ON THE USE OF BUNSEN BURNERS AND COMBUSTION APPARATUS WITHOUT CITY GAS.

By H. D. Gibbs.

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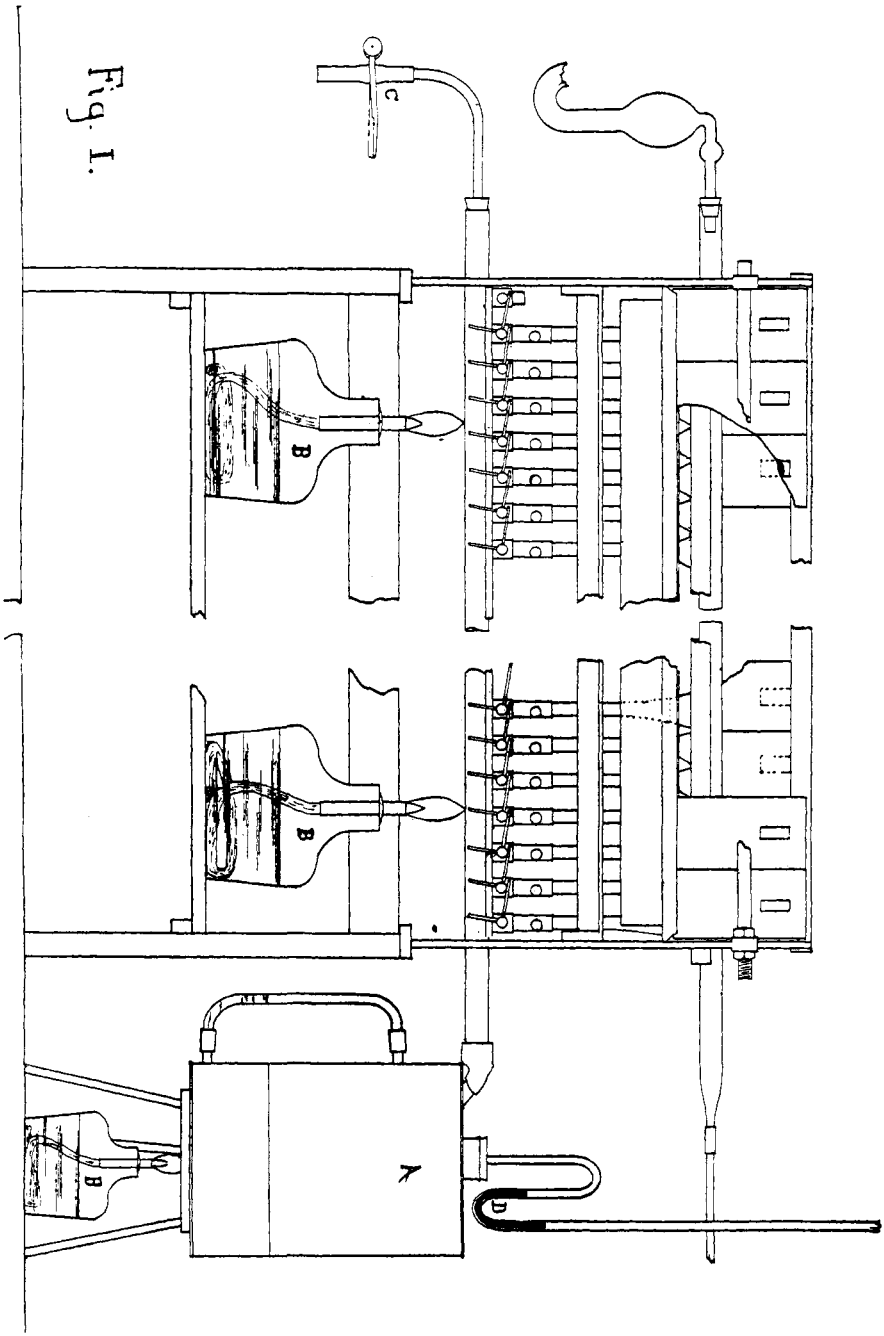
Description of an apparatus whereby Bunsen burners, either individually or in large numbers, as in the combustion furnace, are readily made available for use in laboratories devoid of gas of the proper kind and under the proper pressure.

Finding it impossible to employ the ordinary combustion furnace when the only gas available was that manufactured from gasoline by two machines, one of 150 burners capacity, supplying the general chemical laboratories, the other of 75 burners capacity, supplying the organic and agricultural chemical laboratories, owing to the fact that not more than 4 burners in the combustion furnace could be lighted at one time, even though the machines appeared to be giving as good gas and under as great a pressure as is usual in generators of this character, I was forced to attempt the employment of some other easily manufactured gas, obtainable quickly and in large quantities, avoiding the necessity of large storage tanks and which could be burned in Bunsen burners. For this purpose gases derived from boiling gasoline, benzine, ligroin, kerosene, methyl alcohol, ethyl alcohol and mixtures of waste solvents from the organic laboratory were employed in different forms of apparatus with varying success.

Most satisfactory results were obtained by boiling the liquid in a copper boiler of about 4 liters capacity (a gallon kerosene can was first employed, but was found to be of insufficient strength and durability) and passing the vapors directly into the Bunsen burners.

Fig. 1 shows the apparatus as employed with the combustion furnace. The copper boiler A is fitted with a gas outlet tube leading directly into the gas tube of the combustion furnace, a manometer, D, and a gauge to show the height of the liquid. The alcohol lamps B supply heat for vaporizing the liquid and warming the tubing and burners, thus avoiding condensation. The pinch-cock C is opened while air is being expelled and the tubing is warming. When the air is displaced, one or more of the Bunsen burners are opened, the pinch-cock is closed and the burners lighted.

Fig. 1.



Gasoline boiling above 60° C., benzine above 80°, ligroin above 100°, and kerosene above 140° produced a smoky flame, and all efforts to alleviate this difficulty by the introduction of more air were unavailing. Even in the blast-lamp a colorless flame could not be produced with the vapors of these liquids. Moreover, the use of low-boiling paraffins is accompanied by considerable danger unless great care is exercised. It is believed, however, that the vapors of these liquids could be employed in specially constructed burners having an extremely fine hole for the gas outlet

Commercial grades of methyl and ethyl alcohol (95 per cent.) were found admirably adapted to the purpose.

The vapor of either alcohol was capable of producing more heat than would perhaps ever be required in the combustion furnace. The size of the flames is very easily regulated and kept constant by the rate of ebullition of the alcohol in the boiler. The adjustment can be made to a nicety when a number of burners are operated at the same time, and with a little practice even one burner can be used, but the size of its flame will vary rapidly as the pressure in the boiler varies.

When the alcohol once reaches the boiling-point, but very little heat is required to produce all of the gas necessary for a 24-burner furnace and in no case did the pressure, shown by the mercury manometer, indicate over 10 mm. pressure. Usually the pressure was so small as to be hardly visible in the mercury column. Sufficient gas is readily obtainable from one generator for the running of several furnaces at the same time.

The heat for vaporizing the alcohol and warming the tubing conducting the same to the point of ignition can be obtained from alcohol lamps, thus eliminating the necessity of any other form of gas machine. I have employed the apparatus in this way with very satisfactory results, but usually found it more convenient to use, as a source of heat for vaporizing the alcohol and warming the tubing, the low-pressure gasoline gas from the gas machines.

The apparatus was also found adaptable for use in isolated burners where no gas of any description is available.

Fig. 2 shows the apparatus as employed in this way. The copper boiler is fitted as in Fig. 1, the gas outlet tube leading directly to the Bunsen burners. The pinch-cock C is opened

while the air is being expelled from the tubing. When alcoholic vapors issue strongly, the pinch-cock is closed and the burners lighted. D is a mercury manometer, showing the pressure in the boiler.

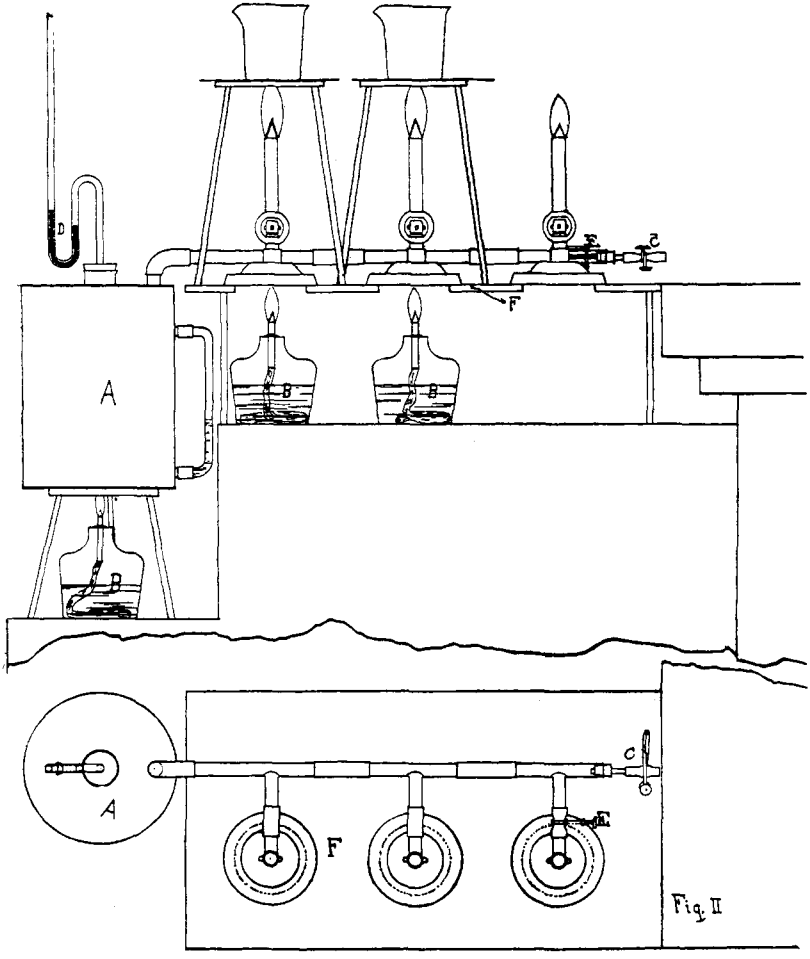


Fig. II

No difficulty is experienced in adjusting the size and regularity of the flame produced if one burner in addition to the number in actual use is kept lighted. By means of the screw pinch-cock E, controlling the flow of gas into this extra burner, the flames in actual use can be adjusted within narrow limits. Such a screw

pinch-cock may be employed for each burner. The sheet steel plate F, at the height of the laboratory table, is perforated at desired points with holes over which the Bunsen burners are placed in position to be readily warmed by small flames from the alcohol lamps B.

The chief advantage of the apparatus for laboratories remote from city supplies of gas is: The almost immediate availability of an unlimited, cheap supply of gas, capable of producing any desired degree of heat in the combustion furnace or in isolated Bunsen burners.

My students find no difficulty or danger in employing the apparatus for all work requiring the combustion furnace.

I have Mr. C. W. Beaver to thank for assistance in the preliminary experimentation.

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FORMS IN WHICH SULPHUR OCCURS IN COAL: THEIR CALORIFIC VALUES AND THEIR EFFECTS UPON THE ACCURACY OF THE HEATING POWERS, CALCULATED BY DULONG'S FORMULA.

(SECOND PAPER.)

BY E. E. SOMERMEIER.

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OXIDATION OF PYRITES: PRODUCTS FORMED, THEIR CALORIFIC VALUES AND THEIR EFFECTS UPON THE HEATING VALUE OF COAL.

Upon exposure to air and moisture the pyrites in coal gradually oxidizes, the main product of oxidation being ferrous sulphate, together with smaller and variable amounts of free sulphur, free sulphuric acid, ferric sulphate and sulphur dioxide.

To obtain quantitative values for the products resulting from oxidation, tests were made upon a number of different samples of coal and pyrites.