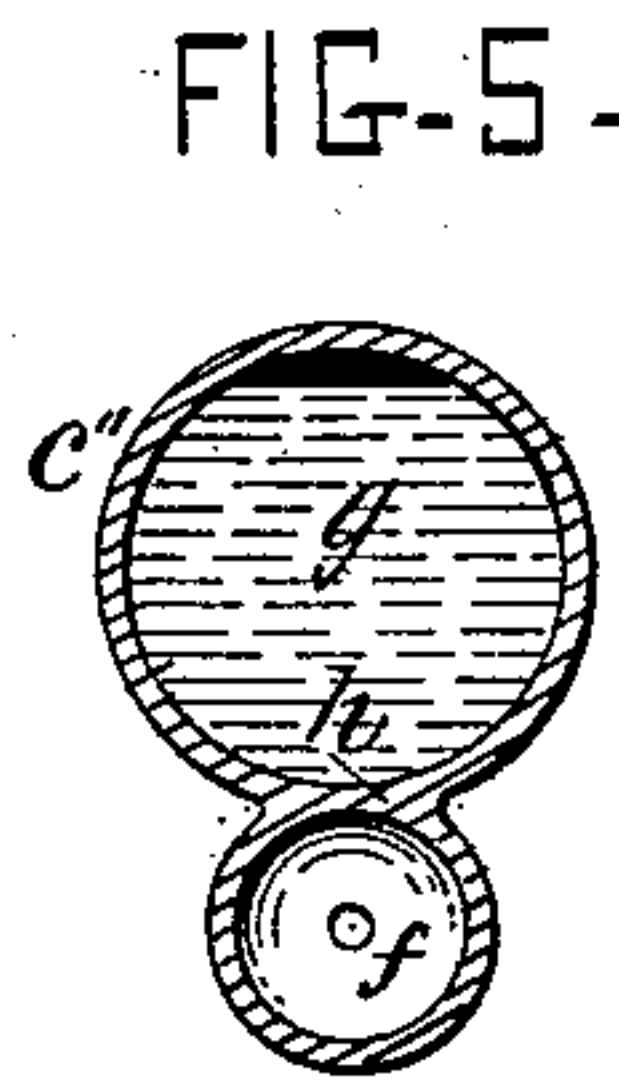
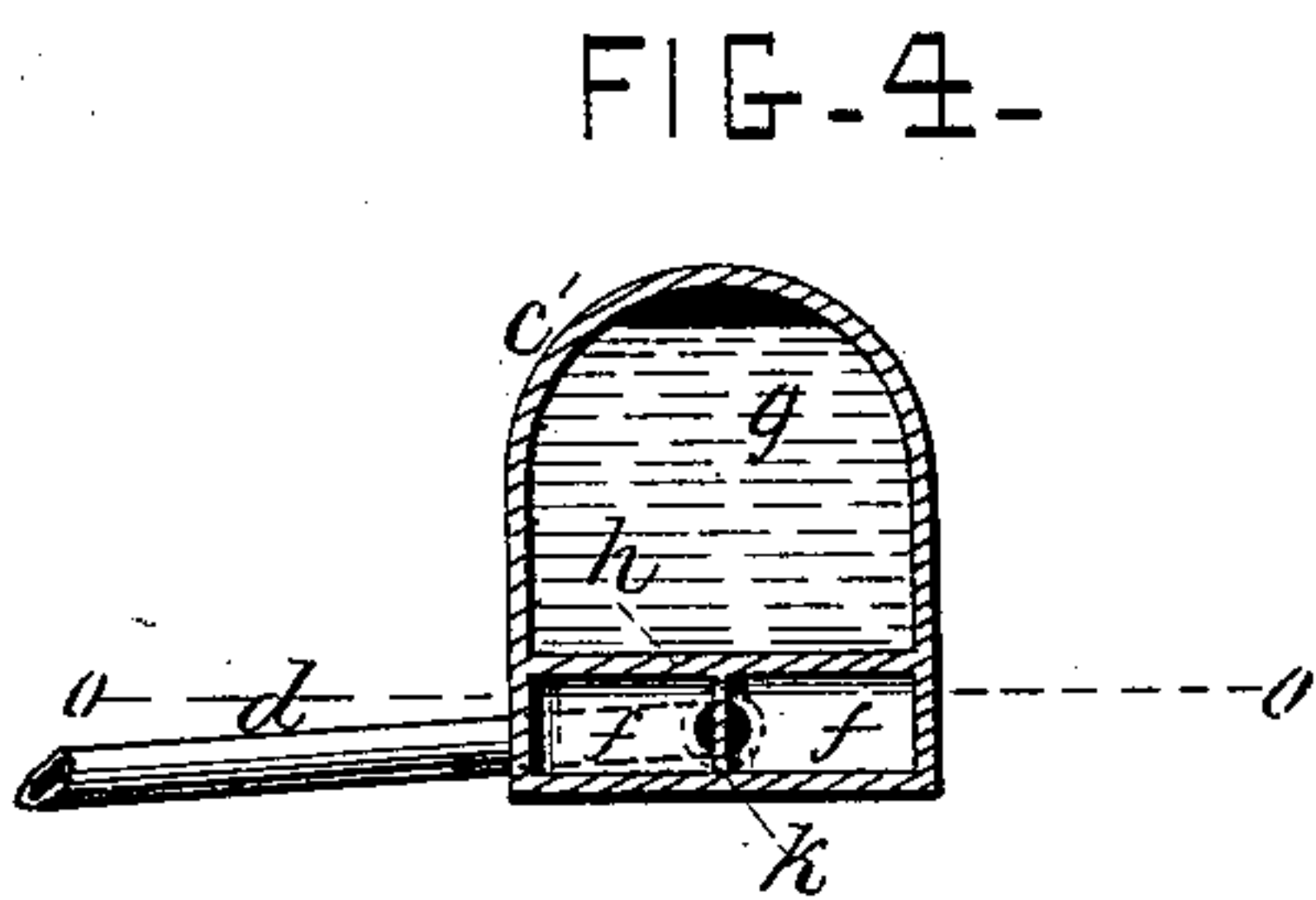
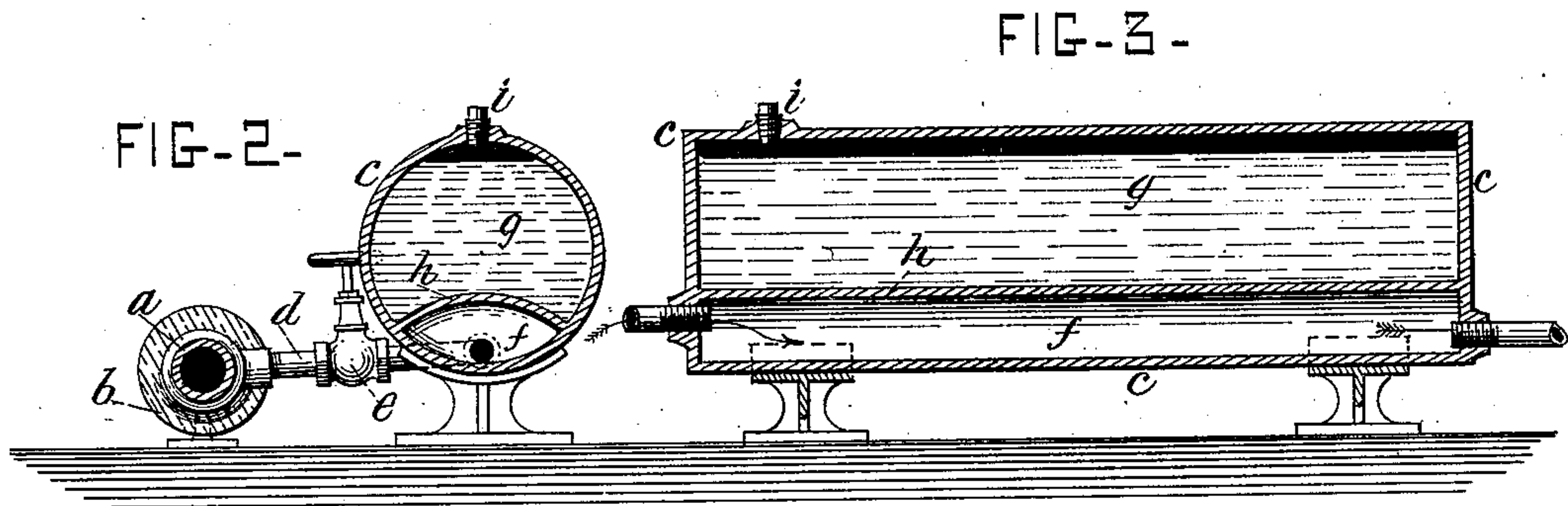
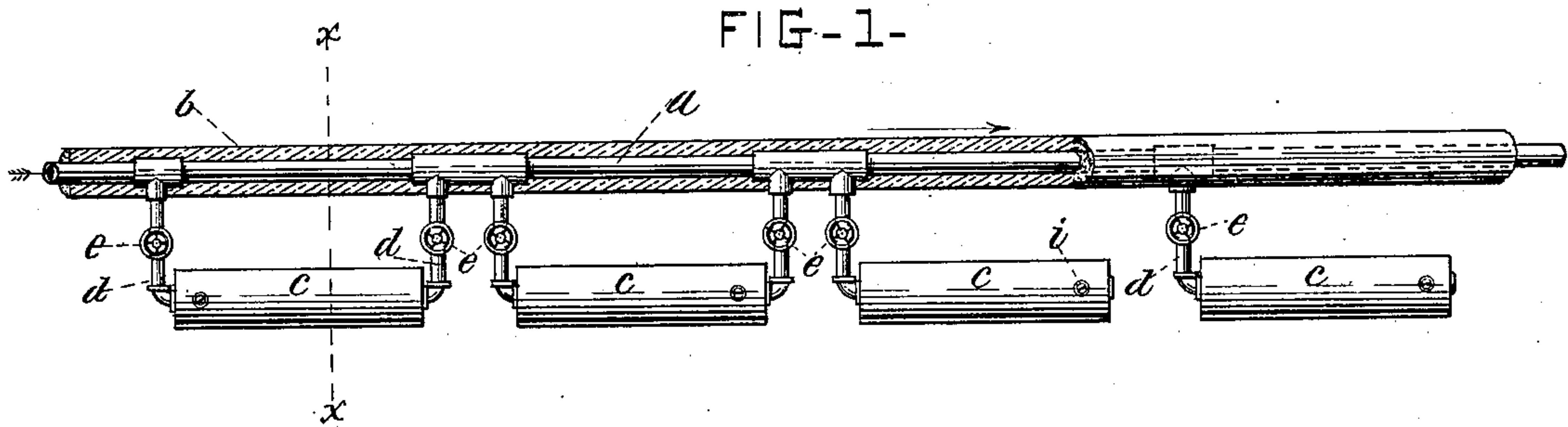


(No Model.)

E. E. GOLD.
STEAM HEATER.

No. 253,693.

Patented Feb. 14, 1882.



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UNITED STATES PATENT OFFICE.

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STEAM-HEATER.

SPECIFICATION forming part of Letters Patent No. 253,693, dated February 14, 1882.

Application filed June 22, 1881. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. GOLD, of Brooklyn, Kings county, New York, have invented certain new and useful Improvements in Steam-Heaters, of which the following is a specification.

My present invention aims to provide a simple, cheap, and efficient system of steam-heaters for cars, greenhouses, or other purposes, and is partly related to the system shown in the Patent No. 242,299, issued to me May 31, 1881, wherein a series of distinct radiators or heaters branch from a main steam-pipe extending along the course to be heated in such manner that the heat may be apportioned to each heater from the main as may be required along the space to be heated, so that the heat may be regulated at any point without affecting the heat at other points or disturbing the flow through the main. My former system was specially designed for railway-cars having transversely-arranged seats, and it shows the branch heaters extending laterally from the longitudinal main pipe and projecting beneath the transverse seats parallel therewith. My present invention is partly distinguished by the combination, with a longitudinally-arranged main pipe, preferably insulated or covered, extending along the course to be heated, of a series of distinct branch radiators or heaters arranged in succession parallel with the longitudinal pipe and connected therewith by lateral branches having suitable valves or regulating devices, whereby the heat may be apportioned to any heater as may be desired without affecting the regulation of heat at other points or the flow through the main, thereby forming a heating apparatus specially adapted for use beneath the benches of greenhouses, or under the longitudinal benches in work-shops, or beneath the longitudinally-arranged seats of railway-cars, ferry-boats, or other places.

My invention also partly consists in the special construction of the branch heaters, the main feature of which lies in their formation with two distinct overlying cells or chambers, the one receiving the steam and the other being charged with a sealed body of liquid or other heat-absorbing substance, and placed over the steam-cell, whereby the heat of the steam is diffused in an effective manner, as hereinafter fully set forth.

In the annexed drawings, Figure 1 gives a plan view of the chief parts of a heating apparatus constructed and arranged according to my invention. Fig. 2 is a cross-section on line *xx* of Fig. 1, and Fig. 3 a longitudinal section of one of the heaters. Figs. 4 and 5 show cross-sections of heaters of modified shape.

In Figs. 1 and 2, *a* indicates the main steam-pipe which conveys the steam from the boiler or other source, being connected therewith at one end, while the opposite end connects to a trap, (not shown,) in which the condensation is accumulated, and which in the case of a stationary heating apparatus will be finally returned to the boiler by a return-pipe in the usual manner of steam-circuits, as will be understood. In the case of railway-cars this main pipe will be arranged longitudinally along the sides of the cars, with each end extending out of the car-body, projecting under the platforms, and coupled from car to car of the train, the connected series being supplied at the initial end with steam from the locomotive or other source, while the terminal end will be left either closed or open—closed by a trap in case live steam is used and open in case exhaust-steam is supplied, as specified in my former patent. This main steam-pipe *a* hence in all cases extends lengthwise along the course in which it is desired to distribute the heat, and the main pipe itself is preferably well covered and insulated by a thick non-conducting coating, *b*, so that little or no heat will be radiated by the pipe itself. Now, *c c* indicate a series of distinct heaters or radiators, which are supplied from the main pipe, and are preferably in the form of elongated hollow drums of circular cross-section; but this cross-section is not essential. It will be observed, however, that these drums or radiators are arranged at intervals along the length of the main closely adjacent thereto, and that they are placed in longitudinal line parallel with the main pipe and connected therewith at one or both ends by lateral branches *d d*, which are provided with regulating-valves *e e*.

The drums *c c* are of course exposed to freely radiate their heat, while the main *a* is well covered, as before described; and it will be seen that by means of the general arrangement and construction shown the heaters and main occupy a compact space in a narrow longitudi-

nal row, thus rendering the apparatus specially adapted for use beneath the benches of green-houses or workshops, or beneath the longitudinally-arranged seats of ferry-boats, and also for heating that class of railway-cars intended for transient travel, such as elevated-railway cars, &c., having seats arranged longitudinally on each side.

In greenhouses it will be seen that the local heat may be raised or lowered to a greater or less degree at any particular part of the greenhouse, as may better suit certain plants which may require more or less heat than others, while the general temperature of the greenhouse may be kept uniform, or nearly so. Thus, if more or less heat is required at any part, the valves of the drum or heater at this part will be opened more or less, thus admitting a greater or less amount of steam and corresponding heat to the drum at the location desired, yet not affecting the heat at other drums. If a low diffused heat is required the valves of the whole series of drums are partially closed, or the valves of each alternate drum are closed entirely and the intermediate ones left open; and it will be observed that as the main is covered and does not diffuse its heat, hence it does not disturb the regulation of the heat in the apartment; and furthermore the main current is kept hot in its flow onward and its heat is given out only in the radiators. Hence, by this general plan the heat is under more perfect control than would be the case in any other system, and it may be distributed in any manner desired—that is, it may be diffused uniformly at either a low or high state along the course of the main, or may be increased locally at any point without increasing it at other points or affecting the flow of the main current onward to the succeeding apartments, cars, or other structures which are being heated, thus having peculiar advantages for the special purposes of greenhouses, railway-cars, and ferry-boats, in addition to which may be named waiting-rooms. In these cases it will be readily understood that there are points which are much more exposed to cold than others—such as those near windows and doors—and by my arrangement greater heat may be emitted at these parts without increasing the heat at others, so as to heat the whole apartment effectively without rendering the atmosphere oppressive, as would be the case if the heat was delivered in one continuous line, as is usual with ordinary steam-pipes.

I prefer to construct the heating-drums or radiators *c c* as best shown in Figs. 2 and 3, which form part of my present improvement—that is, the drum is constructed with two distinct cells or chambers, *f g*, separated by a partition, *h*, the chamber *f* below, which forms the steam-chamber to which the steam is admitted from the main at one or both ends by the branches *d d*, as already described, while the chamber *g*, above the same, is charged with a confined body of liquid, preferably gly-

erine and water, or brine, or other non-freezing liquid.

I prefer to have the drum circular in cross-section, as before stated, and to have the partition *h* arched, so as to make the steam-chamber *f* of oval form and the liquid-chamber *g* of crescent shape, as seen in Fig. 2, the latter being of much greater capacity than the steam-chamber, so that a small body of steam acts on a larger body of liquid, and the heat thereof, being applied directly beneath the same and over a good surface, heats the liquid rapidly, and thus causes the heat to be absorbed uniformly and quickly by the liquid, and thence radiated from the sides of the drum into the apartment. By this means the heat of the steam is, as it were, diluted and radiated from a large surface, which, as will be observed, throws the same, or almost the same, quantity of heat into the apartment, but with less intensity, causing a wider diffusion of heat at lower temperature, which, as will be readily appreciated, is more effective and healthful than would be an intense radiation from a smaller surface.

The liquid-chamber *g* is charged with the desired liquid through an opening at the top, which is afterward closed by a tight screw-plug, *i*, thus sealing the chamber, sufficient unfilled space being, of course, left to allow of the expansion of the liquid when heated.

Sand or some other non-liquid filling might be used in place of the liquid; but it will be readily seen that this would not be at all desirable, for this being immobile and a non-conductor it would simply prevent the rapid and even absorption and diffusion of the heat and retain it a long time when once heated, whereas the mobile nature of the liquid allows that well-known circulation or convection all through its mass when the steam is applied, which causes the whole mass to uniformly and rapidly absorb and diffuse its heat, and to lose or give out its heat as rapidly as it had acquired it, which, as will be observed, is the precise quality desired in my system of locally-controllable heaters.

The entire heater or drum *c* in the form shown is preferably cast in one continuous piece or structure of cast-iron, as illustrated in Figs. 2 and 3, thus producing a very cheap and simple, as well as an efficient and healthful, form of heater.

In lieu of forming the heaters in cylindrical shape, as shown in the first figures, they may be formed as shown in Figs. 4 and 5. In Fig. 4 the heater is of arch shape, with rounded top and flat sides and base, while in Fig. 5 the steam and liquid chambers are both cylindrical, one larger than the other, and joined like the figure 8; but many other shapes may be adopted without departing from the principle set forth.

The steam-chamber of the heater may in some cases have a diaphragm, *k*, running lengthwise and centrally through it to divide the entering current of steam, as shown in Fig. 4.

It will be understood that when the heaters are arranged as shown in Fig. 1 the branches *d d* will be so placed as to incline downward from the heaters to the main, so that the condensation can readily drain back into the main, as shown in Fig. 2, and where the heater is connected only at one end, as shown at the right of Fig. 1, the heater will also slightly incline longitudinally toward the branch.

I am aware that steam-heaters for cars have been made as in Patent No. 124,973, in which a main steam-pipe passes under the car-floor and delivers the steam into a multitubular heater arranged in a chamber beneath the car-floor, the steam flowing onward from one heater by the continuation of the steam-main to the next heater, &c. The space in the heater around the steam-tubes is charged with oil, and circulating-coils are led therefrom between the double flooring of the car, while registers in the upper flooring permit the air which is thus heated by the coils to ascend into the car. This system, however, is obviously distinct from mine in its general construction and mode of applying and regulating the heat, for in this case the steam is delivered in one direct line from heater to heater, and if shut off at one heater would be shut off at all the succeeding ones, and is controlled only at the source of the heat; whereas mine is almost the reverse of this.

I am also aware that steam cooking-kettles have been constructed with a steam-chamber below or a steam-jacket around the open-topped chamber containing the fluid or substance to be cooked; but a radiator constructed with a sealed fluid-cell above a steam-cell is obviously distinct from such cooking-utensils, and forms a new and improved form of heating device.

What I claim is—

1. A locally-controllable steam heating apparatus adapted for long narrow spaces, consisting of a main longitudinal steam-pipe and a series of distinct heating chambers or radiators arranged at intervals lengthwise with and parallel to the main, with lateral branch pipes connecting the same with the main, and controlling-valves in said branches, substantially as and for the purpose set forth.

2. In a heating apparatus of substantially the described kind, the combination, with a longitudinal main pipe, *a*, of the elongated heating-drums *c c*, arranged at intervals parallel with the main, lateral branches *d d*, connecting the same with the main, and valves *e e*, controlling said branches, substantially as herein shown and described.

3. A locally-controllable steam heating apparatus adapted for long, narrow spaces, consisting of a longitudinal main steam-pipe covered to present a non-radiating exterior, in combination with a series of distinct heating or radiating chambers, exposed to give out their heat and arranged closely adjacent to and parallel with the main, and connected therewith by lateral branches provided with regulating-valves, substantially as and for the purpose set forth.

4. A steam heating drum or radiator constructed with two distinct cells or chambers, one placed directly over the other and separated by a partition, the upper one being charged with a sealed body of liquid, while the lower one is adapted to connect with a supply of steam admitted against the intervening partition, substantially as and for the purpose set forth.

5. A steam heating drum or radiator formed of cast metal, and constructed with two distinct cells or cavities, the one being adapted to receive the steam and arranged in the base of the drum, and the other being adapted to be charged with a confined mass of liquid and placed over the steam-chamber, and the whole embodied in one integral structure, substantially as and for the purpose set forth.

6. A steam heating drum or radiator formed in one continuous casting with two distinct cavities, the one placed upon the other and the lower one adapted to receive the steam and the upper one to be charged with a confined body of liquid, substantially as and for the purpose set forth.

EDWARD E. GOLD.

Witnesses:

CHAS. M. HIGGINS,
WILLIAM G. BOOTH.