No. 878,330. PATENTED FEB. 4, 1908.

J. BLAKE.

STEAM GENERATOR.

APPLICATION FILED JAN. 2, 1907.

2 SHEETS—SHEET 1.

Fig. 2.

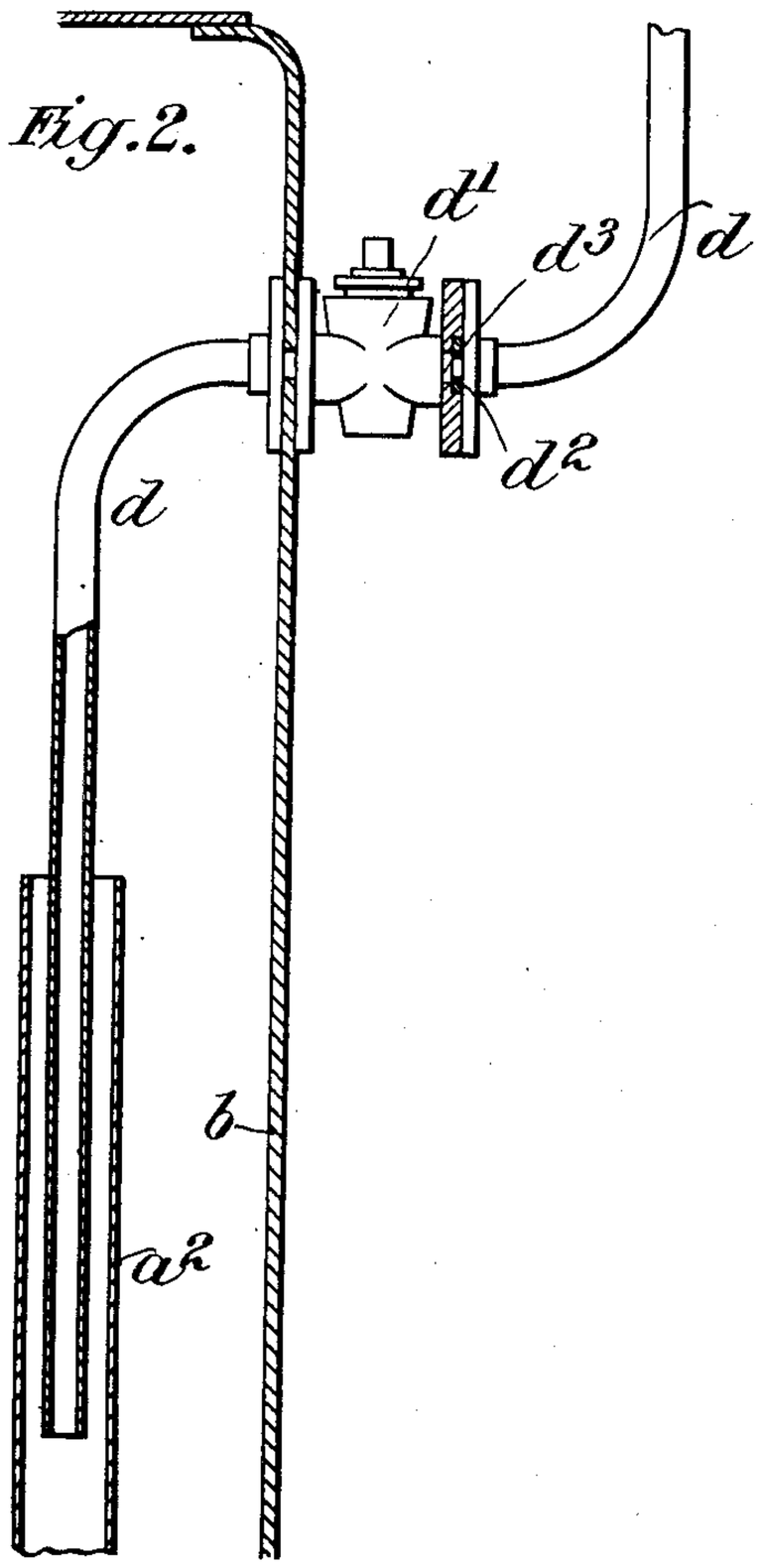
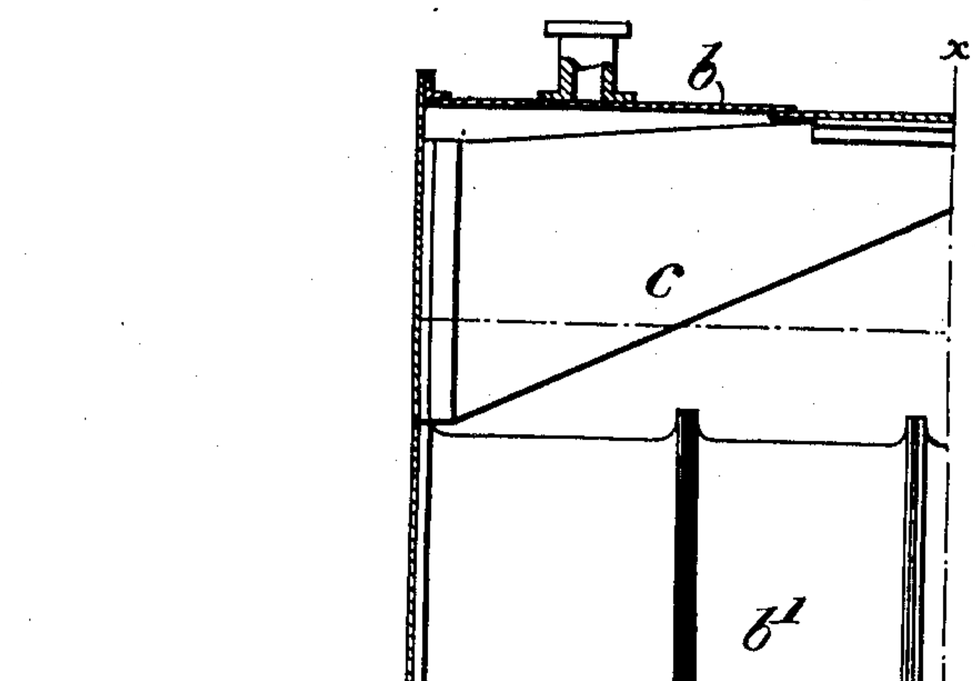


Fig. 1.



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No. 878,330. PATENTED FEB. 4, 1908.

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STEAM GENERATOR.

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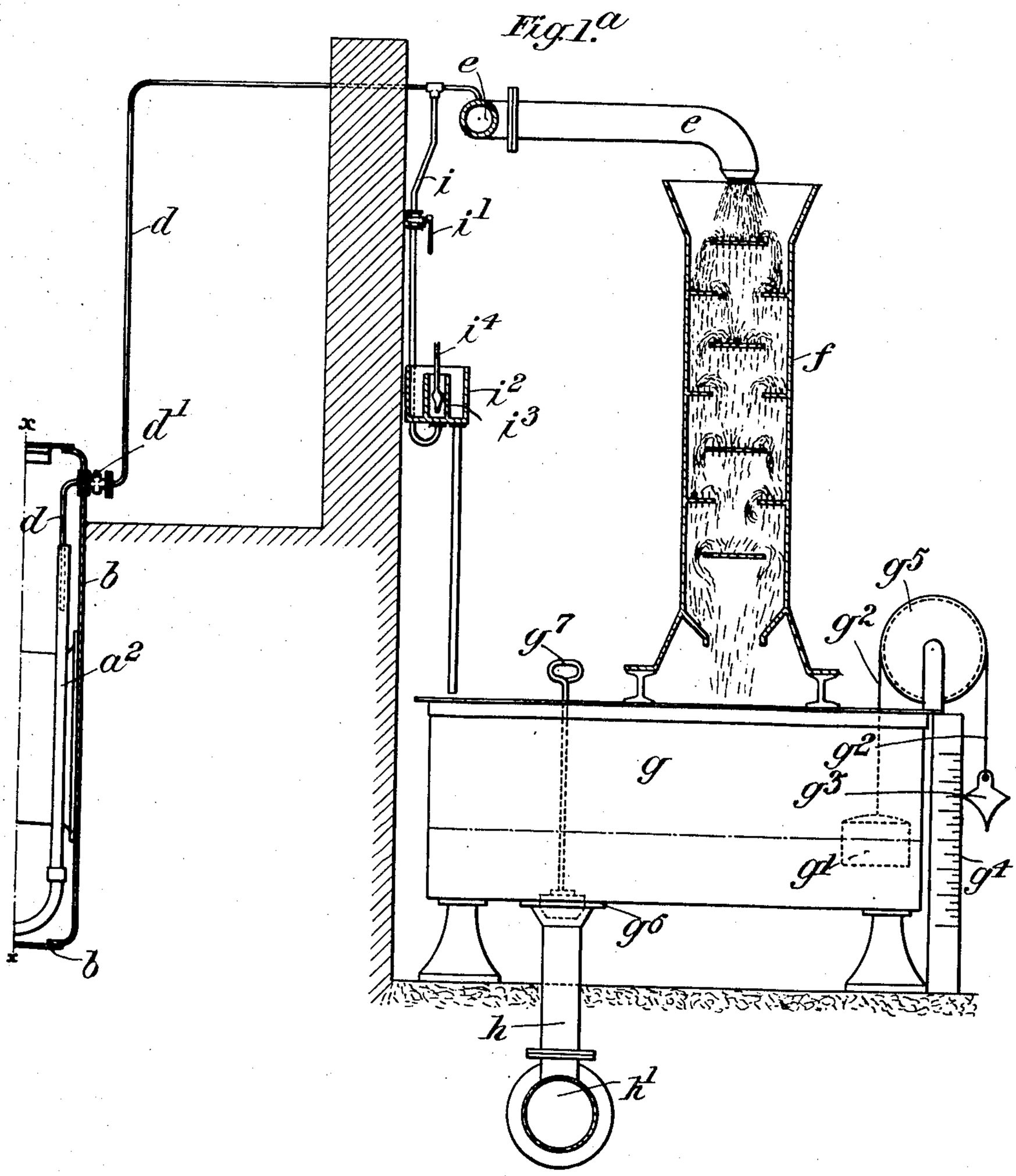
2 SHEETS—SHEET 2.

Fig. 1.a



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UNITED STATES PATENT OFFICE.

JAMES BLAKE, OF SILVERTOWN, ENGLAND, ASSIGNOR OF ONE-HALF TO JOHN WILLIAM MACDONALD, OF SILVERTOWN, ENGLAND.

STEAM-GENERATOR.

No. 878,330. Specification of Letters Patent. Patented Feb. 4, 1908.

Application filed January 2, 1907. Serial No. 350,484.

To all whom it may concern:

Be it known that JAMES BLAKE, a subject of the King of Great Britain, residing at the Thames sugar refinery, Silvertown, in the county of Essex, England, engineer, has invented certain new and useful Improvements in or Relating to Steam-Generators, of which the following is a specification.

This invention relates to steam generators, the object being to afford means for regulating the density or quality of the water during the working of the boiler and to insure safety in connection therewith.

According to the ordinary method, the boiler is provided with a discharge outlet at the lowest point through which the water is discharged when necessary into the drain or common sewer; the discharge outlet being furnished with a stop cock for use in this connection. Grave objections exist to this method from the fact that the water acts detrimentally on the blow down or discharge cock owing to the sediment and impurities contained in the water and its scouring and cutting effect on the blow down or discharge cock. The latter in consequence requires frequent renewal at considerable expense, great difficulty being experienced in preserving the fitting in a tight and good condition. Moreover, owing to the action of the water in the drains—the discharge being oftentimes effected at full pressure and high temperature—local authorities object to or prohibit such discharge.

Now the present invention is designed with a view to obviating these objections and inconveniences and to this end it is proposed to provide the boiler with a collector or pipe having perforations at a certain portion or at certain portions of its length, the said pipe being disposed within the boiler, along or near the bottom thereof or in any disposition most suitable for collecting the water to be discharged or ejected therefrom. In the case of a Lancashire boiler the aforesaid tube may be arranged at or near the shell at the lowest part; the arrangement being capable of adaptation for employment in connection with various types of boilers such as those of the tubular, water tube, locomotive, marine, Cornish and other types. The aforesaid pipe may be carried to near the back or front of the boiler and turned upwardly, terminating at a convenient height above the high water level in the boiler. Into this upturned end of the pipe is inserted an ejector pipe whereof the end descends within the collector pipe to such a distance that under no circumstances can the water in the boiler be blown below this pre-arranged height, say the low water level or any other desired height above the top of the furnace tube or the crown of the furnace as the case may be. Thus safety is insured and the emptying of the boiler provided against in the event of the cock, with which the said ejector pipe is furnished, being accidentally left open. The ejector pipe is carried to the exterior of the boiler where it is provided with a cock having a bronze or other diaphragm formed with an aperture or perforation of suitable size arranged in alinement with the bore of the plug and of the aforesaid ejector pipe. The object of this restricted aperture is to allow the water to be blown out or ejected in the required quantity in proportion to the rise of specific gravity or accumulation of salts or other impurities either due to the water or the treatment it has received previously. The water ejected may be conducted to any suitable apparatus such as a heating, condensing or collecting tank or device from whence it may be drawn for re-use after suitable treatment or from whence it may be discharged into the drain or sewer.

A measuring device may be arranged in connection with the collecting tank if desired.

By means of this invention the condition of the water in the boiler may at all times be under intelligent supervision. The quantity of water discharged may also be readily ascertained and its condition tested from time to time. The necessity for discharging or throwing large quantities of water at high temperatures, and steam, into drains is obviated and the water is maintained at a constant proper working level, the feed always being supplied at a uniform rate to compensate for the evaporation or amount of steam produced. The necessity for increasing the feed supply, as is ordinarily the case, just previous to, and after, the operation of discharging has taken place, is therefore entirely obviated as also the tendency to "prime", incidental to irregularities in the feed supply. Further, by the employment of the improved device, the usual blow off

cock and isolating valve with their attendant dangers and inconveniences—for example the tendency to their being left open—are dispensed with, the said blow off cock (for example) being only required for use when it is desired to empty the boiler, after all pressure has been relieved. The danger in opening and closing blow down cocks under high pressures is also entirely obviated, while the danger to attendants engaged in cleaning or repairing neighboring boilers is avoided, by removing the necessity for the use of the blow down cock.

The blow off cock for the purpose last above mentioned may be provided with a screwed cap or flange, a suitable pipe connection which may be of a flexible type being made with the said cock when it is desired to empty the boiler.

It may be remarked that the wearing action of the device is confined to the diaphragm or plate in the cock on the ejector pipe. This perforated plate or diaphragm may however be removed and replaced at a very small expense.

In order that the invention may be clearly understood and readily carried into effect we will describe the same with reference to the accompanying drawings in which the invention is represented as applied, by way of example, to a boiler of the Lancashire type.

Figure 1 and 1[a] shows a longitudinal section of a boiler of the aforesaid type having the present improvements applied, a sufficient portion only of the length of the boiler being shown as is necessary to illustrate the present invention, there being included a means of condensing cooling and collecting the water ejected or blown out from the boiler. Fig. 2 is an enlarged view of the upturned end of the collector pipe and ejector pipe showing the diaphragm in the cock provided on the latter pipe whereby the quantity of water blown out may be regulated.

In these figures a is the collector pipe arranged within the shell b of the boiler along or near the bottom thereof. This pipe is provided with perforations such as indicated at a' and is turned upwardly at one end as shown at a^2 to a height above the high water level indicated by way of example at c, Fig. 1. Into this upturned end a^2 there is inserted, so as to descend a suitable distance below or about the low water level in the boiler so that the water may never be blown below that level or below the tubes or crown of the furnace b', an ejector tube d. This tube is carried to the exterior of the boiler shell, where it is furnished with a cock d' whereby the blowing is permitted. Owing to the pressure in the boiler the water which rises in the aforesaid collector pipe is prevented from escaping into the boiler but is caused to enter the ejector pipe d and pass away through the cock d'. The water escaping by way of the pipe d may be conducted to a distributing pipe e from whence the water may be delivered to a condenser or cooler f of any suitable type which may be arranged above a collecting tank g. This latter may be provided with a measuring appliance comprising a float shown in dotted lines at g' connected by a cord or other flexible connection g^2 with a marker or indicator g^3 arranged in proximity to a scale g^4. The aforesaid connection g^2 passes over or around a sheave or pulley g^5. The tank g may further be provided with a plug or valve h^6 having a handle g^7 for use in emptying the tank; the said plug being adapted to close an exit to a pipe such as h leading to the sewer or drain h'. The pipe d may be provided with a branch i and cock i' for conducting a quantity of the water blown from the boiler to a testing device such as illustrated at i^2, the said testing device in the present instance comprising a receptacle formed with an inner compartment i^3 in which is disposed a hydrometer i^4. The cock d' is provided with a bronze or other diaphragm d^2 having an aperture d^3 therein of a size adapted to regulate the quantity of water blown out or ejected from the boiler. The said diaphragm in the event of wear taking place may be readily replaced by a new diaphragm. The aperture is arranged in alinement with the bore of the plug pertaining to the cock d' and with the bore of the pipe d.

The operation of the apparatus will be readily understood by those acquainted with the working of steam boilers and it will be further understood that in no case can the level of the boiler be blown below that at which the working of the boiler is conducted in safety and also that the feed of the boiler is maintained constant. The boiler is furnished with the usual blow off cock k, but this when employed in conjunction with the present invention is only required for use when it is desired to empty the boiler.

l is the sewer or drain or pipe leading thereto.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a steam generator, a collector pipe having perforations therein and an upturned portion extending above the water level and being open and an ejection pipe inserted in the said collector pipe and extending exteriorly of the shell of the boiler.

2. In a steam generator, the combination with the collector pipe and ejector pipe of a cock on said ejector pipe having a diaphragm formed with an aperture alined with the bore of the plug of said cock.

3. In a steam generator, the combination of a collector pipe, an ejector pipe, a cock on said ejector pipe, a diaphragm in said cock

having an aperture alined with the bore of the plug in said cock, and a blow down cock in the bottom of the boiler.

4. In a steam generator, the combination with the shell of the boiler and a blow down cock, of a collector pipe having perforations therein and arranged near the bottom of the said shell, an upturned portion on said collector pipe ascending above the high water level in the boiler and being open to the boiler and an ejector pipe inserted in the said upturned portion of the collector pipe so as to descend therein to about the low water level in the boiler.

5. In a steam generator the combination with the shell of the boiler and a blow down cock, of a collector pipe having perforations therein and arranged near the bottom of the said shell, an upturned portion on said collector pipe ascending above the high water level in the boiler, an ejector pipe inserted in the said upturned portion of the collector pipe so as to descend therein to about the low water level in the boiler, and a cock on the said ejector pipe having a diaphragm therein formed with an aperture arranged in alinement with the bore of the plug of said cock.

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

JAMES BLAKE.

Witnesses:

FRANCIS F. MCARDLE,

J. WILLIAM PATCHING.