(No Model.) 3 Sheets—Sheet 1.

W. H. WARD.

MEANS FOR WARMING RAILWAY CARS BY STEAM.

No. 264,913. Patented Sept. 26, 1882.

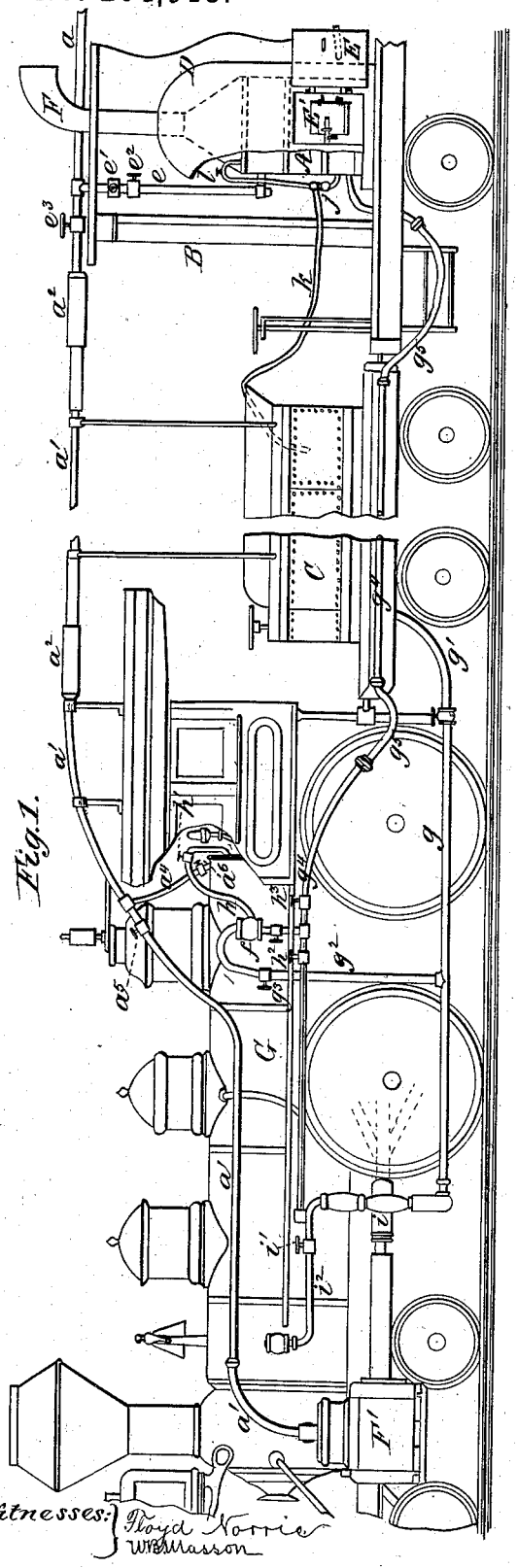

Fig. 1.

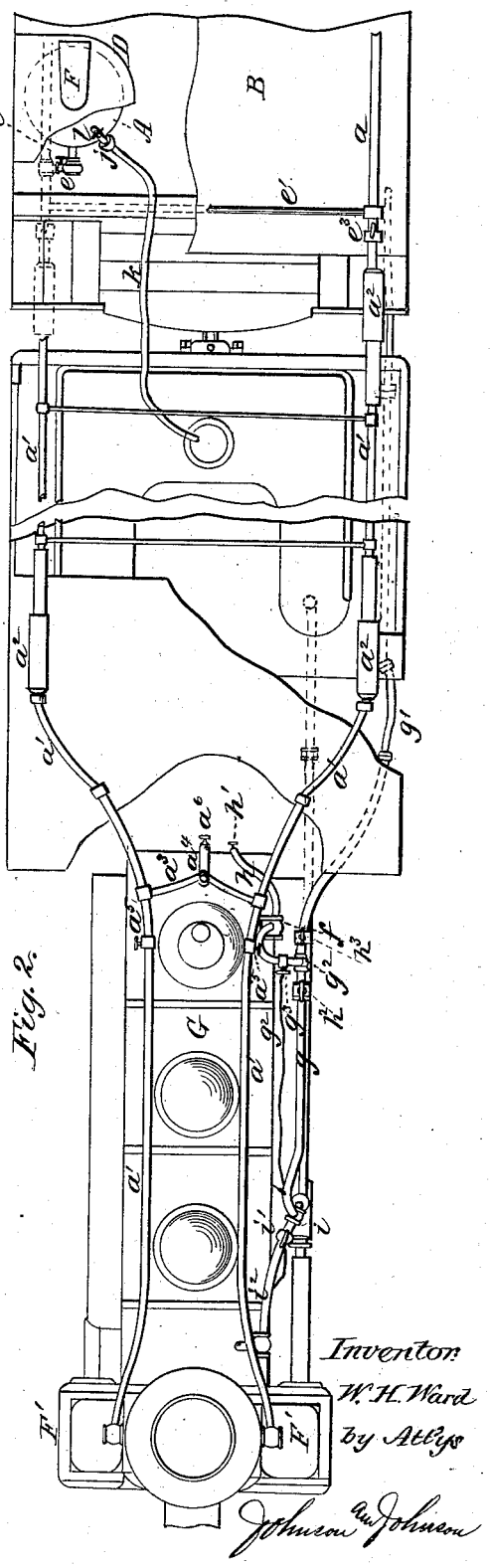

Fig. 2.

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

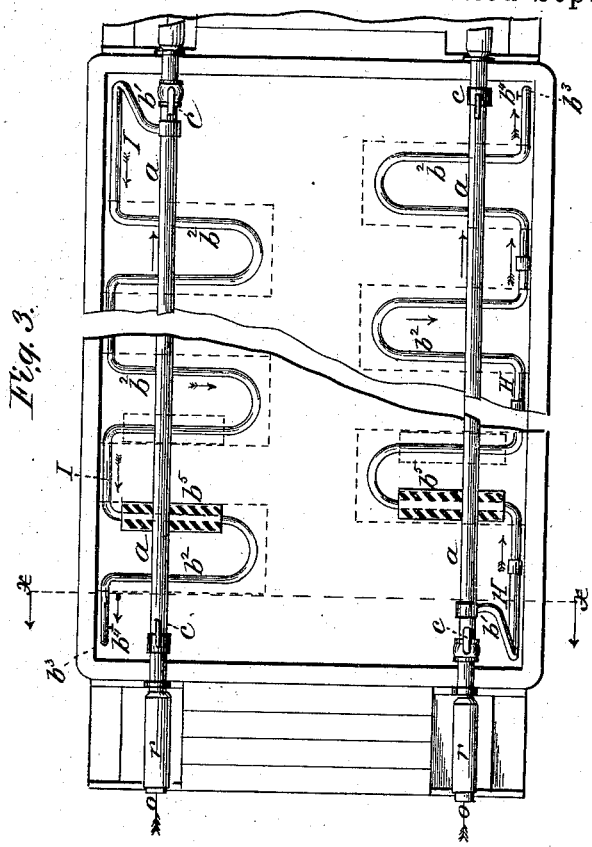


Fig. 5.

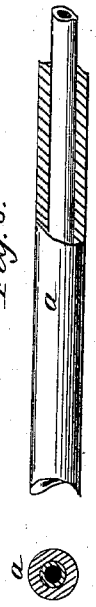
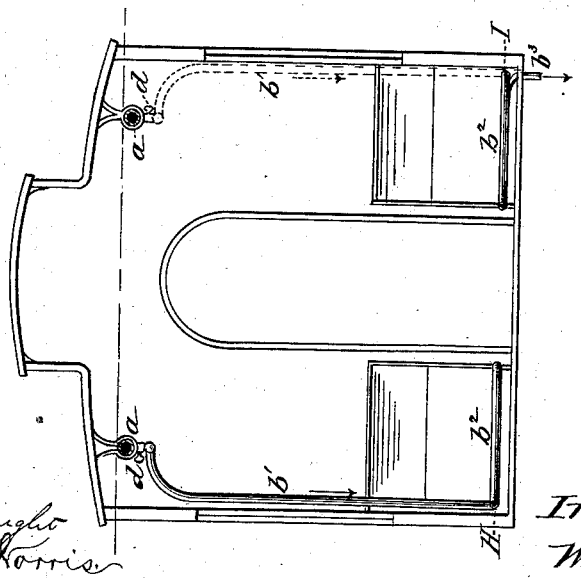


Fig. 4.



Witnesses:
Wm H. Knight
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Inventor:
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(No Model.) 3 Sheets—Sheet 3.

W. H. WARD.

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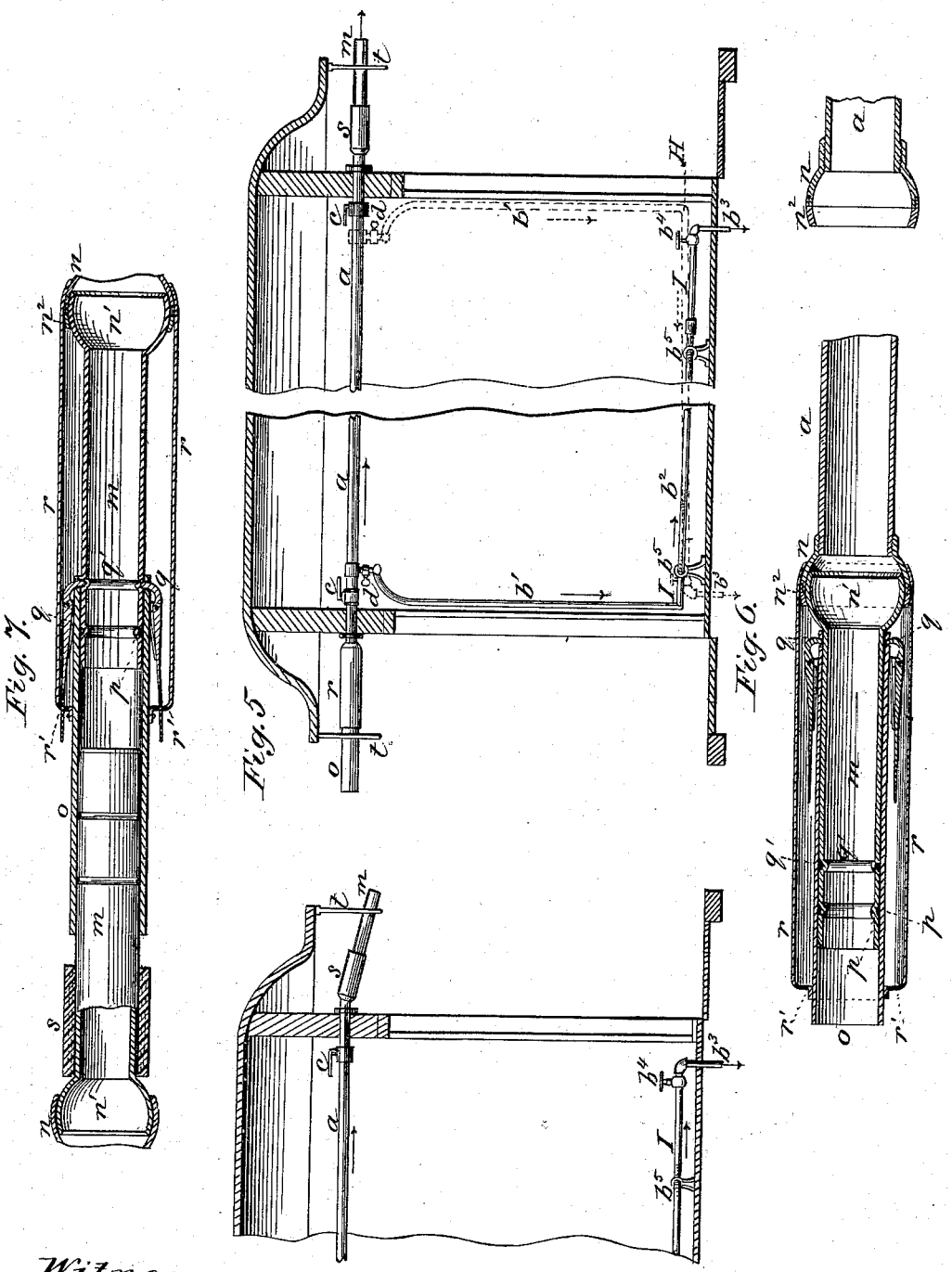

Fig. 4.

Fig. 5

Fig. 6.

Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM H. WARD, OF PITTSBURG, PENNSYLVANIA.

MEANS FOR WARMING RAILWAY-CARS BY STEAM.

SPECIFICATION forming part of Letters Patent No. 264,913, dated September 26, 1882.

Application filed January 19, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HENRY WARD, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Means for Warming Railway-Cars by Steam, of which the following is a specification.

My invention relates to improvements in warming railway-cars in train by continuously-connected pipes, using steam as the heating medium. For this purpose I use an independent steam-generator located in the car next in rear of the locomotive-tender, from the tank of which it is supplied with water. I provide three different and independent ways for effecting this supply for the purpose of insuring a positive feed to such steam-generator at all times, whether the train be standing or in motion. For this purpose I employ the usual locomotive pump and injector, each having suitable connections with the independent steam-generator and with the tender-tank, and a second injector upon such independent steam-generator having direct connection with the tender-tank. The first two of these supply-connections are under the control of the engineer, and the injector of the independent steam-generator is exclusively under the control of the person in charge thereof. These several independent ways of supplying this steam-generator become important matters in the use of such a generator, so that it may be supplied with water under any circumstances when the train is made up. Continuously-connected pipes extend from the exhaust-connections of the locomotive throughout the train and from the heating supply-pipes, which are also connected with the independent steam-generator, which may be used as the primary means for warming the cars of the train, using the exhaust-connections as auxiliary means for supplying steam for this purpose in severe cold weather and in long trains, while with short trains either will answer the purpose. The supply-pipes are also connected directly with the steam-chamber of the locomotive-boiler by suitable connections, the object of which is to furnish a third means by which the train-pipes may be supplied with steam, so that when the train is standing the live steam may be utilized by sending it through the supply-pipes, especially in very cold weather, and in this particular these separate steam-connections for the supply-pipes give very important advantages in insuring the proper warming of the cars. These several means also provide against a contingency in the event of an accident to the locomotive or to the independent steam-generator, and thus afford positive alternative means for warming the several cars of the train. Each car of the train is intended to be provided with steam-supply pipes, having warming-pipes connected therewith, one at each end of the car, and extending along each side of the car in opposite descending planes above the floor and beneath the seats, terminating each in a perpetual discharge at the ends opposite their inlet. The object of these separate receiving and discharging pipes is to effect the uniform warming of the cars of the train, and to allow of the slow escape of the water of condensation and of the steam which has imparted its heat, and thereby keep up a continual supply of fresh steam in the warming-pipes. These warming-pipes, thus receiving the steam and discharging the waste and the water of condensation from each car, are provided with suitable regulating stop cocks or valves at their receiving and outlet ends, whereby the warming-pipes of any one or more cars can be cut out at pleasure from the others without interfering with the warming of cars in the rear of the car or cars in which the flow of the steam had been cut off from the warming-pipes. The supply-pipes are provided with suitable cocks or valves at each end of the car inside of the coupling-joints, so as to stop the flow of the steam at the end of the train, and without regard to which end of the car is coupled. The supply-pipes are suitably protected by non-conducting covering to prevent radiation of the heat, and are preferably arranged at the top of the cars, and are provided with metallic couplings, so that there will be no depressions in the lines of these supply-pipes for the collection of water caused by condensation, and hence the flow of the steam will be uninterrupted.

To enable others skilled in the art to construct and use my invention, I will now proceed to describe more fully and specifically the several matters which constitute my improve-

ments in the heating appliances for railway-trains.

Referring to the accompanying drawings, Figure 1 represents in elevation a locomotive, its tender, and a portion of the car in which the independent steam-generator is located, showing the connections of the supply-pipes with the steam-chest exhaust-pipes of the engine, and also the pump and injector-pipe connections with the independent steam-generator; Fig. 2, a top view of the same; Fig. 3, a horizontal section of so much of a car-body as shows the connections of the steam-supply and the warming pipes; Fig. 4, a cross-section of the body of a car, taken on the line *x x* of Fig. 3; Fig. 5, a vertical section of a portion of two car-bodies, showing the supply-pipes in uncoupled position. Fig. 6 is an enlarged sectional view of the coupling end of one of the supply-pipes; Fig. 7, a similar sectional view, showing the coupling ends of two of the supply-pipes in coupled positions, and Fig. 8 shows a portion of the insulated supply-pipe.

In carrying out my invention each car is provided with one or more steam-supply pipes, preferably two, one on each side of the car; but a centrally-arranged pipe may be used. These supply-pipes *a a* may be arranged outside upon the top of the car or inside along the ceiling, and are of suitable capacity—say from one and a half to two and a half inches interior diameter—and they extend sufficiently beyond the ends of the car to be properly coupled. They are covered with suitable non-conducting substance or material to prevent radiation of heat. These pipes therefore serve only to supply steam to suitably-arranged pipes in each car.

The arrangement for the warming-pipes is such as to warm the car from each end by the flow of the steam in opposite directions on each side of the car. For this purpose the warming-pipes H and I are non-insulated, arranged separately on each side of the car—that is, one has no connection with the other. The pipe H on one side connects with the supply-pipe *a* at one end and inside of the car by a vertical branch, *b'*, and extends along the floor by the side of the car and by bends b^2 beneath each seat, and with a gradual descent terminates in an open end, b^3, at the opposite end of the car, while the warming-pipe I on the other side of the car connects by a vertical branch, *b'*, with the supply-pipe on that side at the end of the car at which the warming-pipe first described has its open termination, and extends along the floor and beneath the seats, and terminates with a gradual descent in an open end, b^3, at the opposite end of the car, so that the flow of the steam through the warming-pipes is from each end of the car, and in opposite direction therefrom, to produce a more comfortable and uniform warmth in the car, the temperature being regulated by cocks or valves. The open ends b^3 of these warming-pipes are provided with cocks b^4, by which to allow of the escape of the water from condensation and the slow discharge of the steam which has given out its heat, whereby a uniform temperature is maintained in said pipe.

The supply-pipes of each car are provided with cocks *c* or valves near each end, by which to stop or to regulate the flow of the steam when required. The warming-pipes H and I therefore must be connected with the supply-pipes at a point just at that side of the cock *c* that will, when open, allow the steam to flow from said supply-pipe into the warming-pipe. At such junction the warming-pipes are also provided with stop-cocks *d*, by which the heat can be regulated in or cut off from any one or more of the cars of the train without stopping the flow through the supply-pipe. The bends b^2 of the warming-pipes form bows which are supported at their parallel sides by suitable foot-rests, b^5, (shown in Figs. 3 and 5,) and which are provided with top openings to form a grating for warming the feet.

Provision is made for supplying steam to the supply-pipes by three separate and independent connections therewith. The first and primary means is by connecting said supplying-pipes with an independent steam-generator, A, located in a car, B, a portion of which only is shown in Fig. 1, and which generator is supplied with water from the tender C, a portion of which is also shown in Fig. 1. A second and auxiliary means is by connecting said supply-pipes with the exhaust of the steam-cylinders, and a third auxiliary means is by suitably connecting said supply-pipes directly with the steam-chamber of the locomotive-boiler. These auxiliary means are provided for use in case of emergency, such as accident to the independent steam-generator, or the failure of such generator to sufficiently warm the train, in which case a portion of the exhaust-steam from the engine is utilized to assist the steam-generator in warming the cars of long trains. In the event of the detention of the train, when the exhaust-steam cannot be brought into use, then live steam from the locomotive steam-chamber is utilized to assist the steam-generator in keeping up the temperature in the cars of the train, and thus make good use of the steam which would otherwise be wasted through the blow-off valve. Of the primary means the steam-generator A is connected with the supply-pipes *a* by a pipe, *e*, from which leads a cross branch pipe, *e'*, to the supply-pipe on the opposite side, as shown in Figs. 1 and 2. The pipe *e* is provided with a cut-off cock, e^2, Fig. 1, by which the steam is either let into the supply-pipes or is cut off, as may be required, while cocks e^3 are placed in the supply-pipes in front of the connections therewith of the pipe *e*, as shown in Figs. 1 and 2, for the purpose of directing the steam into the supply-pipes of the cars of the train when the cock e^2 is open. This steam-generator A may be placed in the baggage, express, mail, or combination car, while on trunk lines and long

trains it might be found desirable to have a car especially for such independent steam-generator and the fuel therefor, and in which a water-tank may be provided for supplying said generator in case the engine-tender should not be connected with the train. This independent steam-generator is provided with a fire-proof enveloping-case, D, having a base-plate upon which is placed the steam-generator, and the whole is securely fastened to the floor of the car. The enveloping-case is provided with a safety-door, E, which, when closed, securely locks the generator-door E′, and a smoke-pipe, F, passes through the enveloping-case and the top of the car. From the junction of the pipe *e* with the supply-pipes the latter are extended to and connect with the steam-exhaust of the locomotive-cylinders F′ by the continuations *a′* of said supply-pipes, said pipe-continuations *a′* having couplings a^2 at their crossings between the generator-car and the locomotive. These supply-pipe continuations *a′* are tapped by a cross-pipe, a^3, which is connected by a branch pipe, a^4, with the steam-chamber of the locomotive-boiler G, and when it is desired or necessary to use live steam from said steam-chamber cocks a^5, placed in said pipes *a′* in advance of the cross-pipe a^3, must be closed to direct the flow of the live steam into and through the supply-pipes to warm the cars of the train when the cock a^6 in said branch-pipe a^4 is open.

Having now described the means by which the cars of the train are warmed to a comfortable degree of temperature, I will now describe the means by which the independent steam-generator is supplied with the necessary quantity of water. For this purpose the injector *f* of the locomotive-boiler is connected to the tender-tank by a horizontal pipe, *g*, and its flexible coupling-pipe *g′*, through a vertical suction branch pipe, g^2, which is provided with a cock, g^3, by which, when open, the injector can suck water from the tender-tank through said pipe *g g′* into and through said injector into a feed-pipe, g^4, which by its flexible coupling-pipe connections g^5 leads into the steam-generator A. This is effected by a pipe, *h*, connecting the injector *f* with the steam-chamber of the locomotive-boiler, and which has a cock, *h′*, which, when opened, allows a force of pressure-steam to pass through the pipe *h* into the injector *f*, and thus force the water from the tank into the pipe g^4, and thence into the steam-generator A. To do this, however, the cock h^2 in said pipe g^4 must be closed and the cock h^3 in said pipe g^4 opened. This use of the locomotive-boiler injector is especially for filling the steam-generator A upon the making up of the train; but when the train is in motion this supplying of the steam-generator A with feed-water is effected by the locomotive-pump through the pipe *g*, which has its connections with pump *i*, and which, through said pump, connects with the pipe g^4, which leads to the steam-generator A, as already described. In using said pump, however, the injector-connection with said pipe g^4 must be cut off, and also the cock *i′* of the pump-boiler feed-pipe i^2, and it will be understood that these connections are independent of the pump-boiler connections, which it is unnecessary to describe.

As the attendant of the steam-generator A has no control over the locomotive injector or pump when the train is moving, it is necessary that he should have some means within his control by which feed-water from the tender-tank can be supplied, and he does this by means of an injector, *j*, on the generator A, from which injector a flexible hose-pipe, *k*, leads into the tank, as shown, so that when feed-water is required in the generator A he turns the injector-cock *l*, Figs. 1 and 2, drawing water thereby from the tank as may be required from time to time.

The supply-pipes are connected between the cars by stiff couplings, which give freedom for the vibrations of the cars. The coupling is made stiff for the purpose of avoiding sag-bends and the collection of water from condensation therein when the cars are coupled, and which would interrupt the flow of the steam. It consists of two separate pipe-sections *m m*, which are jointed to the ends of the supply-pipes by sections of hollow hemispheres, one of which, *n*, is screwed upon the end of the supply-pipe, and the other, *n′*, is formed with the pipe-section *m*, and is adapted to fit within the section *n* with a ground or packed joint, and when so fitted is confined by a screw-section, n^2, which forms an extension of the fixed screw-section *n*, within which the pipe-section *m* has a universal-joint play to accommodate the vibrations of the cars. The pipe-sections *m* thus connected do not telescope with each other nor complete the coupling, but are of a length less a few inches than the distance between the ends of the supply-pipes, so that they always stand separated at their free ends when the cars are coupled in train. To support and envelop these separated ends of the pipe-sections *m m*, I employ a sleeve, *o*, fitted upon one of the pipe-sections *m*, upon which it is adapted to be slid back out of the way in coupling the cars, and to be slid out over the separated ends of the joint-sections *m m* when the cars are coupled. This sleeve has a suitably-packed joining with its supporting joint-section *m* and with the other section *m* when serving its supporting and enveloping function, and such packing may be placed in circumferential grooves, as shown at *p* in Figs. 6 and 7. The sleeve *o* is provided at one end with spring-catches *q q*, adapted to enter holes in the sleeve, and a circumferential groove, *q′*, in the joint pipe-section *m*, by which to hold the sleeve in position longitudinally when covering the separated ends of said pipe-sections *m* and supporting them, as shown in Fig. 7. These spring-catches I prefer should be thumb-levers, arranged so as to release their retaining end when the sleeve is to be shoved back over its

supporting-section in uncoupled position, as shown in Fig. 6. A jacket, *r*, fixed to and extending from the end of the fixed joint-coupling *n*, serves as a cover for the sleeve-supporting section *m* when the coupling is made. The other joint-section *m* may be protected by a non-conducting covering, *s*, up to the point at which the sleeve covers it when coupled. The outer end of this jacket *r* is turned inward to join the sleeve *o*, and at this turn there are openings *r'*, to allow the thumb-levers *q* to pass out with the sleeve in enveloping the joint-sections *m*, and thus expose the thumb-levers for releasing their lock, as shown in Fig. 7. These joint-sections *m m*, when uncoupled, are supported by depending links or straps *t* from straining their joints.

Each end of each supply-pipe of the cars is provided with a suitable cock or valve, *c*, which is used for either feed or cut-off, and by this means the heat is prevented from escaping at the end of the train.

It will be understood that when the train is completed and the connections are made the steam pressure in the supply-pipes will be equal, or nearly so, throughout the train, and that the cocks of all the warming-pipes being open the steam will enter them as it passes through the supply-pipes, and thus afford an equal or nearly equal degree of temperature in all the cars of the train.

It will also be noticed that the sleeve which unites the separated ends of the joint-sections of the supply-pipe couplings is carried by and locked to one of said sections, so that when the coupling is made the said sleeve will have a free movement upon the other joint-section to accommodate the longitudinal play of the cars.

I have described the warming-pipes as receiving and discharging at opposite ends of the car; but it is obvious that they may be returned and discharge at the same end of the car at which they receive the steam.

As the stiff coupling is made the subject of a separate application for a patent by me, it is not specifically claimed herein.

I claim—

1. For warming railway-cars by steam, the combination of an insulated supply pipe or pipes, *a a*, in each car, adapted to be made continuous in the cars of the train, substantially as described, with non-insulated warming-pipes H and I in each car, receiving from said steam-supply pipes and having their discharge terminations outside of said car, substantially as described, for the purpose specified.

2. For warming railway-cars by steam, the combination of an insulated supply pipe or pipes, *a a*, in each car, with non-insulated warming-pipes H and I, connected with said supply pipe or pipes at opposite ends of the car, and extending in opposite directions from their connected ends, terminating in open discharge ends, and having no connection with the warming-pipes of the next car or cars, the said supply pipe or pipes being continuously connected throughout the train when the cars are coupled, substantially as described, for the purpose specified.

3. For warming cars by steam, the combination of an insulated supply pipe or pipes, *a a*, with non-insulated warming-pipes H and I, connected with said supply pipe or pipes at opposite ends of the car, and extending in opposite directions from their connected ends, terminating in open discharge ends, and having no connection with the warming-pipes of the next car or cars, the said warming-pipes provided with cocks or valves $d\ b^4$ at their receiving and discharging ends, respectively, the said supply-pipes being continuously connected throughout the train when the cars are coupled, substantially as described, for the purpose specified.

4. In warming railway-cars by steam, the combination, with a supply pipe or pipes, substantially as described, of the pump *i* on the locomotive, the independent steam-generator A, arranged in a car which is in rear of the tender of said locomotive, suitable pipe-connections, *e e'*, and cock e^2 for connecting said supply-pipes with the steam-chamber of said generator, and suitable pipe-connections and cocks, $g^4\ g^5\ i'\ h^2$, whereby said pump and its connected tender-tank are put in communication with said independent steam-generator, substantially as described, for the purpose specified.

5. The combination of a steam-supply pipe or pipes, provided with suitable couplings for train-connection, with an independent steam-generator, A, arranged in a car which is in rear of the tender of the locomotive, suitable pipe-connections, *e e'*, and cock e^2 for connecting the said independent steam-generator with said supply-pipes, the injector *f* of the locomotive-boiler, suitable pipe-connections and cocks, $g\ g'\ g^2\ g^3$, for connecting said injector and the tender-tank, and suitable pipe-connections and cocks, $g^4\ g^5\ h^2\ h^3$, for connecting said injector and said independent steam-generator A, substantially as described, for the purpose specified.

6. The combination of a steam-supply pipe or pipes provided with suitable couplings, whereby they are made continuous throughout the cars of the train, with an independent steam-generator A, arranged in a car which is in rear of the tender of the locomotive, suitable pipe-connections, *e e'*, and cock e^2 for putting the steam-chamber of said independent generator in communication with said supply-pipes, the injector *j* of said generator, and suitable pipe and cock connections, *k l*, connecting said injector direct with the said tender-tank and with said independent steam-generator, substantially as described, for the purpose specified.

7. For warming cars by steam, an insulated supply pipe or pipes, *a a*, provided with suitable couplings for train-connection, and non-in-

sulated car-warming pipes H and I, connected therewith, substantially as described, the independent steam-generator A, arranged upon a car which is in rear of the tender of the locomotive, the injectors *f* and *j* and the pump *i*, and suitable pipe-connections and cocks therefor, connecting with the said independent steam-generator and with the tender-tank, substantially as described, for the purpose specified.

8. The combination of an insulated steam-supply pipe or pipes, provided with suitable couplings for train-connection, and non-insulated car-warming pipes H and I in each car, receiving from said supply-pipes and discharging from each car, as described, with suitable pipe and cock connections, a' a^4 a^6, connecting said car receiving and discharging warming-pipes with the steam-chamber of the locomotive, substantially as described, for the purpose specified.

9. For warming cars by steam, the combination of an insulated supply pipe or pipes, *a a*, provided with suitable couplings for train-connection, and non-insulated car-warming pipes H and I, connected therewith, substantially as described, with the independent steam-generator A, arranged upon a car which is in rear of the tender of the locomotive, the pipes *e e'* and cock e^2 e^3, the pipes a' a', and the pipe a^4 and cocks a^5 and a^6, the said pipes connecting the steam-generators A and G and the exhaust-ports of the engines with the said supply-pipes when the cars are coupled, substantially as described, for the purpose specified.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

W. H. WARD.

Witnesses:
A. E. H. JOHNSON,
J. W. HAMILTON JOHNSON.