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Date of Application, 14th Mar., 1899

Complete Specification Left, 14th Dec., 1899—Accepted, 14th Mar., 1900

PROVISIONAL SPECIFICATION.

Improved Method and Apparatus for Ventilating Rooms and other Enclosed Spaces.

I, Dr. ALEXANDER HINTERBERGER, of IX. Frankgasse No. 10, Vienna, Austria, Medical Practitioner, do hereby declare the nature of this invention to be as follows:—

5 The means heretofore employed for effecting the ventilation of rooms and other enclosed spaces have proved insufficient or impracticable in particular in the case of hospital wards partly because they do not effect an intimate mixture of the freshly admitted air with that of the room, as is necessary for an effective ventilation, and partly because they cause draughts which are very inconvenient and detrimental more particularly in sick rooms.

10 Good results have been obtained by the system under which fresh air is forced under slight pressure into the enclosed space to be ventilated, as by this means the slight excess of pressure over that of the outer atmosphere prevents the occurrence of in draughts through imperfectly closed windows and doors &c., but this system is still open to the objection that the fresh air forced in is not mixed
15 intimately with the air in the room, producing strata of fresh air outside of which, and in particular in the corners or recesses of the room, the vitiated air remains stagnant. Also, if the fresh air be forced in through comparatively large openings, as is generally the case, this in itself is apt to produce objectionable currents or draughts.

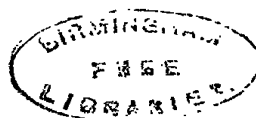
20 The present invention has for its object to improve the above described system of forced air ventilation and consists in so introducing the fresh air under pressure that it shall produce no objectionable draughts, that an intimate mixture of the fresh air with that in the room shall be effected, and that the fresh air shall be warmed before entering the room without the employment of any special heating
25 devices for the purpose.

The improved method consists essentially in arranging round the room or any part thereof and at a certain distance from the floor and walls, a set of perforated pipes communicating at one or more points by branch pipes with a suitable
30 external supply of fresh air under slight pressures, produced by fans or other known means. Thus the air forced through these pipes firstly becomes somewhat warmed by the heat of the room which is conveyed by conduction through the walls of the pipes, and it then issues into the room through a large number of small perforations of the pipes, in the form of small jets which cannot cause draughts and which effectually mingle with the air in the room.

35 The perforations of the pipes are preferably so formed that the issuing air jets are directed downwards towards the floor, and where it is necessary that the fresh air shall be warmed to a greater extent on entering than is possible by the means above described, the heating pipes that are usually provided in hospital wards are arranged in proximity to and somewhat below the air supply pipes so
40 that the jets of fresh air on entering pass in contact with such heating pipes.

In some cases I arrange two sets of air inlet pipes, the one set being above

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the heating pipes and the other set below these, and I control the admission of the air supply to these two sets of pipes by means of a suitable four-way cock or valve, by turning which the air can either be admitted through the upper set of pipes so as to become warmed, or through the lower set of pipes, so as not to be warmed on issuing, as may be required. 5

I also in some cases connect the two sets of air supply pipes at the ends by loops, and I arrange the four-way cock in the middle of the length of such pipes, so that according as the cock is turned into one position or the other, the air supply, may either be admitted through the upper set of pipes, or through the lower set of pipes, or through both the upper and lower set of pipes extending 10 on the one side or the other of the cock, those on the other side being thereby cut off for the time being so that by this means the fresh air is supplied only to one end of a room when required.

With this arrangement I, in some cases, make the lower set of air pipes without perforations, so that, the cock being turned so as to admit the fresh air into the lower pipe only, the air in travelling through this will become warmed by the heat radiated from the contiguous hot air pipes, and in then passing round the connecting loop into the upper air pipe, the air will be still farther heated on issuing in direct contact with the heating pipes. 15

The vitiated air can be discharged in the usual manner through one or more perforated exhaust pipes near the ceiling of the room, but, according to another improvement, more particularly applicable to hospital wards with many beds, where it may be desirable to confine the exhalations of one or more patients to the space immediately surrounding their beds, I provide an exhaust pipe extending along the wall behind the head of the beds, at a height somewhat 20 above the patients heads, and provided with openings at each bed, such openings being provided with slides or valves. 25

By this means, the fresh air on entering, being directed downwards as described will first pass along under the beds near the floor and in mixing with the air of the room will rise up just beyond the foot of each bed, and after circulating 30 through the upper part of the room above each bed, will be drawn down again by the suction of the said exhaust pipe, and will pass away through the opening of the latter, the body of circulating air being thus practically confined to the space surrounding each bed.

Dated this 14th day of March 1899. 35

ABEL & IMRAY,
Agents for the Applicant.

COMPLETE SPECIFICATION.

Improved Method and Apparatus for Ventilating Rooms and other Enclosed Spaces. 40

I, DR. ALEXANDER HINTERBERGER, of IX. Frankgasse No. 10, Vienna, Austria, Medical Practitioner, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

The means heretofore employed for effecting the ventilation of rooms and other enclosed spaces have proved insufficient or impracticable in particular in the case of hospital wards partly because they do not effect an intimate mixture of the freshly admitted air with that of the room, as is necessary for an effective ventilation and partly because they cause draughts which are very inconvenient and detrimental more particularly in sick rooms. 45 50

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Good results have been obtained by the system under which fresh air is forced under slight pressure into the enclosed space to be ventilated, as by this means the slight excess of pressure over that of the outer atmosphere prevents the occurrence of in draughts through imperfectly closed windows and doors &c., but this system is still open to the objection that the fresh air forced in is not mixed intimately with the air in the room, producing strata of fresh air outside of which, and in particular in the corners or recesses of the room, the vitiated air remains stagnant. Also, if the fresh air be forced in through comparatively large openings, as is generally the case, this in itself is apt to produce objectionable currents or draughts, and this is only partially avoided if the air be admitted through several smaller openings instead of a large one.

The present invention has for its object to improve the above described system of forced air ventilation and consists in so introducing the fresh air under pressure that it shall produce no objectionable draughts, that an intimate mixture of the fresh air with that in the room shall be effected, and that the fresh air shall be warmed before entering the room without the employment of any special heating devices for the purpose.

The improved method consists essentially in arranging round the room or any part thereof and at a certain distance from the floor and walls, a set of perforated pipes communicating at one or more points by branch pipes with a suitable external supply of fresh air under slight pressures, produced by fans or other known means. Thus the air forced through these pipes firstly becomes somewhat warmed by the heat of the room which is conveyed by conduction through the walls of the pipes, and it then issues into the room through a large number of small perforations of the pipes, in the form of small jets which cannot cause draughts and which effectually mingle with the air in the room.

I will proceed to describe the mode of carrying out my said invention by means of the accompanying drawings, in which Fig. 1 shews a cross section of a hospital ward and Figs. 2 and 3 two modified arrangements of the ventilating pipes therefor, while Fig. 4 shews the application of the invention to a railway carriage.

The essential feature of the invention consists, as will be seen from Fig. 1, in that the fresh air is propelled at a low pressure into the room to be ventilated through perforated pipes 1, extending longitudinally along the walls thereof.

By this arrangement the fresh air current becomes divided into a considerable number of very small jets in entering the room through the small perforations of the pipes 1, which jets on the one hand do not produce any draught and on the other hand insure an intimate mixture of the fresh air with the air in the room. The pipes are placed at a height of about 0.6 metre from the floor, and at a distance of about 0.3 metre from the wall, and they are either arranged to run right round the room, being interrupted at the doorways and if necessary also at the windows, or the pipes may extend only along the longitudinal walls. The holes in the pipes, which must not be too small in order that the air may issue without noise, are preferably made to incline downwards in the direction towards the middle of the floor of the room, so that the small entering air jets may strike downwards towards the floor. The air is introduced into the pipes preferably at several points through supply pipes 2, in order to obtain as uniform an air pressure as possible. The fresh air is already warmed to some extent during its travel through the pipes 1, which are of the same temperature as the air in the room; such warming can however be considerably increased in winter time by causing the small air jets, in issuing, to pass in contact with heated surfaces.

Such heating surfaces may in many cases consist in the usual heating pipes which extend along the walls of the rooms. Thus if the air supply pipes 1 be arranged above the heating pipes 3 the downward directed air jets from the former will pass in contact with the latter and become warmed to the required extent thereby.

The removal of the vitiated air from the room can be effected either in the usual manner by difference of temperature and density, or by means of an

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exhaust fan, the air being led off through a perforated pipe 4 arranged near the ceiling. In sick wards however, where a patient may be rendered unpleasant or even dangerous to the other patients on account of his exhalations, it is necessary to draw off the vitiated air immediately above each bed.

According to the present invention this is effected by arranging above the fresh air supply pipes 1 air discharge pipes 5 arranged along the walls at a greater distance therefrom than the pipes 1, and near to the heads of the bedsteads, these pipes being provided at each bed with one or more openings 6. These pipes all communicate with a common exhaust pipe from which the air is drawn by means of a fan.

Each such opening 6 can be closed by means of a valve or slide, only those being opened that are situated near a source of vitiated air.

By this means the bad air can be withdrawn from each patient immediately upon its production, without incommoding the patient (as the speed of the air currents can be accurately regulated by the fan), and without materially interfering with the fresh air supply, as this is effected at a great number of points, and the pipes are at some distance apart, while the fresh air jets enter in quite a different direction from that in which the expelled air issues.

Fig. 2 shews an arrangement of the air supply pipes whereby the air supply can be more or less warmed on entering, the pipes being supposed to extend along the longitudinal wall of a room.

This arrangement consists of two perforated lines of pipes 7 and 8, of which the pipes 7 are arranged at a small distance above the heating pipes 3, while the pipes 8 are at a greater distance below the same.

These lines of pipes all converge at the middle to a three way cock 9 having an axial passage 10 and radial passages 11 and 12.

The passage 10 is, in every position of the cock, in communication with the fresh air supply through a pipe 13, while the passages 11 and 12 are made to communicate with different lines of pipes, according as the cock is turned into one position or another by means of the lever 14. In the position thereof shewn on the drawing the passages 11 and 12 communicate with the pipes 7 so that the fresh air entering from the supply pipe 13 passes into these pipes, where it is warmed to a certain extent, and on issuing through the downwardly directed openings it passes in contact with the heating pipes 3 so as to be warmed to a considerable degree thereby.

If the cock is turned half round, so that the lever 14 is situated in the position marked II the passages 11 and 12 communicate with the pipes 8 and consequently the entering fresh air is only warmed to a slight extent by the heat radiated downwards from the pipes 3, and then issues through the downward directed openings towards the floor.

At intermediate positions of the cock air can be supplied from pipe 13 through one or other of the passages 11 or 12 to either the left or the right hand length of either the pipes 7 or the pipes 8 while the other length of the said pipes is closed by the surface of the cock plug 9.

By this means the fresh air will consequently only issue from one half the length of the pipes 7 or 8. Thus when handle 14 is turned into position III the left hand line of pipes 7 will receive air, while at position IV the left hand line of 8, at position V the right hand line of 7, and at VI the right hand line of 8 will communicate with the supply pipe 13.

By this means it is therefore possible to regulate both the quantity and the temperature of the entering fresh air as also to determine the part of the room to which it is to be supplied.

In the modified arrangement shewn at Fig. 3, the two lines of pipes 7 and 8 are connected together at the ends, and only the line of pipes 7 is perforated. Thus if the fresh air be admitted directly to the pipes 7 it will not become warmed to such an extent as would be the case if it were first admitted into the pipes 8, as in this case it would first become heated up to the temperature of the room

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while passing through the considerable length of the pipes 8 before issuing through the pipes 7 where it becomes further heated by contact with the heating pipes 3.

As it is of importance that the entering fresh air should be as pure as possible, it is advisable to lead it through conduits from open spaces, such as a park situated in the neighbourhood or, special enclosed spaces may be provided for the purpose.

The invention may also be applied to the ventilation of railway carriages, in which case pipes are arranged along the whole length of the train, and are provided with funnel-mouthed openings at the front end for the entrance of the air.

From this main pipe branch pipes are carried into each compartment preferably first under the seats as shewn at 15 Fig. 4.

In this case there are arranged two concentric pipes, of which either the inner one is the air supply pipe while the outer one is supplied with steam from the engine, or the inner one may be supplied with steam while air passes through the outer one.

The air supply thus becomes warmed to the required temperature and then passes up through pipes in the side walls into the perforated pipes 16 at the ceiling, whence it issues into the compartment.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Effecting the ventilation of rooms and other enclosed spaces, by causing the fresh air to pass through lines of pipes such as 1, arranged round the room or space, which pipes have small slits or perforations so that the air issues thence into the room in the form of a number of very small jets of low velocity and preferably directed downwards distributed throughout the room, such air jets being, if necessary caused in issuing to pass in contact with heating pipes such as 3 so as to become warmed thereby, substantially as described.

2. In combination with the method of ventilating rooms referred to in the First Claim, the method of drawing off the vitiated air from the room by means of pipes such as 5 arranged along the walls of the room at a suitable height from the floor and provided with valved openings 6 at any points required, such as over every bed in an infirmary, the vitiated air being exhausted from the pipes 5 by fans or other suitable means, substantially as described.

3. The use, for carrying out the method of ventilating referred to in the First Claim, of groups of pipes such as 7 and 8 arranged in combination with a three way cock 9 communicating with the fresh air supply pipe 13, the arrangement being such that according to the position into which the cock is turned the fresh air is admitted either through the whole or a part of the pipes 7 and becomes warmed by contact with the heating pipes 3, or it is admitted through the whole or part of pipes 8 without being warmed, substantially as described with reference to Fig. 2 of the drawings.

4. The modified arrangement of the ventilating pipes referred to in the Third Claim in which the lines of pipes 7 and 8 are connected together at the ends, only the one line of pipes 7 being perforated, so that according as the threeway cock is turned, the fresh air is admitted either directly through the pipes 7, or is first caused to pass through the pipes 8 so as to become warmed before issuing through the pipes 7, substantially as described with reference to Fig. 3.

Dated this 14th day of December 1899.

ABEL & IMRAY,
Agents for the Applicant.

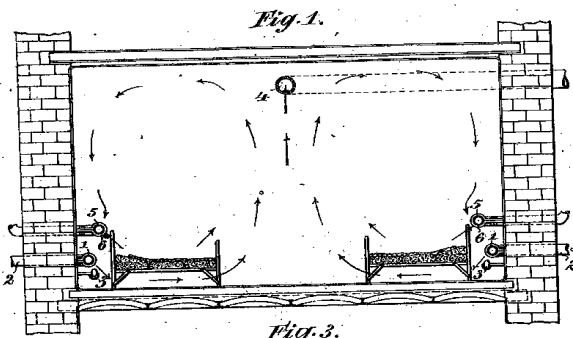


Fig. 1.

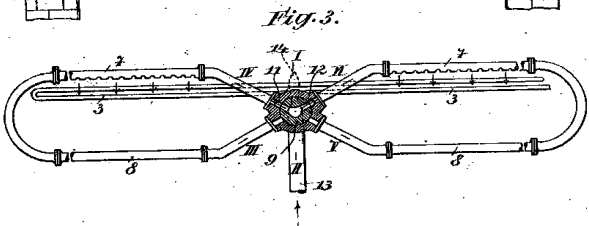


Fig. 3.

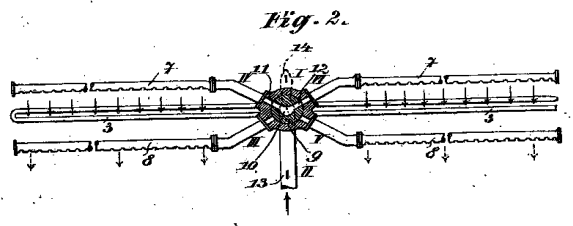


Fig. 2.

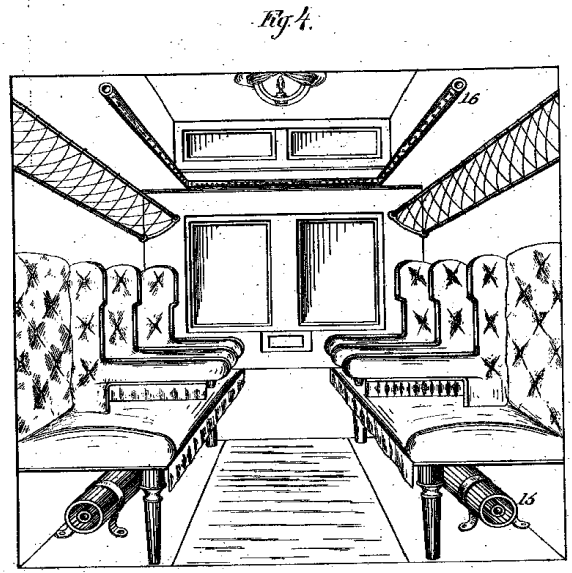


Fig. 4.

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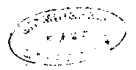


Fig. 1.

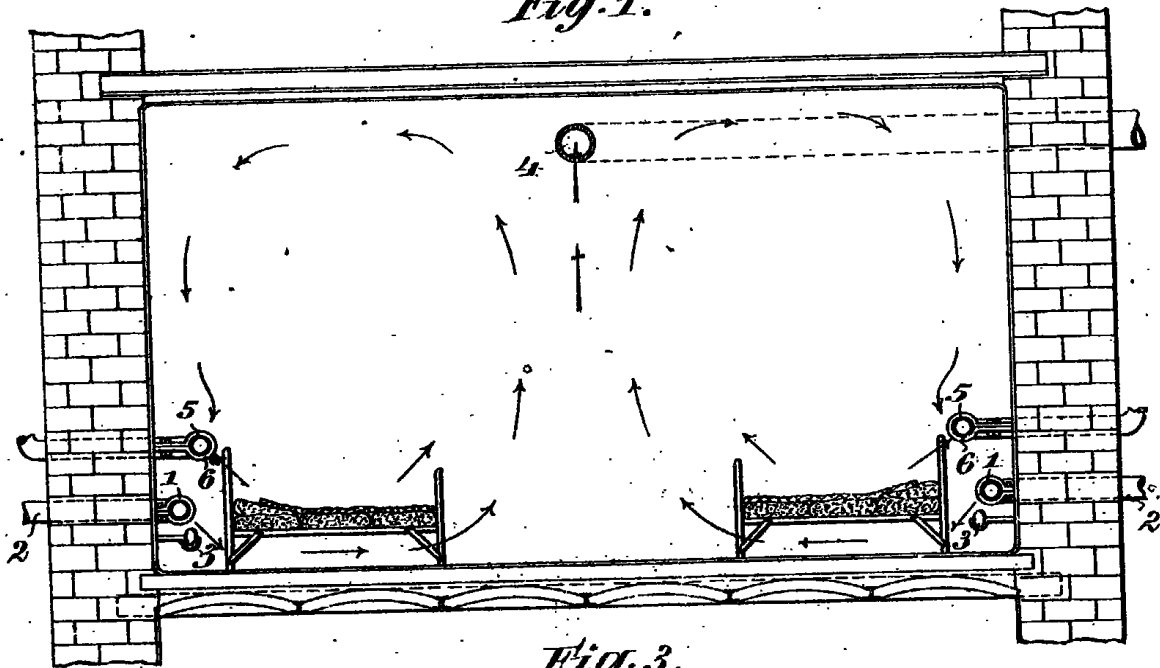


Fig. 3.

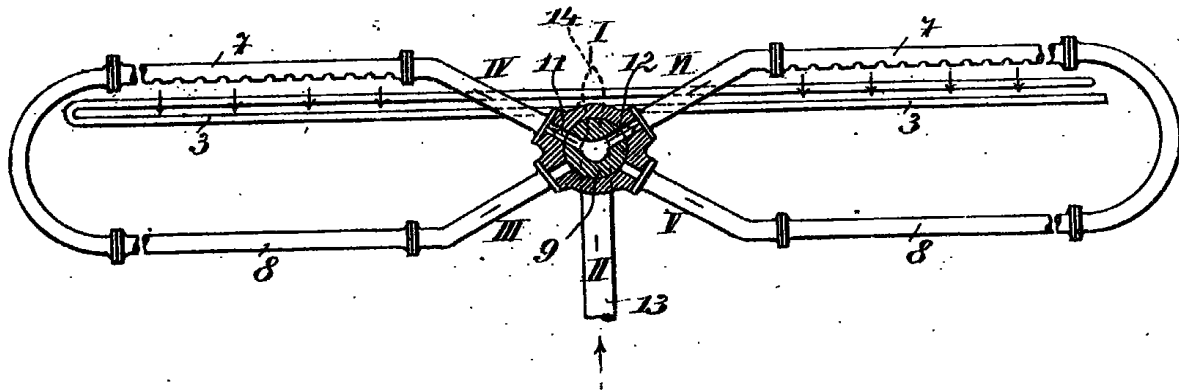


Fig. 2.

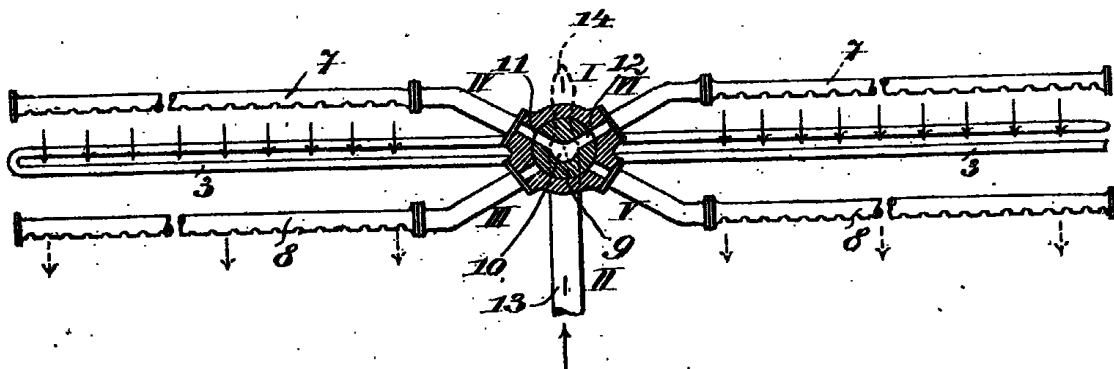
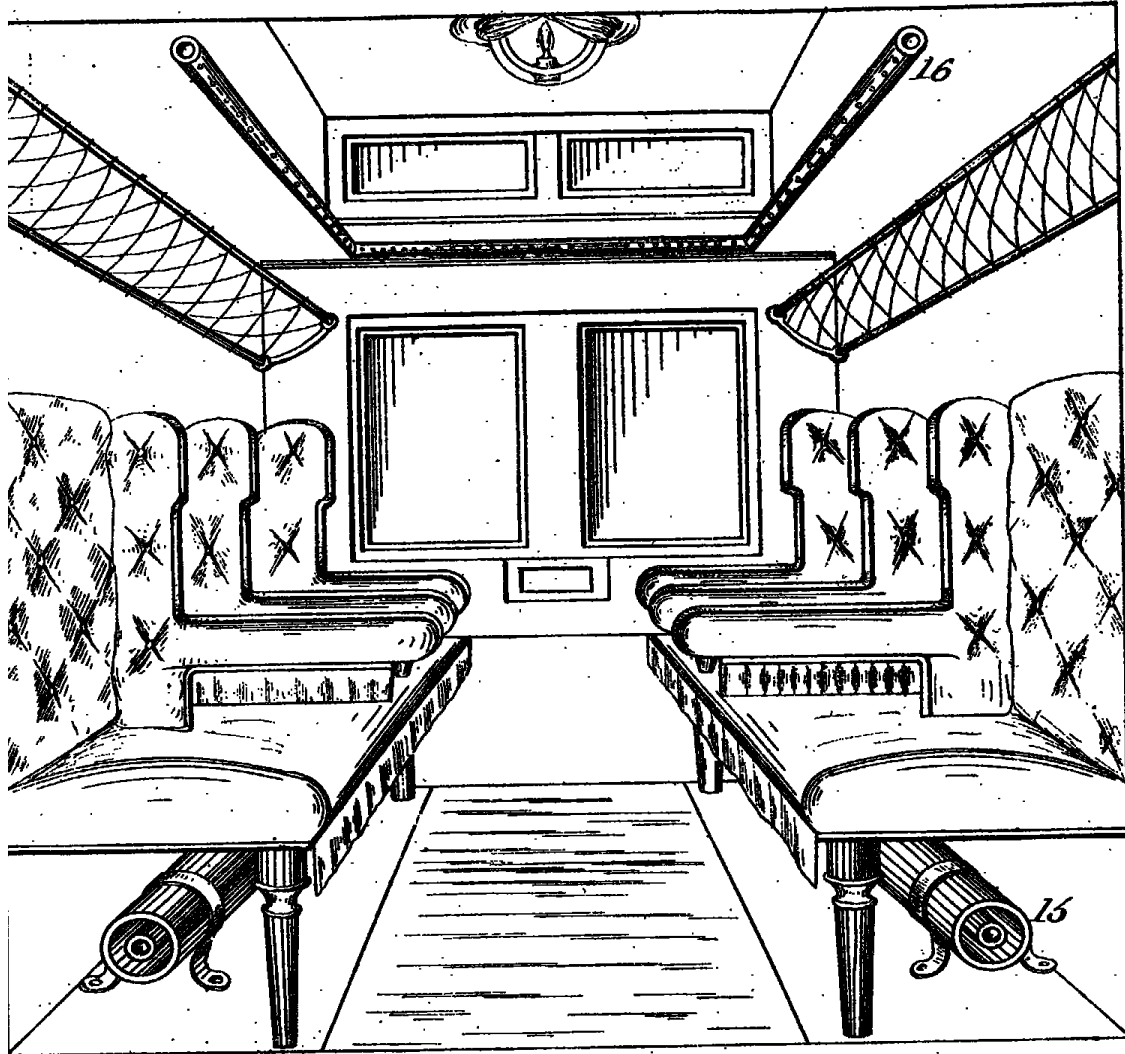


Fig. 4.



[This Drawing is a reproduction of the Original on a reduced scale.]

