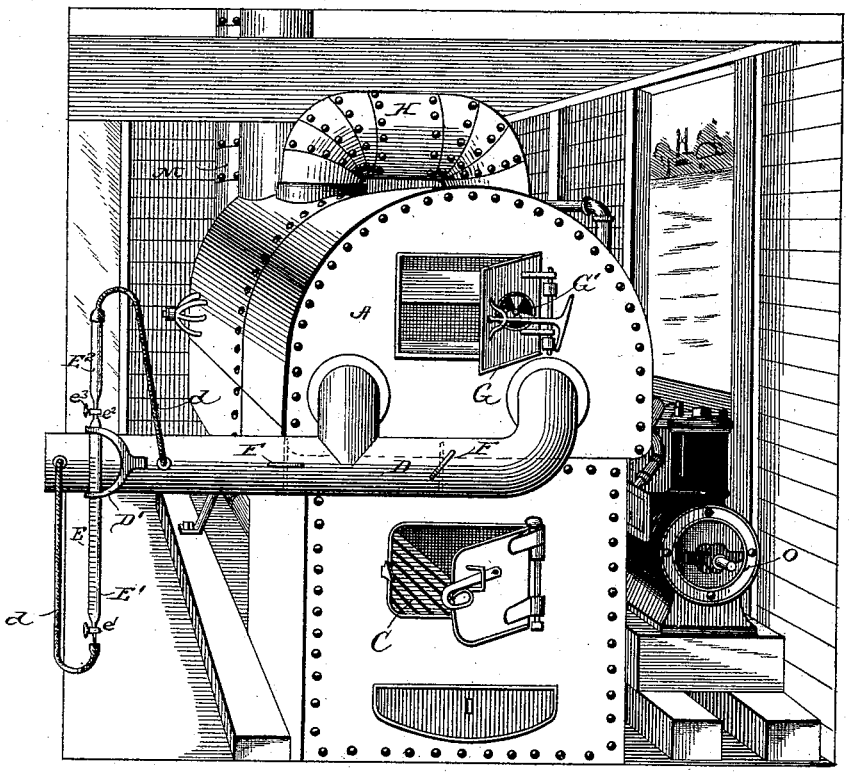
(No Model.) 5 Sheets—Sheet 1.

S. R. OLLIPHANT & T. A. CLAYTON.

FUMIGATING APPARATUS.

No. 490,981. Patented Jan. 31, 1893.

Fig. 1.



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(No Model.) 5 Sheets—Sheet 2.

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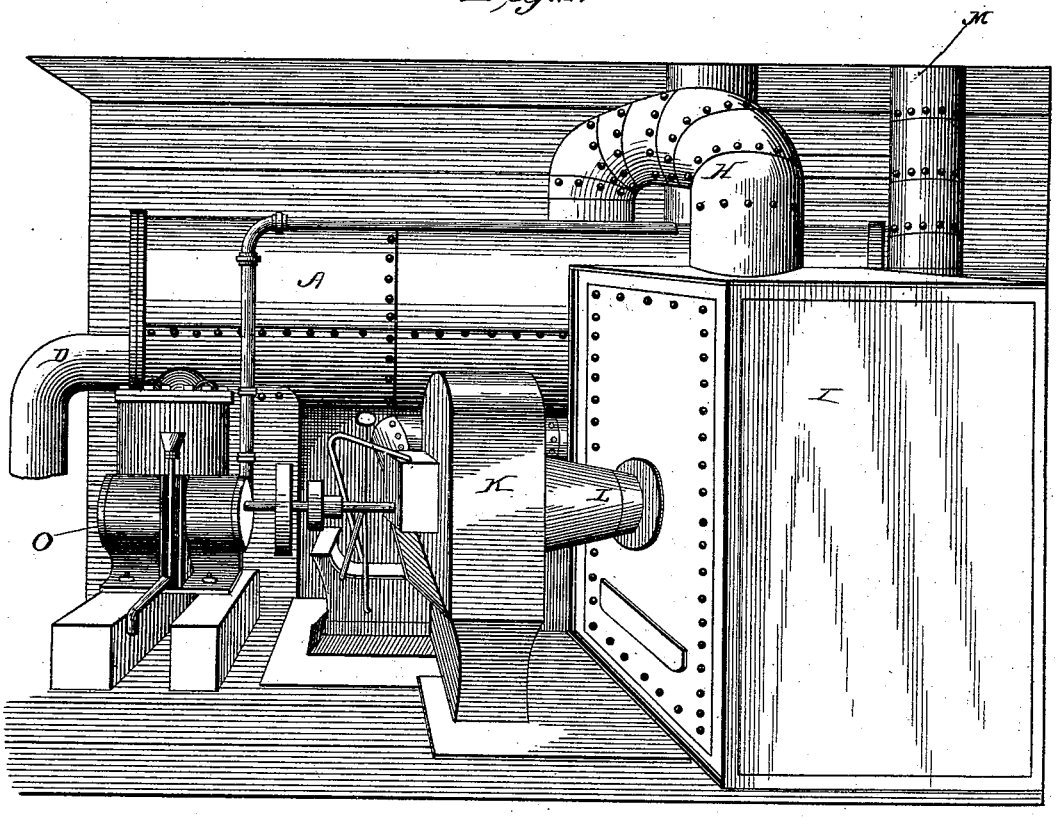
Fig. 2.



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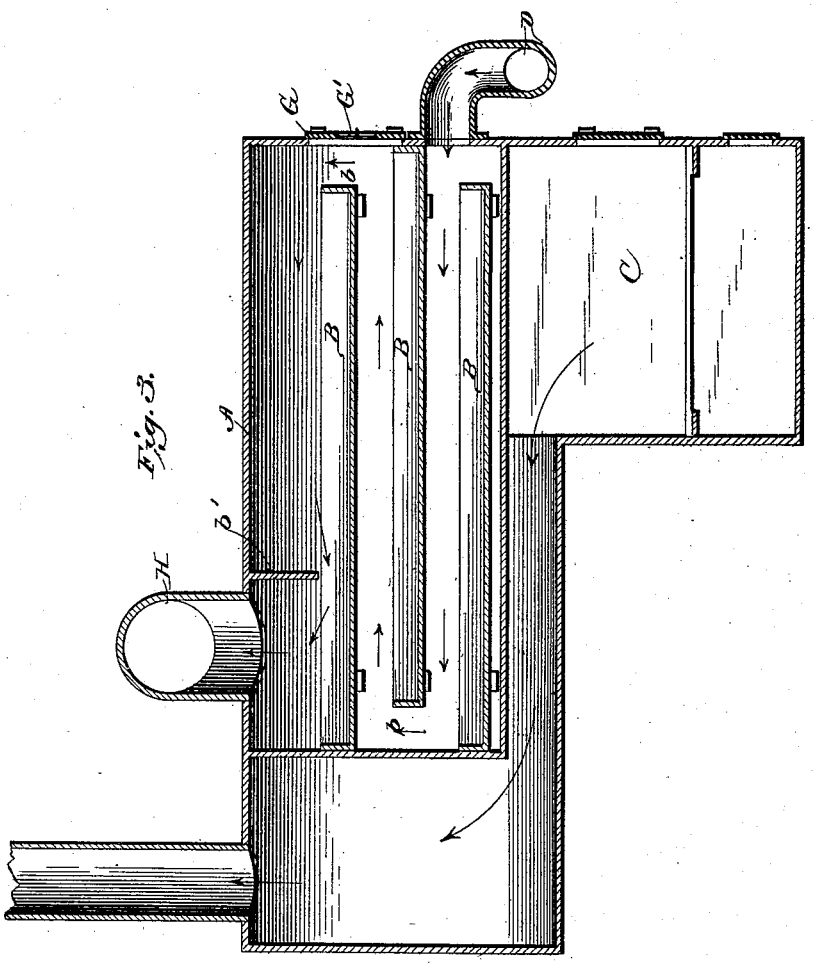

Fig. 3.

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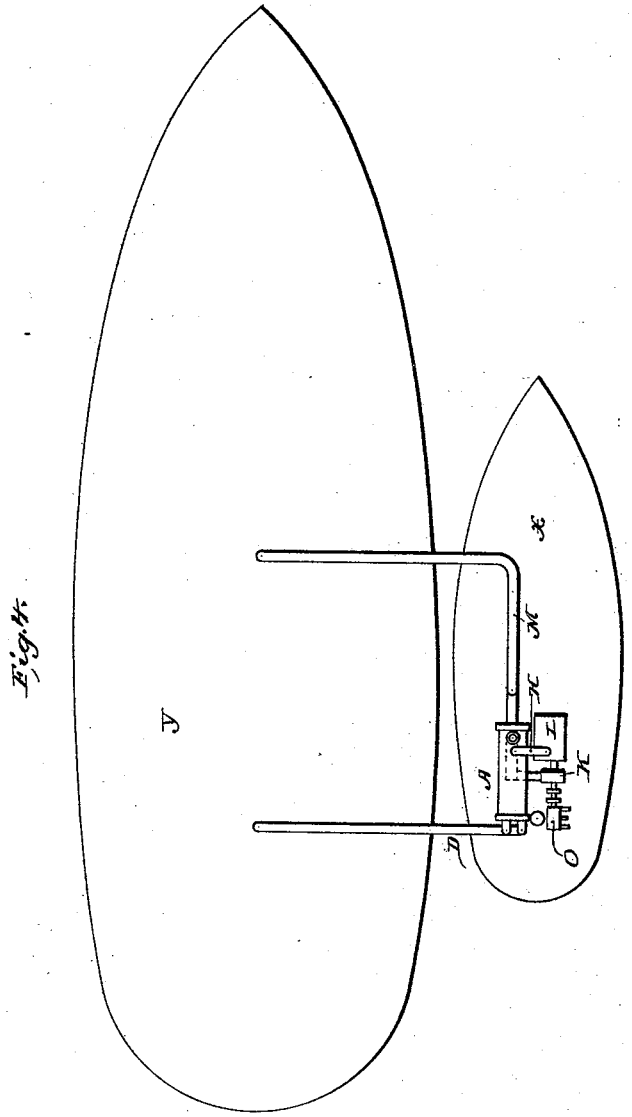

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S. R. OLLIPHANT & T. A. CLAYTON.

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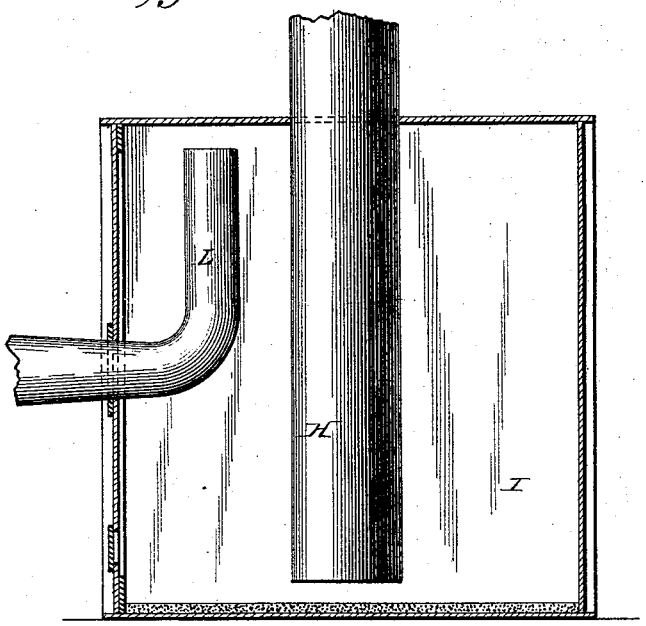
Fig. 5.



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UNITED STATES PATENT OFFICE.

SAMUEL R. OLLIPHANT AND THOMAS A. CLAYTON, OF NEW ORLEANS, LOUISIANA.

FUMIGATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 490,981, dated January 31, 1893.

Application filed January 25, 1892. Serial No. 419,172. (No model.)

To all whom it may concern:

Be it known that we, SAMUEL R. OLLIPHANT and THOMAS A. CLAYTON, both citizens of the United States, and residents of New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Fumigating Apparatus for Disinfecting Ships and other Compartments, of which the following specification, taken in connection with the accompanying drawings, is a full, clear, and exact description, such as will enable those skilled in the art to make and use the same.

Our invention relates to an apparatus adapted to generate sulphur dioxide gas and convey it into ships' holds with a view to killing all germs of disease therein contained. With this object in view it is desirable to obtain the gas in as concentrated a form as possible, it being stated by bacteriologists that less than a ten per cent. gas is not absolutely sure of killing all disease germs, some germs having greater vital power than others. It has been proposed for this purpose to provide a furnace having three compartments for the reception of the sulphur pans and an open face to supply oxygen from the air to the heated sulphur. The pans are supplied with sulphur and ignited, and a current produced by a suction fan, draws the fumes through a pipe connected with the furnace, and thence drives them on into the ship's hold. By this process a gas of a very uncertain strength is produced. Later it was proposed to change this apparatus into a closed furnace, and change the position of the fan. With this apparatus, however, there was danger of firing the ship, and with a view to overcoming this danger the pipe leading from the furnace to the ship was lengthened and curved in order to obstruct and burning particles of sulphur that might be carried into the current. Had the gas produced by this furnace been of a ten per cent. strength there could have been no fear of fire, as combustion cannot take place in an atmosphere that has one half its oxygen replaced by sulphur dioxide gas. As an actual fact, however, the gas generated by this furnace is not stronger than four to six per cent., and while it is theoretically possible to obtain a ten per cent. gas by this method, it is practically impossible that more than six or eight per cent. would ever be produced.

In view of the above it is the object of our invention to provide a fumigating apparatus which will produce a gas of ample and certain strength so that it will be absolutely sure to kill all disease germs. And the principle upon which our device operates might be briefly stated to consist in keeping the sulphur in a molten state by a fire underneath, and causing a continuous current of gas, to circulate through the furnace over the molten sulphur into the hold of the vessel and back into the furnace again by means of suitable pipes. The strength of the gas being regulated by the supply of air or oxygen, and the speed of the fan. By this method it is possible to replace the entire oxygen of the atmosphere in the hold of the vessel by the sulphur dioxide.

Referring to the drawings:—Figure 1 is a front perspective view of our improved furnace. Fig. 2 is a side perspective view of the same. Fig. 3 is a longitudinal section. Fig. 4 is a diagrammatical view. Fig. 5 is a sectional view of the receiver.

The apparatus consists of a boiler like retort or chamber A containing one or more pans B arranged one above the other with air spaces *b* connecting them alternately at the front and back, and a deflector *b'* extending down from the top whereby the air is made to pass over the contents of all the pans. Underneath the retort A is a furnace C arranged in the same manner as for steam boilers with ash pit &c., which furnace serves to keep the sulphur in the pans in a molten state.

An air-tight pipe D from the hold of the vessel or other compartment to be fumigated is connected with the front or other part of the cylinder A, and in communication with the bottom sulphur pan for supplying oxygen for the generation of the sulphur dioxide gas, said pipe being provided with a gage E for ascertaining the strength of the gas and dampers F for regulating the flow of gas. A door is also provided having a damper G' the door affording access to the sulphur pans, and the damper allowing the regulation of the strength of the gas by the admission of outside air. The gage E consists of a long glass tube E'

and a shorter tube E^2 connected to the upper end of the long tube by a contracted neck e^2, in which is provided a cock e^3 for opening and closing the passage way between them. The long tube is also formed with a contracted lower end provided with a cock e' for controlling the passage way through it. The gage is supported from the pipe D by bracket D', and its ends connected with said pipe by rubber tubing d, d. The exterior of the tube E', is graduated from 1 to 100, which graduations extend from the bottom up to the top.

H is an eleven inch outlet pipe tapping the retort A at top and curving over leads down into and within six inches of the bottom of a receiver or reservoir I; the bottom of this reservoir is covered with a layer of cement to prevent corrosion.

From the reservoir I the gas is drawn by a "Sturtevant" or other suitable fan K, through an eight inch pipe L issuing from the side of the reservoir but having a curved section on the inside reaching nearly to the top, and is forced through a lead of pipe M extending through the roof of the tug to the pilot house, and thence to the ship's hold.

It will thus be seen, that as the gas entering the reservoir is led nearly to its bottom, and having to leave again through the curved section of pipe near the top, the direct current is broken, and any particles of burning sulphur that may enter are apt to be lodged at the bottom.

The difference of size of pipe of entrance and exit is made with a view of having a slow current in and from the furnace to the reservoir, so as to avoid drawing out the sublimed sulphur, and a rapid current from the reservoir through the fan into the ship, so as to retain the heat of the gas and have it enter the ship's hold under as much pressure as possible; this result naturally following as the same amount of gas must necessarily leave the reservoir through the small pipe as enters through the large pipe.

In operating the device the tug or other small vessel X upon which the apparatus is built is run alongside the vessel Y to be treated and the inlet and outlet pipes put in place. The furnace being started and the sulphur in the pans melted, the engine O is set in motion, which through suitable gearing operates the fan and starts the circulation of the gas and air from the retort A, through the pipe H, into the reservoir I, through the hold of the vessel Y and back into the retort A through the pipe D. In this manner a very high percentage of sulphur dioxide is generated and introduced into the compartment, and at the same time, the air in the said compartment is made to pass over the molten sulphur; so that all germs must necessarily be destroyed by the heat and disinfecting gas. It will be observed, also, that we make room for the reception, of the sulphur gas by withdrawing an equal volume of the air in the compartment, which passing over the molten sulphur is deprived of its oxygen, and in its turn re-enters the compartment in the form of germicidal gas. This insures a thorough disinfection of the compartment by heated sulphur dioxide with a minimum expenditure of both time and sulphur.

The receiver referred to is used for the purpose of arresting any sublimed sulphur that may possibly be formed in the generator, and to insure this the pipe into the receiver is led to within a few inches of the bottom and the pipe to the fan or pump from within a few inches of the top of the receiver. A quantity of water may be kept in the receiver also.

E is a gage supported in perpendicular position and connected by rubber or other tubing with the pipe D, so that the gas may readily enter, both cocks of the gage being open for that purpose. When thus exposed a sufficient length of time to allow the air contained in the tube to be replaced by the air containing the sulphurous acid gas generated by the furnace, the cocks are closed, the lower one being closed first. There is then inclosed between the two cocks a column of gas generated by the furnace. The upper connecting tube d is then removed and the glass tube above the upper cock filled with water to about two-thirds its capacity. Then the upper cock e^3 is slowly opened till the water can be seen trickling down the sides of the tube and rising from its bottom. When the water introduced gradually in this manner ceases to flow, the cock can be turned on full, and no more water will enter the tube. The amount of water thus contained in the tube will indicate the percentage of sulphurous acid gas, each graduation on the tube representing one per cent.

The principle upon which the improved gage is constructed is the refilling of the vacuum caused by the absorption of the gas by the water. For instance, if the apparatus contains a gas composed of ninety per cent. of inert gases, such as nitrogen, oxygen, &c., (which are practically not absorbed by water) and ten per cent. of sulphurous acid gas, and a few drops of water be allowed to enter the tube, the sulphurous acid gas will be absorbed thereby, requiring ten cubic centimeters of water to restore the equilibrium.

The advantages claimed for this apparatus are, first: it does away with all the dangers of fire; (ships have been set on fire with previous furnaces.) Second the lessened amount of galvanized piping for conducting the gas; an economy worth considering, when it is remembered that this pipe costs one dollar and fifty cents per foot. Third: being relieved of this excessive amount of pipe, it is more easily run and manipulated. Fourth, the very great superiority of the gas generated, it being at least three times the strength of that formerly generated. And last, the air of the ship's hold or other compartment to be fumigated is itself subjected to the disinfecting influence

of the heat of the furnace in addition to having its oxygen replaced by SO_2 gas,—high temperature being recognized as the most powerful disinfectant known.

Having thus described our invention, the following is what we claim as new therein and desire to secure by Letters Patent:

1. The combination of a furnace for heating, a retort for generating gas, a receiver or gasometer, a fan, and pipes for connecting the retort, fan and receiver with the vessel or compartment to be fumigated in a closed system through which a continuous circulation of the gas alone may be maintained, substantially as set forth.

2. The combination with a furnace for generating a disinfecting gas, inlet and outlet pipes to said furnace, a receiver or reservoir, a pipe connected with the outlet pipe of the furnace and entering said receiver or reservoir at top and extending nearly to the bottom, and a pipe leading from the side of said receiver and extending up inside nearly to the top, substantially as set forth.

3. The combination of a suitable furnace, a chamber above said furnace for generating a disinfecting gas, suitable pans in the generating chamber, an inlet pipe to said chamber which is adapted to be connected with the compartment to be fumigated, an outlet pipe leading from said generating chamber, a receiver or reservoir into which said outlet pipe extends, a fan communicating with said receiver for drawing the gas therefrom, and a lead of pipe extending from said fan and also adapted to be connected with the compartment to be fumigated, whereby a continuous circulation of the fumigating gas can be maintained through the generating chamber and compartment being fumigated, substantially as and for the purpose set forth.

4. The combination with a furnace for generating a disinfecting gas, inlet and outlet pipes, a receiver or reservoir for the gas, the outlet pipe for the furnace extending into said receiver, and a pipe leading from said receiver, the pipe which enters said receiver being of larger diameter than the pipe which leads from the receiver, substantially as and for the purpose set forth.

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