

1,037,695.

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MEANS FOR COLLECTING AVERAGE SAMPLES OF GAS.

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To all whom it may concern:

Be it known that I, HENRY J. WESTOVER, a citizen of the United States, residing at the city of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Means for Collecting Average Samples of Gas; 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.

In the management of steam boilers according to modern standards of economy it is important to be able to secure daily tests of the average composition of the gaseous products of combustion of each furnace. Such tests serve as an accurate check upon the economical management of the various furnaces.

The apparatus hitherto proposed for the purpose of collecting these gases has been open to two principal objections.

In the first place the supply of gas collected at any given moment depends upon the momentary gas pressure existing in the furnace, or in that part of the flue or chimney whence the gas to be tested is led to the collecting means. Inasmuch as this pressure is subjected to variations of a very considerable magnitude as compared with the total pressure, it follows that the final composition of the gases collected in a working day will contain too great a proportion of gas of the composition existing at times of high furnace pressure, and too little gas of the composition existing during periods of low pressure.

In the second place, the apparatus hitherto most commonly employed has depended for operation upon the slow movement of a displacing liquid through small apertures and tubes. The accidental collection of dirt within such discharge openings has been unavoidable, and given rise to serious errors in composition of averages.

My present invention has reference to means whereby a volume of gas of true average composition may be collected during any predetermined period of time; and my improved apparatus avoids both of the serious objections above discussed.

My invention is illustrated diagrammatically in a preferred embodiment in the accompanying drawing.

In the practice of my invention I employ an automatic collector in combination with an introductory container and with means for producing a flow of gas through said container due to a pressure-difference so much greater than the total pressure-difference productive of ordinary draft at the point of derivation of the gas from the furnace that the expected variations in this latter pressure-difference will have no appreciable effect upon the composition of the small proportion of gas taken into the final collector from the introductory container. A pressure-difference having this overwhelming predominance over the natural pressure-difference within the furnace or flue I shall call a "dominant" pressure-difference.

In the drawing a boiler furnace of any desired construction is shown at 10, and from any convenient point of derivation 11, the primary collecting pipe 12 is carried to the primary seal or liquid check valve 13. At 14 is a gage which may be used if desired on the pipe 12.

From a point above the liquid in the vessel 13 the gases are led into the introductory container, which, in the form shown consists of a pipe 15. The gases are led through this container to a point beneath the surface of the liquid in the secondary seal 16. In order to safely dispose of any liquid carried over by the gas, and to prevent undue rise in the level of the liquid in the seal 16, I prefer to use an outlet valve 17, normally open during collection of gas. To prevent air being sucked inward through this valve, I use a partition 18 depending from the closed top of the vessel 16. The liquid in the vessels 13 and 16 is kept at a common level by a pipe 19 connecting the two, and the ends of the pipes 12 and 15 should have an equal submergence in their respective sealing liquids.

An automatic regulator is preferably employed in the line of travel of the gases, and, in the form shown, this comprises a vessel 20 containing an appropriate liquid and connected to the vessel 16 by a pipe 21 whose extremity is submerged in said liquid, as shown. From the top of the vessel a pipe 22 leads to a suction ejector 23 provided with a steam jet 24 fed through a pipe 25 leading from a boiler 26. The valve 27 may be used to control this steam jet. Other

means for producing a rapid and positive circulation of gas in this connection are within my invention.

Passing downward through the top of the vessel 20 and submerged in the sealing liquid is a pipe 28 so mounted as to be capable of adjustment up and down. Owing to the excess of pressure in the atmosphere over that in the top of the vessel 20, the level of liquid will stand much lower in the tube 28 than in said vessel. In adjusting the tube 28 it is so placed that any considerable excess of suction in the pipe 22 will admit air through 28, and thus prevent a too violent evolution due to entrance of gas through the container-tube 15. Small changes in the suction exerted by the jet 24 are compensated for by admitting full atmospheric pressure on one side of a depending partition 29, so that, when a small increase of suction occurs, the liquid rises around the tube 21, and counteracts the tendency to draw too much gas there-through.

It is to be understood that other suction producing means may be substituted for the steam jet, and that other forms of automatic check valves and regulating valves may be employed without departing from this invention.

It is to be further understood that it is not essential to my broad invention that the mechanism or any part thereof should be run without intermission.

It is clear that, by use of the means thus far described, a stream of gas is produced through the introductory container 15 and that the pressure-difference between this gas and the atmosphere is always practically independent of the pressure-difference existing at a given moment in the furnace. My invention, broadly considered, covers any means for producing this condition, in combination with an automatic collector. The invention also covers the method involved.

The form of automatic collector shown in my drawing comprises a receiver 30 closed at the top, save where a pipe 31 connects the receiver to the introductory container 15. The receiver 30 is fixed, as by the suspending devices 32. The bottom of the receiver is open.

Where it is desired to collect gases from a number of furnaces at once, a corresponding number of receivers should be used, each leading to a corresponding introductory container. I have shown two such receivers, but it will not be necessary to duplicate the illustration of the remaining parts.

Surrounding the receiver or receivers 30 is a tank 33, containing a suitable displacing liquid, the top of said tank being open to the atmosphere.

The tank 33 is supported upon chains or

cables 34, passing over suitable pulleys 35, and provided with counter-weights 36. The movement of the tank is controlled by any automatic motor, as for instance the clockwork 37 acting through a pinion 38 and chains or cables 39. This clockwork produces a slow downward movement of the tank 33, causing the level of liquid to descend in the receivers 30, and thus drawing into these receivers a continual slow supply of gas from the pipe 15. Obviously the composition of the gas in any receiver 30, at the end of a given period, will represent the average composition of the gases drawn through the pipe 15 corresponding to such receiver. Any mode of testing this gas when desired may be resorted to. For instance, a gas analyzing apparatus, shown in diagram at 40, may be connected to the pipe 31, by a branch pipe 41. The valve 42 being opened and the valve 17 closed, the tank 33 may be lifted, by reverse movement of the pinions 38 or otherwise, and thus gas will be forced back into the analyzing apparatus 40.

Various changes may be made in this apparatus without departing from my invention, and I do not limit myself to the details herein shown and described.

What I claim is—

1. Means for obtaining an average sample of gas from a furnace comprising in combination an automatic collector, an introductory container connected with the furnace and with said collector, and means for producing a dominant pressure-difference in said introductory container, substantially as described.

2. Means for obtaining an average sample of gases from a furnace comprising in combination an automatic collector, an introductory container connected with the furnace and with said collector, and means for creating a strong current of gases from the furnace through said container, substantially as described.

3. Means for obtaining an average sample of gases from a furnace comprising in combination an automatic collector, an introductory container connected at a point between its ends with said collector, a connection between the furnace and one end of said container, and a steam ejector connected with the opposite end of said container, substantially as described.

4. In means for obtaining an average sample of gases and in combination with a furnace, an automatic collector, an introductory container connected with said furnace and said collector, means for creating a dominant pressure-difference within said container and a gas analyzing apparatus connected with said collector, substantially as described.

5. In means for obtaining an average

sample of gases, an introductory container, a liquid seal at each end thereof and means for drawing a current of gas through said container and said seals, substantially as described.

6. In means for obtaining an average sample of gases, an introductory container, a liquid seal at each end thereof, a connection between said seals beneath the liquid in each to preserve a common level in the two, and means for drawing a current of gas through said container and seals, substantially as described.

7. In means for obtaining an average sample of gases a suitably sealed introductory container, means for creating a current of gas in the same and a pressure regulating valve connected to one end of said container, substantially as described.

8. In means for obtaining an average sample of gases, an introductory container, means for creating a current of gas through the same, and a liquid seal at each end of said container, one of said liquid seals comprising a vessel of liquid having a depending partition, substantially as described.

9. In means for obtaining an average sample of gases, and in combination with an

introductory container and means for creating a current of gas through the same, a regulating valve connected with one end of said container and comprising a vessel containing liquid placed in the path of said current of gas and a tube adjustable in position leading from the atmosphere to a point beneath said liquid, substantially as described.

10. In means for obtaining an average sample of gases, and in combination with an introductory container and means for creating a current of gas through the same, a regulating valve connected with one end of said container and comprising a vessel containing liquid, having a depending partition and open to the atmosphere on only one side of said partition, and a tube adjustable in position on the closed side of said partition leading from the atmosphere to a point beneath said liquid, substantially as described.

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

HENRY J. WESTOVER.

Witnesses:

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