

1,016,145.

2 SHEETS—SHEET 1.

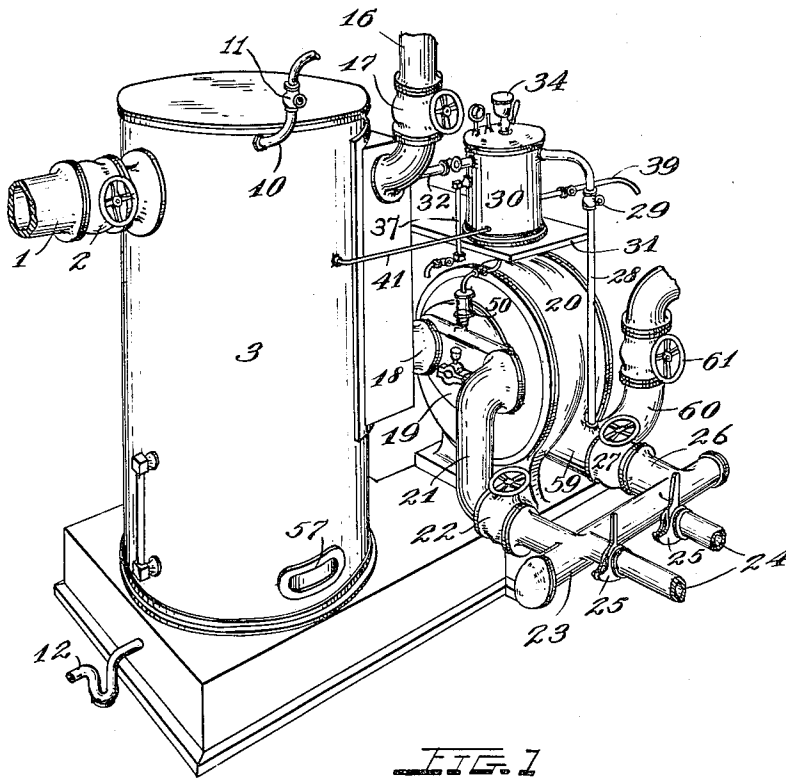


FIG. 1

Witnesses.

G. K. Smith
Hugh B. McGill

Inventor

George Harner
H. H. & Smith
INC. NEWS

G. HARKER.
 PROCESS OF DISINFECTING INCLOSED SPACES.
 APPLICATION FILED APR. 6, 1911.

1,016,145.

Patented Jan. 30, 1912.

2 SHEETS—SHEET 2.

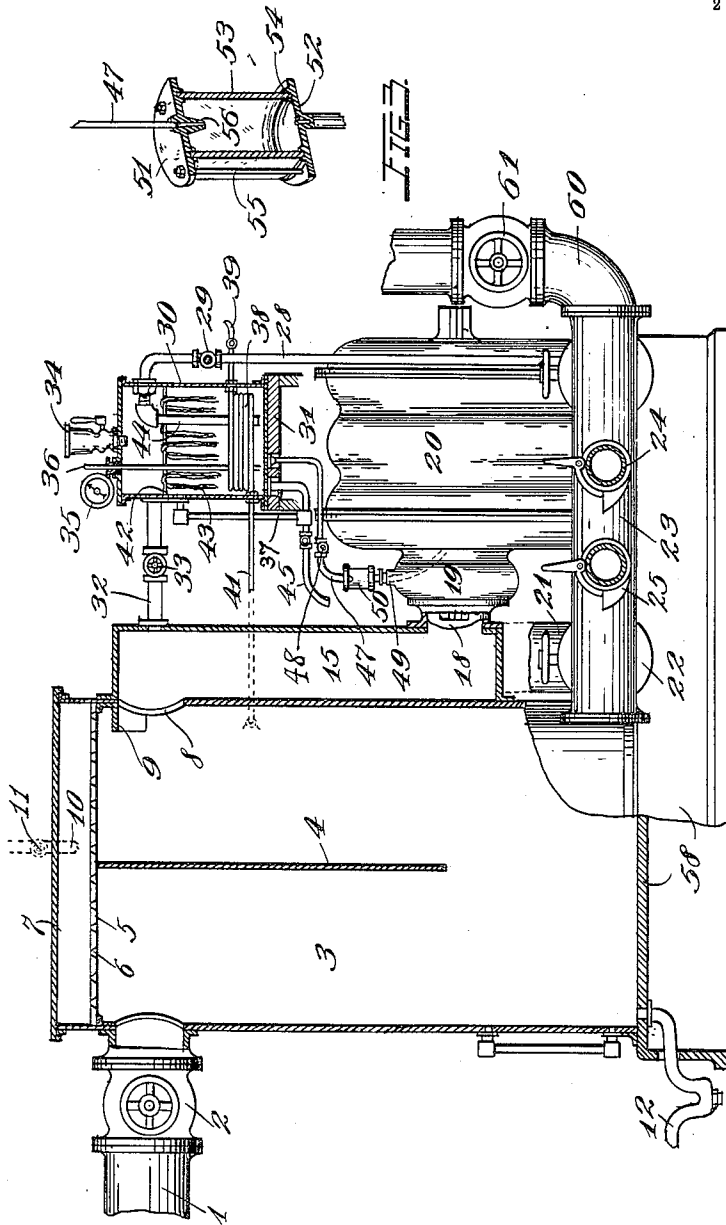


FIG. 2.

Witnesses:
 G. K. Smith
 Hugh B. McGill

Inventor
 George Harker
 By Hull & Smith
 Attorneys

UNITED STATES PATENT OFFICE.

GEORGE HARKER, OF PETERSHAM, NEW SOUTH WALES, AUSTRALIA.

PROCESS OF DISINFECTING INCLOSED SPACES.

1,016,145.

Specification of Letters Patent.

Patented Jan. 30, 1912.

Original application filed November 5, 1908, Serial No. 461,139. Divided and this application filed April 6, 1911. Serial No. 619,259.

To all whom it may concern:

Be it known that I, GEORGE HARKER, a subject of the King of Great Britain and Ireland, residing at Petersham, New South Wales, Australia, have invented a certain new and useful Improvement in Processes of Disinfecting Inclosed Spaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

In fumigating and disinfecting operations as practiced heretofore, the range of practically usable fumigant and disinfectant agents has been limited. Certain known valuable materials could not be used because their vapors or fumes become explosive or inflammable when mixed with atmospheric air. When, for instance, carbon bisulfid, or petroleum, is vaporized in atmospheric air, the mixture is under certain conditions inflammable and explosive.

The object of my invention is the production of a process by which fumigating and disinfecting operations and subsequent restoration of fumigated and disinfected chambers to habitable condition may be safely and rapidly carried out at a minimum cost, and by means of which volatile or vaporizable substances otherwise inflammable or explosive, such as carbon bisulfid, light petroleum oil or mineral naphtha, naphthalene, benzene, and oil of eucalyptus, may be used. This application is a division of my co-pending application, filed November 5th, 1908, Serial Number 461,139, in which my apparatus is disclosed and claimed. The vapors of those substances are not explosive or inflammable in an atmosphere containing a small proportion of oxygen, particularly in the presence of carbon dioxid, and they may then be used with safety; while if used with atmospheric air they would be highly dangerous. My said invention includes the practical utilization of this fact in certain apparatus hereinafter fully described.

In carrying out my said invention I use as a vehicle or medium to carry the fumigant or disinfectant gas or vapor, cooled and washed gaseous products of combustion drawn from the funnel of a boiler furnace, or the gaseous products of combustion from any closed furnace producing flue gases containing little free oxygen and much carbon dioxid. It is not necessary that

there should be no free oxygen nor that a very high percentage of carbon dioxid should be contained in said gases; it suffices if the firing operation is conducted so as to obtain good combustion of the fuel, in which case the free oxygen will be sufficiently low and the carbon dioxid content sufficiently high to qualify the gas produced to carry safely vapors and gases otherwise inflammable or explosive. The disinfecting agents used in practice are carbon bisulfid, light petroleum oil or mineral naphtha, naphthalene, benzene, and oil of eucalyptus. Of these, carbon bisulfid, light petroleum oil, and benzene are volatile and give off their vapors at atmospheric pressure and ordinary temperatures. The others must be heated and the gases or vapors so obtained mixed in the required proportion with the furnace gases before mentioned. The furnace gases are treated in an apparatus in which water is showered through them for the purpose of reducing their temperature and washing out soot and solid matters, and thereafter they are charged with the fumigant or disinfectant gas or vapor. They are drawn through a trunk or flue from the scrubber and cooler by means of a centrifugal fan or a pump or by a steam blast, and forced thereby through pipes of adequate size into the holds, apartments, sewers or other chambers in which they are to be applied. The feeder or gas charging device consists of a closed vessel for containing the fumigant or disinfectant, connected by three valved pipe connections to the centrifugal pump,—one for delivering gas from the pump under pressure to said vessel; a second for conveying liquid from said vessel to be dripped into the gas current through a sight feed glass; and a third for delivering vaporized fumigant or disinfectant to the pump intake; at the head it has also a valved filling funnel; and it is provided with a steam coil vaporizer, a pressure gage, a gage glass to exhibit the depth of disinfectant being carried in it from time to time and to show the rate of feed of the same into the furnace gases, and a thermometer to indicate the temperature. The construction of the cooler and scrubber is hereinafter more particularly described. The gas pipes are disposed and valved so that, by means of the pump, charged gases may be conveyed

thereby into ships' holds or other chambers to fumigate and disinfect the same, and drawn out of said chambers subsequently, and so that atmospheric air may be pumped into the said chambers to restore them to habitable condition and to ventilate them.

The apparatus is used to treat apartments to destroy insects, vermin, and disease germs therein, and may be operated periodically to treat grain or like perishables (not injuriously affected by the gases used) to preserve same in storage or transit from destruction by weevils, fungus or like agencies.

The annexed drawings illustrate the apparatus in a form adapted for use on shipboard, Figure 1 being a perspective view, Fig. 2 a longitudinal sectional elevation, and Fig. 3 a sectional perspective view of the sight feeder.

A rearrangement to adapt the apparatus to be carried on wheels for land service may be readily designed by a competent engineer.

The pipe 1 leads from a chimney carrying furnace gases of the kind described, and conveys said gases to the cooler and scrubber 3, a valve or gate 2 being provided in said pipe 1. The cooler and scrubber 3 consists of a shell mounted on a bed 58 which may also carry the pump as shown; a diaphragm plate 5 perforated with a large number of small conical holes 6 forms a false head 7 from which streams of water pass downward, said water being fed thereto by a water service pipe 10. A septum plate 4, between the intake 1 and gas outlet 8, divides the upper part of the chamber 3 below said false head into two parts. The gas outlet aperture 8, covered by a water hood 9, connects the chamber 3 with a casing 15, and a trapped pipe 12 serves to carry off waste water from said chamber. An intake pipe 16 valved at 17 is provided to open the casing 15 to atmosphere when required. The lower end of the casing 15 is connected at 18 to the suction casing 19 of the pump 20. The pump is shown as a high pressure multiple chamber centrifugal blower, though obviously any suitable type of pressure producing apparatus could be employed, dependent upon the work in view. The capacity of the pump and the sectional area of the various pipes must be proportioned to the volume of gas required to be passed in a predetermined time. The suction casing 19 of the pump 20 is also connected by a pipe 21, valved at 22, with a header 23, to which one or a plurality of pipes 24 valved at 25 are connected. The pipes 24 are carried to the several holds or other chambers in which fumigating or disinfecting operations are being conducted; and they may be fitted with hose connections. The pump gas delivery vent 59 is connected with the trunk 23 by a pipe

26 valved at 27; a branch connection 60, valved at 61 opens the vent 59 to atmosphere.

57 is a manhole or mudhole door near the foot of the chamber 3.

The feeder 30 is carried on a conveniently arranged support 31. A pipe 28 fitted with a non-return stop valve 29 connects it with the pump vent 59; this pipe is dipped as shown at 44, in order that gas passing through it from the pump will be delivered near the bottom of the feeder. The feeder is charged with benzene, carbon bisulfid, or other liquid volatile or vaporizable fumigant or disinfectant, through the valved filling cup 34.

35 is a pressure gage, and 36 a thermometer.

38 is a pipe coil supplied with steam through a connection 39, and discharging waste steam through pipe 41 into the chamber 3 or elsewhere.

42 is a rack carrying strings or wicks 43 which are provided to absorb liquid and increase the vaporizing surface.

A pipe 32 valved at 33 conveys vapors from the feeder 30 to the casing 15; this pipe may be carried instead to the pump intake 19, or into the header 23 or gas pipes 24; but it is preferred to carry it into the casing 15 where its delivery will not be affected by back pressure.

A pipe 47 from the bottom of the feeder 30 connects with the pump intake 19. It is fitted with a stop valve and with a sight feed indicator 50. It enters the casing 19 at 49 and is bent as indicated, in dotted lines, Fig. 2, so as to convey liquid into the fan, and not merely drip it into the casing 19, in order that it will be subjected to maximum agitation and contact with the gas to facilitate its vaporization. While that is the most advantageous location for the introduction of the liquid fumigant or disinfectant, I wish it understood that it may be introduced into the delivery neck 59, the header 23, or even into the service pipes 24.

The sight feed attachment, which is fitted in the pipe 47, consists of a glass barrel 53 carried between heads 51 and 52 secured together by bolts 55, and packed around the top and bottom barrel grooves 54. A nipple 56, into which the pipe 47 is screwed, delivers the feed either as drops or as a current of liquid, the volume of which may be constantly observed through the glass barrel 53.

The operation is as follows:—When liquid fumigant or disinfectant is being fed into the gas stream; the pump 20 being set in motion, and the feeder 30 charged, the valves and gates 2, 11, 27, 25 and 48 are opened and all other valves closed. A current of furnace gas now passes through the

chamber 3, being cooled and washed therein, and thence through the aperture 8, casing 15, neck 18, and intake 19, and is delivered under pressure through the pipe 26 into the header 23, and thence passes into the service pipes 24, which lead it to the holds or other chambers under treatment. The liquid level is observed in the gage glass 37, and the rate of feed in the sight glass 50. The liquid fumigant or disinfectant passes through the glass 50 into the pump 20, in which it is vaporized and mixed with the current of gases passing through the same. If the flow of liquid is not fast enough, the valve 29 is opened, whereby gas pressure from the pump delivery 59 is applied to force it through the pipe 47. When the liquid is required to be vaporized in the feeder 30, the valve 48 is closed and the valve 33 opened but to insure maximum vaporization the valve 29 should also be opened. Thereupon, gas pumped into the feeder 30 through the pipe 28 will bubble up through the liquid therein, becoming charged with the vapor of said liquid in that operation, and pass into the casing 15 through the pipe 32, charging the gas passing through the same with fumigant or disinfectant vapor. If the liquid will not vaporize sufficiently in this operation, it is heated by steam passed through the coil 38, the temperature and pressure being in that case observed by means of the thermometer 36 and gage 35 to insure safety. The additional surface of liquid presented by the wicks 43 facilitates the speedy vaporization of the liquid.

To restore treated chambers to habitable condition, atmospheric air may be pumped in to displace the fumigant or disinfectant gas therein, or the latter may be pumped out and atmospheric air allowed to replace it by entry through any available apertures. The apparatus may be used in this way for ventilating holds and other chambers and removing foul gases therefrom. To pump in atmospheric air, the valves are manipulated

as follows:—All valves on pipes connecting to the feeder are closed; also the valves or gates 2, 22, and 61; and the valves or gates 17, 27, and 25 opened. To draw gas out of the treated chambers and discharge same into atmosphere, the valves or gates 2, 17, and 27 are closed, and 22, 25 and 61 opened, the feeder connections being closed as before.

Having thus described my invention, what I claim is:—

1. The process of disinfecting which consists in charging a gas incapable of supporting combustion with a fluid disinfecting agent which, when mixed with air alone, is inflammable, the fluid mixture being constituted in such proportions as to be non-inflammable, and conducting such mixture to the point of use.

2. The process of disinfecting inclosed spaces which consists in charging a gas incapable of supporting combustion with a disinfecting fluid which is normally explosive or inflammable when mixed with air alone, the fluid mixture being constituted in such proportions as to be non-explosive and non-inflammable, and conducting such mixture to the inclosed space to be disinfected.

3. The process of disinfecting which consists in charging furnace gases with vapor of carbon bisulfid in such proportions as to form a non-explosive and non-inflammable mixture, and supplying such mixture to the point of use.

4. The process of disinfecting which consists in charging a gas incapable of supporting combustion with vapor of carbon bisulfid, the mixture being constituted in such proportions as to be non-explosive and non-inflammable, and conducting such mixture to the point of use.

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

GEORGE HARKER.

Witnesses:

D. S. O'BRIEN,
JOHN T. NOURSE.