P. H. GRIMM.

SULFUR BURNER.

APPLICATION FILED MAY 23, 1908.

924,980.

Patented June 15, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

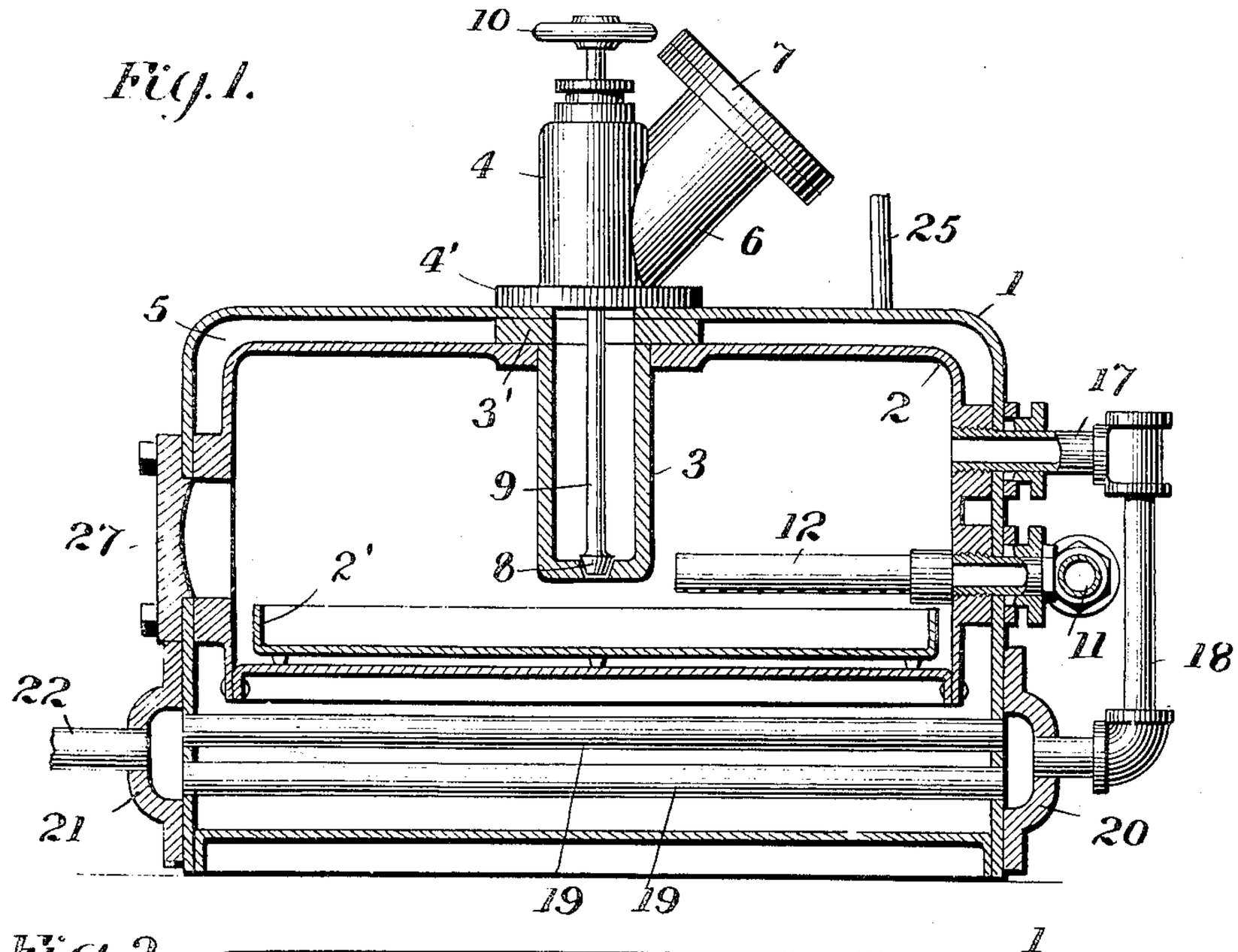
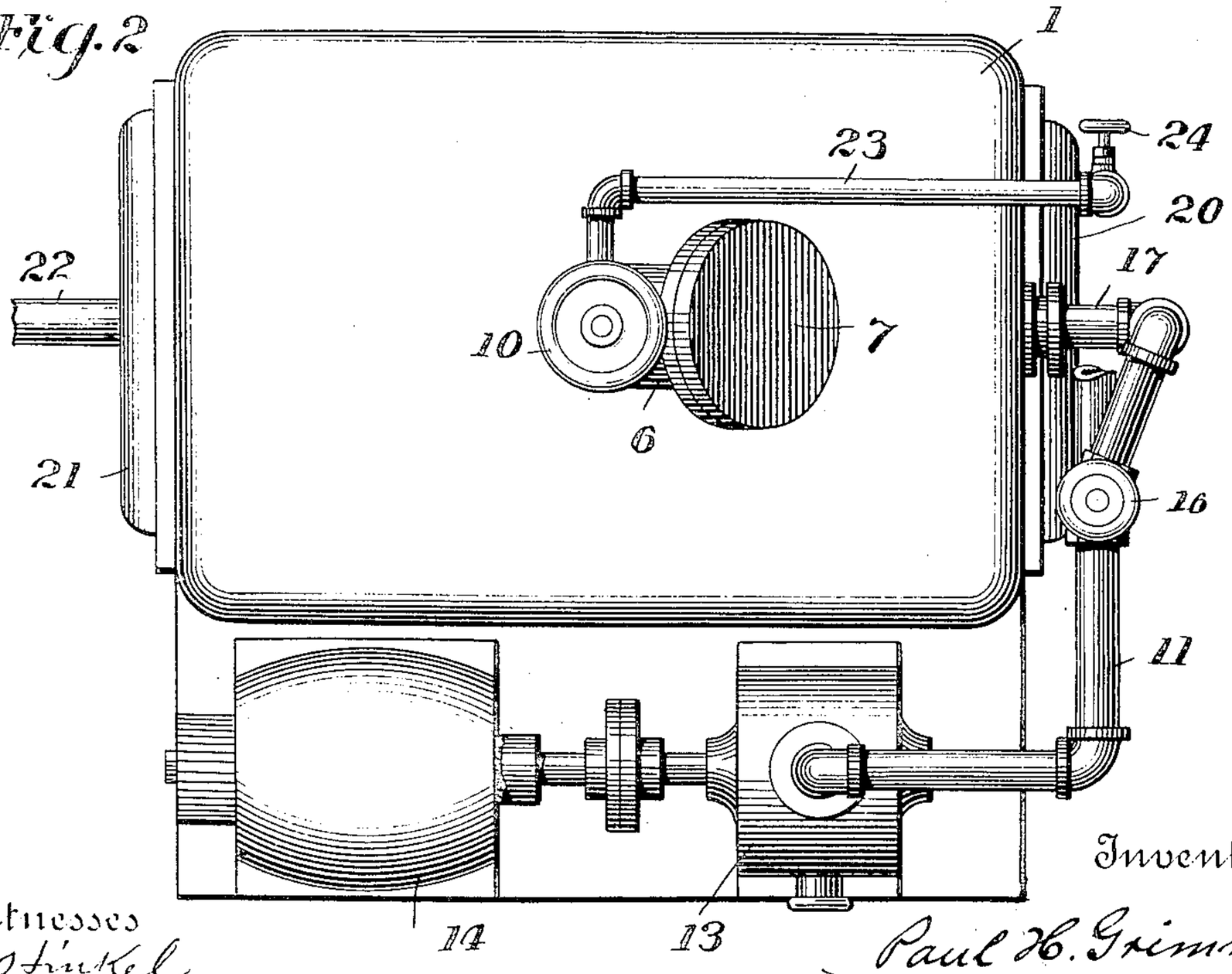


Fig. 2.



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2 SHEETS—SHEET 2

Fig. 3

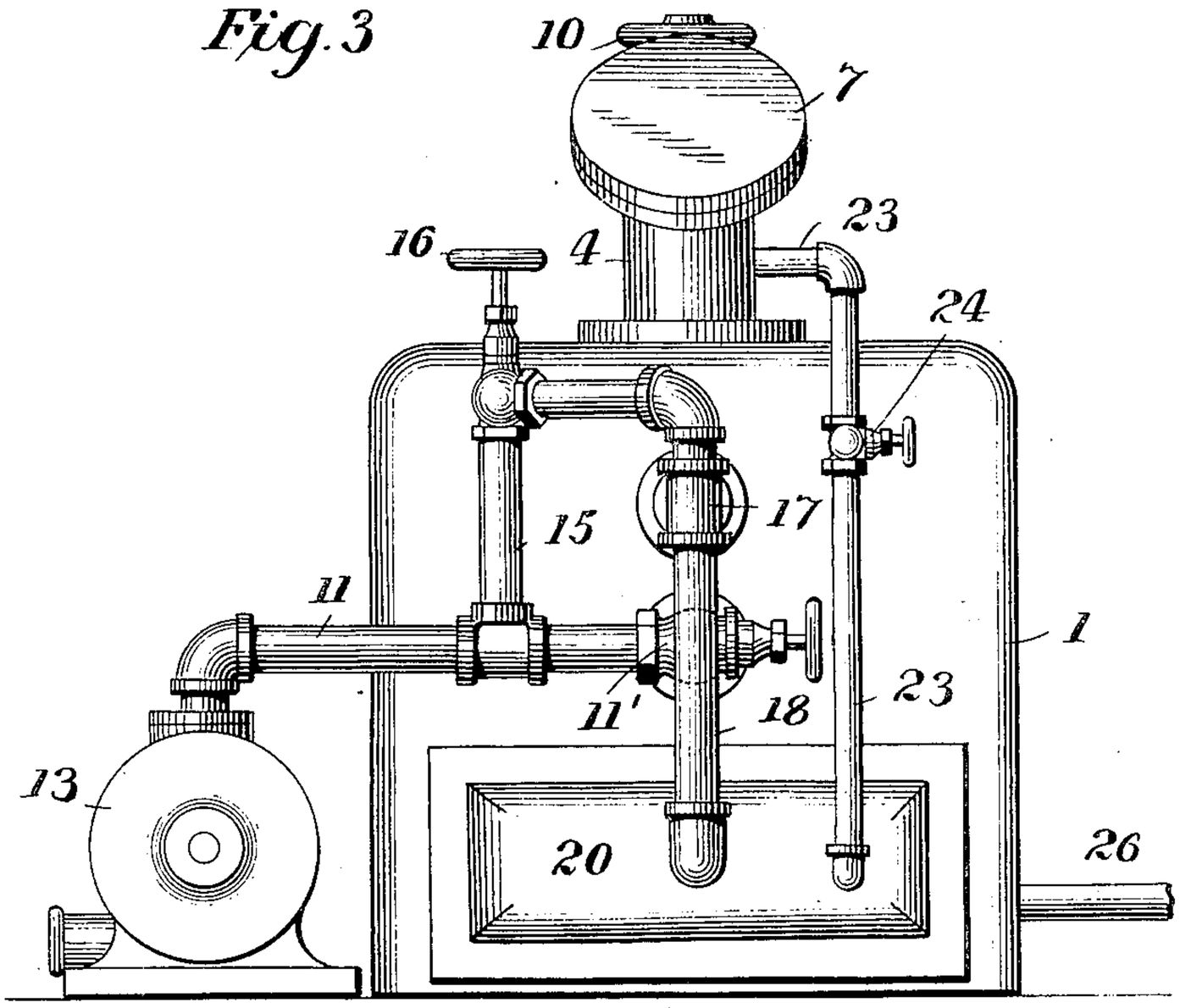


Fig. 4.

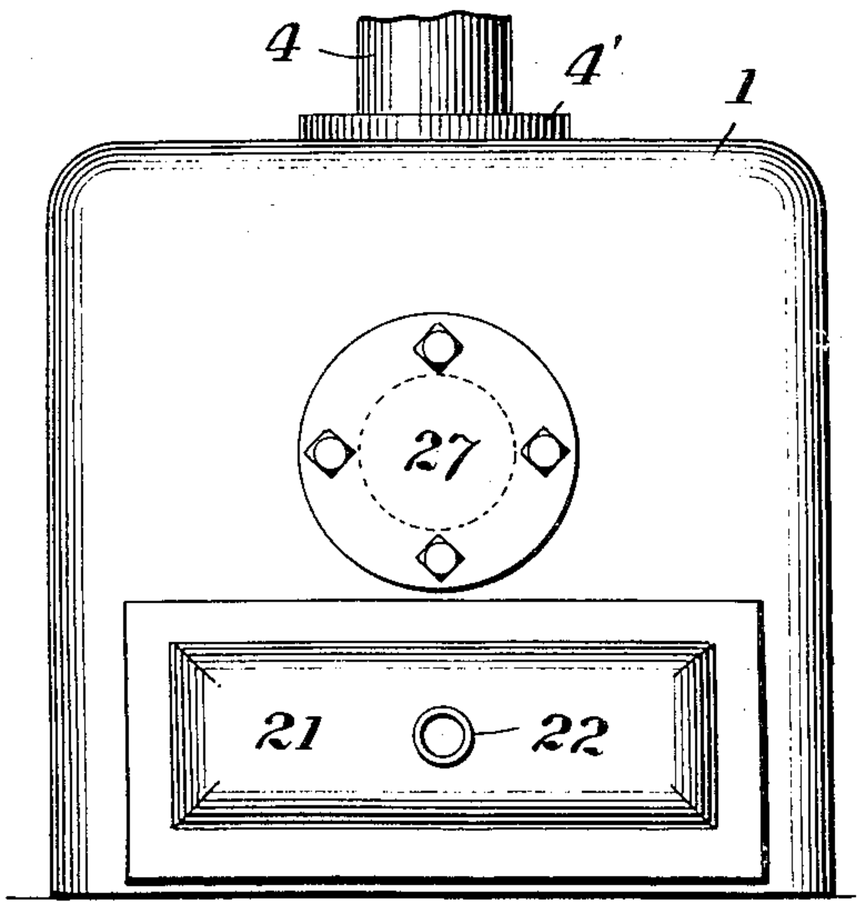
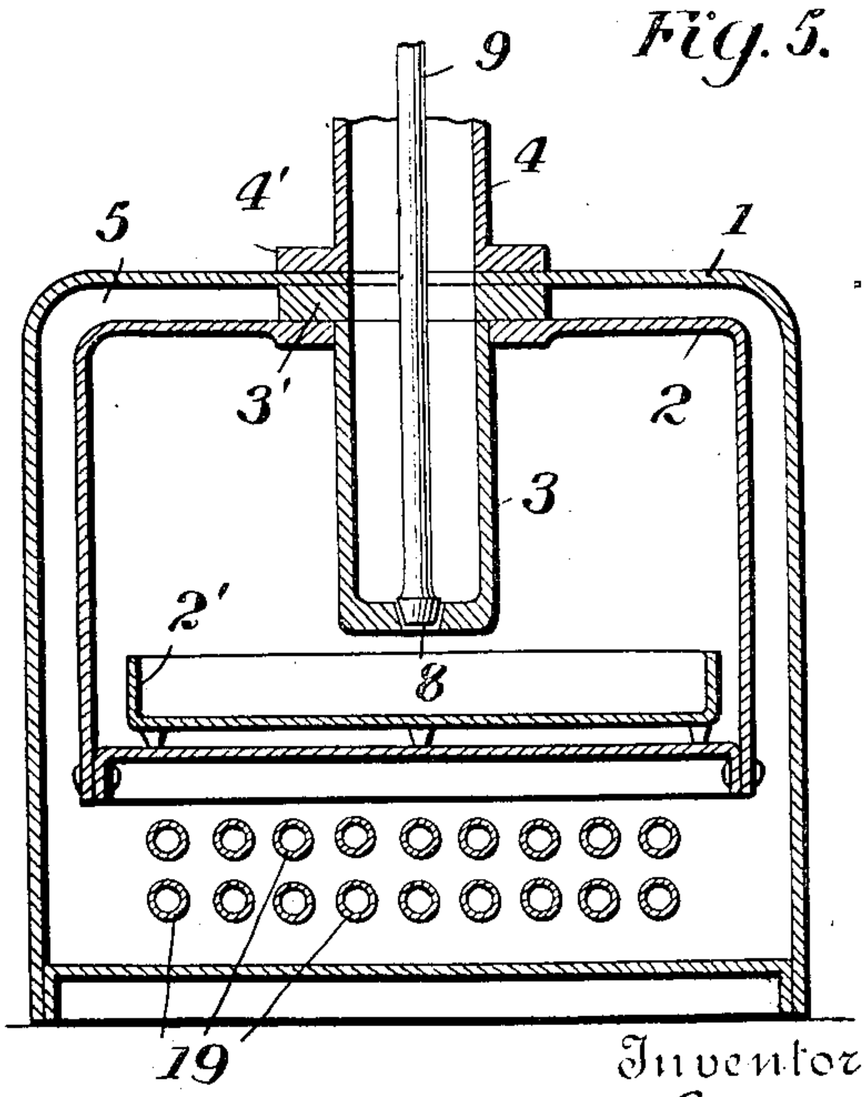


Fig. 5.



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UNITED STATES PATENT OFFICE.

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SULFUR-BURNER.

No. 924,980. Specification of Letters Patent. Patented June 15, 1909.

Application filed May 23, 1908. Serial No. 434,485.

To all whom it may concern:

Be it known that I, PAUL H. GRIMM, a citizen of the United States, residing at Glen Cove, in the county of Nassau and State of New York, have invented certain new and useful Improvements in Sulfur-Burners, of which the following is a specification.

My invention relates to apparatus for the purpose of generating under pressure sulfur di-oxid gas in large quantities suitable for fire extinguishing as well as numerous other uses, such as fumigating, disinfecting, the destruction of noxious insects and vermin, etc.

I am aware that furnaces have heretofore been constructed for this purpose, but my invention consists in a furnace for the purpose stated having certain novel features, hereinafter particularly set forth. By virtue of such features the feeding of the furnace is more conveniently accomplished, ease and safety of manipulation are promoted, the output is rendered more uniform, and other desirable results accrue.

It is a well known fact that sulfur will melt at 239° F. If heat is then added to the sulfur until it reaches 570° F. the liquid mass will boil and vaporize, forming what is commonly known as sublimed sulfur or flowers of sulfur. If a current of air is passed over the burning mass in this condition, there is a liability of entrainment of vaporized sulfur which will rapidly clog up the pipes and channels of the apparatus and render the same inoperative. The usual way of burning sulfur for the purpose of generating sulfur di-oxid is to place in a suitable furnace a quantity of sulfur and ignite it. The burning operation is continued by drawing air into the furnace and over the burning mass of sulfur, taking off the resultant gas and forcing it through some form of cooling apparatus by means of an exhauster or blower; but whether the gas is exhausted from the furnace or air is forced into the furnace under pressure, it is necessary to interrupt the operation of gas making in order that more sulfur may be introduced into the furnace from time to time and thus continue the operation, but it will readily be seen that such intermittent feeding of sulfur will lead to an irregular production of gas both in quality and quantity. This entails a large expense in the production of gas as it requires constant and careful watching and renders the apparatus less flexible in the production of useful and satisfactory results.

In the construction of my improved apparatus, I employ a water-tight metallic casing, within the upper part of which is suspended the furnace in which the sulfur is burned. A water space is left between the furnace and the casing for the purpose of carrying off the excessive heat created by the burning sulfur. In the lower part of the casing or water space, I introduce metallic tubes, expanded or otherwise fastened into the opposite walls of the casing. As said tubes are located near the point where the cooling water first enters, it follows that the heat is extracted from the gas before leaving the apparatus, the water then passing upward and cooling the furnace, and although the water after cooling the gas in the tubes is somewhat raised in temperature yet it is still effective as a cooling agent for the furnace, because the latter is so much higher in temperature. I further provide a reservoir wherein a supply of sulfur is kept in a molten state by heat from the furnace and fed to the furnace as required, said feeding and the replenishing of the reservoir supply being accomplished without exposure of the furnace contents to the outside atmosphere or any interruption of the operation thereof.

My invention will be clearly understood in detail from the following description in connection with the accompanying drawings, and the same will be thereafter particularly pointed out in the appended claims.

Referring to the said drawings, wherein like reference characters designate the same parts in each of the several views,—Figure 1 is a central longitudinal vertical section through my improved furnace; Fig. 2 is a plan view thereof; Fig. 3 is an end view looking from the right in Fig. 2; Fig. 4 is a view of the opposite end of the furnace from Fig. 3; and Fig. 5 is a central transverse vertical section.

1 is an outer casing made water-tight and within which is suspended a furnace 2. A pan for holding the burning sulfur is preferably formed as a separate member 2′ loosely inserted and supported slightly raised on legs at the bottom of the furnace 2, this being to prevent actual contact of the burning sulfur with the water jacketed surface of the furnace. As shown, the furnace 2 is separated from the casing 1 by a water jacket 5. A melting chamber and reservoir

is fitted through the top of the casing and furnace, the part thereof extending within the furnace being designated at 3 and the outer extension thereof at 4. The part 3 has a flange 3′ which forms a water-tight connection between the furnace and outer casing, the parts being suitably bolted together and to a flange 4′ on the outer part of the melting chamber. The outer part 4 of the melting chamber is of V form and has the lateral branch 6 thereof normally closed by a readily operable cover 7, which may be removed and replaced at will.

8 is a valve arranged in the bottom of the melting chamber, which, it will be observed, extends downward adjacent the burning pan 2′. Said valve is controlled by a stem 9 and handle 10, the stem 9 being threaded or otherwise engaged for manipulation in the top of the chamber 4.

11 is a pipe for supplying air under pressure to the furnace, said pipe extending by suitable stuffing box connections to the interior of the furnace and terminating in a distributer outlet 12. Air is supplied to the pipe 11 from a suitable pump 13 which is shown as a rotary one operated from an electric motor 14, though the particular character of the air supply mechanism is immaterial to the present invention. Said air supply is under control of a valve 11′.

Branching from the air supply pipe 11 is a by-pass pipe 15 controlled by a suitable valve 16, for passing part of the air from the pump 13 directly to the gas pipes without passing through the furnace. Said by-pass pipe 15 joins the gas delivery pipe 17 from the furnace and a continuation 18 of said pipes has connection with the cooling tubes 19, by means of a suitable bonnet 20 secured to the casing. As shown, the gas delivery pipe 17 from the furnace extends through the casing into the furnace by suitable stuffing box connections, which also act as expansion joints because of the high temperature of the furnace. The cooling tubes 19 deliver to another bonnet 21 at the opposite end of the casing from the bonnet 20, and thence to a delivery pipe 22.

23 is an equalizing pipe between the upper part of the melting chamber and the gas system which is under pressure, so that the melted sulfur may run into the furnace by gravity. 24 is a valve for controlling said pipe.

25 is an inlet for cooling water to the jacket, and 26 is the outlet therefor. An opening 27 is made into the furnace to enable ready access to the burning pan for the initial firing of the same and to enable cleaning of the parts.

The operation of the furnace is as follows: A small quantity of sulfur is introduced into the burning pan 2′ through the opening 27, and set on fire in any convenient way. The blower 13 is now started and air supplied to the furnace, after which the opening 27 is closed and the combustion of the sulfur carried on by the air introduced from the blower. The valve 8 in the melting chamber having been closed previously by the hand wheel 10, the melting chamber is now filled with sulfur through the opening exposed, by cover 7 being removed, after which said cover is replaced. The sulfur within the chamber will gradually be melted by the heat in the furnace, and thereafter melted sulfur is supplied to the furnace in proper quantities by manipulating the valve 8. The melting chamber can be replenished with sulfur as often as necessary and without interfering with the operation of the furnace by simply closing valves 8 and 24 and opening cover 7. After cover 7 is replaced valves 8 and 24 may be reopened and the sulfur fed as desired to the furnace. The gases generated in the furnace are driven by their own pressure through pipe 17 and cooling tubes 19 to the outlet 22 and point of consumption.

It will thus be seen that I am enabled to control the heat of the furnace almost completely, and further, to feed the sulfur automatically in small or large quantities as desired, this being much more readily accomplished by reason of its liquefied form. I can thus produce SO_2 in pure form and of any percentage of strength without danger of forming sublimed sulfur. The heat resulting from the burning sulfur is localized at the point of consumption and not stored up in the walls of the furnace, but transmitted to the water and thus it will be seen that the operation can be carried on indefinitely. It will be further seen that as my furnace is never opened to the outer air after being once started, the danger from throwing sulfur into a highly heated furnace through an open door is avoided; and still further that as only air and not gas is handled by the pump, the working parts thereof are much more durable than is the case when by a suction action the gas itself is drawn through the pump.

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

1. A gas generating apparatus comprising a normally closed furnace, an air pressure supply thereto, a gas delivery therefrom, a normally closed fuel reservoir extending within and heated by the furnace and arranged to feed liquefied fuel to the furnace without exposure of the interior to the outside atmosphere, and means for supplying air pressure to the fuel reservoir.

2. A gas generating apparatus comprising a normally closed furnace, a pressure air supply thereto, a gas delivery therefrom, a normally closed fuel reservoir extending within and heated by the furnace and ar-

ranged to feed said furnace with liquefied fuel, said reservoir having a controller valve to regulate the liquid fuel delivery, and means for supplying air pressure to the fuel reservoir.

3. A gas generating apparatus comprising a normally closed furnace, a pressure air supply thereto, a gas delivery therefrom, a fuel melting reservoir extending within said furnace to a point adjacent the firing bed thereof, a controller valve to regulate the liquefied fuel delivery from said reservoir, means to replenish said reservoir, the same being arranged so that the reservoir may be kept normally closed, and means for supplying air pressure to the fuel reservoir.

4. A gas generating apparatus comprising a normally closed furnace, a pressure air supply pipe thereto, a gas delivery therefrom, a fuel melting reservoir extending within said furnace, a by-pass for delivering air from the supply pipe to the gas delivery pipe directly, and a controller valve in said by-pass.

5. A gas generating apparatus comprising a normally closed furnace, a water jacket inclosing the same, an air supply thereto, a fuel melting reservoir extending within said furnace for liquid fuel thereto, and a gas delivery therefrom.

6. A gas generating apparatus comprising a furnace, air supply therefor, a gas delivery conduit therefrom, a fuel melting reservoir extending within said furnace and adapted to feed liquid fuel thereto, and a water jacket inclosing said furnace, said jacket also surrounding portions of said gas delivery conduit.

7. A gas generating apparatus comprising a furnace, a removable firing pan therein, air supply therefor, a gas delivery conduit therefrom, a fuel melting reservoir extending within said furnace and adapted to feed liquid fuel thereto, said conduit consisting in part of cooling tubes and a water jacket inclosing said furnace and said tubes.

8. A gas generating apparatus comprising a normally closed furnace having a door thereinto, a removable cover for said door, air supply therefor, a gas delivery therefrom, a fuel melting reservoir extending within said furnace and adapted to feed liquid fuel thereto, and a water jacket inclosing said furnace.

9. A gas generating apparatus comprising a normally closed furnace, a pressure air supply thereto, a gas delivery conduit therefrom, a melting reservoir extending within said furnace and adapted to supply liquid fuel thereto, a controller valve for said reservoir, a removable cover for said reservoir, and a water jacket inclosing said furnace and a portion of the gas delivery conduit.

10. A gas generating apparatus comprising a normally closed furnace, a pressure air supply thereto, a gas delivery therefrom, a fuel reservoir extending into and heated by the furnace and arranged to feed said furnace with liquefied fuel, said furnace having a controller valve to regulate the liquid fuel delivery, and an equalizing pipe connecting the interior of the upper part of the fuel reservoir with the interior of the furnace.

11. A gas generating apparatus comprising a normally closed furnace, a water jacket inclosing the same, an air pressure supply thereto, a fuel melting reservoir extending within said furnace for liquid fuel thereto, a gas delivery therefrom, and an equalizing pipe connecting the interior of the upper part of the liquid fuel reservoir with the interior of the furnace.

12. A gas generating apparatus comprising a normally closed furnace, a pressure air supply thereto, a gas delivery therefrom, a fuel reservoir extending into and heated by the furnace and arranged to feed said furnace with liquefied fuel, said furnace having a controller valve to regulate the liquid fuel delivery, an equalizing pipe connecting the interior of the upper part of the fuel reservoir with the interior of the furnace, and a valve controlling the equalizing pipe connection.

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

PAUL H. GRIMM.

Witnesses:

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