W. S. BOWEN.

METHOD OF PRODUCING HEAT.

APPLICATION FILED AUG. 17, 1920.

**1,415,780.** Patented May 9, 1922.

Fig. 1.

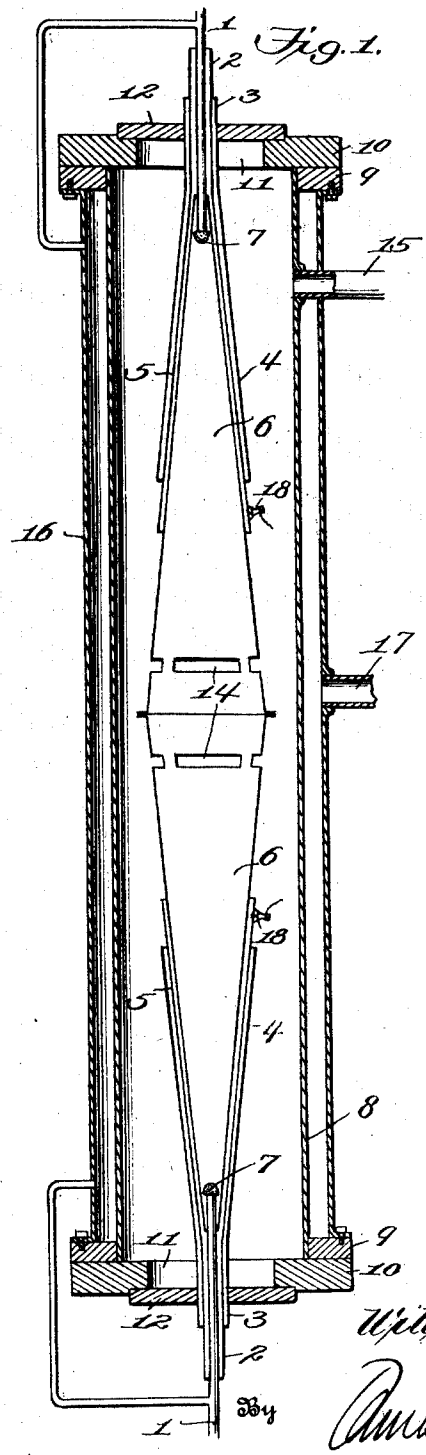



Fig. 3.

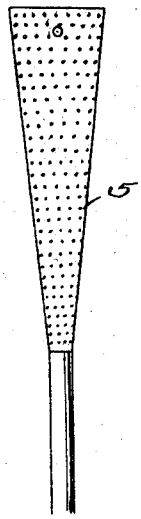
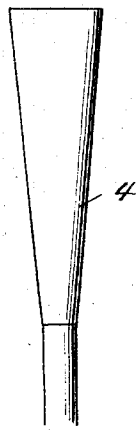



Fig. 2.




Witness

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# UNITED STATES PATENT OFFICE.

WILLIAM SPENCER BOWEN, OF NEW YORK, N. Y.

## METHOD OF PRODUCING HEAT.

1,415,780. Specification of Letters Patent. Patented May 9, 1922.

Application filed August 17, 1920. Serial No. 404,248.

*To all whom it may concern:*

Be it known that I, WILLIAM SPENCER BOWEN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Methods of Producing Heat, of which the following is a specification.

My invention relates to the production of heat by the continuous burning of gaseous mixtures and subsequently cooling said gases to the desired temperature for efficient utilization in doing useful work.

According to my invention the incoming fuel and air mixture is preheated in the heater by the hot gases of combustion previous to ignition. There is no flow of explosive mixture as in surface combustion and consequently the velocity of flow need be only sufficient to carry enough fuel and air to maintain combustion. This point is considered very important as the loss of efficiency involved due to the high velocities required in surface combustion is considerable.

Furthermore, the air used for cooling purposes is introduced after combustion has taken place and this air is previously heated by passing the same through a jacket surrounding the heater thus producing a heat insulating jacket and the air moving through this jacket returns heat to the heater which would otherwise be lost.

The heater of my invention also effectively employs radiant heat by providing cone-shaped shells which are enveloped by the burning fuel and air mixture and the heat from these shells is reflected and re-reflected in the interior thereof until absorbed by the air or other gas while passing through them.

In the drawing accompanying this application:—

Fig. 1 shows a vertical section of an embodiment of my invention.

Fig. 2 is a side elevation of the outer conical tube.

Fig. 3 is a side elevation of the intermediate conical tube.

Two cone-shaped bodies 6 preferably of thin metallic material, so as to proximate shells, are placed base to base within the air jacket or casing 16, and secured together by any suitable means such as bolts (not shown) passing through the contacting base flanges of the same. While it is preferable that the conical bodies should be made of sheet metal such as iron, an infusible material may also be used if deemed advisable. A conical tube 5 surrounds a portion of each of the cones 6, in spaced relation thereto in order to form an annular passageway which is adapted to contain the burning gaseous mixture as will hereinafter appear. The cones 5 are connected directly to the fuel pipes 2 which may conduct either gaseous or vaporized oil fuel for use in the heater.

Air or other combustion supporting gas is admitted through the pipe 3 which preferably surrounds the fuel pipe 2 and connects to a cone-shaped outer tube 4 which surrounds the tube 5 in spaced relation so as to provide an annular passage whereby compressed air may be fed into the annular space between the conical tubes 4 and 5. The surfaces of the cones 5 are provided with a multiplicity of perforations (see Fig. 3) and the bases of the cones 4 are closed so that all air admitted to the annular spaces between cones 4 and 5 must pass through these perforations. In this way a complete fuel and air mixture is obtained within the heater just before the ignition point is reached. The conical expansion of the flame has a good effect on its burning, since it slows down the initial fuel velocity gradually so that proper mixture and burning can take place more easily and evenly.

Air is supplied to the jacket 16 by connection 17 which leads to an air pump or compressed air reservoir (not shown). After circulating through the air jacket and becoming heated the air is conducted by pipes 1 to the nozzles 7 and into the interior of the conical shells 6. It should be noted that this air has no direct contact with the flame but receives its heat almost solely by radiation from the shells 6.

The compressed air passes through the cones 6 and passes in a diverging stream corresponding to the apex angle of the conical shells and passes out through ports 14 near the bases of the cones into the general receiving chamber within the casing 16 which is beyond the point of ignition and burning of the fuel and air mixture. This air is preheated by its passage through the jacket, and the fuel mixture is preheated by the hot gases surrounding the conical tubes 4 and 5. A spark plug 18 is provided in each of the cones 5 beyond the closed end of the outer conical tube 4 in order to ignite the fuel mixture formed with the air in the annular pas-

sage between the tubes 4 and 5 which passes through the perforations of the tube 5 and forms a combustible mixture with the fuel in the annular space between the cones 6 and the conical tubes 5. The outlet pipe 15 conveys the gaseous products from the heater to the point at which they are utilized.

The numeral 9 designates a flange and 10 a base bored out so as to form the hole 11 through which all interior apparatus can be removed as a unit. A closure plate 12 is provided which may be bolted to the plate 10 or fastened thereto in any suitable manner.

It is contemplated also by my invention that water instead of air may be passed through connection 17, jacket 16 and pipes 1 to suitable nozzles 7 and sprayed into the interior of the conical bodies 6, thus being converted into steam by radiant heat. The steam will then pass through ports 14 and mingle with the combustion products in the manner described above for the compressed air.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. The method of producing heat, which consists in conducting fuel and a combustion supporting gas in proportions to form an explosive mixture in co-axial gradual tapering streams, mixing the fuel and gas near the point of ignition, enveloping a cone-shaped moving column of air in the burning fuel and gas mixture, and subsequently introducing air from said column into the products of combustion.

2. The method of producing heat, which consists in conducting fuel and a combustion supporting gas in proportions to form an explosive mixture in co-axial gradual tapering streams, mixing the fuel and gas near the point of ignition, preheating the mixture by the hot gases of combustion and introducing air for cooling the products of combustion.

3. The method of producing heat, which consists in enveloping a diverging moving column of air in a burning fuel and air mixture and subsequently introducing air from said column into the products of combustion.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

WILLIAM SPENCER BOWEN.

Witnesses:
CHAS. J. WILLIS,
LESTER STORK.