(No Model.) 4 Sheets—Sheet 1.

E. D. BANGS & A. L. WAITE.

BRAKE AND HEATING SYSTEM FOR RAILWAY CARS.

No. 472,424. Patented Apr. 5, 1892.

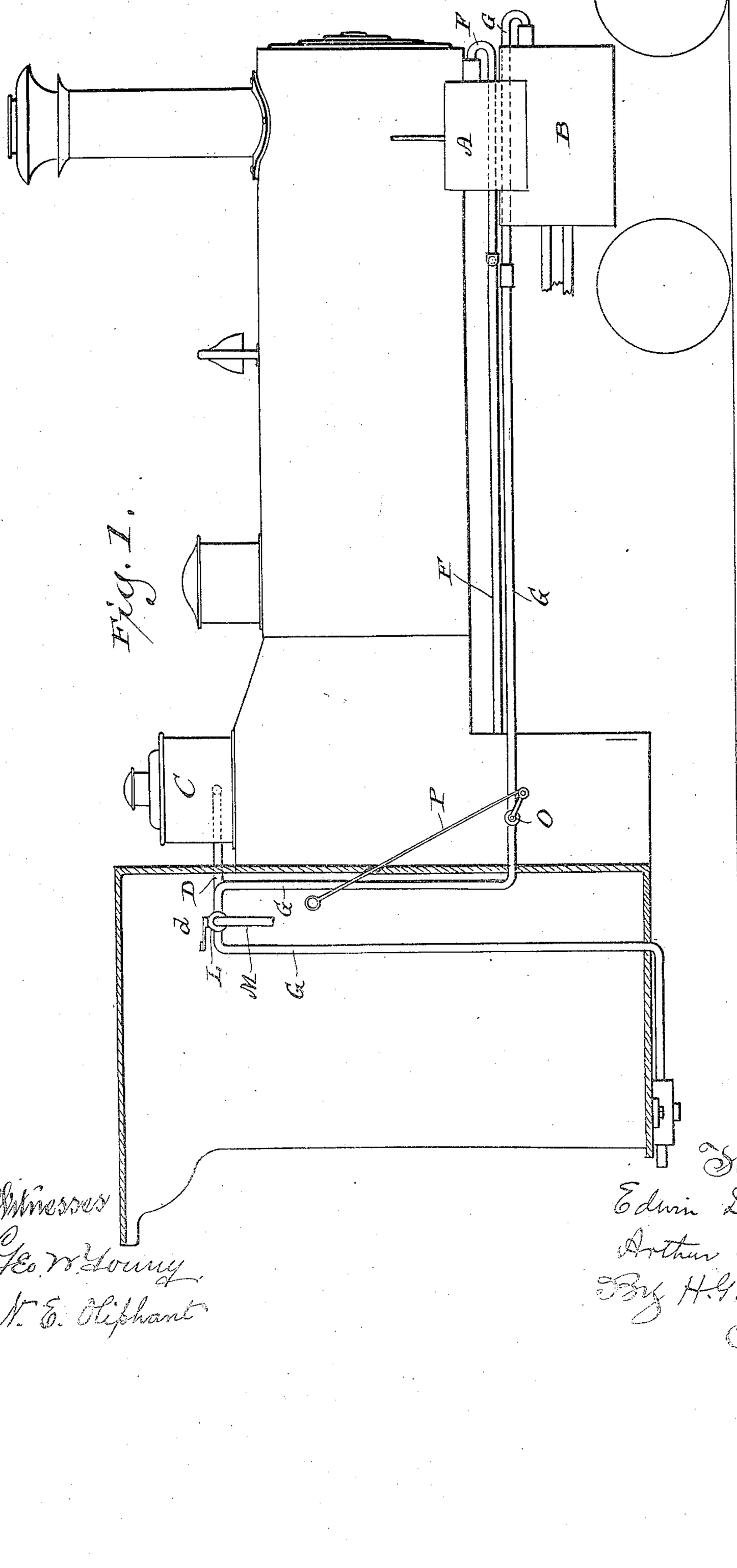

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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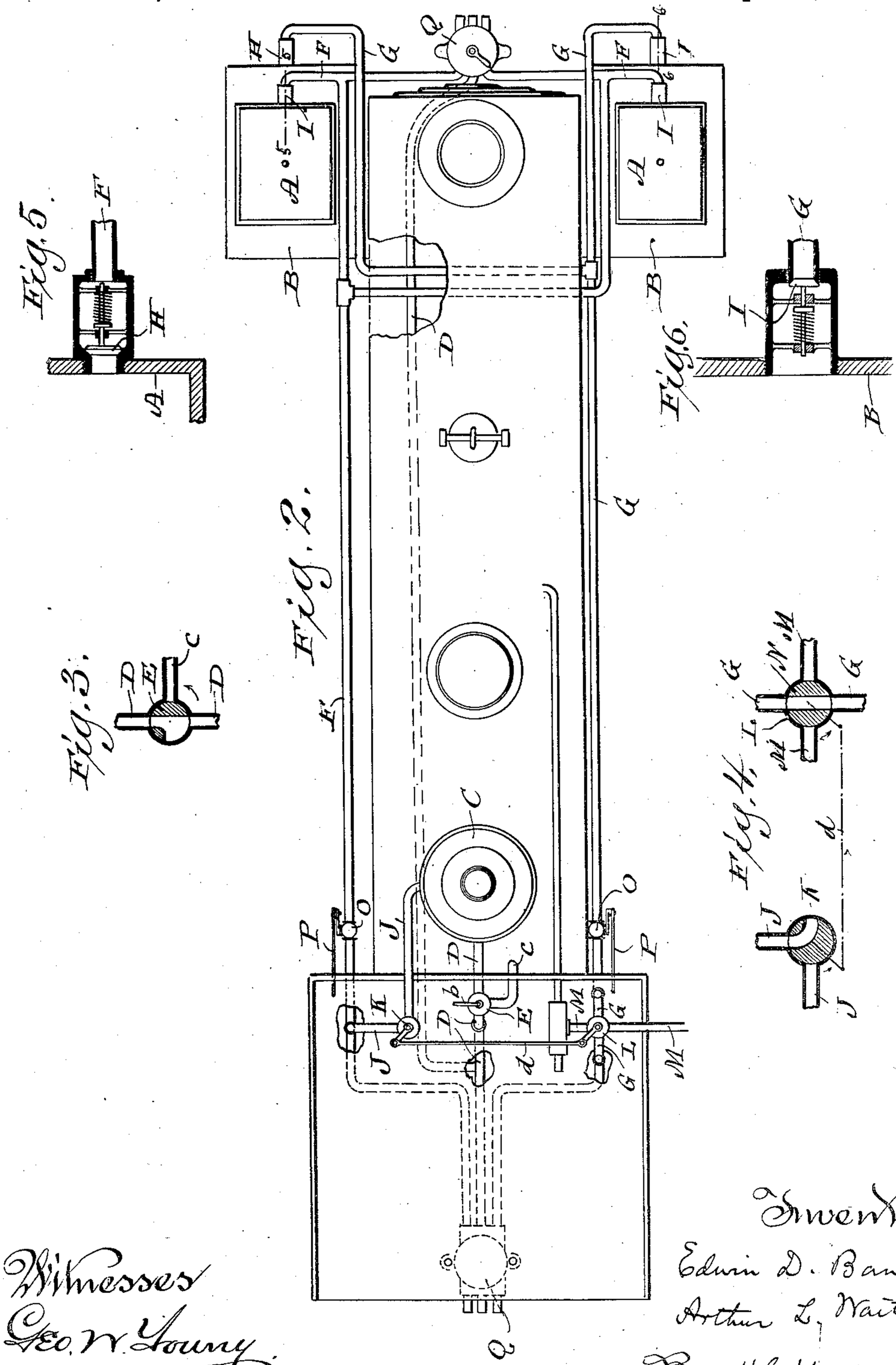

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BRAKE AND HEATING SYSTEM FOR RAILWAY CARS.

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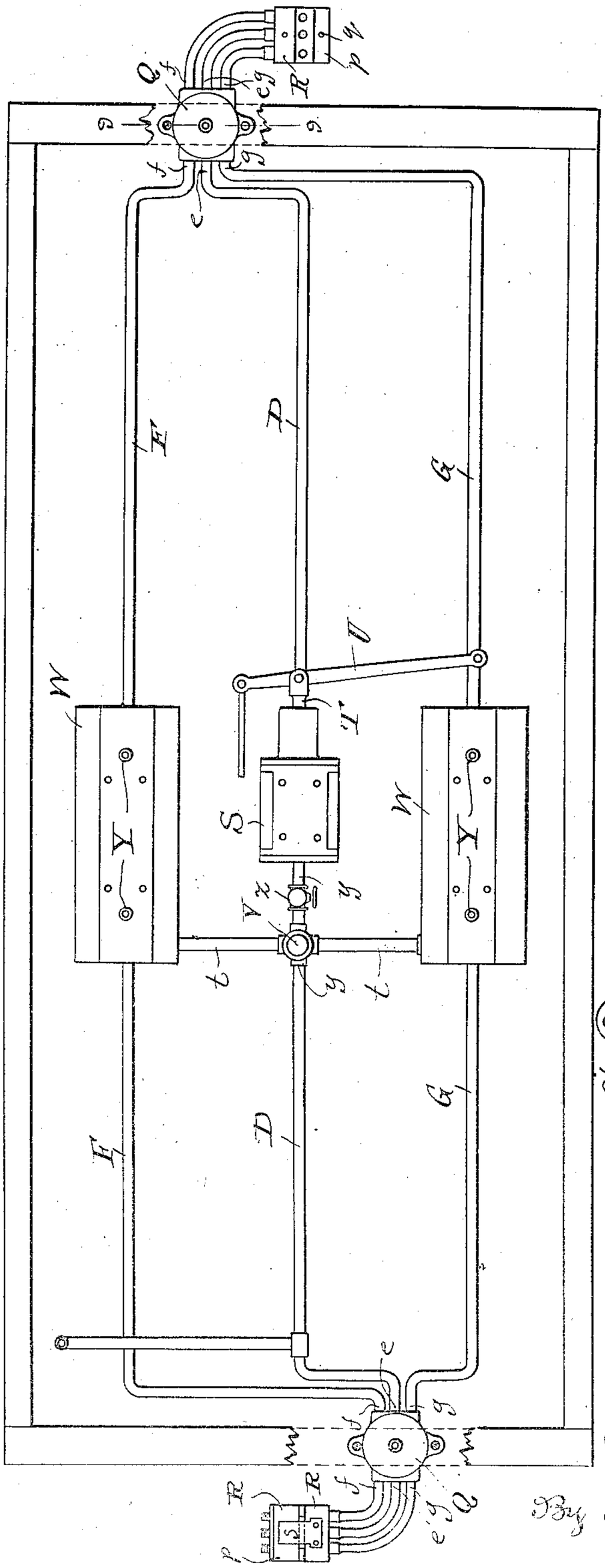


Fig. 9.

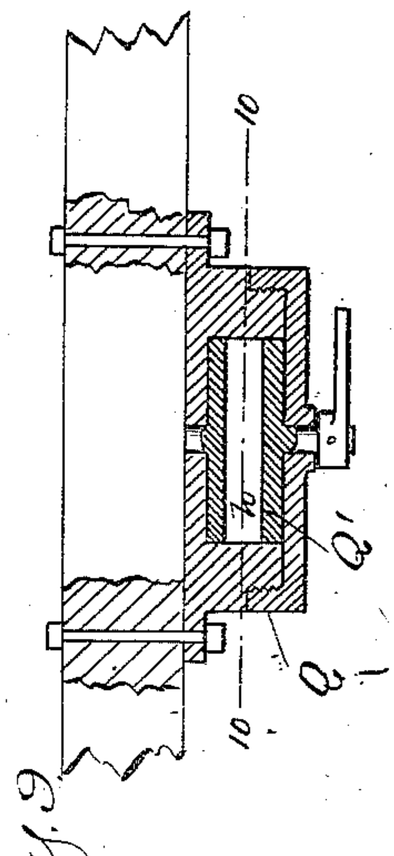


Fig. 8.

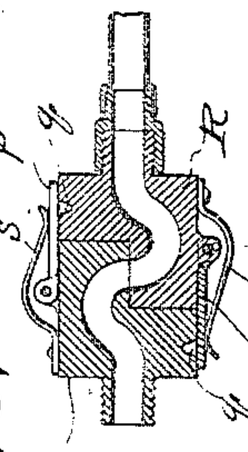


Fig. 12.

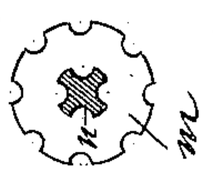


Fig. 11.

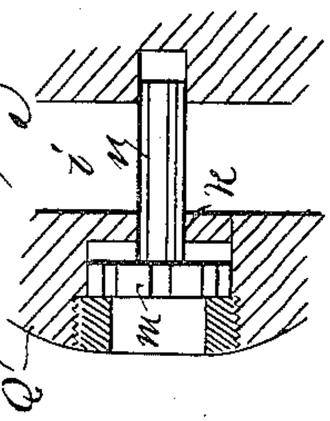
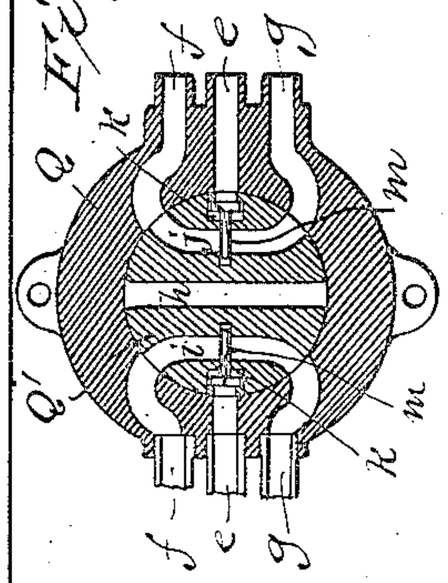


Fig. 10.



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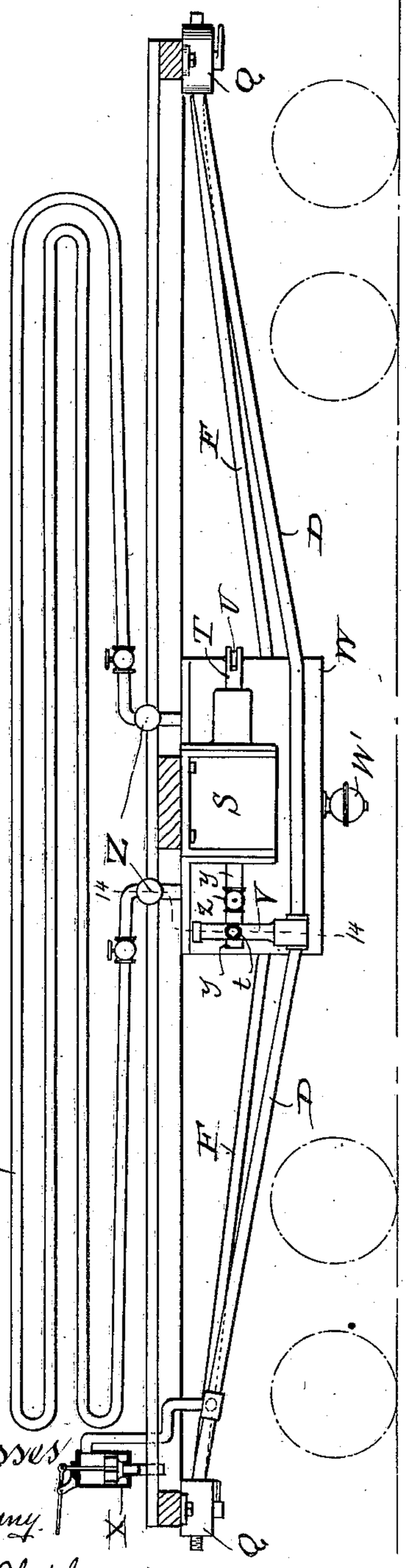

Fig. 13.

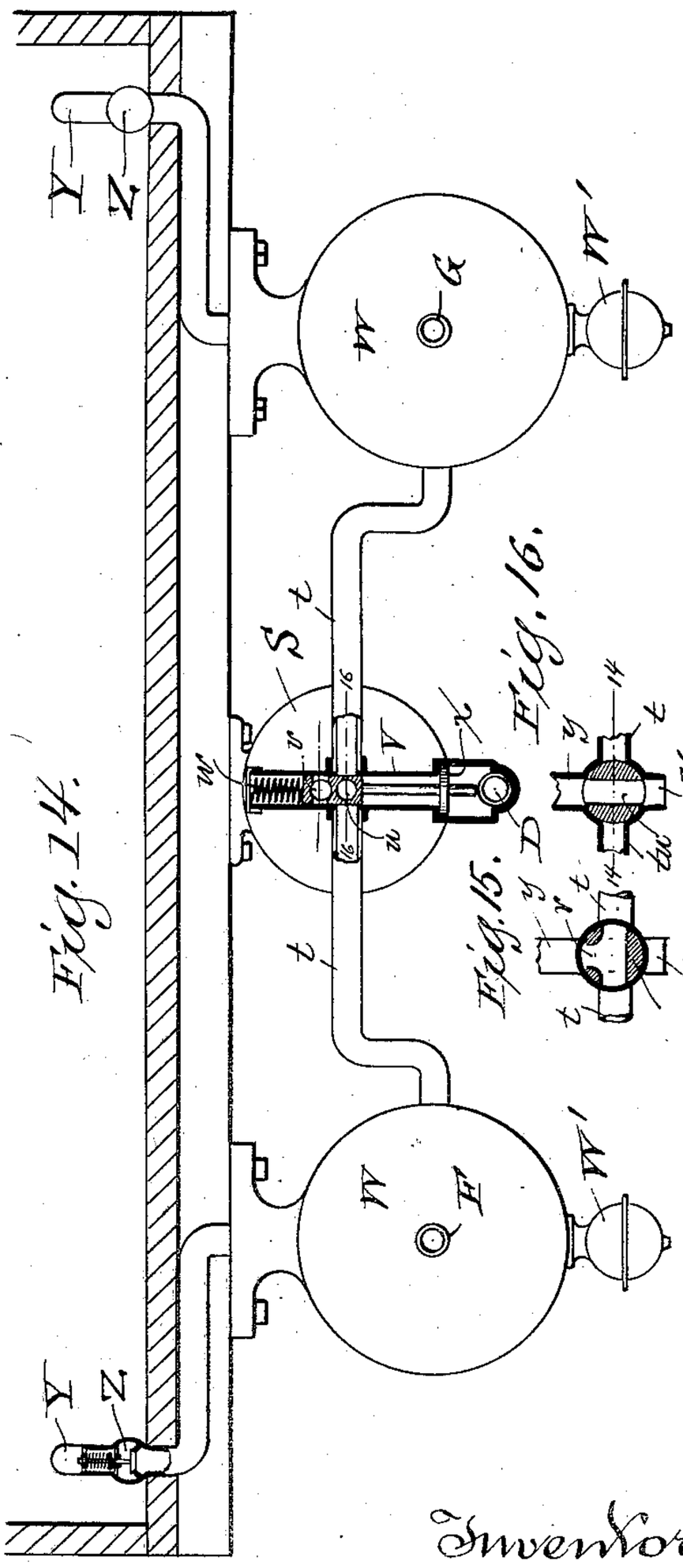

Fig. 14.

Fig. 15.

Fig. 16.

Witnesses
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UNITED STATES PATENT OFFICE.

EDWIN D. BANGS, OF MILWAUKEE, AND ARTHUR L. WAITE, OF BARABOO, ASSIGNORS OF ONE-FIFTH TO MANNING H. CASE, OF MILWAUKEE, WISCONSIN; ANNIE L. WAITE ADMINISTRATRIX OF SAID ARTHUR L. WAITE, DECEASED.

BRAKE AND HEATING SYSTEM FOR RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 472,424, dated April 5, 1892.

Application filed August 12, 1891. Serial No. 402,422. (No model.)

To all whom it may concern:

Be it known that we, EDWIN D. BANGS, of Milwaukee, in the county of Milwaukee, and ARTHUR L. WAITE, of Baraboo, in the county of Sauk, in the State of Wisconsin, citizens of the United States, have invented certain new and useful Improvements in Brake and Heating Systems for Railway-Trains; and we do hereby declare that the following is a full, clear, and exact description thereof.

Our invention has for its object to operate the brakes of a railway-train by steam in continuous circulation throughout said train under the control of engineer and conductor, as well as to combine the brake system with a heating system for the coaches in the aforesaid train.

Said invention therefore consists in certain peculiarities of construction and combination of parts to be hereinafter described with reference to the accompanying drawings, and subsequently claimed.

In the drawings, Figure 1 represents a diagrammatic side elevation of a locomotive and certain steam connections forming part of our invention; Fig. 2, a plan view of what is shown in elevation by the preceding figure; Fig. 3, a detail section of a valve under control of the engineer for regulating pressure in what will be hereinafter designated as the "train-pipe;" Fig. 4, a like view illustrating valves controlling connections between the steam-dome, injector, overflow-pipe, and circulating-pipes; Figs. 5 and 6, detail sections taken on lines 5 5 and 6 6 of Fig. 2; Fig. 7, a plan view illustrating those parts of our apparatus that are stationary on the under side of a railway-coach; Fig. 8, a detail section of a device that forms part of our invention and constitutes a coupling between the steam-pipes of opposing railway-coaches; Fig. 9, a vertical transverse section taken on line 9 9 of Fig. 7, to illustrate a coupling-valve, also forming part of our invention; Fig. 10, a section on line 10 10 of the preceding figure; Figs. 11 and 12, detail views on an enlarged scale illustrating a check-valve that forms part of the coupling-valve; Fig. 13, an elevation, partly in section, illustrating our combined brake and heating system, as well as the conductor's valve for operating said brake system; and Fig. 14, a view showing in end elevation certain of the parts illustrated in the preceding figure, the remainder of these parts being in section on line 14 14 of the said preceding figure and on the same line in Fig. 16; Figs. 15 and 16 represent horizontal sections, respectively taken on lines 15 15 and 16 16 of Fig. 14.

Referring by letter to the drawings, A represents the steam-chests, B the cylinders, and C the steam-dome of a locomotive. Leading from the steam-dome is what we term the "train-pipe" D, provided with a valve E, the latter having a crank *b* within reach of the engineer, and an outlet *c* to the open air. The engineer's valve E is clearly shown in Fig. 3 as full open, so as not to obstruct the train-pipe D, and when said valve is in this position its outlet *c* is cut off. Now if the engineer's valve be given a quarter-turn that portion of the train-pipe between it and the steam-dome C will be cut off and the remainder of said train-pipe will be open to the outlet for the purpose hereinafter described.

Connected to the steam-chests A is the supply-pipe F of our brake and heating system, and connected to the cylinders B is the return-pipe G of said system, these pipes being sometimes termed the "circulating-pipes."

In Fig. 5 we have shown the connection of the supply-pipe F with each steam-chest A, and this connection consists of a spring-controlled valve H, that opens only to a pressure of steam coming from said chest, while in Fig. 6 we have shown the connection between the return-pipe G and each cylinder B, this latter connection being a spring-controlled valve I, that opens only to a pressure of steam coming from said return-pipe.

Leading from the steam-dome C is a pipe J, that connects with the supply-pipe F and is provided with a cut-off valve K, and we also have a connection L between the return-pipe G and the injector overflow-pipe M of the lo-

comotive, this latter connection being controlled by a cut-off valve N, said valves (shown in detail, Fig. 4) being connected by a rod *d* within reach of the engineer, as best illustrated in Fig. 2.

Each of the circulating-pipes F G is provided with a cut-off valve O, operated by a lever P, extending into the cab of the locomotive, and in practice it is designed that these cut-off valves shall be open only when said locomotive is using steam. When the locomotive is not using steam, the cut-off valves O are closed and the ones K N opened to obtain a circulation of steam direct from the dome C of said locomotive. In any event the train-pipe D and circulating-pipes F G are brought parallel to each other at the rear of the locomotive and joined to a triple coupling-valve Q, to be hereinafter described as to details of construction, and in some instances said pipes may be brought parallel to each other at the front of said locomotive and joined by a similar coupling, as shown in Fig. 2. By having the train and circulating pipes joined by a triple coupling at both ends of the locomotive the latter need not be turned to make the proper steam connections with the remainder of the train, this arrangement of pipes being particularly designed for locomotives of suburban trains.

Each coupling-valve Q throughout the train comprises a casing having three parallel passages *e f g* on opposite sides of a central transverse line, the first of these passages being in line with the train-pipe D and the others in line with the circulating-pipes F G, as best illustrated in Fig. 10.

The turning-plug Q′ of the valve Q is controlled by a crank and provided with three passages *h i j*, parallel to each other, designed to be brought in and out of register with the ones *e f g* in the casing, and each of the passages *i j* is provided with a port *k*, controlled by a check-valve consisting of a disk *m*, having a corrugated periphery and a corrugated central stem *n*, the latter working in guides in said plug. The triple coupling-valve Q is shown in Fig. 10 as cut off by a quarter-turn, and on a train this will be the position of the rear one of such valves in our system, all the others being opened to have their passages *e f g* in line with the train and circulating pipes. Now if the locomotive be using steam so much of the latter as enters the supply-pipe F from the locomotive-chests A will find its way back to said rear coupling-valve into the passage *g* and then back through the return-pipe G into the locomotive-cylinders, from whence it passes into the exhaust.

At this point in the specification we desire to call attention to the fact that the steam circulated through the train enters the cylinders at each alternate stroke of the pistons therein and acts as an auxiliary or increased cushion for said pistons in that end of said cylinders at which the connection is made. It is to be understood that steam let into the train-pipe D direct from the dome C has a greater pressure at all times than the steam in the circulating system, and when the rear one of the coupling-valves Q is cut off, as shown in Fig. 10, the check-valve (disk *m* and stem *n*) therein that controls the port leading from the passage *g* will yield to the pressure in said train-pipe to permit the steam in the latter to enter the circulating system to thereby inspire the circulation and find its way back to the waste termini of said circulating system, these termini being either the cylinders or the injector overflow-pipe, accordingly as the locomotive may or may not be using steam, it being a matter of fact that said check-valve is otherwise held to its seat by the pressure in the aforesaid circulating system.

Beyond the coupling-valves Q throughout a train the pipes D F G are fitted to coupling-sections R, such as are best illustrated in Fig. 8, each of these sections being a casting having a series of apertures corresponding in number to said pipes, a hinged plate *p*, provided with a beveled lug *q* for engagement with a recess in the opposing coupling-section, and a flat spring *s* impinged against said plate. The construction of their component sections permits the couplings to automatically connect and disconnect, this of itself effecting a saving of time and labor on the part of the makers-up of trains.

Under each coach in the train we arrange a brake-cylinder S, such as is in common usage in connection with air-brake systems, the rod T of a piston (not shown) in said cylinder being connected to the brake-lever U, as best illustrated in Fig. 7. A casing V, rising from that portion of the train-pipe D under the coach, is coupled by pipes *t* to reservoirs W, also arranged beneath said coach in circuit with the circulating-pipes, and a slide-valve having apertures *v u* is arranged in the casing in opposition to a spiral spring *w*, as shown in Fig. 14. A stem extending down from the slide-valve carries a horizontal piston *x*, opposed to a suitable seat against which it is held by pressure in the train-pipe, and said slide-valve, stem, and piston constitutes what answers to the triple valve in the art to which our invention relates, but which is hereinafter generally referred to as the "brake-valve," a branch *y* serving to connect the valve-casing V with the brake-cylinder above described. Each of the reservoirs W is preferably provided with an automatic drip-cock W′; but as the latter are well-known devices they are not shown in detail and extended description is deemed unnecessary.

The branch *y* is provided with a cock *z*, and by means of the latter the brake-cylinder S may be cut off from steam at such times as may be necessary or desirable. When the pressure in the steam-pipe D is sufficient to overcome the power of the spring *w* in the valve-casing V, the brake-valve is seated to cut off steam from the brake-cylinder S, the

aperture *u* in said brake-valve being in line with the branch *y*, the latter being open to the atmosphere at its end farthest from said brake-cylinder. Now if the pressure in the train-pipe be decreased, the spring in the valve-casing will expand to unseat the brake-valve, and the aperture *v* in said valve will be thus brought into line with the pipes *t*, leading from the reservoirs W, and also into communication with the branch *y*, leading to the brake-cylinder, the outer end of this branch being closed by the solid portion of said block, as is best illustrated in Fig. 15, said aperture *v* being a triple one, as is also best illustrated in the same figure. Steam from the reservoirs entering the brake-cylinder will actuate the piston therein to thus set the brakes, and the latter will remain set until such time as the pressure in the train-pipe is increased sufficient to overcome the resistance of the spring in the valve-casing and bring the brake-valve to its normal position, as shown in Fig. 14. This operation being accomplished, the steam previously admitted to the brake-cylinder will escape through the now open end of the branch *y*, and thus the brakes will be released.

The decrease of pressure in the train-pipe may occur from an operation of the engineer's valve previously described, or from a break in the train, and we prefer to connect said train-pipe with an escape-valve X in each coach of the train, one of the latter valves being shown in Fig. 13.

The valves X in the coaches of the train are generally termed "conductors' valves," and are normally held closed by steam-pressure thereon; but any one of them may be opened at any time to decrease pressure in the train-pipe, and thus cause an automatic setting of the brakes throughout the entire train independent of any action on the part of the engineer.

As shown in Figs. 13 and 14, the inlet and outlet of a radiator Y may be connected to each reservoir W, said inlet and outlet being provided with a shut-off cock, as is usual in such devices. In the connections between the radiator inlet and outlet we arrange spring-controlled valves Z, that open to steam-pressure in only one direction, the valve in one connection being arranged to work reverse to the one in the other connection.

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

1. A steam-brake system for railway-trains, comprising a train-pipe and steam-circulating pipes arranged to take steam from the locomotive, reservoirs in circuit with the circulating-pipes at intervals of the train, brake-cylinders in connection with the train-pipe and reservoirs, but having outlets to the atmosphere, and valves of such construction and arrangement as to normally cut off the reservoirs from the brake-cylinders under a certain pressure of steam in said train-pipe, while being at the same time open to said brake-cylinders and their atmosphere-outlets, but which automatically close said atmosphere-outlets and open communication between said reservoirs and brake-cylinders on a decrease of the pressure in the aforesaid train-pipe, substantially as set forth.

2. A steam-brake system for railway-trains, comprising a train-pipe having a valve-controlled connection with the steam-dome of the locomotive, circulating-pipes leading from the locomotive steam-chests back to the locomotive-cylinders and having a valve-controlled communication with the train-pipe, reservoirs in circuit with the steam-circulating pipes at intervals of the train, brake-cylinders in connection with train-pipe and reservoirs, but having outlets to the atmosphere, and valves of such construction and arrangement as to normally cut off the reservoirs from the brake-cylinders under a certain pressure of steam in said train-pipe while being at the same time open to said brake-cylinders and their atmosphere-outlets, but which automatically close said atmosphere-outlets and open communication between said reservoirs and brake-cylinders on a decrease of pressure in the aforesaid train-pipe, substantially as set forth.

3. A steam-brake system for railway-trains, comprising a train-pipe having a valve-controlled connection with the steam-dome of the locomotive, valve-controlled circulating-pipes leading from the locomotive steam-chests back to the locomotive-cylinders and having a valve-controlled communication with the train-pipe, a valve connection between the steam-dome and one of the steam-circulating pipes and a like connection between the other of these steam-circulating pipes and the injector overflow-pipe of the locomotive, reservoirs in circuit with circulating-pipes at intervals of the train, brake-cylinders in connection with the train-pipe and reservoirs, but having outlets to the atmosphere, and valves of such construction and arrangement as to normally cut off the reservoirs from the brake-cylinders under a certain pressure of steam in said train-pipe while being at the same time open to the latter cylinders and their atmosphere-outlets, but which automatically close said atmosphere-outlets and open communication between said reservoirs and brake-cylinders on a decrease of pressure in the aforesaid train-pipe, substantially as set forth.

4. A combined steam-brake and heating system for railway-trains, comprising a train-pipe and circulating-pipes arranged to take steam from the locomotive, reservoirs in circuit with the steam-circulating pipes at intervals of the train, radiators in the train-coaches connected to the reservoirs, brake-cylinders in connection with the train-pipe and reservoirs, but having outlets to the atmosphere, and valves of such construction and arrangement as to normally cut off the reservoirs

from the brake-cylinders under a certain pressure of steam in said train-pipe while being at the same time open to said brake-cylinders and their atmosphere-outlets, but which automatically close said atmosphere-outlets and open communication between said reservoirs and brake-cylinders on a decrease of pressure in the aforesaid train-pipe, substantially as set forth.

5. A steam-brake system for railway-trains, comprising a train-pipe and circulating-pipes in coupled sections arranged to take steam from the locomotive and joined at intervals to valves, each of which latter consists of a casing provided with a series of passages on opposite sides of a central line, a turning-plug having passages designed to come in and out of register with the casing-passages on a straight line and to stand on a quarter-turn, so as to cut off the train-pipe passage therein without interference with the adjacent pipe-passages, a port leading from each steam-circulating-pipe passage in the turning-plug to register with the train-pipe when said plug is in its latter position, and a one-way valve controlling the port, reservoirs in circuit with the circulating-pipes at intervals of the train, brake-cylinders in connection with said train-pipe and reservoirs, but having outlets to the atmosphere, and valves of such construction and arrangement as to normally cut off the reservoirs from the brake-cylinder under a certain pressure of steam in said train-pipe while being at the same time open to said brake-cylinders and their atmosphere-outlets, but which automatically close said atmosphere-outlets and open communication between said reservoirs and brake-cylinders on a decrease of pressure in the aforesaid train-pipe, substantially as set forth.

6. A steam-brake system for railway-trains, comprising a train-pipe and circulating-pipes arranged to take steam from the locomotive, reservoirs in circuit with the steam-circulating pipes at intervals of the train, brake-cylinders at corresponding intervals with the reservoirs, valve-casings connected to the train-pipe, reservoirs, and brake-cylinders, a slide-valve loosely arranged in each casing and provided with a single and a triple aperture arranged one below the other, the former aperture being normally in line with the atmosphere-outlet of the adjacent brake-cylinder, a compressed spring in opposition to the top of the slide-valve, a stem depending from said valve, and a piston carried on the rod to oppose a seat in said casing, against which it is normally held by a certain pressure in the train-pipe, substantially as set forth.

In testimony that we claim the foregoing we have hereunto set our hands, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

EDWIN D. BANGS.
ARTHUR L. WAITE.

Witnesses:
N. E. OLIPHANT,
WM. KLUG.