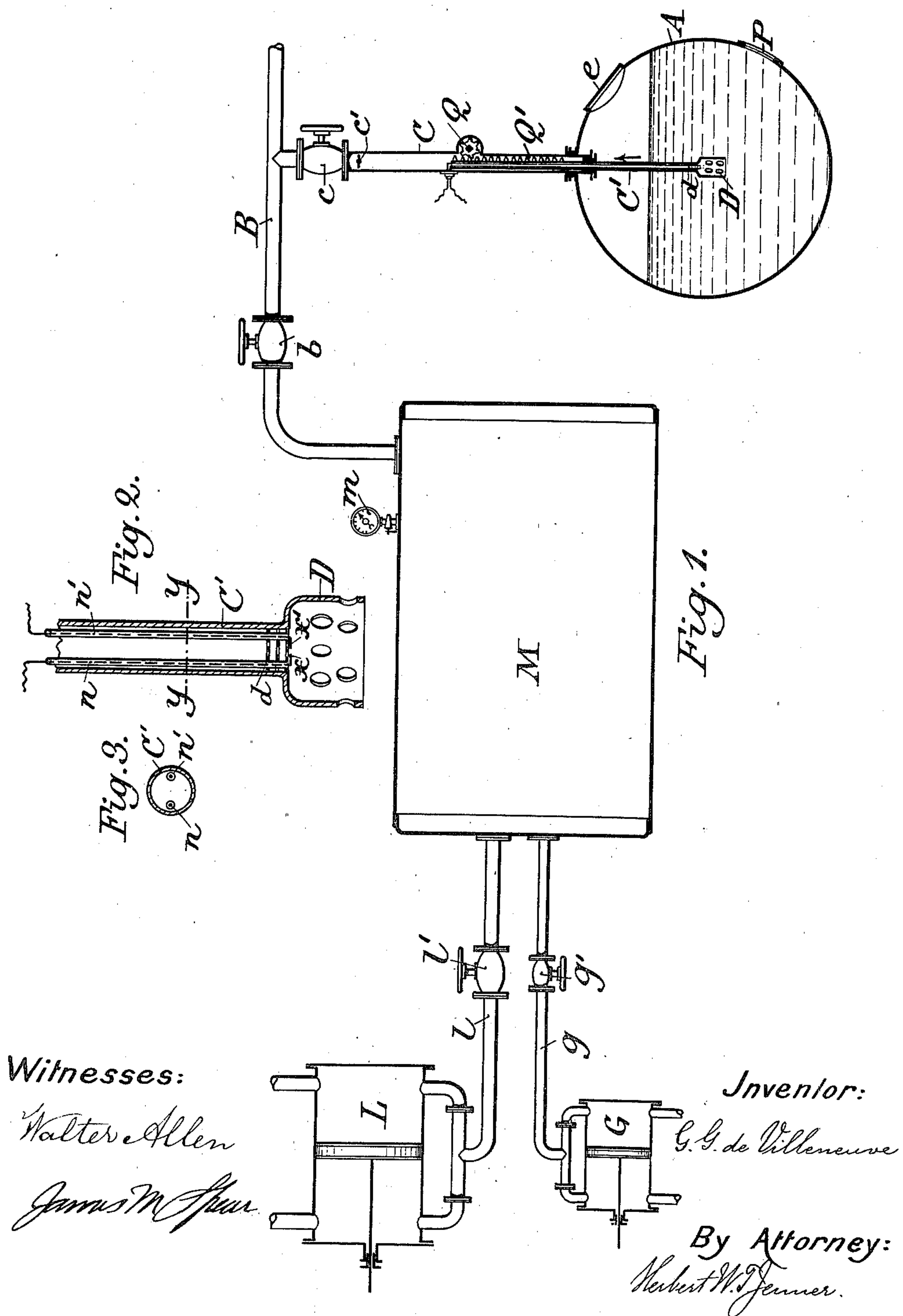


(No Model.)

G. G. DE VILLENEUVE.
METHOD OF GENERATING STEAM.

No. 541,779.

Patented June 25, 1895.



UNITED STATES PATENT OFFICE.

GUILLAUME GÉRARD DE VILLENEUVE, OF THE HAGUE, NETHERLANDS.

METHOD OF GENERATING STEAM.

SPECIFICATION forming part of Letters Patent No. 541,779, dated June 25, 1895.

Application filed January 12, 1895. Serial No. 534,683. (No model.) Patented in England June 13, 1894, No. 11,494.

To all whom it may concern:

Be it known that I, GUILLAUME GÉRARD DE VILLENEUVE, a citizen of the Kingdom of the Netherlands, residing at The Hague, Luid, Holland, the Netherlands, have invented certain new and useful Improvements in Methods of Generating Steam in Steam-Boilers, (for which I have obtained a patent in England, No. 11,494, dated June 13, 1894;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has for its object the generation of steam in steam boilers by the combustion of a gaseous mixture under pressure, led directly into the water in the boiler. By this means the external heating of the boiler is obviated, the heat produced is better utilized, and consequently there is a greater economy of fuel.

In the drawings, Figure 1 is a diagram of the apparatus used in carrying out this invention. Fig. 2 is a vertical section of the burner, drawn to a larger scale. Fig. 3 is a cross-section taken on the line *y y* in Fig. 2.

The steam boiler is marked A. Externally of this boiler is a receptacle M serving for mixing and storing combustible gases under pressure, air being forced into it by a pump L and combustible gas (such as illuminating gas, water gas, producer gas, oil gas, &c.), by a pump G under the requisite pressure and proportional volumes. The pumps L and G may be ordinary piston pumps or of any other construction. The only essential thing is, that in every case the mixture of the gases in the necessary proportions shall be effected and the mixture stored ready for use outside the boiler under such a pressure that it can be led continuously into the boiler at a certain higher pressure than that in the boiler.

The pumps L and G are connected with the reservoir M by pipes *l* and *g* which can be closed if necessary by cocks *l'* and *g'*. The reservoir M carries at a suitable point a pressure gage *m*. From the reservoir M a pipe B with shut off valve *b* leads to the boiler.

The introduction of the gaseous mixture in the steam boiler is effected from the pipe B through a pipe C with shut-off valve *c*. The pipe C reaches down to below the level of the

water and has near its boiler opening *d* one or more layers of metal wire gauze, perforated plates, or the like, which prevent the flame burning at the end of the pipe from flashing back into the pipe. To the pipe C is fixed a burner D of any suitable construction.

According to requirements, one or more burners can be provided in the boiler.

The ignition of the gaseous mixture is effected either directly through a closed opening in the sides of the boiler, or by an electric current. In the first named case the pipe C must be arranged to slide telescopically, in order, that its mouth may be raised above the water level for igniting the gaseous mixture.

For regulating the pressure of the gaseous mixture so as to be in accordance with the steam pressure, there may be provided in the pipe C in addition to the shut off valve *c*, a throttle valve *c'* which is so controlled by the steam pressure, that the quantity of the admitted gaseous mixture is reduced.

When the pipe C is telescopic, its lower part C' may be raised and lowered by any approved means, such as the rack Q' and pinion Q, and the mixture may be ignited through the opening *e*. A window P may be provided for observing the flame. When the mixture is lighted by electricity the wires *x x'* are inclosed in tubes *n n'* and inserted in the pipe C'. As the pressure of the gas mixture before ignition is greater than that of the steam and water in the boiler, the flame is not forced backward through the pipe C', and as the mixture contains all the elements necessary for combustion the flame is not extinguished by the water. The steam is led out of the boiler continuously and is not permitted to equal the gas mixture in pressure.

What I claim is—

1. A method of generating steam, which consists in first compressing inflammable gas and air, then conducting and igniting the compressed combustible mixture below the surface of water subjected to a less pressure than that of the said mixture, permitting the mixture to burn constantly thereby transforming the water into steam, and conducting the said steam away before its pressure becomes equal to that of the said mixture, substantially as set forth.

2. An apparatus for generating steam, comprising a boiler for holding water, a receptacle for compressed gas and air, telescopic pipes provided with a burner at their lower ends arranged below the water level of the boiler, and a pipe connection with the said receptacle, substantially as set forth.

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

GUILLAUME GÉRARD DE VILLENEUVE.

Witnesses.

HERMAN H. REQUE.

ERNST WOORINDER.