

(No Model.)

2 Sheets—Sheet 1.

A. B. MURRAY & H. HARRISON.

VENTILATING AND WARMING RAILWAY CARS.

No. 397,092.

Patented Jan. 29, 1889.

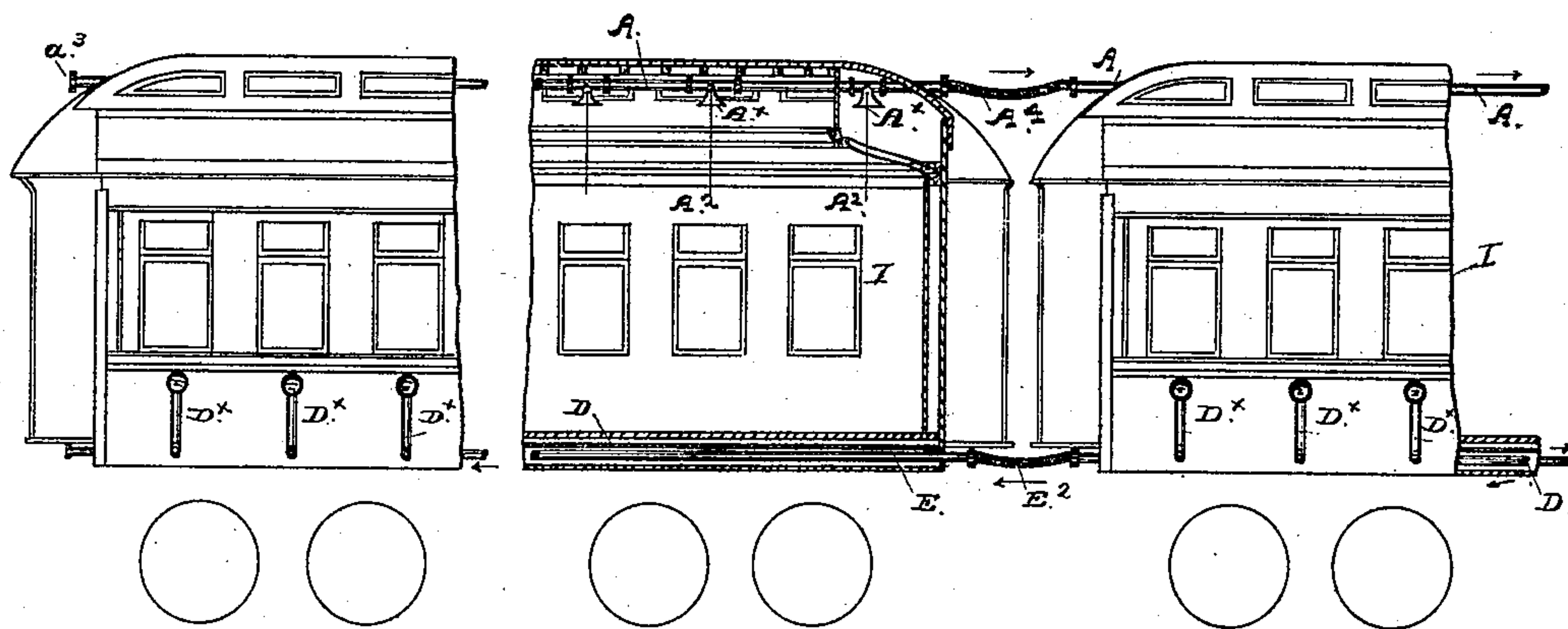
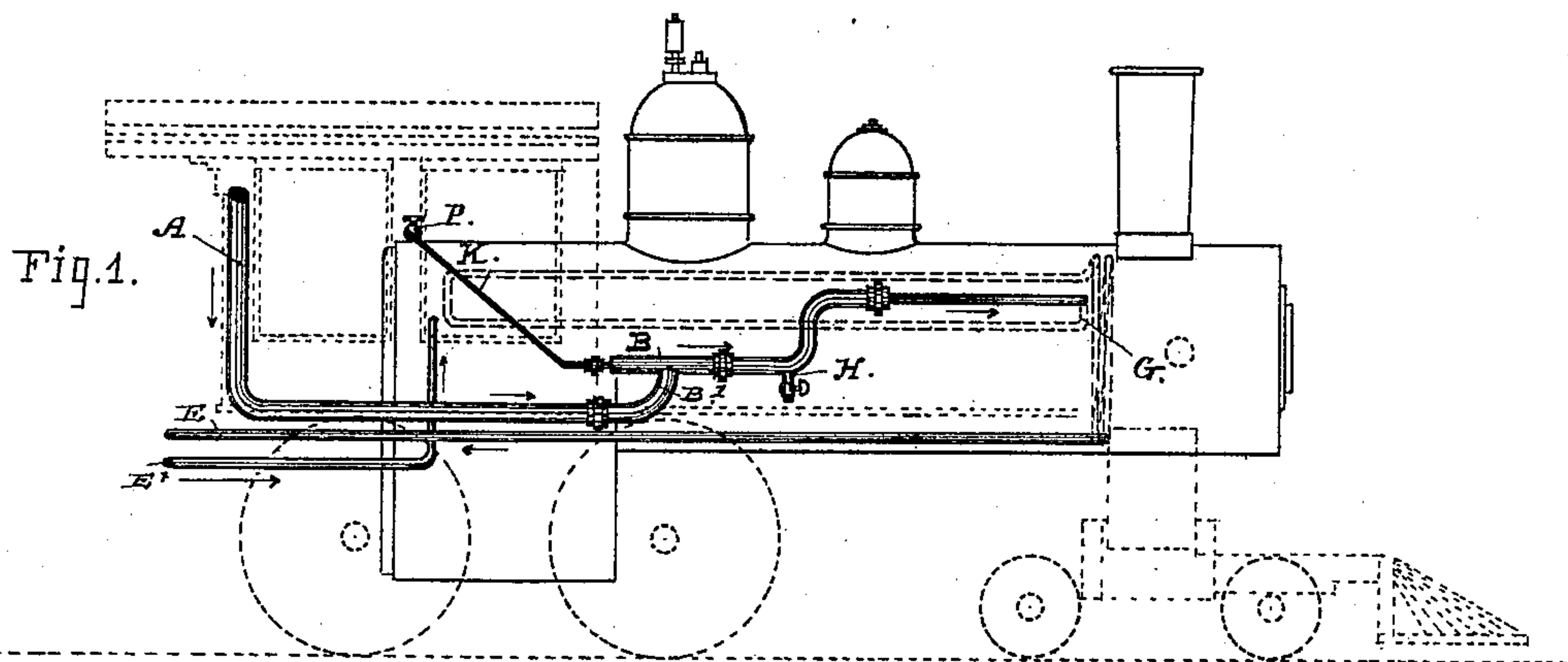


Fig. 2.

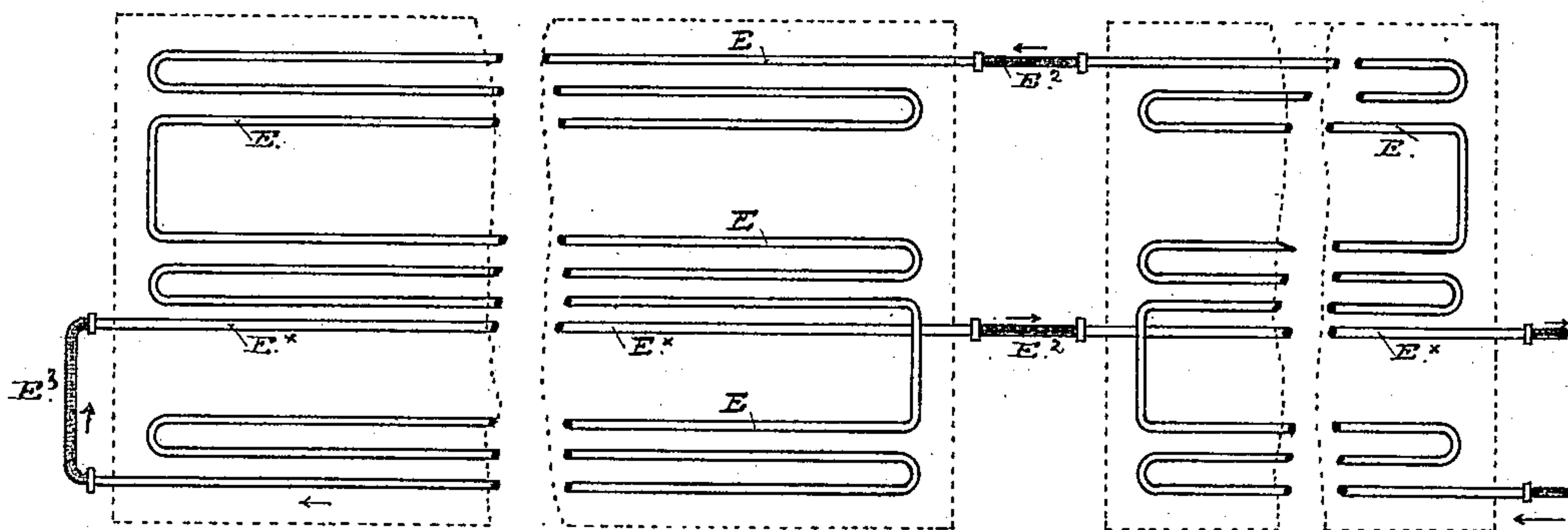


Fig. 3.

Witnesses:

Wm. Mayer
Joseph E. Ford

By

Inventors

Archibald B. Murray
and Henry Harrison

Smith & Osborn

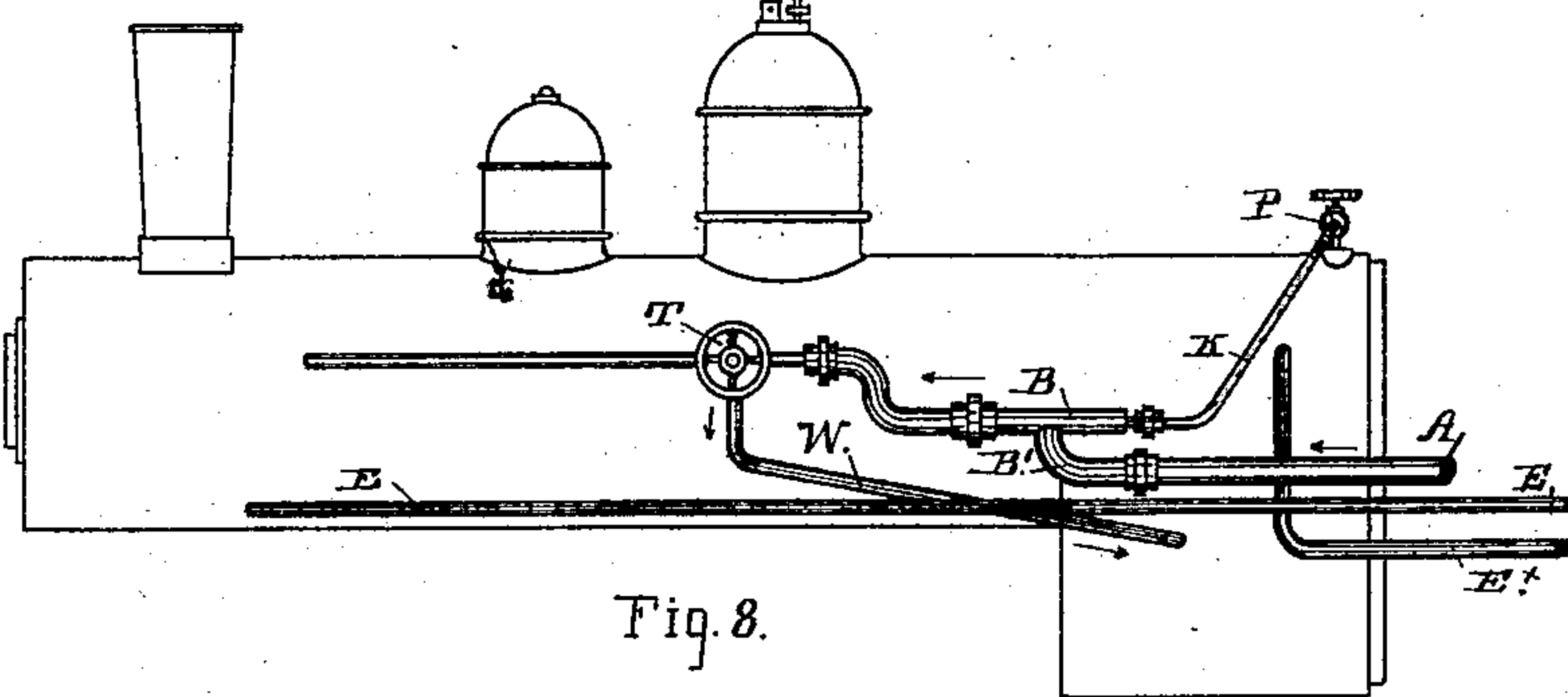
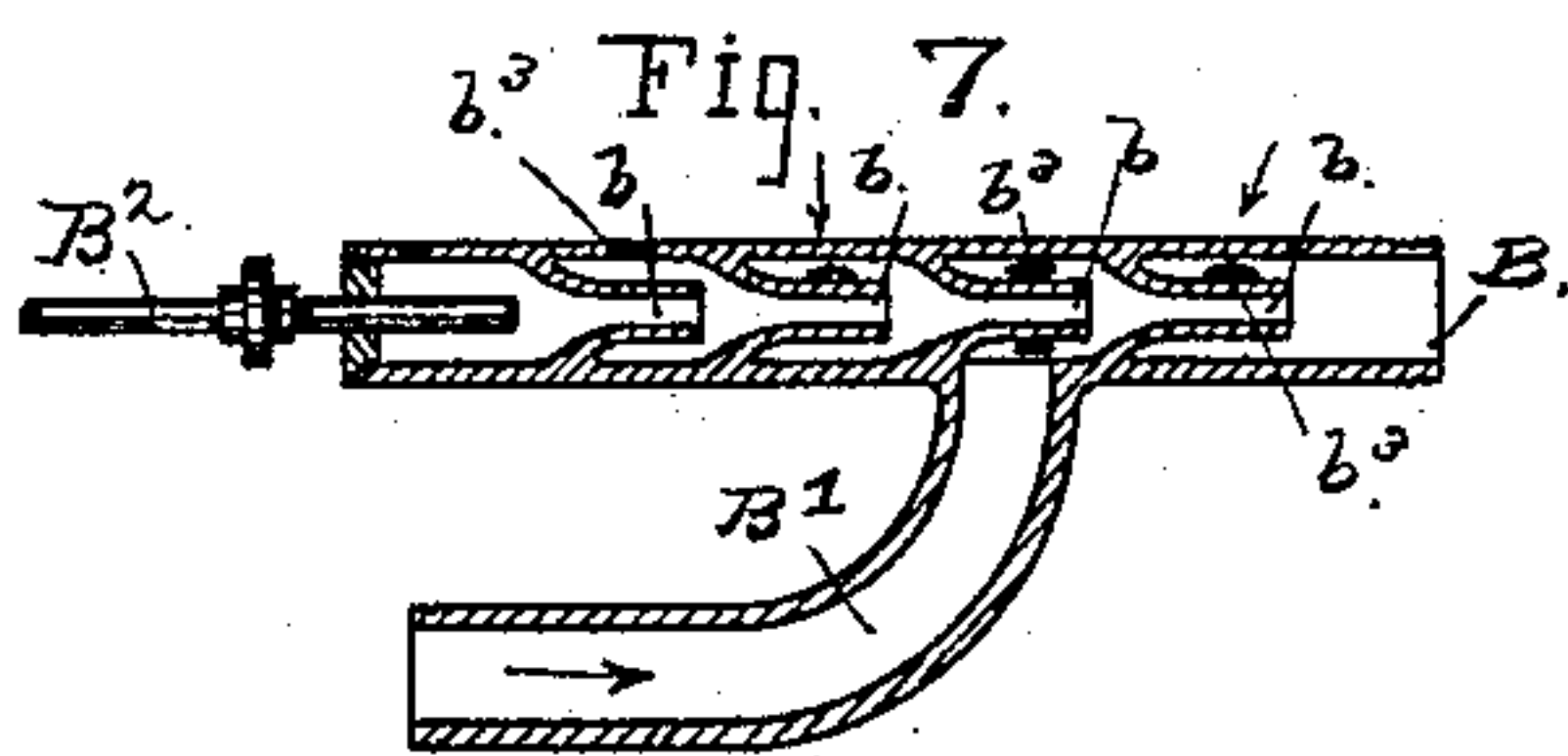
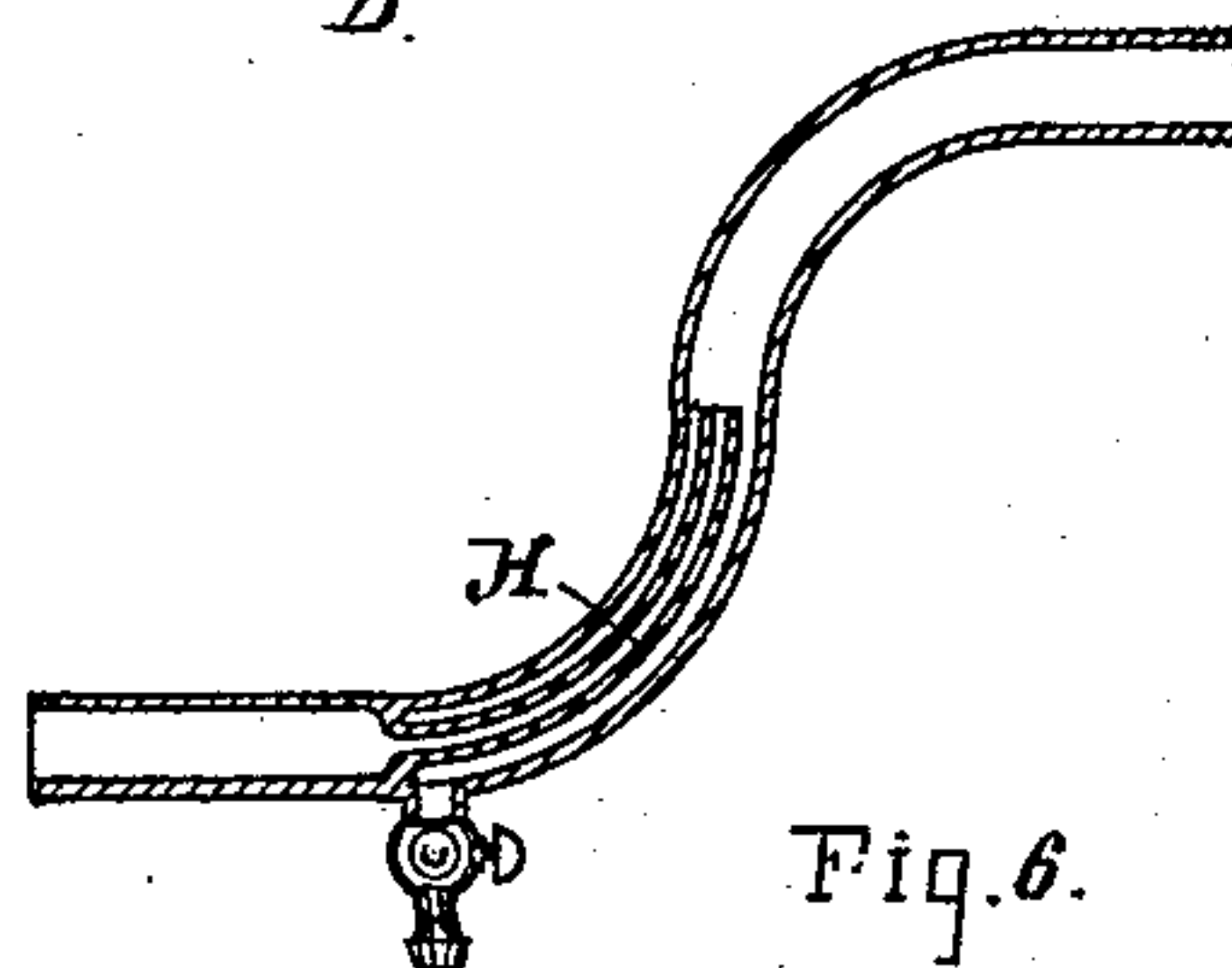
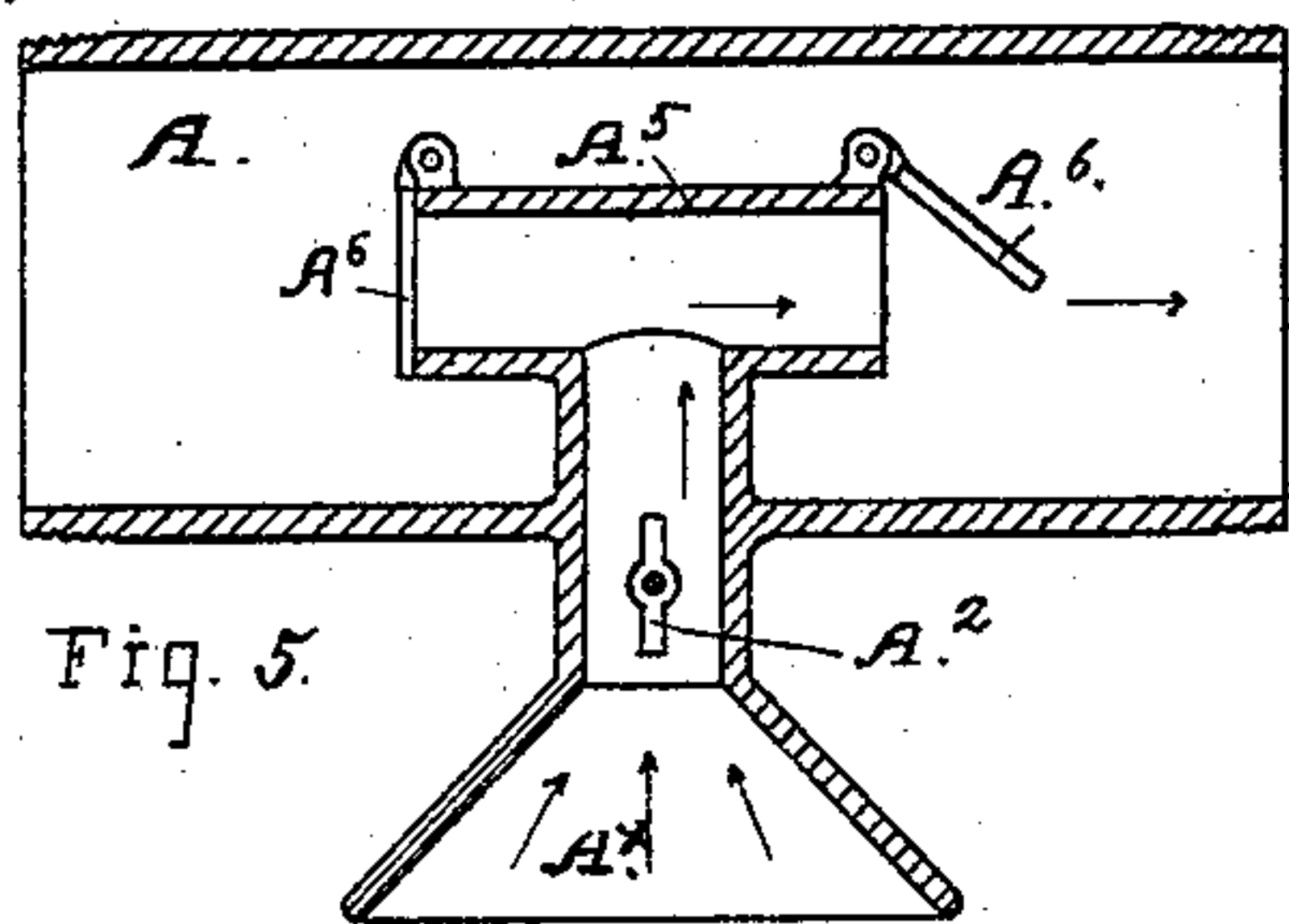
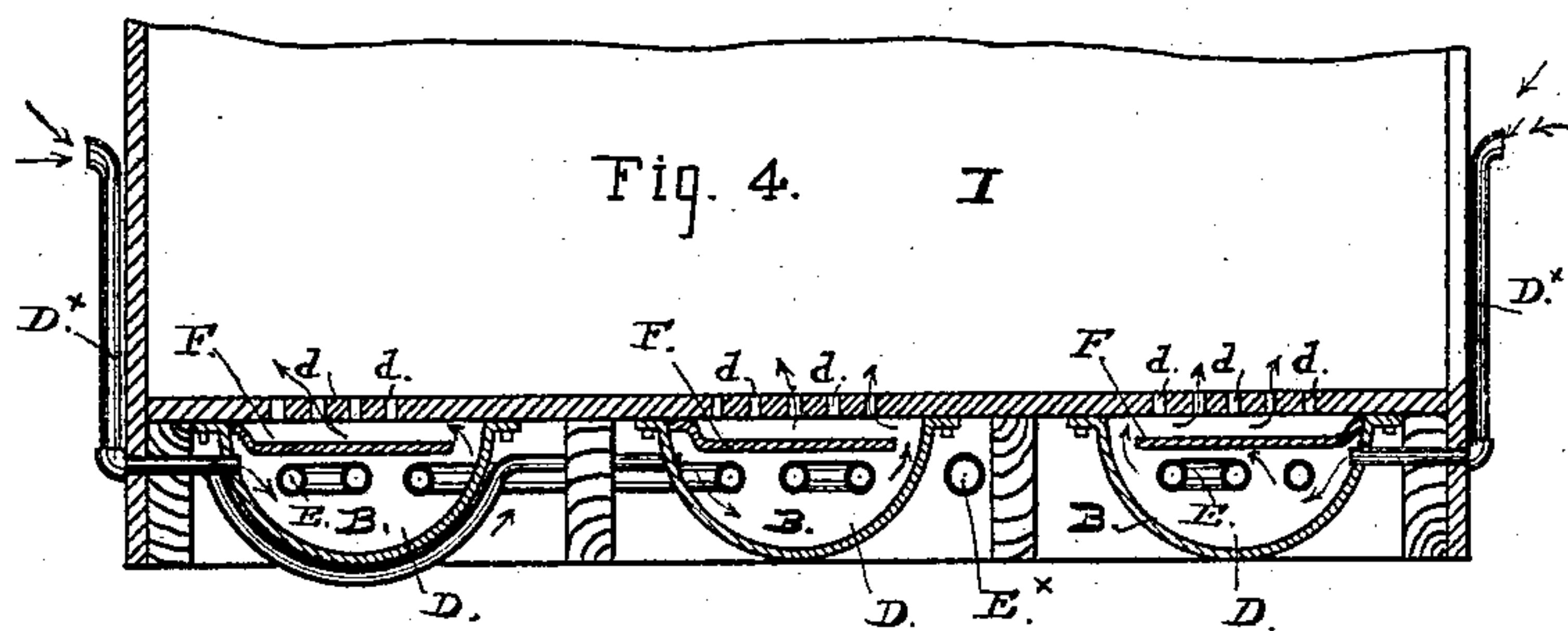
Attys.

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Att'y

UNITED STATES PATENT OFFICE.

ARCHIBALD B. MURRAY AND HENRY HARRISON, OF SAN RAFAEL,
CALIFORNIA.

VENTILATING AND WARMING RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 397,092, dated January 29, 1889.

Application filed July 7, 1887. Renewed November 28, 1888. Serial No. 292,132. (No model.)

To all whom it may concern:

Be it known that we, ARCHIBALD B. MURRAY and HENRY HARRISON, citizens of the United States, residing at San Rafael, in the county of Marin and State of California, have invented certain new and useful Improvements in Ventilating and Warming Railway-Cars; and we do hereby declare that the following is a full, clear, and exact description of our said invention, reference being had to the accompanying drawings.

Our invention has for its object to ventilate and warm cars in a railway-train, and the novel points or features thereof may be stated to consist in a novel ventilating apparatus for drawing off or removing air from the upper part of the cars and supplying fresh air from the outside to each car, and in a novel heating apparatus combined and operated with the ventilating apparatus to raise the temperature of the fresh air before it is supplied to the car, all as hereinafter fully described.

To enable persons skilled in the art to apply, carry out, and operate our said invention, we will proceed to describe the nature thereof and the manner of constructing and applying the apparatus both for heating and for ventilating a railway-train, the drawings that form a part of this specification being referred to by figures and letters.

Figure 1 illustrates that part of the apparatus which is placed on the locomotive. Fig. 2 represents the ends of two coupled passenger-coaches in a railway-train with parts of the heating and ventilating apparatus applied for joint operation. Fig. 3 is a plan of the system of air-heating pipes and air-chambers under the floor of the cars. Fig. 4 is a vertical section, on a larger scale, taken through the car-floor air-chambers and heating-pipes. Fig. 5 is a longitudinal section through a portion of the ventilating-pipe at one of its exhaust tubes or openings. Fig. 6 is a detail in section of a drain-tube to carry off the water of condensation from the heating-coils. Fig. 7 is a detail of the injector, by which air is forced through the heater and heating-pipes. Fig. 8 illustrates the injector and parts of the apparatus on the engine adapted

either for ventilating or for warming the cars of a train.

Similar letters of reference indicate like parts in all the views.

A is an air conduit or passage provided on each car, either on the inside or upon the roof of the car, or to one side of the clear story, and forming a permanent part or fixture. Apertures at intervals in the length of this pipe or passages have tubes A^x , with flaring mouths, that extend into the general air-space of the car, and suitable valves, A^6 , are provided in each one to shut off or contract the openings at pleasure, for the purpose of varying the general area of the air-outlets from the car into the pipe A. The ends of the pipes A, being carried to the outside and through the hood of the car, have unions A^8 for coupling the end of a flexible section, A^4 , to each pipe. By such means the cars of a train when made up are in common connection with an air-pipe that extends from the last coach forward to the engine. At this point the pipe is connected to the suction end of an injector-pump, B, placed to take its supply of steam from the boiler, and by the action of which, when steam is turned on, sufficient vacuum is produced to draw air from the cars through the outlets A^x to the front. To replace this air, we provide the chamber D under the floor of each car, running the length of the floor, and apertures $d\ d$, opening into the car, and air-tubes D^x are carried from the outside down the sides of the coach and underneath into each chamber. The mouths of these tubes are placed considerably above the level of the roadway to prevent dust from entering them, and their inlets at the sides of the chambers are set to deliver air below a horizontal plate or diaphragm, F, which is carried from one side across the chamber just beneath the inlet-apertures $d\ d$. The injector B, thus drawing air from the cars I by suction through the continuous passage A, produces in each car a circulation from the outside through the tubes E into the chambers beneath the floor and from these into the car through the apertures $d\ d$. By carrying the discharge end of the injector by a pipe, W, into the fire-box the air can be utilized to increase the activity

of the fire. The end of the pipe in the fire-box in such case is furnished with a spray-nozzle to divide the stream and throw it over the flame and gases toward the tube-sheet or over the bridge-wall. These parts constitute that part of our apparatus which is employed for ventilating purposes; but to secure a warm atmosphere at the same time we cause the air from the ventilating-pipe to pass through a heating-coil on the engine, and from this part we lead it by pipes in a circuitous manner through the chambers D. Each chamber in such case has a heating-coil, E', that is supplied from the heating apparatus on the engine, and the whole number of coils throughout the train, being connected by suitable couplings, E², when the train is made up, form a complete system of pipes for the circulation of the heated air from the engine back through all the air-chambers to the end car, and then forward again through connection E² and return-pipe E', from which it is discharged at the engine at some point where suction may be given to it, if desired. This double circulation of air from the outside first and thence through the ventilating-pipe A to the front, and next through the heater on the engine, and thence through all the heating-coils under the cars, is produced by the injector-pump B, which is placed between the end of the air-exhausting pipe A and the heater G, both to produce an outdraft of the air from the cars and to force this air through all the heating-pipes. The air from the pipe A thus drawn off from the cars is turned into the heating-coils and utilized for the system of heating-pipes in the air-chambers D.

Provision is made for keeping up a sufficient supply of air for the heating apparatus under all conditions by using an injector of the construction shown in Fig. 7 of the drawings, where the tube or cylinder is fitted with a number of small nozzles, one behind the other, each of which takes air from without through an aperture or apertures in the tube just back of each nozzle. The air-pipe A from the cars is coupled to the branch pipe B' of the injector, and the cylinder B has the nozzles *b b* set in one behind the other at the air-apertures *b³ b³*. Steam is supplied to the jet-tube B² by the pipe K from the boiler, the latter having a valve, P, for controlling the supply. With an injector of this kind sufficient pressure can be obtained to produce circulation of the heated air through all the pipes and coils in the train without creating excessive exhaust or draft upon the air-pipe, and also under conditions of adjustment where the area or number of the outlets A^x may be varied. When a number of the outlets A^x are shut off, as in cold weather, and the quantity of air to be derived from the pipe A for the heater is thereby reduced, the injector will draw in air through the apertures *b³* to make up for the deficiency.

Whatever reduction may take place at any time in the air-supply from the pipe A, it

will be seen that the injector will be suitably supplied from the outside atmosphere direct through the apertures before mentioned. One ejector can thus be made to work the ventilating-pipe and produce circulation of heated air throughout the coils and pipes in the train, and the form herein described, being particularly adapted for this purpose, will be found also to furnish a considerable degree of force or pressure with a small jet. The drain-tube H, Figs. 1 and 6, is placed at some point in front of the pressure end of the injector.

Fig. 5 shows a construction of draft-tube to secure effective draft by impingement of the moving column of air in the pipe with the discharge end of the tube in the pipe. This end has a hood or cap, A⁵, with openings facing in both directions in the same longitudinal line as the pipe and in the center of the space, so that the air passes around or on all sides of the cap. The openings are fitted with flap-valves A⁶, hinged loosely at the top and of suitable character to be lifted by the suction. The opening presented to the front or against the air is thus kept closed by the pressure against the valve; but the rear valve is lifted by the impingement of the air and the suction that results from it. The valve A² is provided with a rod or other suitable means for operating it within the car, and as the quantity of air taken in from the chambers D D will be governed by the volume of air drawn off, the circulation in the car will be regulated by the number and the combined area of the draft-tubes in use at any time. These may be closed or contracted, as circumstances require, by means of the valve A².

Fig. 8 of the drawings illustrates an arrangement of exhaust-pipes and the heating-pipes on the engine, by which the heating apparatus can be thrown out of operation and the ventilating apparatus can be used alone. This is effected by leading the return-pipe W from in front of the injector back into the fire-box and placing a two-way valve, T, at the point of junction, by which the heating-coil can be cut out and the air directed into the fire-box. The heating-air from the apparatus on the cars is returned from the rear car to the front through the pipe, which may be carried in a direct line by straight sections E^x, coupled together between the cars, or it may be arranged in coils through the air-chambers to utilize the heat from them.

We do not in this application claim the ventilating system alone, as we have made it the subject-matter of a separate application filed December 22, 1887, Serial No. 258,692.

Having thus fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a heating and ventilating apparatus for railway-trains, air-heating chambers in each car, having air-supply tubes or passages taking air from the outside and air-inlets into

the car, in combination with heating-coils connected together and with a heater on the engine, a return-pipe from the last coil in the line, and an air-draft pipe in the cars, connected to the injector, and an air injector or pump in the line of heating-pipes, adapted to force air through the heater and all the coils of the air-chambers throughout the train, substantially as described, for operation as set forth.

2. In a heating and ventilating apparatus for railway-trains, the air-draft pipe, A, having draft-tubes controlled by valves, air-cham-

bers D, with heating-coils E, a heater on the engine, and the injector B, to which the draft-pipe and heating-coils are connected, said injector having nozzles *b* and air-apertures *b*³, substantially as set forth.

In testimony that we claim the foregoing we have hereunto set our hands and seals.

ARCHIBALD B. MURRAY. [L. S.]
HENRY HARRISON. [L. S.]

Witnesses:

CHAS. E. KELLY,
JAS. D. BYRNE.