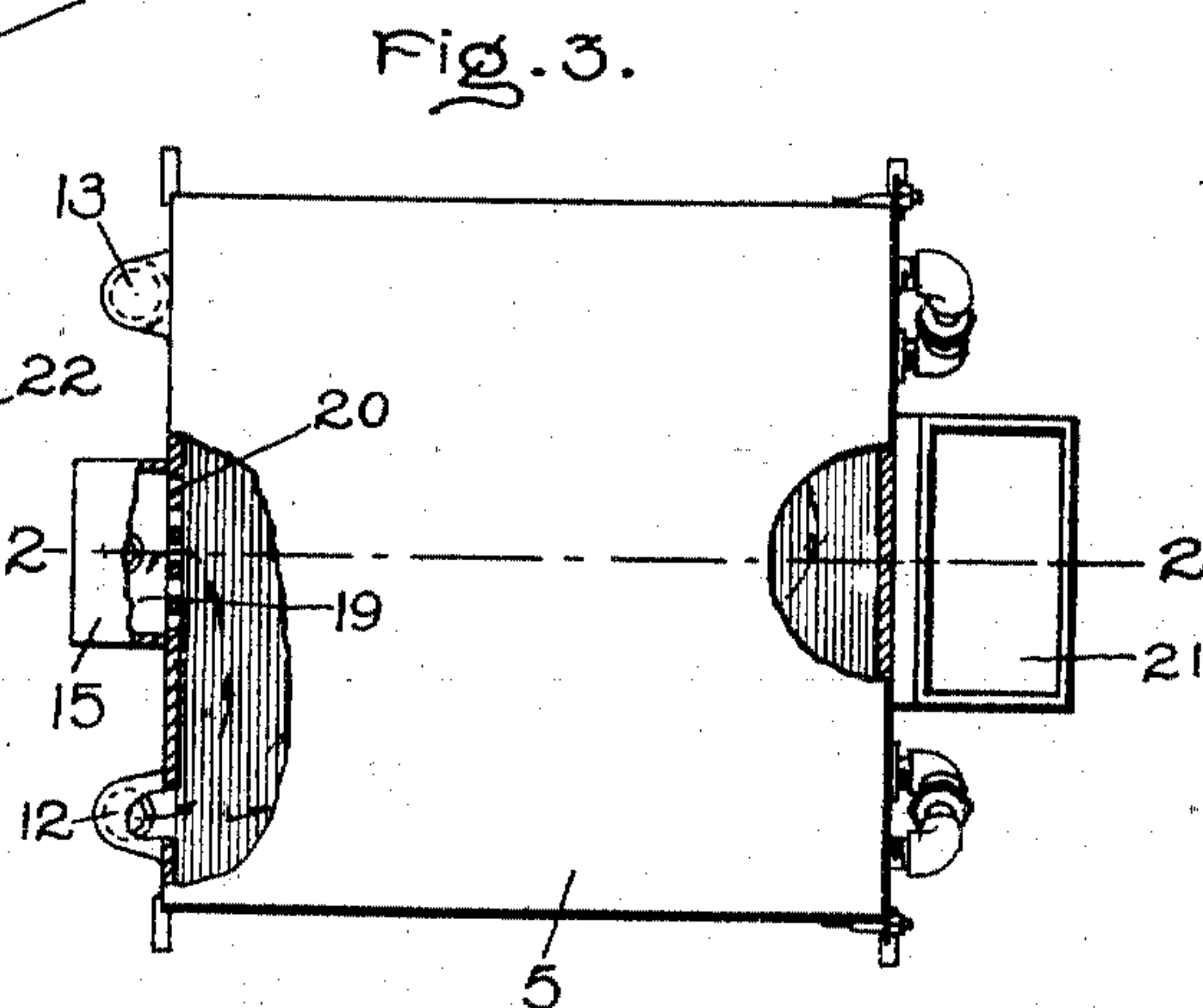
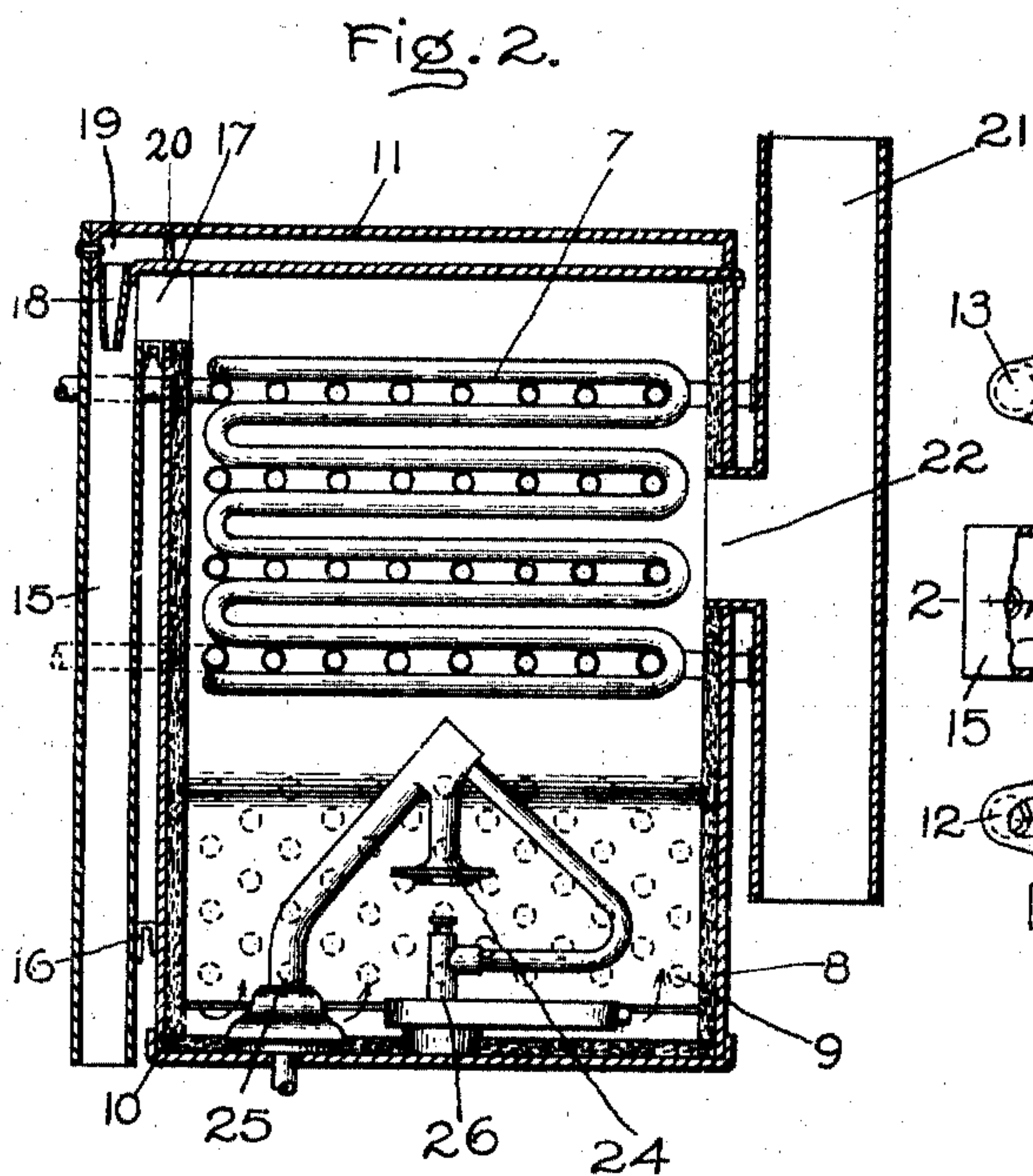
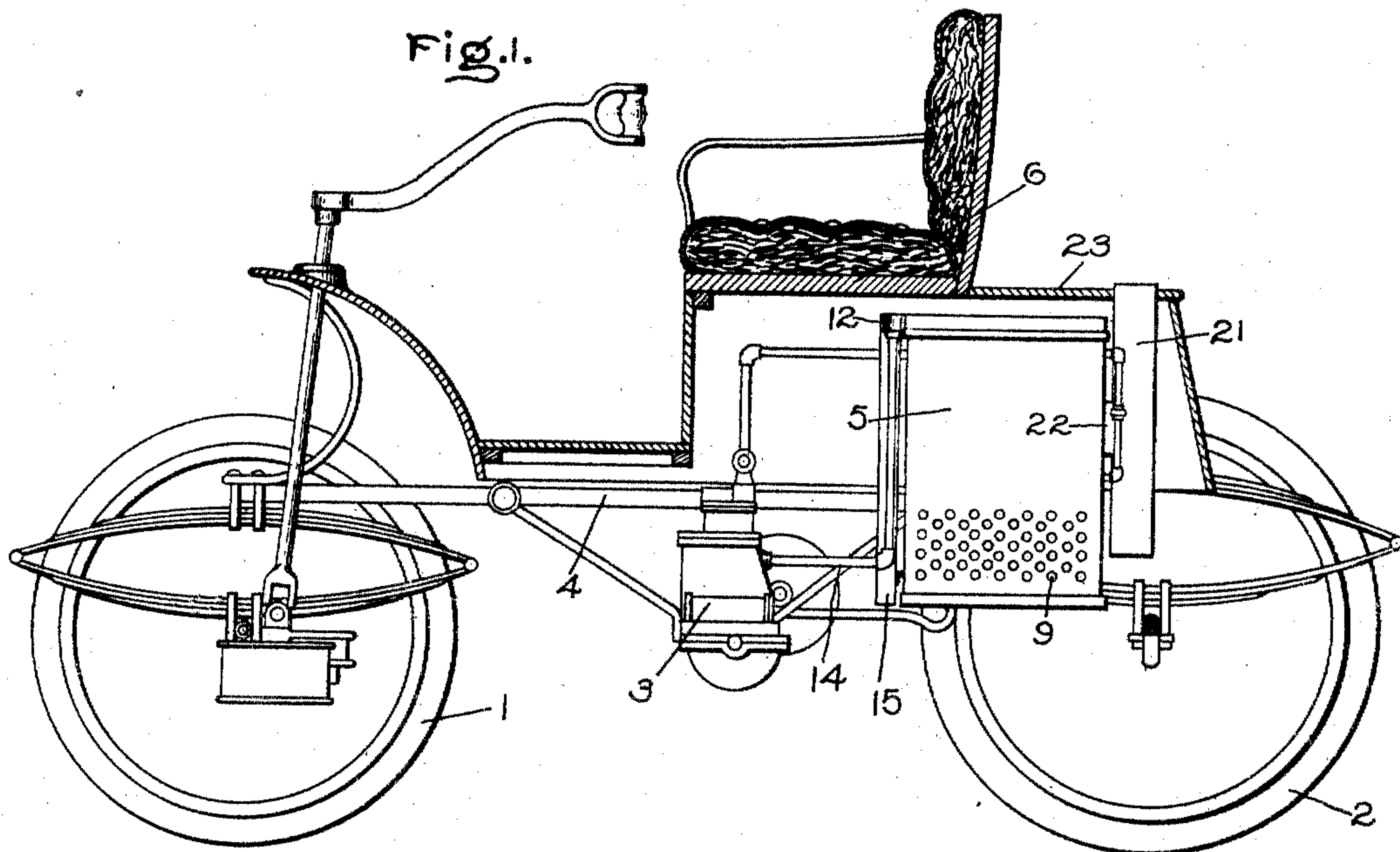


No. 767,072.

PATENTED AUG. 9, 1904.

H. LEMP.  
FLUE CONSTRUCTION FOR VEHICLES.  
APPLICATION FILED DEC. 2, 1901.

NO MODEL.



Witnesses:

Benjamin B. Hall,  
Charles Steiner.

Inventor,  
Hermann Lemp,  
By *Alfred H. Davis*  
Att'y.



## UNITED STATES PATENT OFFICE.

HERMANN LEMP, OF LYNN, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## FLUE CONSTRUCTION FOR VEHICLES.

SPECIFICATION forming part of Letters Patent No. 767,072, dated August 9, 1904.

Application filed December 2, 1901. Serial No. 84,326. (No model.)

*To all whom it may concern:*

Be it known that I, HERMANN LEMP, a citizen of the United States, residing at Lynn, in the county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Flue Construction for Vehicles, of which the following is a specification.

The object of the present invention is to improve the flue construction of steam-propelled vehicles, and the scope of my invention will be more fully described and claimed hereinafter.

In the accompanying drawings, which illustrate an embodiment of my invention, Figure 1 is a vertical section of a steam-propelled vehicle, showing the boiler and engine in elevation. Fig. 2 is a vertical section of the boiler, taken on line 2 2 of Fig. 3; and Fig. 3 is a plan view of the boiler with certain of the parts broken away.

Referring to Fig. 1, 1 represents the steering-wheels, and 2 the driving-wheels. An engine 3 is suitably supported from the framework 4. The latter also supports the boiler 5. The boiler, which is inclosed in the body 6, is of the flash type and consists of a coil of pipe 7. In so far as the operation of my invention is concerned the boiler may be of any other desired character. The tubes are inclosed in a casing 8, containing perforations 9 to permit the air to enter and mingle with the fire-gases, as is indicated by the arrows in Fig. 2. The interior of the casing is lined with heat-resisting material 10—such, for example, as asbestos. The top of the casing is provided with a cover 11, which contains a chamber into which the exhaust-steam passes from the engine 3. The object of this chamber is to reheat the exhaust, so as to render it invisible, or practically so, at ordinary temperatures. On the top are two similar projections 12 and 13 for admitting steam to the chamber. Under ordinary conditions of running only one steam-inlet is necessary, in which case the second opening is closed with a plug. In the drawings the projection 12 is shown as being connected with the exhaust from the engine by the pipe 14, while the pro-

jection 13 is closed by a suitable plug. Situated at the front end of the boiler or at any other convenient point is a flue 15, which extends downwardly toward the road-bed and is open only at its lower end. The upper end of the flue is closed and is riveted to the cover 11, and the lower end is secured to the boiler-casing by a bracket 16. Communication between the upper end of the flue and the interior of the boiler-casing is established by a short horizontal flue 17. Extending into the upper end of the flue is a short steam-nozzle 18, which communicates with a small chamber 19, the latter being in open communication with the chamber in the cover through a series of small holes or passages 20. These small passages serve to reduce the noise of the exhaust, and as the latter passes down through the nozzle 18 it creates a suction through the short horizontal flue 17, which draws the fire-gases from the interior of the boiler-casing and projects them downwardly toward the road-bed. I have referred to the use of the exhaust-steam for creating this downdraft; but it is of course evident that direct steam can be employed, if so desired. The vertically-extending flue 15 and the transversely-extending short flue 17, together with the steam-jet 18, constitute a means for creating a forced draft.

Situated at the rear of the vehicle and preferably as far away from the seat as possible, so as not to annoy the occupants, is a flue 21 for the natural draft, which is open at both ends. This flue is connected with the interior of the boiler-casing by a short transverse flue 22. The flues 21 and 22 constitute a means for creating a natural draft, and when the vehicle is standing still or running under only a moderate forced draft certain of the products of combustion will pass from the burner through the flue 22 and upwardly into the flue 21, escaping at a point back of the seat. The upper end of the flue 21 passes through the top plate 23 of the body. For the purpose of natural draft it would be sufficient if the flue 21 was closed at its lower end; but at times the wind would blow into the upper end



and create what is called a "back draft." In other words, the wind blowing into the flue passes into the boiler-casing and tends to check or spread the burner-flame or in some cases to do both. In some instances the effect of this back draft is great enough to cause the burner-flame to spread laterally and set fire to the vehicle-body. To obviate this, cross-flues have been attached to the upwardly-extending natural flue. The use of this cross-flue is objectionable, as it tends to obstruct the outward passage of gas and collects soot. It also detracts from the appearance of the carriage as a whole. I have found that by providing a flue which is open at both ends and connecting it by a transverse flue at a point intermediate its ends all tendency of the back draft to check and spread the burner-flame is obviated. As shown, a blast of air can blow up or down through the flue and not cause the burner-flame to spread. In event of a protracted blast of air passing through the flue 21 either from the top or bottom it will increase the effect of the natural draft by creating a suction. Thus I am enabled to take advantage of what is ordinarily considered as a disadvantage.

The burner may be of any suitable construction, as it forms no part of the present invention. The one shown in the drawings consists of a nozzle 26, a baffle-plate 24, and a vaporizer 25. This burner forms the subject-matter of a separate application.

When the vehicle is standing still or moving slowly or when little or no steam is being consumed, the products of combustion will pass upward between the boiler-tubes, through the flue 21, and out of its upper end. The fire-gases do not come into direct contact with all of the tube-sections under such conditions; but of course they are all subjected to high temperatures. When, however, the vehicle is started into operation and steam passes through the chamber in the cover 11 and out through the passages 20 and nozzle 18, a suction is created in the downwardly-opening flue 15, which creates a forced draft and sucks the burned products of combustion from the boiler-casing and projects them toward the road-bed. Under this condition practically all of the fire-gases are shunted past the opening of flue 22, and all of the tube-sections will be subjected to the intense heat of the fire-gases, thereby increasing the steam production. By placing the flue 15 at a point opposite the flues 21 and 22 I am enabled to take virtually all of the waste products of combustion away from the flue 21 and project them downwardly toward the road-bed in such manner that they will not be objectionable to the occupants of the vehicle. It is evident, of course, that more or less of the advantages of my construction will follow where the flue 15 is placed on one of the sides

of the boiler-casing or at the rear in proximity to the natural-draft flue, and I aim to embrace such an arrangement in the claims.

It will be noted that the transverse flue 17 is situated in a plane somewhat above that of the transverse flue 22. This arrangement I have found to be a satisfactory one, for when the vehicle is standing idle and little or no steam is passing through the engine the demand of the boiler is light, and hence it is desirable to shunt all or a portion of the gases around certain of the tube-sections of the boiler; but when the demand for steam is heavy and a forced draft is employed all of the products of combustion will pass between the convolutions of the boiler and out through the flue 17 into the downwardly-opening flue 15.

I have shown the flues as extending parallel with the boiler-casing; but in cases where it is more convenient they may be inclined more or less with respect thereto.

In accordance with the provisions of the patent statutes I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is merely illustrative and that the invention can be carried out by other means.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In combination, a boiler, a burner therefor, a casing for both, a flue open from end to end arranged exterior of the casing, and means of communication between the casing and flue arranged intermediate the ends of each.

2. In combination, a boiler, a burner therefor, a casing for both, and a flue having separate outlets to the atmosphere and connected at a medial point with the side of the casing for communication with the interior thereof.

3. In combination, a boiler, a burner therefor, a casing for both having an outlet remote from the burner and another outlet less remote from the burner and below the top of the boiler, a forced-draft flue for the former outlet, and a natural-draft flue for the latter outlet.

4. In combination, a boiler, a burner therefor, a casing for both having an outlet at the top and another outlet in its side arranged in a position intermediate the top and bottom of the boiler, a forced-draft flue for the top outlet adapted to control the fire-gases to heat the entire boiler, and an end-to-end-open natural-draft flue for the side outlet whereby the fire-gases may effectively heat only a portion of the boiler.

5. In combination, a boiler, a burner arranged in coöperative relation thereto, a casing for the boiler and burner, a vertical flue open at both ends, a transverse flue connecting the vertical flue with the interior of the



casing, and a second flue closed at its upper end to the atmosphere and open to the interior of the casing.

6. In combination, a boiler, a burner arranged in coöperative relation therewith, a boiler-casing, a flue open at its ends, a transverse flue connecting the first flue with the boiler-casing at points intermediate the ends of the former and the top and bottom of the latter, and a flue independent of the others communicating at one end with the interior of the casing at the top thereof and open to the atmosphere at the other end at a point adjacent the bottom of the casing.

7. In combination, a boiler, a burner arranged in coöperative relation to the same, a casing for the boiler and burner, and separate exterior vertical flues, one flue being open to the atmosphere at top and bottom and in communication with the interior of the casing intermediate its open ends, and the other flue being open to the atmosphere at its lower end and in communication with the interior of the casing at its upper end and at a point in the casing higher than that of the other flue.

8. In combination, a boiler, a burner arranged in coöperative relation to the same, a casing for the boiler and burner, two independent flues, one arranged to draw the fire-gases through the boiler and out of the casing from the space above the boiler and discharging the fire-gases under the casing, and the other flue being arranged to draw the fire-gases through a portion of the boiler and discharging them upwardly, and means connected with the latter flue for preventing back currents of the gases from the flue to enter the boiler or casing.

9. In combination, a boiler, a burner therefor, a casing for both, a vertical flue having its ends open to the atmosphere, a transverse flue connecting the vertical flue with the casing, a second vertical flue open to the atmosphere only at its bottom, a second transverse flue connecting the second vertical flue with the casing at a point above the first transverse flue, and a nozzle for directing steam into the second vertical flue for discharging the fire-gases through the same instead of through the first vertical flue.

10. In combination, a boiler, a burner therefor, a casing for both closed to the atmosphere at the top and having air-inlet openings at the bottom, a vertical flue open to the atmosphere at its ends and communicating with the casing, a second vertical flue having communication at its upper end with the interior of the casing at a point nearer the top than the point of communication between the first vertical flue and the casing, a chamber in the casing for reheating steam, and a nozzle for discharging steam from the chamber into the second vertical flue to create a forced draft through the boiler and casing.

11. In combination, a boiler, a burner therefor, a casing inclosing each and having means

for admitting air to the burner, a flue having open ends, a second flue having one end open and the other closed directly to the atmosphere, and a connecting-flue between each of said flues and casing, one connecting-flue affording communication between the uppermost portion of the casing and the closed end of the second flue, and the other connecting-flue affording communication between the first flue and an intermediate portion of the casing.

12. In combination, a boiler, a burner therefor, a casing for both, two vertically-disposed flues, one at the rear of the casing and the other at the front thereof, said rear flue being open at its ends and in communication with the interior of the casing at its middle and said front flue being open at its lower end and communicating with the interior of the casing at its upper end, and the means for discharging steam into the front flue for creating a forced draft through the casing.

13. A casing for a boiler, comprising a shell closed directly to the atmosphere except for air-inlet openings at its lower portion, and exterior flues communicating with the interior of the casing one at the top and the other at a medial point, the latter flue being open at both ends and the former being open only at one end to the atmosphere.

14. A casing for a boiler, comprising a shell closed directly to the atmosphere except for air-inlet openings at the bottom thereof, two vertical flues substantially the height of the casing, one being open to the atmosphere at both ends and the second one being open to the atmosphere only at its lower end, a transverse connecting-flue connecting the first vertical flue with the casing at a point some distance below the top of the casing, and a second transverse flue connecting the second vertical flue with the casing on the side opposite the other vertical flue and at the top of the casing.

15. A casing for a boiler comprising a shell closed directly to the atmosphere except for air-inlet openings at the bottom thereof, two vertical flues substantially the height of the casing, one being open to the atmosphere at both ends and the second one being open to the atmosphere only at its lower end, a transverse connecting-flue connecting the first vertical flue with the casing at a point some distance below the top of the casing, a second transverse flue connecting the second vertical flue with the casing on the side opposite the other vertical flue and at the top of the casing, a chamber supported at the top of the casing, and means communicating between the chamber and the upper end of the second vertical flue.

16. In combination, a boiler, a burner therefor, means for controlling the burner for heating a portion of the boiler, and means adapted to act in opposition thereto for controlling the heating of the entire boiler.



17. In combination, a boiler, a burner there-  
for, means tending constantly to control the  
heating of a portion of said boiler, and means  
adapted to operate in opposition to the first  
5 means for heating the entire boiler.

18. In combination, a boiler, a burner there-  
for, means for controlling the heating of the  
entire boiler, and means holding a subordinate  
operative relation with the first means and  
10 adapted to be active when the latter is inac-  
tive for controlling the heating of a portion  
of said boiler.

19. In combination, a boiler, a burner there-  
for, means for controlling the heating of the  
entire boiler, and means exerting a constant 15  
tendency to heating a portion of the boiler to  
the exclusion of the other portion and ren-  
dered operative when the first means is idle.

In witness whereof I have hereunto set my  
hand this 29th day of November, 1901.

HERMANN LEMP.

Witnesses:

ALEX. F. MACDONALD,  
DUGALD McK. McKILLOP.