No. 842,951. PATENTED FEB. 5, 1907.

G. GIBBS.

VENTILATION OF ELECTRIC MOTORS.

APPLICATION FILED OCT. 25, 1906.

3 SHEETS—SHEET 1.

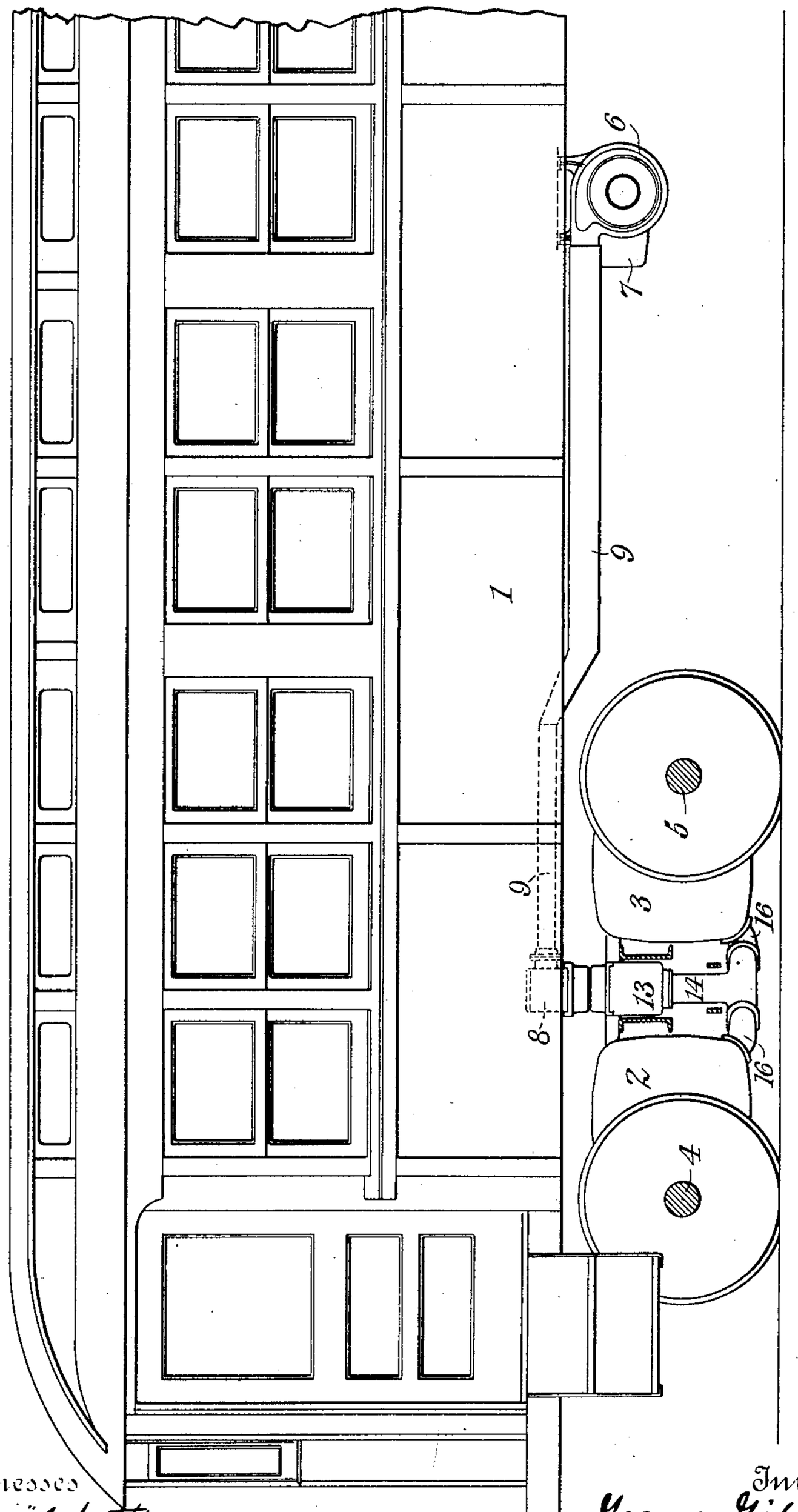

Fig. 1

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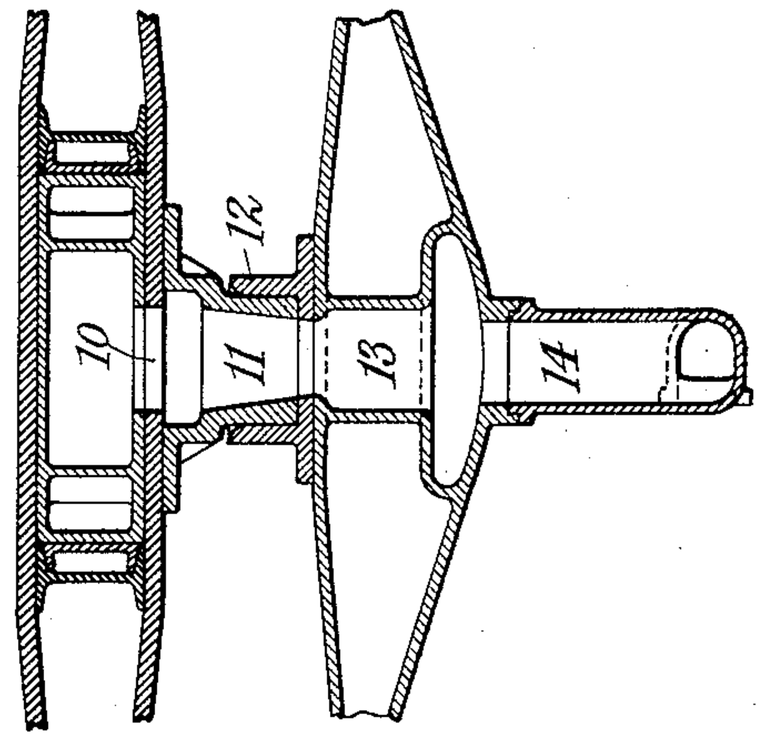

Fig. 4

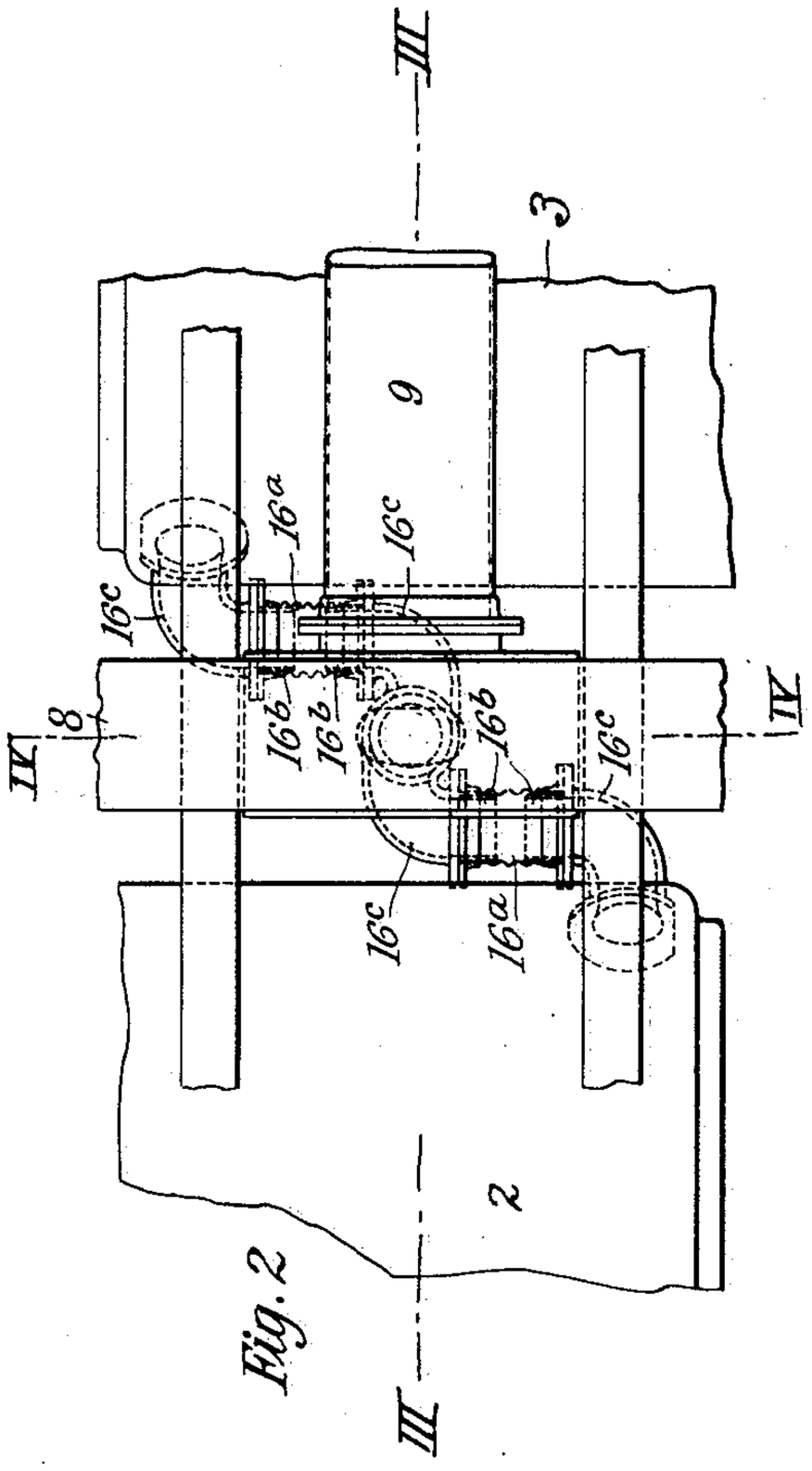

Fig. 2

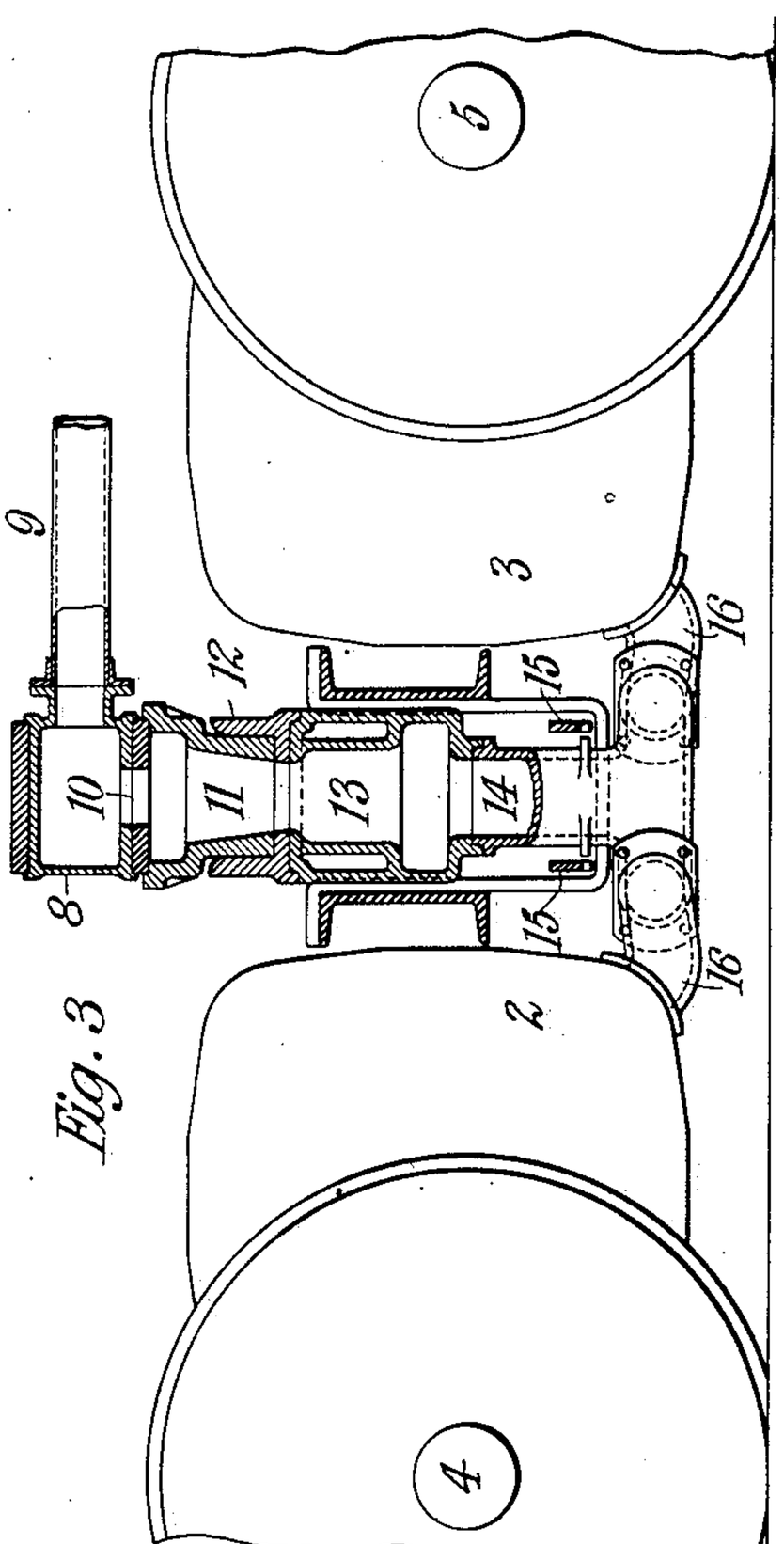

Fig. 3

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3 SHEETS—SHEET 3.

Fig. 5

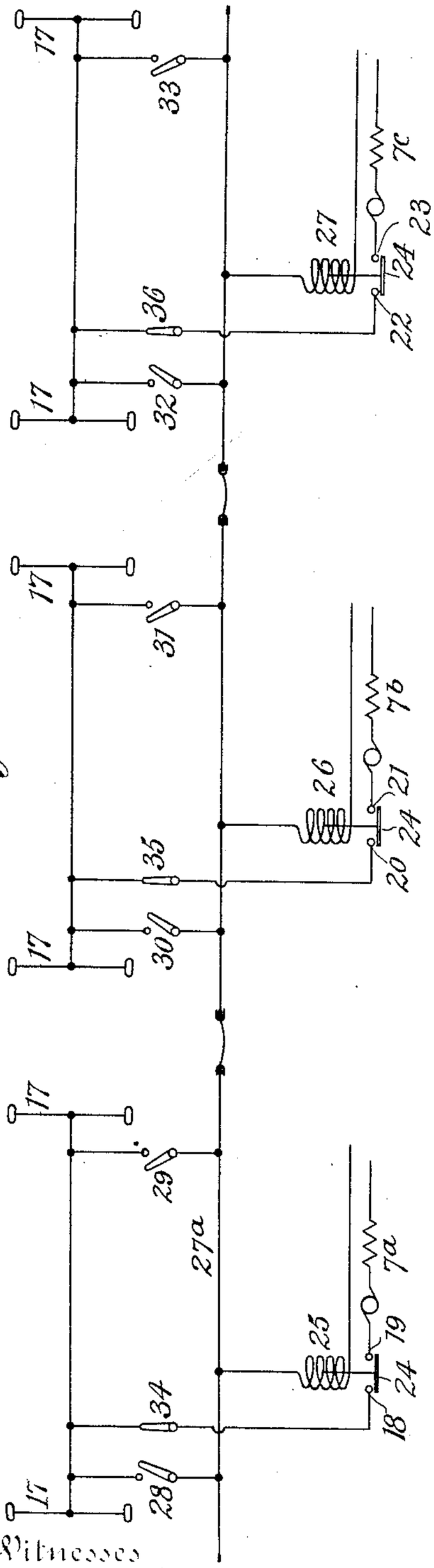
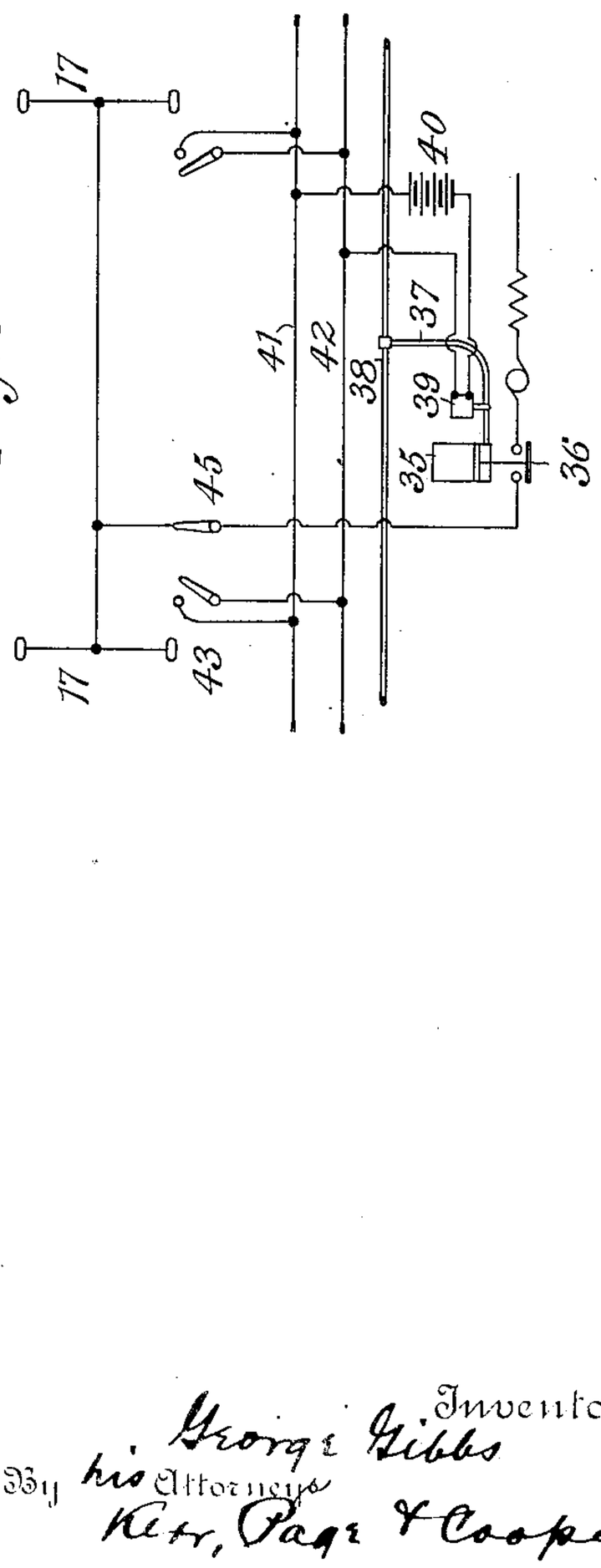


Fig. 6



Witnesses
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UNITED STATES PATENT OFFICE.

GEORGE GIBBS, OF NEW YORK, N. Y.

VENTILATION OF ELECTRIC MOTORS.

No. 842,951. Specification of Letters Patent. Patented Feb. 5, 1907.

Application filed October 25, 1906. Serial No. 340,488.

To all whom it may concern:

Be it known that I, GEORGE GIBBS, a citizen of the United States, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Ventilation of Electric Motors, of which the following is a specification, reference being had to the drawings accompanying and forming part of the same.

At the present time one of the principal limitations in the hauling capacity of electric railway-motors is the necessity of preventing too high a temperature rise in the motors, whether of the direct or alternating current type. This rise of temperature is occasioned in general by the resistance of the armature and field windings to the passage of current and by changes in magnetic intensities of the iron and steel of the armature-core and field-core. The increase of temperature is progressive, the temperature increasing according to the current and the time the current is on the motor, and the limit is reached only when radiation from the motor balances the heat generated in it.

Modern design of motors provides for ventilation both by openings in the motor-casing to permit circulation of air therethrough and by fan action of the armature, which is provided with ducts for that purpose. The above plan increases the capacity of the motor considerably above that of one without ventilation; but in the case of railway-motors which are restricted in size by reason of the restricted space available therefor the desired output of power in some cases cannot be obtained without overheating, even with the ventilation secured by the plan mentioned, thus causing a serious limitation in the speed and schedule in heavy electric traction.

The object of my present invention is therefore, primarily, to provide a ventilating system for the motors of single cars or cars operated in multiple-unit trains, by which the desired output may be obtained from the motors without unsafe heating.

A further object is to provide a system which can be operated while the car or train is at rest, if desired, so that the temperature of the motors may be materially lowered during stops.

Another object is to provide a system which can be controlled from a single point, as the forward end of the train.

A still further object is to provide a system of this kind which shall be simple in construction and operation, which may be applied to motors mounted in swivel-trucks, and which shall withal be thoroughly effective for the purpose in hand.

In carrying out my invention in its preferred form I provide on the car, preferably on the under side of the car-bottom, where space is available, a blower and a motor for driving the same. Leading from the blower to the pivot of the car-truck is an air duct or conduit to convey the air to the pivot, which is hollow. Below the pivot are branch pipes or ducts conveying the air into the motor-casings. The blower-motor is driven, preferably, by current from the contact-rail or trolley-line from which the car-motors are driven; but suitable circuit-controlling devices are provided, so that the fan or blower may be operated whether the car is in motion or not. This preferred arrangement is illustrated in the annexed drawings, in which—

Figure 1 is a side elevation of a portion of a car equipped with my motor-ventilating system. Fig. 2 is a detail plan view of one of the car-trucks, showing the connections and arrangement of the various air ducts or conduits. Fig. 3 is a section substantially on line III III of Fig. 2. Fig. 4 is a section substantially on line IV IV of Fig. 2. Fig. 5 is a diagram showing a system of electric control for my ventilating system. Fig. 6 is a diagram showing a system of electropneumatic control for the system.

Referring now to the drawings, 1 is the car-body, and 2 3 are the customary outer casings of two driving-motors, mounted in the usual way on the axles 4 5, respectively. Suspended from the bottom of the car is a fan or blower 6 of any suitable type, actuated by a motor 7, connected therewith in any convenient and suitable manner.

8 is the chambered body-bolster of the car, connected with the blower by an air duct or conduit 9. From the bolster the air is discharged through an aperture 10 in the under side of the bolster into the interior of the body center plate, which is provided with a downwardly-extending hollow cylindrical member or pivot 11. The latter is of consider-

able depth and fits into an upwardly-extending collar or bearing 12 on the truck center plate, so that no center-pin is required. Extending downwardly from the center of the truck-bolster 13 is an air duct or pipe 14, passing under or through the spring-plank 15. From the pipe 14 extend branch pipes 16 to the motor-casings 2 3.

From the foregoing the operation of the system will be readily understood. The blower being driven at the desired speed, the air therefrom is conducted by the conduit 9 to the body-bolster 8, passing thence through the truck-pivot to the pipe 14, where the current of air divides, flowing through the branch pipes 16 to the motors and escaping from the casings of the latter through suitable apertures. (Not shown.)

In order to permit the motion due to the swiveling of the truck and the up-and-down motion due to the action of the car-springs, a flexible connection of some sort is required in the system of air-passages. Such connection may be located at any convenient point where sufficient clearance can be obtained between the truck parts and the truck motor or motors. In the present embodiment the desired flexibility is obtained by making the branch pipes 16 in part in bellows form, as shown at 16^a. The bellows may be of light material, such as rubber or canvas, and to prevent collapse of the bellows interior sleeves 16^b may be provided, carried by the elbows 16^c.

The rear end of the car is not shown in Fig. 1; but it is clear that if motors are provided for the rear axles these motors may be cooled by air supplied through a conduit (not shown) extending thereto from the blower 6, or an independent blower (not shown) may be provided therefor.

For the purpose of controlling the blower-motors a system (illustated diagrammatically in Fig. 5) is provided, the system being illustrated as applied to a train, but affording independent control of any blower singly, as well as simultaneous control of all the blowers from any one car. The blower-motors 7^a 7^b 7^c are driven by current from the contact rail or trolley (not shown) on which bear contact-shoes 17. In the circuits of the blower-motors are separated contacts 18 19, 20 21, 22 23, which may be bridged by contact-bars 24, actuated by solenoids 25 26 27. The latter are connected with a bus-wire 27^a, taking current from the contact-rail through the shoes 17. In the connections from the shoes to the bus-wire are switches 28 29 30 31 32 33, and it is apparent that closing any one of the switches will energize the bus-wire and solenoids, causing the contact-bars to be lifted against their respective contacts. In the circuits of the contacts and blower-motors are blower-switches 34 35 36.

The operation of the system will now be readily understood. The blower-switches 34 35 36 are normally closed while the switches 28 to 33, inclusive, are normally open, so that the solenoids are not energized. If now it is desired to operate the blowers, one of the "cab-switches" 28 to 33, so called from the fact that they are for convenience located in the cabs of the respective cars, is closed—as, for example, the switch 28 at the forward end of the train—thereby delivering current to the bus-wire and energizing the solenoids 25 26 27, which then draw up their contact-bars 24 and close the several circuits of the blower-motors. If for any reason it is desirable not to operate a particular blower, it is only necessary to open the corresponding blower-switch—for example, switch 34—which cuts off the power from motor 7^a without affecting the remaining motors in any way. In this way any one or more of the blowers may be cut out while the others remain in operation.

An electric pneumatic system of control is illustrated in Fig. 6. In this arrangement the solenoid is replaced by any suitable pneumatic device 35, actuated by compressed air, to lift the contact-bar 36. The pneumatic device is connected by a pipe 37 with an air pipe or main 38, which may extend the length of the train, suitable coupling devices being provided between the cars. In the branch pipe 37 is a magnet-valve 39, energized by a suitable source of current, as a storage battery 40. The magnet-valve and battery are connected across the bus-wires 41 42, and the circuit of the valve may be closed by the cab-switches 43 44. In the connection from the contact-shoes 17 is a blower-switch 45. With switch 45 closed it is clear that if cab-switch 43 be closed also the contact-bar 36 will be drawn up and complete the circuit of the motor-blower, as desired. Opening switch 43 causes the magnet of valve 39 to be deënergized, cutting off communication of the pneumatically-controlled device 35 with the air-pipe 38, thus causing the contact-bar 36 to separate from the coöperating contacts and break the motor-circuit.

I have shown in Fig. 6 the arrangement for only one car; but it is clear that the same control may be applied to a train of two or more cars, as in Fig. 5.

It is to be understood that the devices herein shown and specifically described constitute merely the preferred form of the invention, which may be embodied in a variety of forms without departing from the proper scope of the invention as defined by the appended claims.

What I claim is—

1. In a system of ventilation for electric railway-motors, the combination of a truck provided with one or more motors and having

swivel connection with the car, said swivel connection having an air-passage through the same; means for delivering a current of air into the upper end of said air-passage; and means for conducting the current of air from the lower end of the air-passage to the motor or motors; as set forth.

2. In a system of ventilation for electric railway-motors, the combination of a truck having one or more motors and having a swivel connection with the car, said swivel connection having an air-passage through the same; a blower; an air-conduit conducting air from the blower to the upper end of the said air-passage; and one or more pipes connecting the lower end of said air-passage with the motor or motors; as set forth.

3. In a system of ventilation for electric railway-motors, the combination of a truck provided with one or more motors, a blower, and an air-duct arranged to convey air from the blower to the motor or motors and provided with a flexible portion or portions, as set forth.

4. In a system of ventilation for electric railway-motors, the combination of a car-truck, one or more motors supported in the truck, a blower carried by the car remote from the truck, and an air-duct connecting the blower and the motor or motors, as set forth.

5. In a system of ventilation for electric railway-motors, the combination of a car-bolster having a downwardly-extending hollow pivot, a blower connected with the upper end of said pivot, a truck having an upwardly-extending hollow collar or seat for said pivot, one or more motors carried in the truck, and one or more pipes connecting the motor or motors with the said collar or seat, as set forth.

6. In a system of ventilation for electric railway-motors, the combination with a train of cars having driving-motors, of blowers carried by the cars, means for conducting air from the blowers to the car-motors, motors for actuating the blowers, and means for controlling the blower-motors from a single point on the train, as set forth.

7. In a system of ventilation for electric railway-motors, the combination with a train of cars having motors, of a blower on each motor-car, connected with the driving motor or motors thereon to cool the same, a motor on each motor-car for driving the blower thereon, means for controlling all the blower-motors of the train from a single point in the train, and means for controlling each blower-motor at will independently of the others, as set forth.

8. In a system of ventilation for electric railway-motors, the combination with a train of cars having driving-motors, of blowers connected with the said motors to cool the same, motors for driving the blowers, and electromagnetic means for controlling the blower-motors, as set forth.

9. In a system of ventilation for electric railway-motors, the combination with a train of cars having driving-motors, of blowers connected with said motors to cool the same, motors for driving the blowers, connected in parallel with each other to the same source of current, means for controlling the circuits of the blower-motors simultaneously from a single point in the train, and means for controlling each blower-motor circuit independently of the others, as set forth.

10. In a system of ventilation for electric railway-motors, the combination of a blower, a motor for driving the same, in circuit with a source of current, separated contacts in said circuit, and electromagnetic means for closing said contacts, as set forth.

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Witnesses:
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