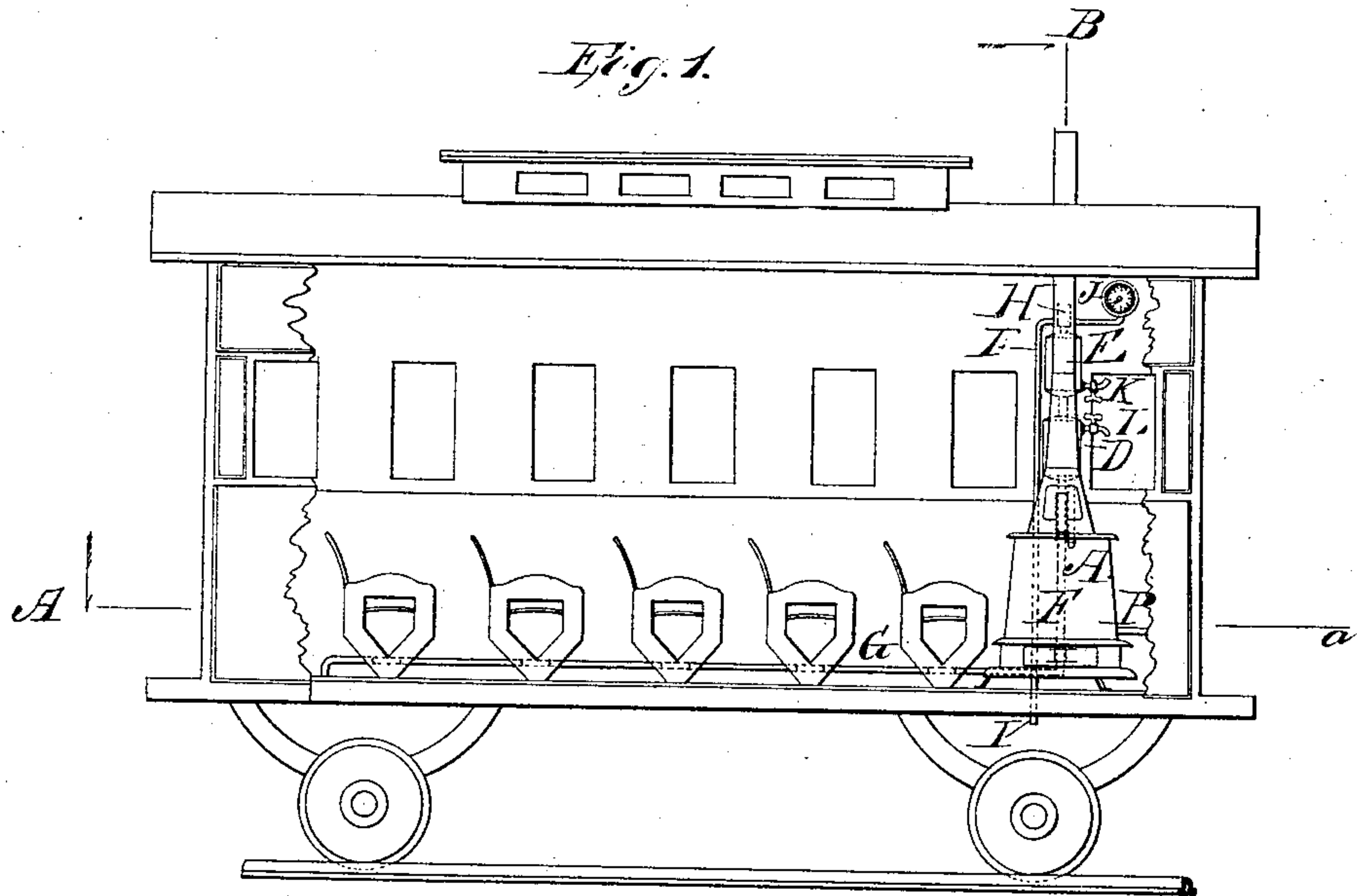


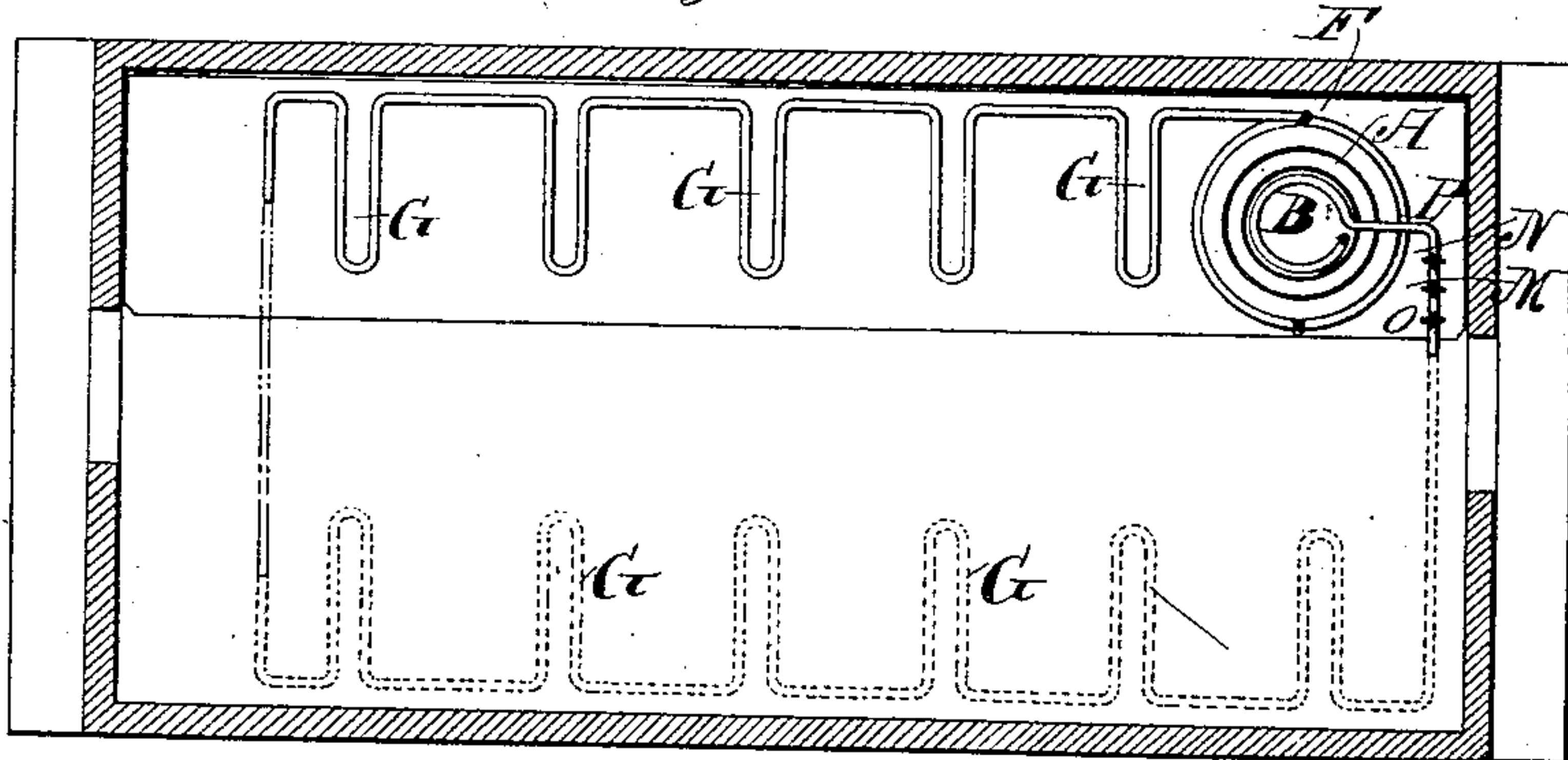
W. C. BAKER.  
RAILROAD CAR HEATER.

No. 75,345.

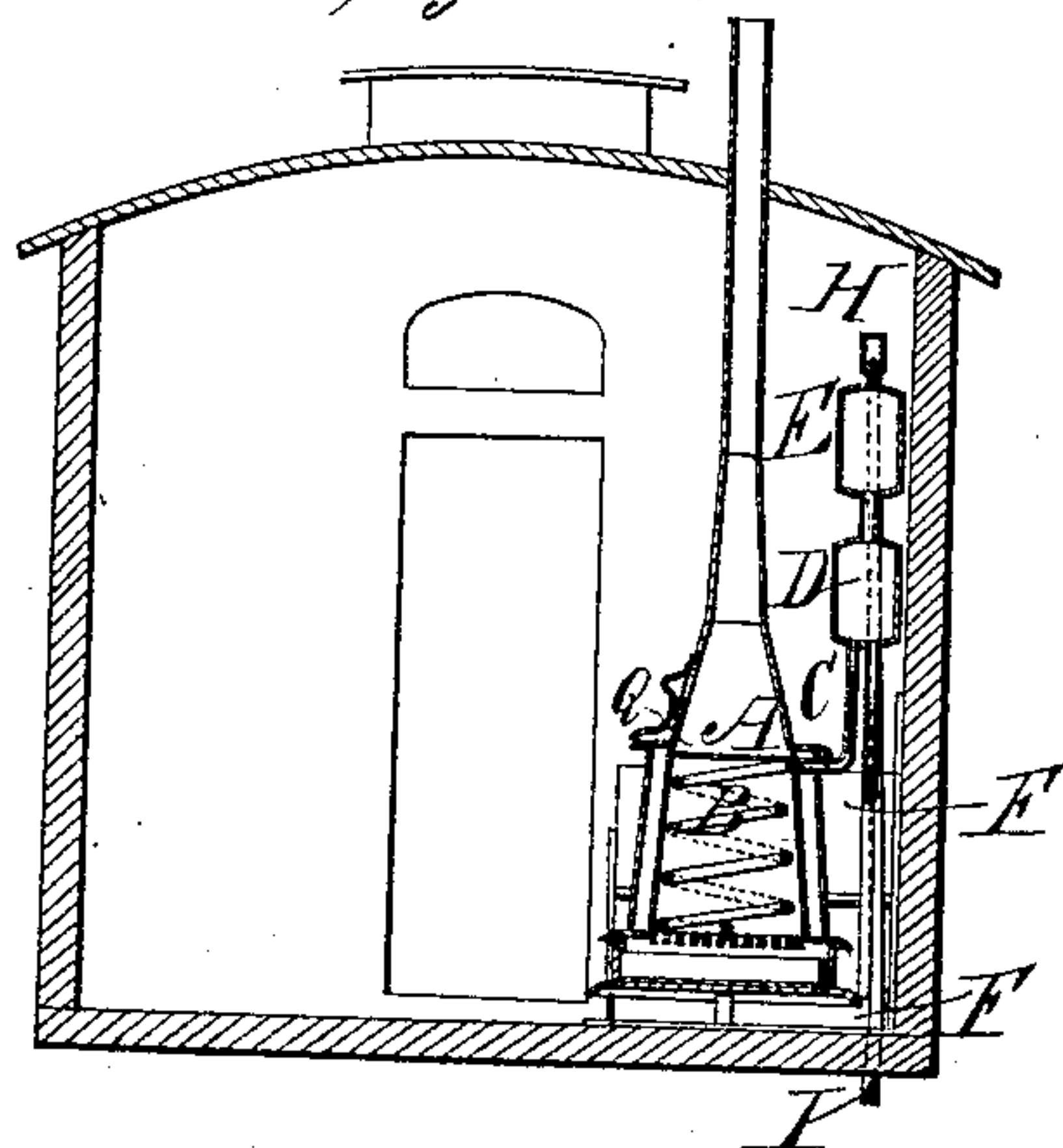
Patented Mar. 10, 1868.



*Fig. 2. A, a.*



*Fig. 3. B, b.*



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# UNITED STATES PATENT OFFICE.

WILLIAM C. BAKER, OF NEW YORK, N. Y.

## IMPROVEMENT IN RAILROAD-CAR HEATERS.

Specification forming part of Letters Patent No. 75,345, dated March 10, 1868.

*To all whom it may concern:*

Be it known that I, WILLIAM C. BAKER, of city, county, and State of New York, have invented a new and Improved Arrangement or Apparatus for Warming Railroad-Cars and other vehicles, and especially the feet of passengers in the same; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to a circulating hot-water apparatus, especially adapted to railroad-cars and other vehicles, in which the radiating or heating pipes are necessarily placed near the level of or below the fire.

In hot-water warming apparatus, the heating-pipes have usually been elevated above the fire, so as to obtain an upward and distant circulation, and a downward return to the heater. Such apparatus has not been adapted to heating railroad-cars, because the heat would not be sufficiently near the floor.

The nature of my said invention consists in a circulating water apparatus, in which the heat is applied to a tube that extends upward to a water and expansion vessel, and from this water-vessel the circulation is downward, and through the radiating or heating tubes, and returns to the heater.

By this construction the heated water rises into the water-vessel, and is freed from bubbles of steam, in order that there may be no opportunity for air or steam to remain and accumulate in any elevated portions of the radiating pipe or tube, and prevent the circulation by forming what is known, as a "trap." The pipes of my coil can, therefore, be led in any desired direction within the car or vehicle, and the stove or heater may be located wherever convenient. The ascending hot-water pipe can be carried up sufficiently high to insure the proper circulation through all the pipes connected with it, without depending upon the relative position of the heater to the coil for effecting the circulation, as heretofore.

To enable others skilled in the art to make and use my apparatus, I will proceed to describe its construction and operation, referring to the accompanying drawings, in which—

Figure 1 is a side elevation of a railroad-car with the side framing removed to show my

improvements. Fig. 2 is a horizontal section at the line A a of Fig. 1, and Fig. 3 is a vertical cross-section at the line B b of Fig. 1.

The same letters of reference indicate like parts in all the figures.

I construct my apparatus of iron, brass, copper, or any other suitable material, the joints being formed of screws of right-hand and left-hand threads, or otherwise.

In the drawings, A represents a stove in which B is a portion of the tubes coiled adjacent to the fire, and on which the fire directly acts. C is a tube through which the heated liquid flows upward into the reservoir D. E is a chamber for the compression of air confined within it, as the circulating liquid becomes expanded and presses against it. F is a tube through which the heated liquid flows downward to supply heat to the radiating-tubes G G G G G G, which are run along the sides, and under the seats of the car, connecting above and beneath the floor and the timbers of the car-body, where necessary, and back to the stove, forming an endless circuit for the heating-liquid. H is a safety-valve. I is a waste-pipe for the safety-valve. J is a pressure-indicator. K is a cock in pipe through which the apparatus is replenished with liquid. L is a try-cock to indicate the proper height of the liquid, and to which height the liquid should be kept. M is a stop-cock for use when the liquid is first forced through to supply the tubes. N is the cock through which the liquid first enters. O is the cock through which the liquid may be discharged from the apparatus. P is the point at which the cooled liquid enters the generator to be reheated. Q is a screen over the fire to prevent it from rolling out in case the stove gets upset by collision, or other railroad accidents.

In adapting my apparatus to railroad-cars, (the use for which it is chiefly intended,) it is particularly desirable to have the joints firmly screwed together, and all the parts well secured, so that the jar of the vehicle shall not loosen the same, and thus allow the liquid to escape. In the use of salted water, no evaporation should be allowed, as the salt will deposit on the interior surface of the tubes whenever the bulk of water is insufficient to hold the salt in a state of solution, but not otherwise. As the connecting parts of the radiat-



ing-surfaces may often be required to be run below the rest, in order to clear the passages, and otherwise form pockets and traps in the channels of circulation, it is usually necessary, when first filling the apparatus, to pump or otherwise employ extra force to fill the liquid in a solid body in the radiating-tubes and into other parts of the apparatus designed for its occupancy. Air-vents at the points where pockets and traps occur are not required in my arrangement. When in operation, my apparatus may be closed in all its parts.

There may be various minor modifications in the construction of my apparatus without differing materially from what I have intended to describe as my invention and application. As, for example, two or more stoves or receptacles for the fire, with separate radiating and heating surfaces or tubes, may be employed in place of one. The boiler or heat-receiving portion and other parts of the apparatus may be differently constructed. The reservoir and air-chamber may be constructed with one cylinder or vessel instead of two. The radiating-surfaces may be located below the floor, and covered with net-work, screens, &c., and in other ways be differently situated without varying essentially from my invention.

As prevention from freezing is requisite in the employment of liquids for transmitting and diffusing heat in railroad-cars and other vehicles, I propose in this apparatus to use for this purpose salted water, glycerine, or their equivalents, to prevent freezing, as set forth in Letters Patent Nos. 58,755 and 71,948, dated October 16, 1866 and December 10, 1867.

In the employment, as a heating medium, of some of the equivalents of salted water and glycerine to prevent freezing—such as oils and spirits of different kinds—danger may be incurred if care be not taken in handling them near the fire, and in well securing them within the apparatus from all contact with the open air.

Ordinary water may be made to circulate and transmit heat in this form of apparatus; but, beside its liability to freeze whenever the fire goes out or gets low, it lacks the density, and consequently the power of absorbing and imparting heat which water impregnated with salt (chloride of sodium) possesses.

The usual systems for creating artificial warmth in cars, either by stoves placed within them or by blasts of hot air from furnaces suspended beneath, accomplish anything but the desired results. The highly-rarefied air from them rushes, by natural law, at once to the highest point, and seeks to find vent through whatever openings there may be at the top of the car for ventilation. As there is no flue or outlet at a lower point, as in stationary buildings, to counteract the upward current and induce the heated air to circulate at or near the floor of the vehicle, the greater portion of the heat is wasted, and the heads of the passengers are uncomfortably hot, while their feet may be as cold as though the vehicle was not warmed at

all. If the openings for egress at the top be closed in order to secure the escaping heat, then all ventilation and change of air are prevented, and the atmosphere of the car at once becomes poisoned, both from air heated over surfaces of too high temperature and by the exhalations from the lungs and bodies of the passengers. Thus the inevitable results, in spite of the numerous attempts made to the contrary, are just the reverse of what health and comfort imperatively require. The rapid movement of the car through the air aggravates this difficulty, causing, as it does, a strong current of the coldest air over the feet and forcing the warmer air still more upward. The frequent opening of the doors at each end and the unavoidable crevices around the doors, especially at the bottom of them, and the cracks in the floor itself, all act most potently in keeping the extremities enveloped in currents of cool air.

These difficulties in the way of pure warmed air in cars during cold weather have made travel by rail one of the most prolific sources of disease and death, more perilous even than the worst accidents to which travelers are liable.

By my system the distributors of heat are stationary, and act first to warm the lower extremities of each and every passenger alike, and at the same time allow pure air and ventilation in the region of the head.

In my apparatus the circulating liquid absorbs most of the heat of the fire, instead of allowing it to concentrate at the stove, and distributes it over the entire space of the car-floor.

No dangerous heat is concentrated at the stove; consequently the space required for its occupancy is small. But one seat in an ordinary railroad-car need be displaced for it, and this generally a small undesirable one in the corner.

The exterior surface of my stove is of so low temperature that clothing in contact with it may not be injured.

This stove may be rendered more secure, and at the same time assist in the accomplishment of the grand object in drawing up and warming the air nearest the floor, by an outer casing, with perforations at the top and bottom, allowing a free circulation of air from bottom to top between it and the casing in immediate contact with the fire. This casing may be a jacket of water that will extinguish the fire in case of accident, and otherwise act to moisten the atmosphere of the car.

Fuel at the lowest and most economical condition of combustion can be used, and a steady constant heat maintained by replenishing coal (hard coal)—say, twice in twenty-four hours in the coldest weather. Thus space for fuel need seldom be provided in the car. The draft to the fire is regulated by a simple adjustment of the stove-doors, which are locked in their places to prevent improper interference.



The slow and perfect combustion of fuel which this apparatus is capable of maintaining, obviates a serious objection in the use of wood-stoves, where the smoke from the rapidly-consuming wood is blown back into the car from the short smoke-flue, in which the draft is unavoidably spasmodic and imperfect. The pressure indicated when the apparatus is in operation is usually about five pounds to the square inch. A car may be divided into several separate and distinct compartments, all of which can be thoroughly warmed by my apparatus by one fire located in some remote and otherwise unavailable space.

I find by satisfactory experiments in the use of salted water for heating purposes, that, although it may be saturated with the salt, the liquid does not, in my closed apparatus, injure even common iron tubes. Nor does the salt in any way leave incrustations or injurious deposits on the interior surfaces. After several months tests, both while the liquid was in circulation and while it remained stagnant, no deposit could be detected at any point. It is not necessary in American climates to have the water fully saturated with salt to prevent congealing, especially where the pipes are protected to some extent from the cold by being run inside of the car; so ordinary water without being salted is all that is required to supply whatever waste of liquid may occur, and carbonate of soda or other suitable material may be used in a small proportion to prevent any injurious effect of the solution of salt on the metal pipe. It will be

apparent that the operation of heating by my apparatus will be the same when pure water is employed in place of salt-water, but there will be a risk of freezing when not in use.

As the space the stove occupies is so small, it is not required to move it during the summer season, but by remaining it is in condition for heating at any moment. A little heat at times, during the warm months, is often desirable. The wear and tear and trouble of removing and storing ordinary stoves, and the seats they displace, and the refitting up of the same each year, are serious objections to their use.

I do not claim steam heating tubes or vessels in a car, as these are known.

What I claim, and desire to secure by Letters Patent, is—

1. A circulating hot-water apparatus, adapted to railroad-cars and other vehicles, in which a rising water-pipe from the heater opens into a water-vessel, in combination with a descending pipe and radiating or heating tubes, substantially as and for the purposes set forth.

2. The heating-tubes arranged as shown, to run from the side of the car beneath the respective seats, and furnish warmth to the individual passengers, in combination with the aforesaid hot-water heating apparatus, as set forth.

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Witnesses:

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