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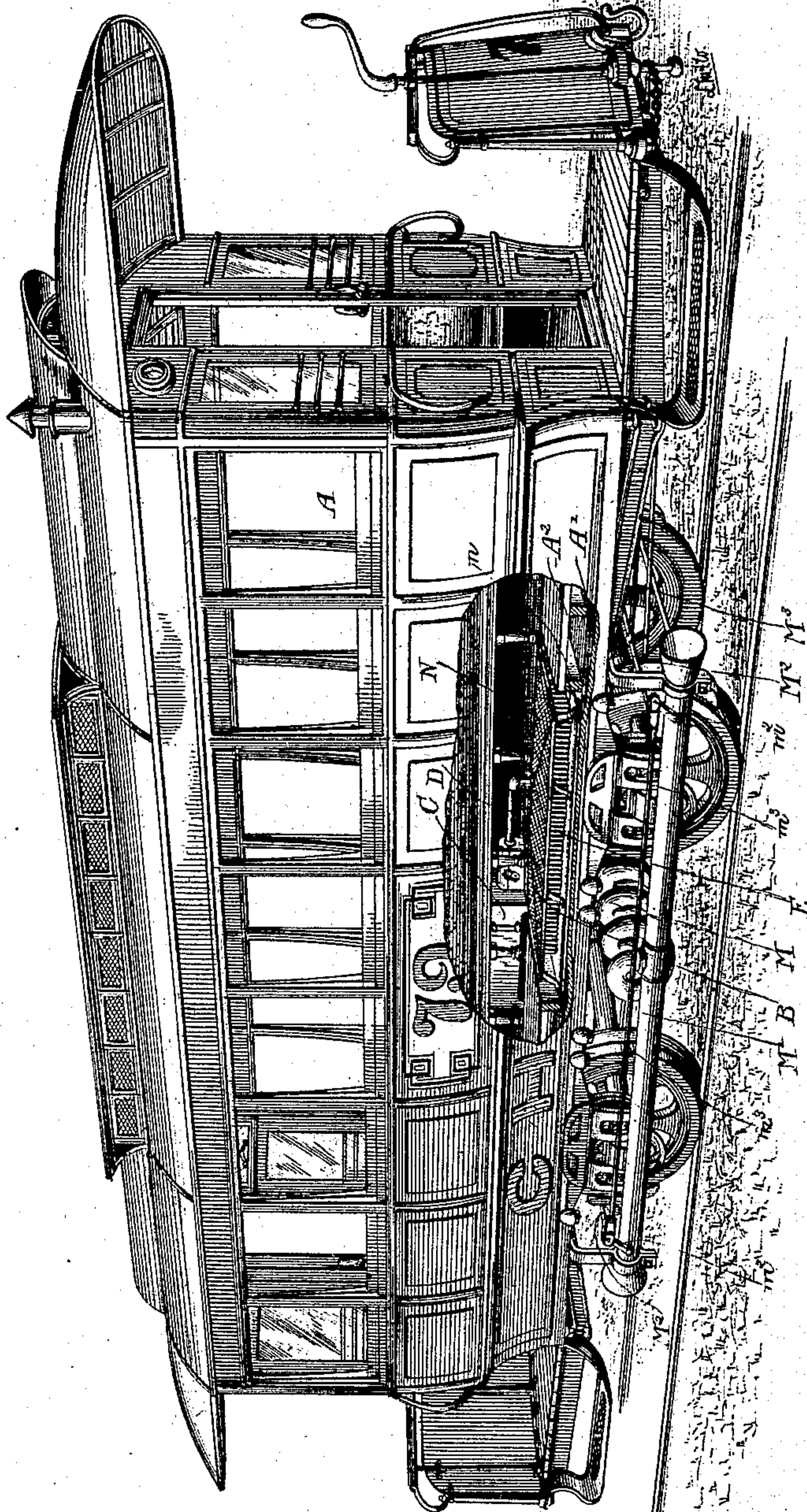
4 Sheets—Sheet 1.

W. VOGEL.  
CAR HEATING DEVICE.

No. 416,877.

Patented Dec. 10, 1889.

*Fig. 1.*



Witnesses:

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*Charles E. Fisher.*

Inventor:

*William Vogel.*

by

*Hayton & Poole*

Attorneys.



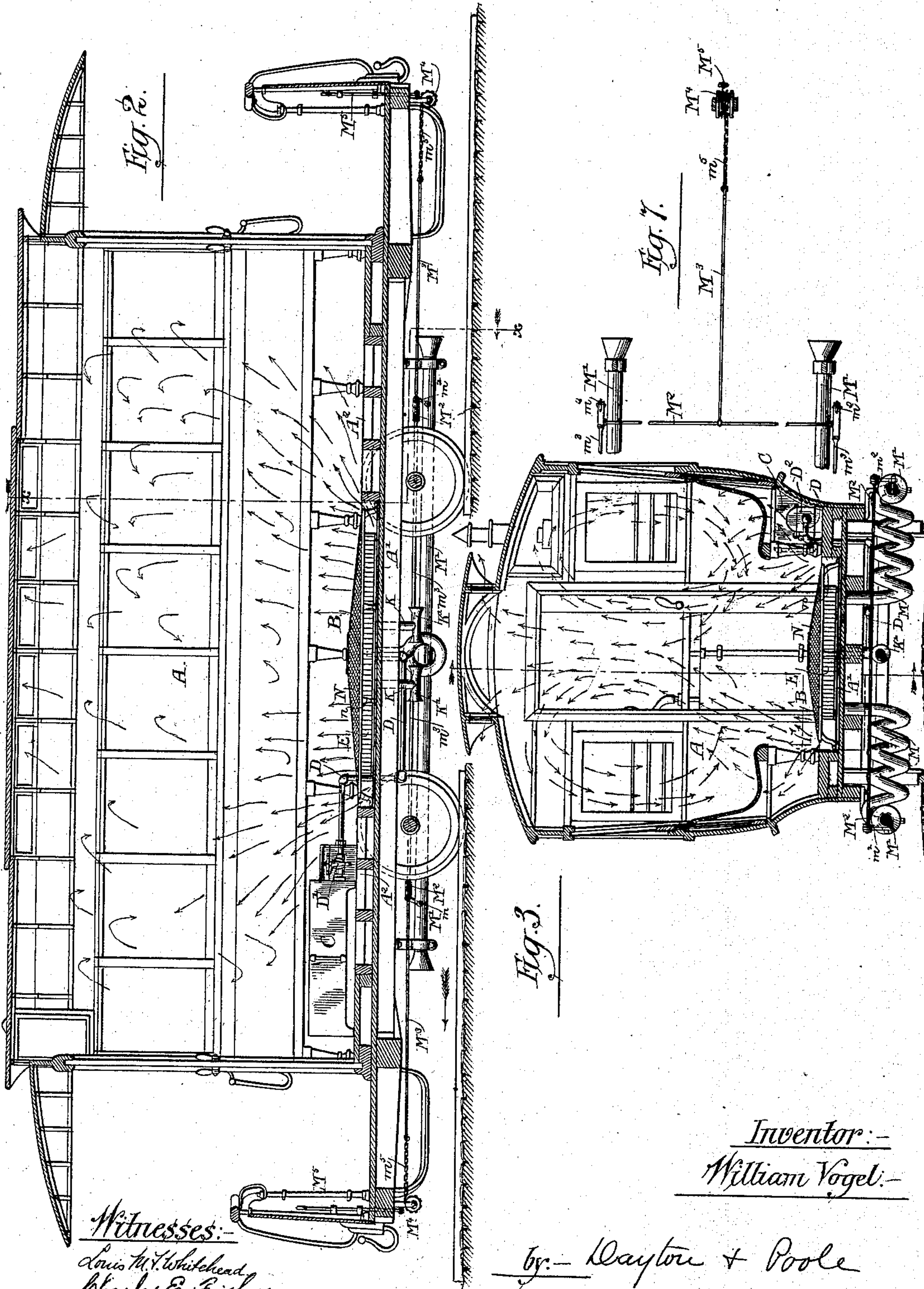
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Witnesses:  
Louis M. T. Whithead.  
Charles E. Fisher.

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William Vogel:-

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(No Model.)

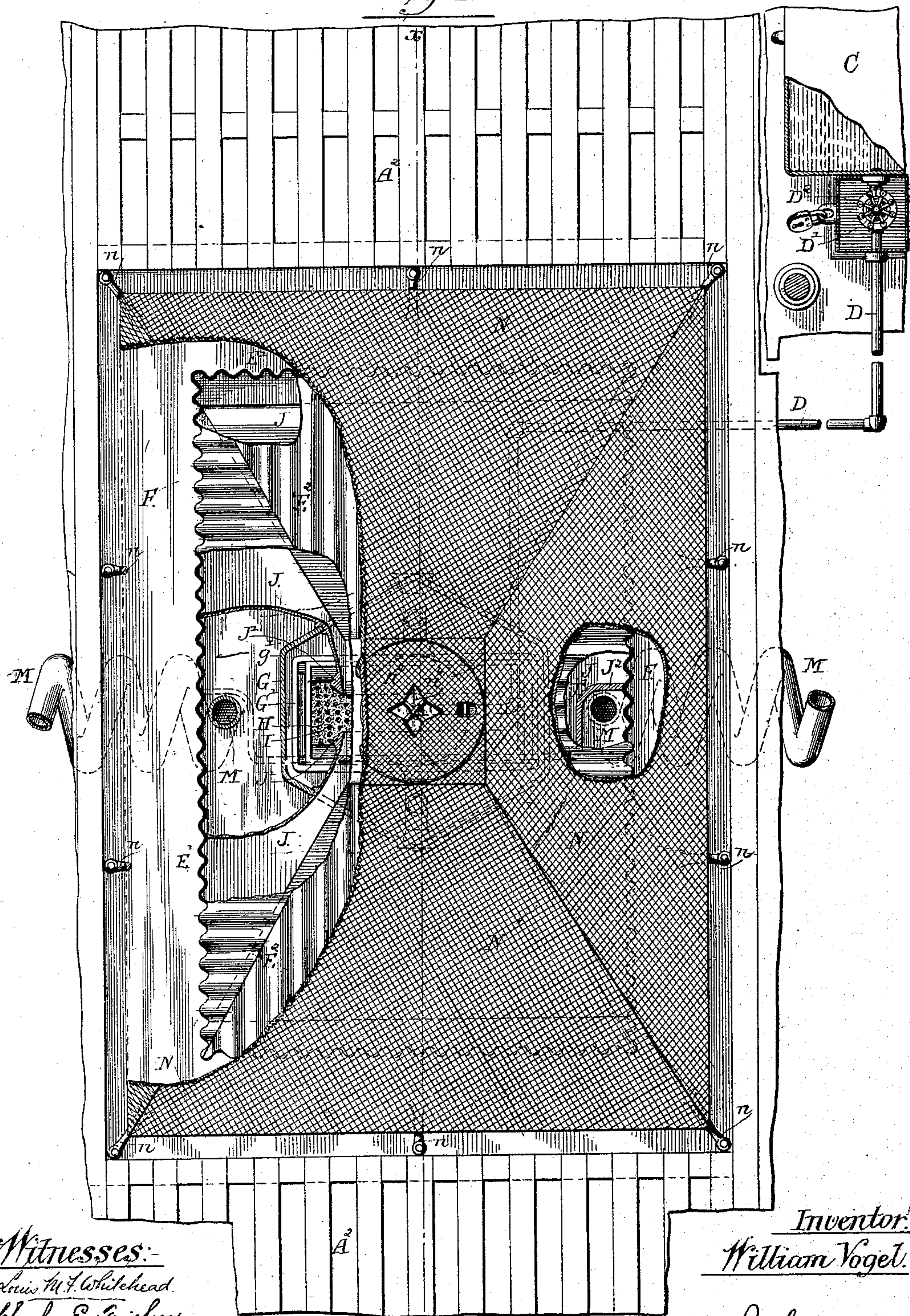
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*Fig. 4*



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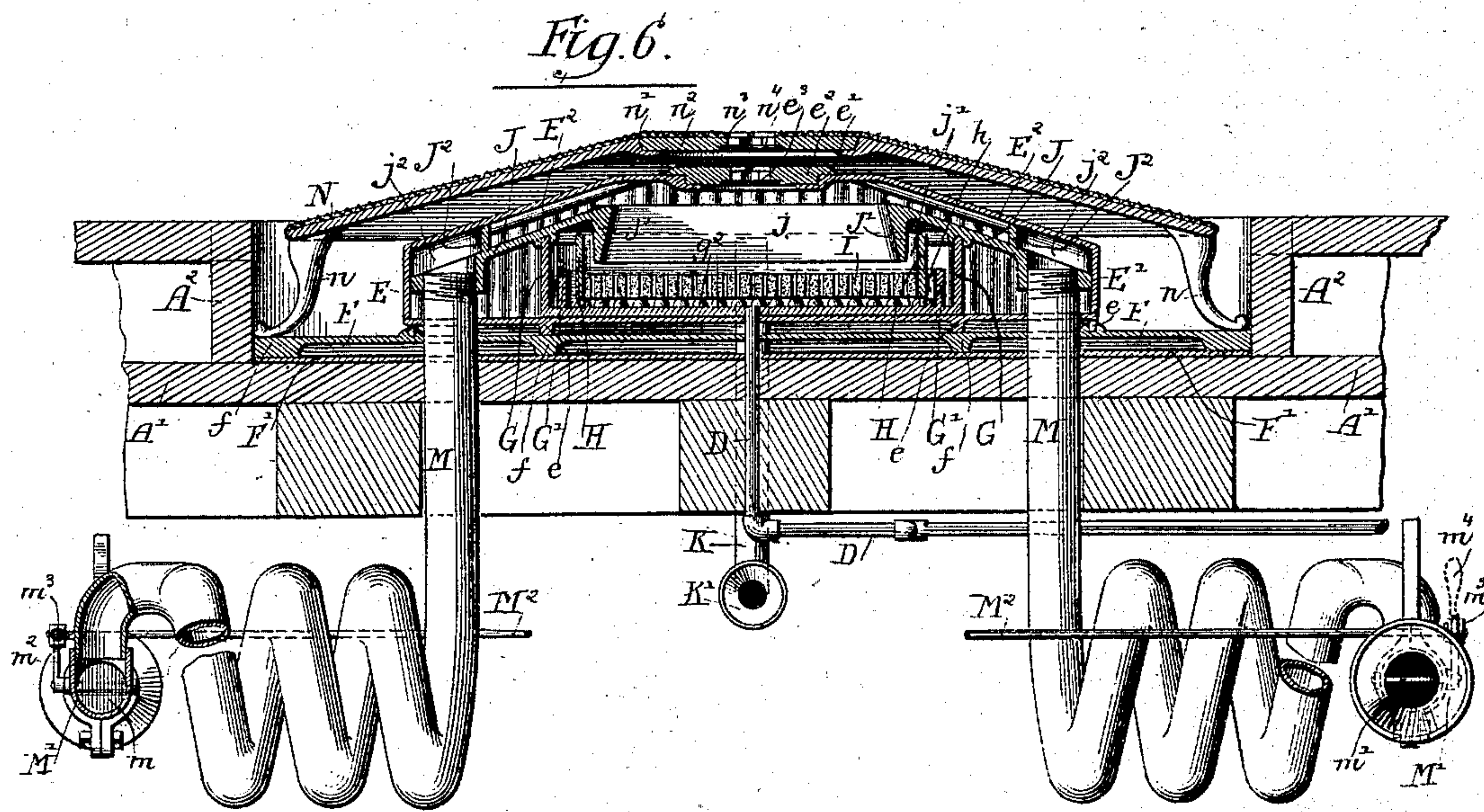
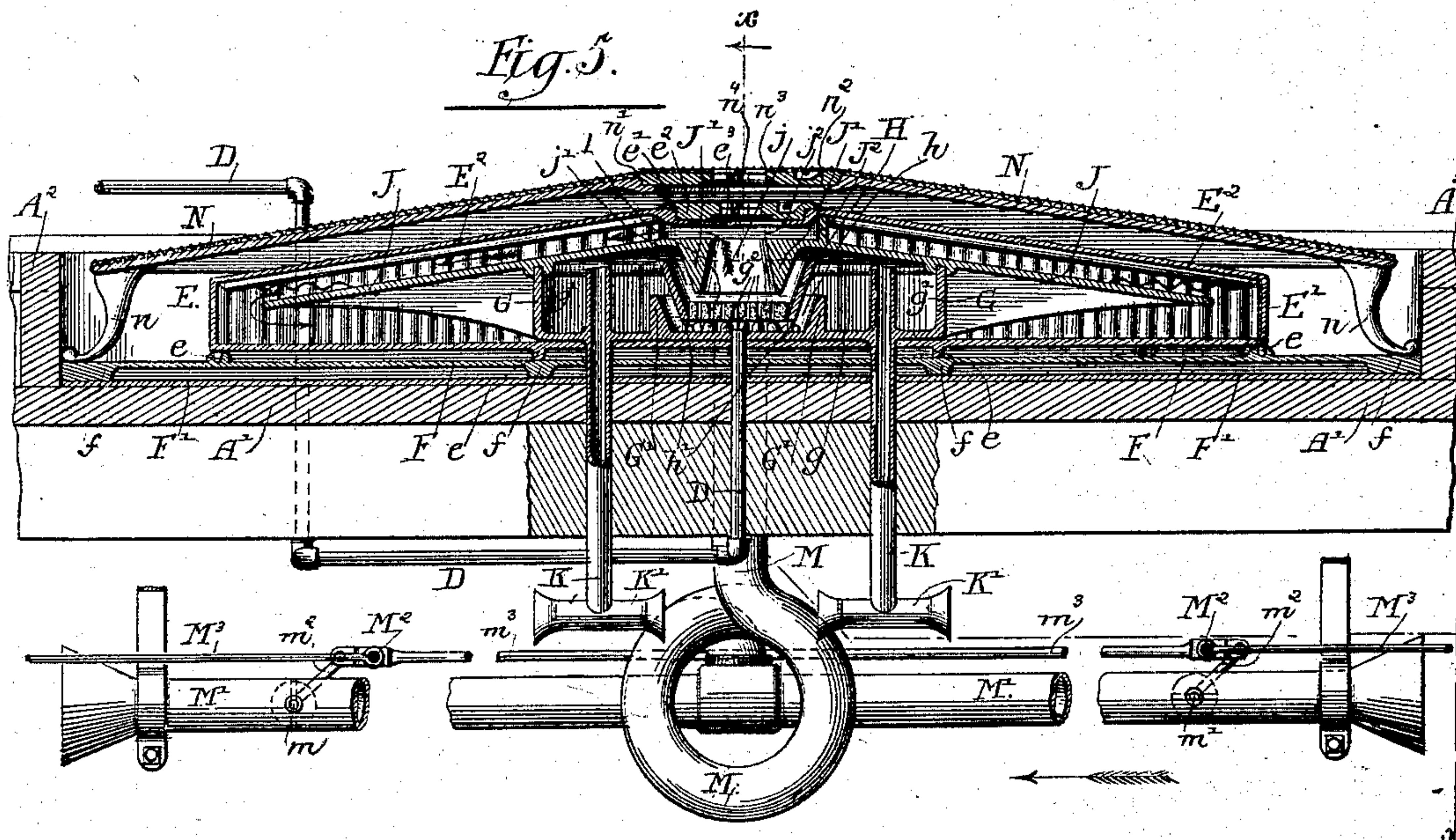
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4 Sheets—Sheet 4.

W. VOGEL.  
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# UNITED STATES PATENT OFFICE.

WILLIAM VOGEL, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE VOGEL PETROLEUM HEATING COMPANY, OF SAME PLACE.

## CAR-HEATING DEVICE.

SPECIFICATION forming part of Letters Patent No. 416,877, dated December 10, 1889.

Application filed August 30, 1886. Renewed July 30, 1889. Serial No. 319,258. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM VOGEL, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Car-Heating Devices; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention embraces a novel construction in devices for heating street-cars, wherein certain novel features of construction in an oil-burning apparatus set forth in a prior application for patent, Serial No. 210,046, filed August 5, 1886, are applied for the purpose mentioned, and other features of construction in car-heating devices, as hereinafter fully explained, and pointed out in the appended claims. In the said prior application a novel heating device is described and shown, comprising in its essential features a fire-box sustaining a perforate bed, means supplying oil to said bed, and a plate or casting provided with a depending part or flange extending downwardly into the fire-box near the side walls of the latter and forming with the said side walls and other parts of the burner a passage delivering air for maintaining combustion to a point near the surface of the said perforate bed.

The heating device herein illustrated comprises a burner made as above described, which is inclosed by a flat or low casing or housing located in the bottom of the car, with its top surface slightly below or upon a level with the car-floor, a protecting plate or grating being placed over the heating device thus formed and located to prevent immediate contact of the feet or clothing therewith. The said burner is provided with air-inlet passages taking air from beneath the car, and the casing or housing of the burner is formed to provide a circulation of the heated products of combustion therein and with suitable outlet-passages for said products of combustion.

The construction of the several parts of the apparatus will be described in detail in

connection with the accompanying drawings, fully illustrating my invention.

In said drawings, Figure 1 is a perspective view of a street-car containing a heating device embodying my invention, with parts broken away to show the location of the said heating device. Fig. 2 is a longitudinal sectional view of the same. Fig. 3 is a transverse sectional view of the same, taken upon line *x x* of Fig. 2. Fig. 4 is an enlarged plan view of the heating device, portions of the top plates thereof being broken away to show the construction of interior parts. Fig. 5 is a longitudinal vertical section of the same, taken upon line *x x* of Fig. 4. Fig. 6 is a transverse sectional view taken upon line *x x*, Fig. 5. Fig. 7 is a detail plan view of devices upon the car for controlling the outlet-openings of the smoke-pipes.

In the said drawings, A indicates the car-body, B the heating device as a whole, and C an oil-tank from which the heating device is supplied through a pipe D.

As herein shown, the heating device is made generally flat in form or with little height in proportion to its width and length, and said heating device is located at the middle of the car-floor. The tank C is shown as placed beneath one of the seats at one end of the car. As far as the general purposes of the invention are concerned, the heating device when thus located may be sustained in any suitable manner by the floor or framing thereof; but in the particular construction illustrated the flat casing of the heating device rests upon the floor *A'*, which is commonly present in cars, and a raised secondary floor or grating *A<sup>2</sup>* is placed upon the said floor *A'* with its top surface at or near the level of the top surface of the heating device, said raised part or floor forming a shallow recess or pit in which the heating device is placed. This construction will generally be used in placing the heating device in cars already built; but in cars especially constructed to receive the heating device the latter will preferably be located in a space or depression formed for the purpose in the floor-frame of the car.

In cases in which it is desired to remove the heating apparatus from the car in sum-



mer the secondary floor or grating will consist of two removable pieces located one at each end of the heating device, as seen in Fig. 4, so that the said heating device and  
 5 both gratings may be taken out and replaced by a single grating, which may or may not be as high as the gratings employed with the heating device.

The heating device proper, consisting of the  
 10 oil-burner and its casing or housing, is, as herein shown, constructed as follows:

E indicates the outer casing or housing of the heating device, being shown as made with a lower trough-shaped part E', having a flat  
 15 bottom and low vertical side walls, and with a top E<sup>2</sup>, highest in the middle and sloping outwardly and downwardly to the several sides of the casing. Said casing is desirably provided with short legs or projections e upon  
 20 its lower surface, by which it is sustained upon a horizontal plate or grating F, which is also provided with short legs f f, resting upon the car-floor, a metal plate F' being desirably interposed between said plate F and the  
 25 floor to more fully protect the latter from the heat of the casing. The side and top walls of the casing E are preferably corrugated, as shown, to increase the effective heating surface of the device.

30 G is a shallow box, which forms part of the casing of the burner proper and which is preferably made of cast metal with a flat bottom g and vertical walls g'. Said box G rests within the casing E upon the bottom of  
 35 the latter, and is herein shown as made hexagonal in plan view; but this shape thereof is not essential. Upon the flat bottom of the said box G, within the outer walls g' thereof, is cast an upwardly-extending flange or wall  
 40 G', herein shown as rectangular in plan, and which forms a shallow receptacle or trough in the central part of the box G.

H is a rectangular frame without bottom or top, which is sustained upon the bottom g of  
 45 the box G within the flange or wall G', with its bottom edges elevated slightly above the said bottom, a space h being provided between the wall G' and the said frame H, so as to afford a passage between the said frame  
 50 and the adjacent parts of the box G. The said frame H is, as shown, sustained in the position described by means of lugs or projections h h upon its lower edge.

I is a perforated bed, preferably of asbestos, fire-brick, or similar porous material, but  
 55 which may be of perforated cast-iron. Said bed fills the open bottom of the frame H and is preferably supported upon studs or projections g<sup>2</sup> upon the surface of the bottom g  
 60 of the said box G.

J is a top plate or casting, which rests upon the upper edge of the box G and closes the top of said box, with the exception of a central exit-opening j, located over the porous  
 65 bed I, said casting being provided with a depending flange J', extending downwardly within the frame H, near the side walls there-

of, and surrounding the opening j. Said flange terminates at its lower edge slightly above the top surface of the perforate bed I, 70 and the top edge of the said frame H is terminated at a short distance below the under surface of the top plate J, thereby forming a passage j', leading from the space of the burner within the box G, exterior to the frame I, be- 75 tween said frame and the flange J', to the top of the bed I. The said top plate J is extended beyond the walls g' of the box G, so as to form partitions to cause a circulation of air within the casing E, as will be hereinafter 80 described.

The oil-supply pipe D, which extends from the tank C beneath the car-floor to the burner, is extended upwardly through the plate F and the casing E and is fixed in the bottom 85 g of the box G within the wall or flange G', so as to deliver the oil into the trough or receptacle formed by said wall G' beneath the bed I, through which the oil rises in the operation of the burner, as will hereinafter 90 more fully appear. The top of the said wall G' is preferably lower than the lower edge of the flange J', so that the oil which rises through the porous bed H may overflow the wall G' into the part of the box G exterior to 95 said wall, and thereby prevent the closing of the air-passage between the top of the bed and the said flange.

K K are air-supply tubes, which extend from points beneath the car upwardly 100 through the casing E and box G, and which open within the latter. Said tubes K K are preferably extended upwardly through the box G to points near the top of the latter, and are desirably provided at their lower ends with 105 open-ended cross-tubes K' K', arranged horizontally and parallel with the sides of the car, whereby the influx of air to the tubes will be facilitated when the car is moving in either direction, said tubes K' K' being pref- 110 erably made bell-mouthed, as shown, to favor the influx of air thereto.

The top plate J of the burner is extended beyond the walls of the box G and in such manner as to come in contact with the verti- 115 cal walls of the casing at the longer sides thereof, while terminating short of the said vertical walls at the shorter sides or ends of said casing, as clearly shown in the drawings, Figs. 4 and 5. The space or chamber thus 120 formed between the top E<sup>2</sup> of the casing and the said top plate J is divided transversely by a cross-wall J<sup>2</sup>, located at one side of the burner-opening j, Figs. 4 and 6, said wall J<sup>2</sup> being herein shown as formed by an upward- 125 ly-extending flange cast upon the plate J.

M M are exit-pipes for smoke or products of combustion. Said pipes are located one at each side of the burner and are fixed at their upper ends in the top plate J, so as to 130 communicate with the space above said plate, and extend downwardly through the bottom of the casing E and the car-floor and are provided with suitable exit-openings, a particu-



lar construction of which is herein shown and will be hereinafter described. The pipes M are herein shown as located upon a transverse line passing through the center of the burner, and the partition J<sup>2</sup> is shown as made with offsets j<sup>2</sup> j<sup>2</sup> at its ends, extending between the burner-outlet j and the said pipes, so that the direct passage of the products of combustion from the said outlet j to the exit-pipes is prevented.

In the operation of the heating device the oil admitted through the pipe D rises through the perforate bed I and is burned in the space or combustion-chamber above the bed. The air entering the box G through the air-pipes K K passes downwardly through the space j' between the frame H and flange J', and is thereby delivered at a point adjacent to the top of the bed I, where combustion takes place. Any surplus oil passing over the wall G' to the box G is therein vaporized and passes to the combustion-chamber with the air from the tubes K K and is there burned. The flames and products of combustion pass upwardly through the aperture j in the top plate J and are carried toward one end of the casing over said top plate, as indicated by the arrows in the drawings, the transverse partition J<sup>2</sup> preventing the passage thereof in the contrary direction. Upon reaching the end of the casing the said products of combustion pass downwardly around the edge of the plate J and then backwardly beneath said plate and around the sides of the box G to the opposite end of the casing. At this point they pass upwardly around the edge of the plate J, and they then pass over said plate toward the middle of the casing, where they encounter the partition J<sup>2</sup> and are carried downwardly and out of the casing through the pipes M M. By this construction a circulation of the flames and heated products of combustion from the burner is obviously maintained throughout all parts of the casing of the heating device. The cold-air-inlet pipes K K are made much smaller in cross-sectional area than the exit-pipes M M, thereby insuring the outward passage from the burner of the heated products of combustion and the necessary draft through the burner.

To allow access to the burner for lighting it and for other purposes, the top E' of the casing is preferably provided with a central opening e', provided with a cover e<sup>2</sup>, which may be lifted off at pleasure. A plate e<sup>3</sup>, of glass or mica, is desirably inserted in the cover e<sup>2</sup> to permit inspection of the burner-flame without removing the said cover.

N in the drawings indicates a plate or guard of a form which I preferably employ for covering and protecting the heating apparatus. Said plate is, as shown, made in the same general form as the top of the casing E, with its middle part higher than its margins, and is provided with legs n n, whereby it is supported from the surface upon which the said casing rests. The said plate will be sup-

ported free from contact with the burner-casing, and its margins will preferably be located upon the same level with the adjacent floor of the car, the legs n n being arranged to rest upon the bottom of the recess or pit within which the heating device is located. By this construction the said plate N forms part of the car-floor, and by being elevated in its middle part at the same time affords ample space beneath it for the burner and its casing. The said plate N is desirably provided with a central opening n', within which is fitted a removable cover n<sup>2</sup>, said opening n' being preferably made larger than the opening e' of the casing E, so that the cover e<sup>2</sup> of the latter may be removed through said opening n' and access thereby had to the said casing without removing the plate N. The cover n<sup>2</sup> is preferably provided with an opening n<sup>3</sup>, filled by a plate n<sup>4</sup>, of mica or glass, whereby, in connection with the similar opening in the cover e<sup>2</sup> beneath it, the burner-flame may be viewed from the interior of the car.

To facilitate the free passage of smoke and products of combustion from the exit-pipes M M, the latter are connected at their outer ends with horizontally-arranged pipes M' M', placed parallel with the sides of the car and open at both ends. Said pipes M' are provided with valves m m' m' at their open ends, by means of which the ends of the pipes which are in advance when the car is moving in either direction may be closed and the ends at the rear may be opened, thereby allowing the free passage of the products of combustion from the smoke-pipes in whatever direction the car is moving. As preferably constructed, the valves m m' consist of horizontally-pivoted flat disks, the supporting-pivots of which are connected with levers m<sup>2</sup>, located at the outside of the pipes. The free ends of said levers m<sup>2</sup> belonging to the valves m m' of each pipe are preferably connected by a rod m<sup>3</sup>, and the said valves are arranged relatively to each other in such manner that when one valve is open the other is closed. This construction obviously enables both valves m and m' to be properly turned by moving either one of them or by moving the connecting-rod m<sup>3</sup>. I have shown in dotted lines at m<sup>4</sup> a handle applied to the rod m<sup>3</sup>, whereby the valves may be readily moved; but a preferable means for actuating the said valves whereby they may all be operated from the car-platforms is illustrated in full lines and more clearly shown in Fig. 7. Said device consists of cross-bars M<sup>2</sup> M<sup>2</sup>, rigidly connecting the rods m<sup>3</sup> m<sup>3</sup> at opposite sides of the car, and rods or chains M<sup>3</sup> M<sup>3</sup>, attached to said cross-bars and extended to points upon the car-platforms where they can be conveniently reached by the driver or conductor. In the particular construction illustrated rods M<sup>3</sup> M<sup>3</sup> are employed, which extends to points beneath the platforms, where they are connected with chains m<sup>5</sup> m<sup>5</sup>, which pass over pulleys M<sup>4</sup> M<sup>4</sup> and are attached to



vertically-sliding rods  $M^5 M^5$ , Figs. 2 and 7, extending upwardly through and sliding in the platform and provided with handles at their upper ends. By drawing upwardly upon the said rods at one or the other end of the car the valves  $m m'$  may be shifted in an obvious manner.

The exit smoke-pipes  $M' M'$  are preferably located at the sides of the car exterior to the wheels, and the main smoke-pipes  $M M$  are bent into spiral form in their parts which extend horizontally outward to said pipes  $M' M'$ , in order to facilitate the passage of the products of combustion through said pipes. This spiral construction of the smoke-pipes is advantageous, and is therefore herein claimed; but such construction is not essential to the successful working of other parts of the apparatus.

The oil-supply pipe  $D$  is shown in the drawings as provided with a regulating-valve  $D'$ , Figs. 2 and 4, similar to that described and claimed in a prior application, Serial No. 210,047, filed August 5, 1886, whereby the quantity of oil delivered to the burner may be accurately controlled. As herein shown and preferably constructed, said valve is inclosed within a box or casing  $D^2$ , provided with a lock, whereby access to the valve by unauthorized persons may be prevented.

The location of the heating device, made broad and flat, in the position shown—namely, in the middle of the car-floor—is of advantage as tending to produce an equal diffusion of the heat throughout the car, the probable course of the warm-air currents within the car being approximately indicated by the arrows in Figs. 2 and 3.

I claim as my invention—

1. In a heating device for street-cars, the combination, with a closed exterior box or casing, of a box  $G$ , consisting of side walls and a bottom, said box being provided with an inner wall or flange  $G'$ , forming an oil holder or receptacle, an open frame  $H$ , a pipe supplying oil to said oil holder or receptacle, a top plate  $J$ , resting upon the top of said box  $G$  and provided with the central flame-outlet  $j$  and a depending flange located within the frame  $H$ , an air-outlet pipe communicating with the interior of the box  $G$ , and a smoke-exit pipe or pipes communicating with the casing  $E$  exterior to said box, substantially as described.

2. The combination, with the exterior casing  $E$ , of the box  $G$ , provided with side and bottom walls, forming an oil holder or receptacle, a combustion-chamber located over the bed, a top plate  $J$ , resting upon the side walls of the box  $G$  and provided with a flame-opening, partitions dividing the casing horizontally and formed to provide passages at opposite ends of the casing, smoke-pipes communicating with the upper compartment of the casing, and a partition extending across said upper compartment between the flame-outlet passage of the burner and the said exit-

pipe, whereby the products of combustion are caused to circulate from end to end of the casing before making their exit therefrom, substantially as described.

3. The combination, with the exterior closed casing  $E$ , of an oil-burner located within the casing and consisting of a box or shell  $G$ , formed to provide an oil holder or receptacle, a top plate  $J$ , and a combustion-chamber located over the bed and having an outlet-opening through the top plate  $J$ , said top plate being extended to form a partition dividing the casing into two parts or chambers and formed to provide passages adjacent to the end walls of the casing, a partition  $J^2$ , extending across said top plate at one side of the flame-opening therein, and a smoke-exit pipe or pipes communicating with the said upper part of the casing, substantially as described.

4. In a heating device for street-cars, the combination, with a closed exterior box or casing, of a box  $G$ , consisting of side walls and a bottom, said box being provided with an inner wall or flange  $G'$ , an open frame  $H$ , a porous bed forming the bottom of said frame, a pipe supplying oil to said bed, a top plate  $J$ , resting upon the top of said box  $G$  and provided with a central flame-outlet  $j$  and a depending flange located within the frame  $H$ , an air-outlet pipe communicating with the interior of the box  $G$ , and a smoke-exit pipe or pipes communicating with the casing  $E$  exterior to said box, substantially as described.

5. The combination, with the exterior casing  $E$ , of the box  $G$ , provided with side and bottom walls, a porous bed located within said box, a combustion-chamber located over the bed, a top plate  $J$ , resting upon the side walls of the box  $G$  and provided with a flame-opening, partitions dividing the casing horizontally and formed to provide passages at opposite ends of the casing, smoke-pipes communicating with the upper compartment of the casing, and a partition extending across said upper compartment between the flame-outlet passage of the burner and the said exit-pipe, whereby the products of combustion are caused to circulate from end to end of the casing before making their exit therefrom, substantially as described.

6. The combination, with the exterior closed casing  $E$ , of an oil-burner located within the casing and consisting of a box or shell  $G$ , a top plate  $J$ , a porous bed, and a combustion-chamber located over the bed and having an outlet-opening through the top plate  $J$ , said top plate being extended to form a partition dividing the casing into two parts or chambers and formed to provide passages adjacent to the end walls of the casing, a partition  $J^2$ , extending across said top plate at one side of the flame-opening therein, and a smoke-exit pipe or pipes communicating with the said upper part of the casing, substantially as described.

7. The combination, with a car-heating device, of an exit-pipe for products of combus-



tion, provided with two oppositely-facing exit-openings, valves controlling said openings, and means connecting said valves, whereby when one of the valves is opened the other will be closed, substantially as described.

8. The combination, with a car-heating device, of an exit-pipe for products of combustion and provided with two oppositely-facing exit-openings, valves severally controlling said exit-openings, means connecting the said valves, whereby when one of said valves is open the other will be closed, and actuating devices connected with the valves and extending to the platform of the car, substantially as described.

9. The combination, with a car the floor of which is provided with a shallow pit or de-

pression, of a heating device located within said pit or depression, consisting of a flat or shallow casing and a heating-burner located within said casing, substantially as described.

10. The combination, with a car the floor of which is provided with a shallow pit or depression, of a heating device occupying said pit or depression, and removable gratings located upon the car-floor adjacent to said heating device, substantially as described.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

WILLIAM VOGEL.

Witnesses:

C. CLARENCE POOLE,  
CHARLES E. FISHER.