W. WILEY.

LOCOMOTIVE ECONOMIZER.

APPLICATION FILED AUG. 8, 1907.

910,758.

Patented Jan. 26, 1909.

3 SHEETS—SHEET 1.

FIG. 2.

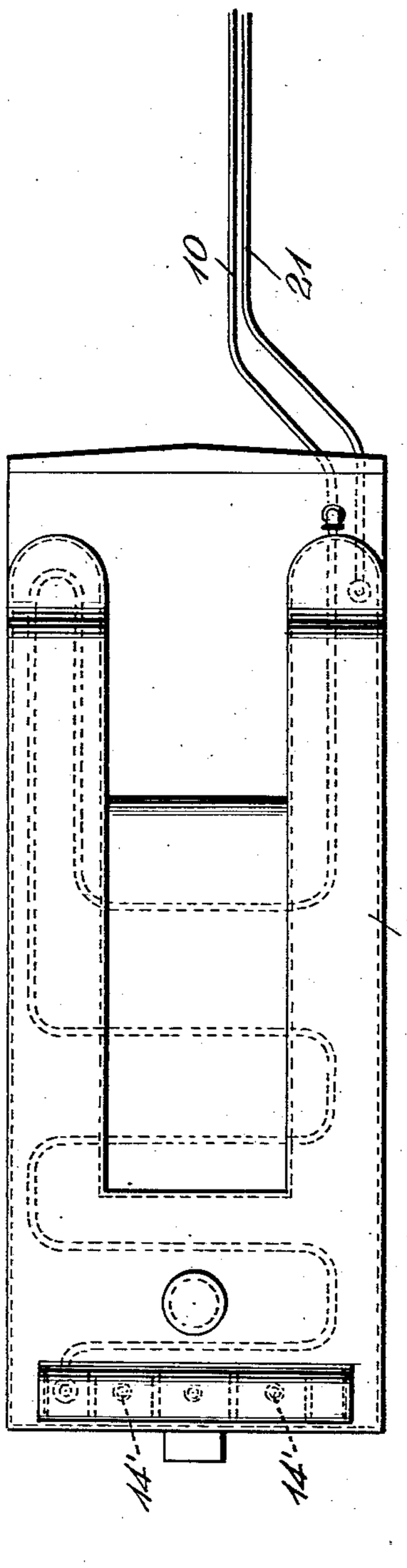
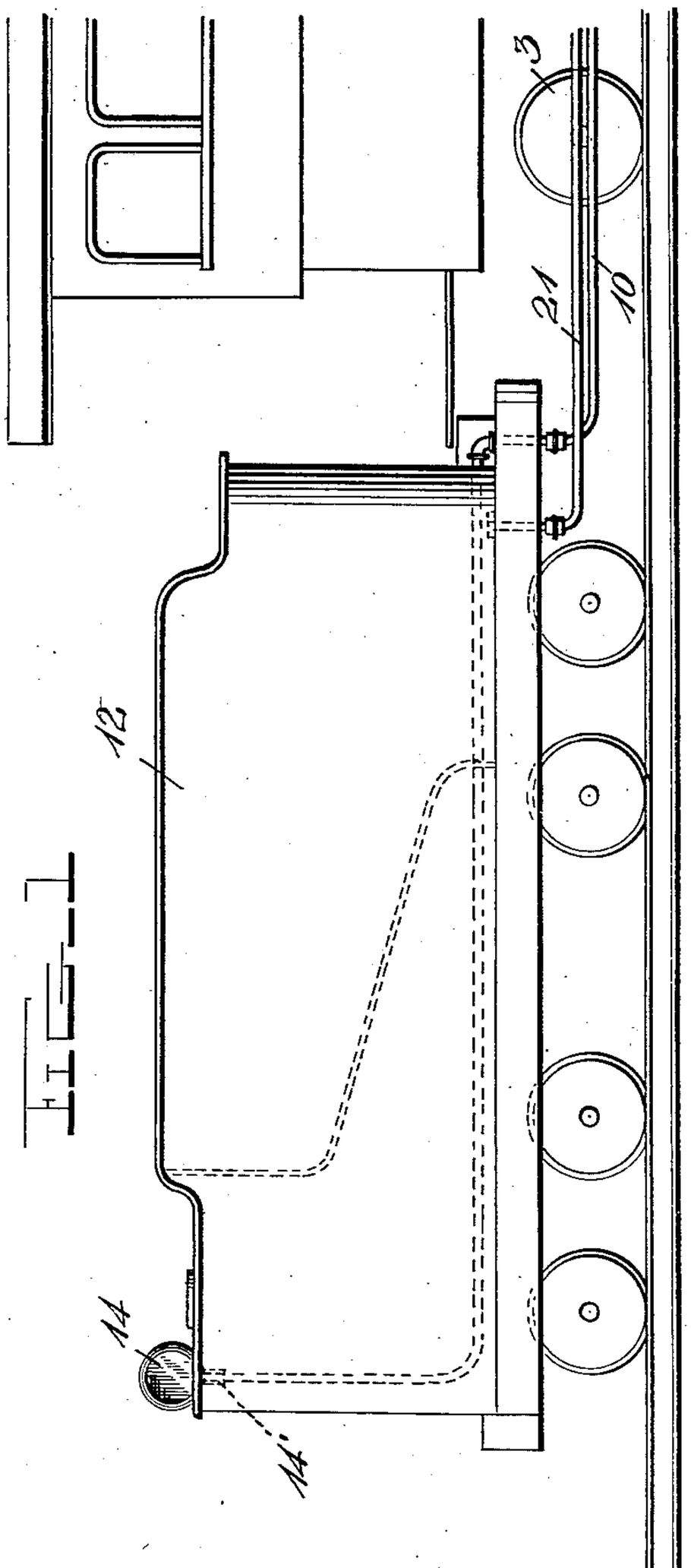


FIG. 1.



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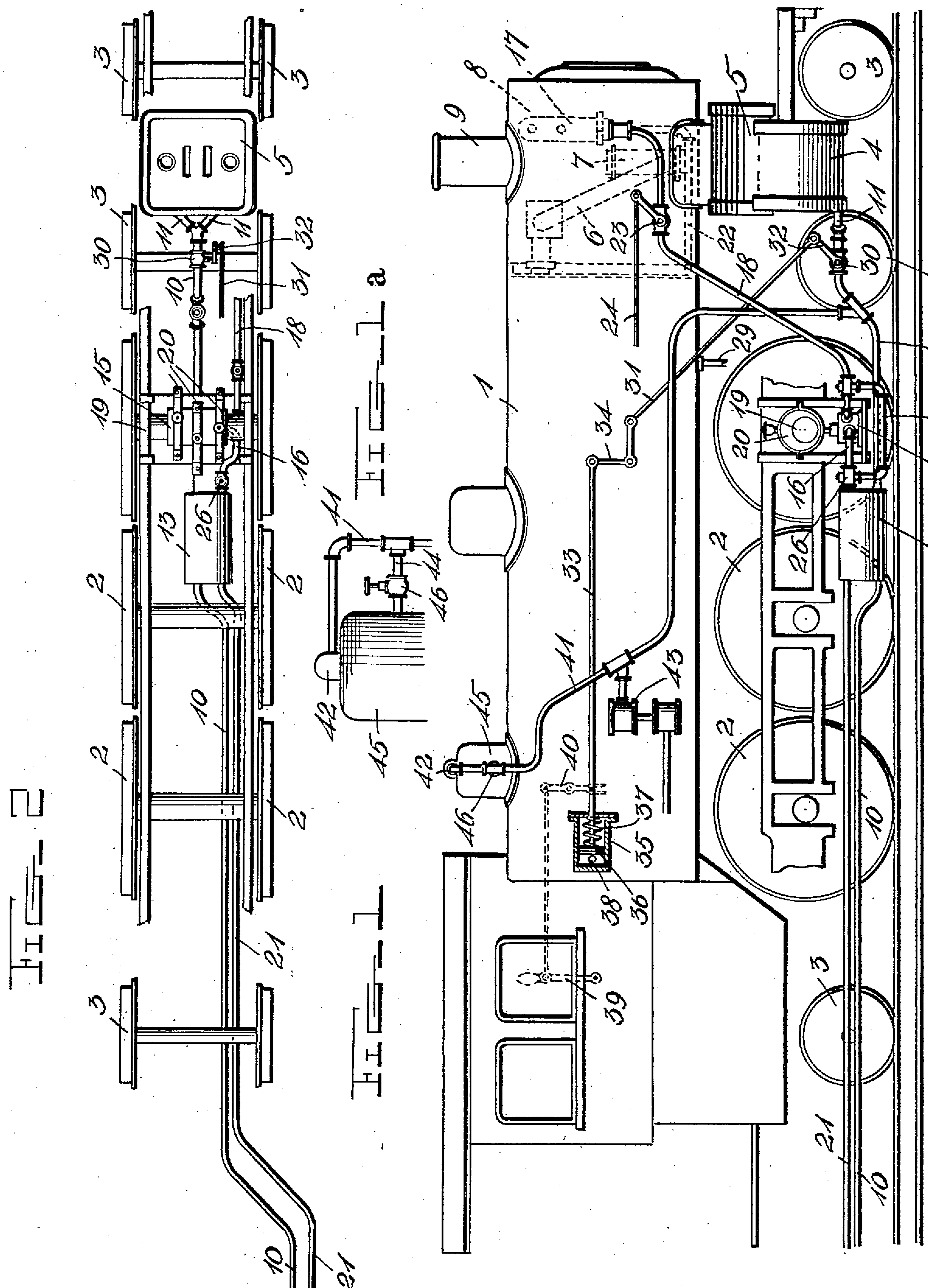
3 SHEETS—SHEET 2.



Witnesses

[illegible]

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3 SHEETS—SHEET 3.

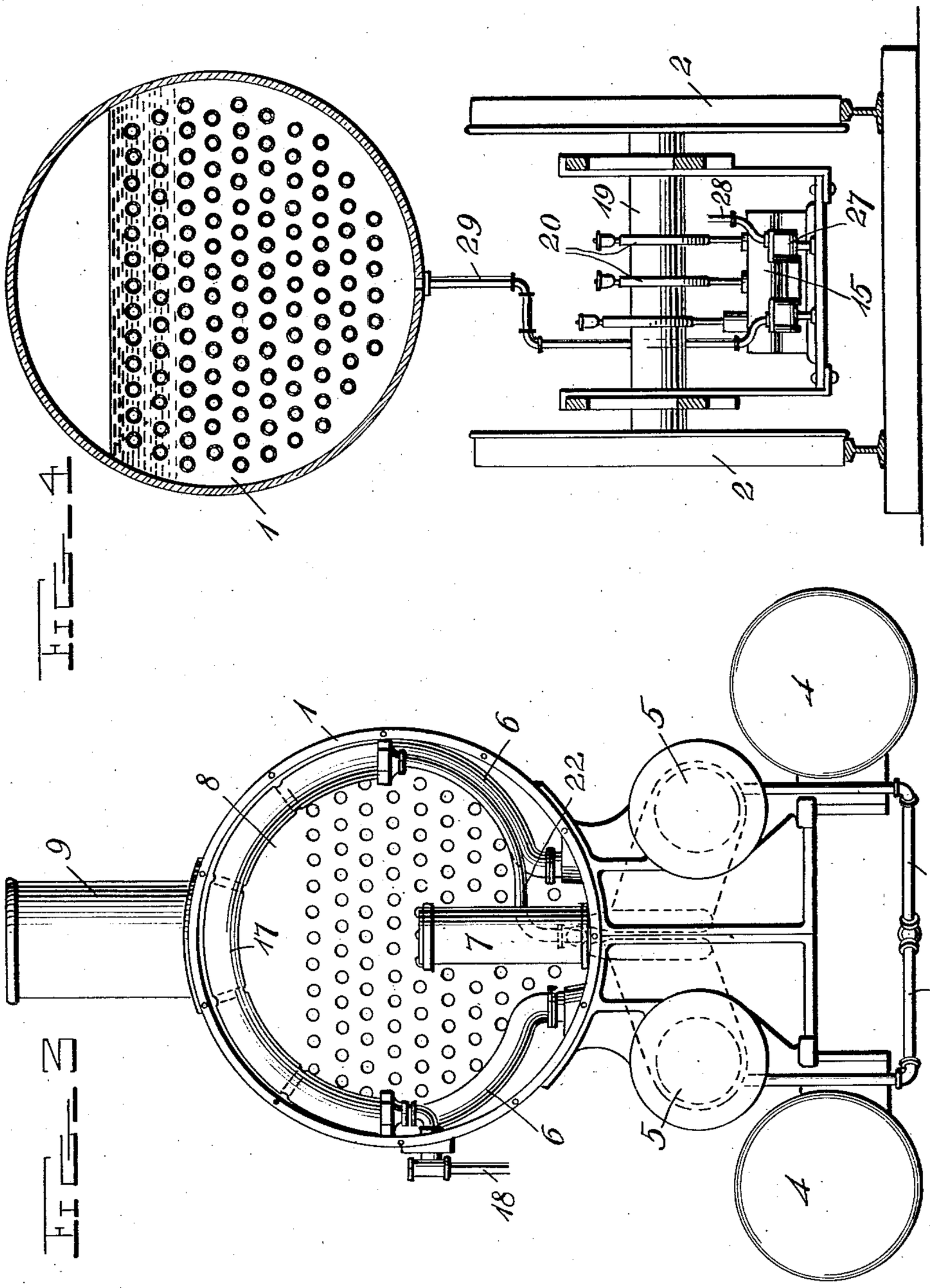

FIG. 2.

FIG. 1.

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UNITED STATES PATENT OFFICE.

WILLIAM WILEY, OF SIOUX CITY, IOWA.

LOCOMOTIVE-ECONOMIZER.

No. 910,758. Specification of Letters Patent. Patented Jan. 26, 1909.

Application filed August 8, 1907. Serial No. 387,730.

To all whom it may concern:

Be it known that I, WILLIAM WILEY, a citizen of the United States, residing at Sioux City, in the county of Woodbury and State of Iowa, have invented certain new and useful Improvements in Locomotive-Economizers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to locomotives, and more particularly to what I shall call "an economizer" therefor; and it has for its object to provide devices by means of which the steam can be more economically used or utilized, and especially the exhaust steam, as for instance, by heating the water in the tender by means of the condensed steam, and also in the smoke box before it has discharged into the boiler.

With these and other objects in view, the invention consists in the improved construction and novel arrangement of a locomotive economizer, as will be hereinafter more particularly set forth.

In the accompanying drawings, which illustrate the invention,—Fig. 1 is a broken side elevation of a locomotive and tender provided with my improved economizer and is illustrated part on Sheet 1 and part on Sheet 2; Fig. 1[a] is a fragmentary view of the steam dome; Fig. 2 is a top plan view of the tender and of the locomotive trucks and is illustrated part on Sheet 1 and part on Sheet 2. Fig. 3 is an end view of the front of the locomotive without the driving wheels and with the front of the boiler removed; Fig. 4 is a vertical sectional view through the boiler.

Referring more particularly to the drawings, which are for illustrative purposes only, and therefore, are not drawn to a particular scale, 1 indicates the boiler of a locomotive which may be made of any desired shape, and is supported upon the usual driving wheels 2 and trucks 3. The steam is admitted to the cylinders 4 through the valve mechanism 5 from the boiler through the pipes 6 in the usual manner, and the exhaust is also connected with the nozzle 7 in the smoke box 8, so as to discharge through the smoke stack 9, as is usually done in locomotives, and therefore, need no further description.

A pipe 10 is connected with the exhaust ports of the driving cylinders by two branches 11, and is extended back to the tender 12 after having been passed through a suitable heater 13, which is preferably suspended underneath the boiler at any suitable point. After entering the tender the pipe 10 is preferably arranged circuitously so as to expose a considerable portion of its length to the water, and it is then extended upwardly and connected with a condenser 14, which is adapted to discharge or empty into the water tank of the tender through pipes 14′.

Owing to the inability to satisfactorily introduce hot water into a boiler through the ordinary injectors, I prefer to use a pump 15, which is connected with the heater 13 by means of a pipe 16, and with a water heater 17 arranged in the smoke box 8 by means of a pipe 18. The pump is preferably located underneath the front axle 19 of the locomotive and is operated by eccentrics 20, three being shown in the drawings. The heater 13 is connected with the tender by means of a pipe 21, and the heater 17 is preferably made substantially semi-circular and is connected with the boiler by means of the pipe 22. By constructing the parts in this manner it is evident that the exhaust steam will pass back through the pipe 10 into the water tank and condenser, thereby utilizing substantially all of the heat that is ordinarily allowed to escape into the atmosphere generally through the smokestack. The partially heated water from the tender will pass through the heater 13 adjacent to the pump 15 where it will be further heated, and finally it will be passed through the heater 17 in the smoke box where it will be heated to as great an extent as possible before it is discharged into the boiler, thereby permitting of the use of warm water for generating steam, which will effect quite a saving in the amount of fuel required to keep up the desired steam pressure for running the locomotive.

The pump or pumps 15 are arranged to be operated at their full capacity, while the engine is running, which will cause them to discharge more water than will be needed at all times in the boiler. To provide for this emergency the pipe 18 is provided with a valve 23, which can be controlled from the cab by means of a rod 24 and a pipe 25 is arranged to communicate with the pipe 18 upon one side of the pump and extends back to the pipe 16 between the pump and heater, where

it is provided with an ordinary by-pass valve 26. In this manner, whenever the valve 23 is wholly or partially closed, the excess of water discharged by the pumps will pass back through the pipe into the heater 13 or be taken up by the pump and thereby circulated round and round until the valve 23 will permit it to pass into the heater 17, and thence into the boiler.

As the pumps 15 remain inactive while the locomotive is standing still, a steam pump 27 is connected with the pipe 18, as by a pipe 28 and with the boiler 18 by a pipe 29. As it is frequently necessary to cause the exhaust steam to pass through the smokestack of the locomotive to provide for a forced draft to keep up the necessary steam pressure a valve 30, as an ordinary plug valve, is located in the pipe 10. A rod 31 is connected with the valve by means of an arm 32 and with a rod 33 by means of an elbow 34. The rod 33 extends back to the cab, where it is extended into a cylinder 35 or connected therewith so as to be reciprocated or moved longitudinally when the piston 36 in the cylinder is forced outward against the pressure of a spring 37 by the entrance of steam from the boiler, as through an opening 38. A lever 39 within the cab, shown only in dotted lines, is connected with the rod 33 in any suitable manner, as by means of a lever 40, so that the rod 33 can be reciprocated to control the valve 30 by the engineer independently of or in opposition to its movement by means of the steam. In this manner, the movement of the valve may be automatically or manually controlled so as to cause more or less of the exhaust steam to be passed into the heater or out through the smokestack, as may be desired.

The valve is controlled manually at any time, but preferably when the locomotive is being taken from the roundhouse, and it is controlled automatically when running upon the road, and automatic control is effected in this manner. If the locomotive is set to blow off at, say two hundred pounds, the spring 37 is arranged to be compressed to its greatest amount when the pressure reaches one hundred and ninety-seven pounds, and thereby opens the valve to its fullest extent and permits of the entire amount of exhaust steam passing back into the tender instead of passing out through the nozzle and smokestack.

From the above, it is evident that when the steam in the boiler is not sufficient to entirely open the valve, a portion of the exhaust steam will escape through the nozzle, and thereby increase the draft and accelerate the heating of the water in the boiler, but as the steam increases in the boiler, the pressure upon the spring 37 gradually increases, and thereby decreases the draft so that by the time the steam is raised to its limit, the forced draft is entirely cut off.

In addition to effecting the saving or utilization of the exhaust steam from the pistons, I prefer to connect a pipe 41 with the blow-off or safety valve 42 and join it with the pipe 18 between the valve 30 and the pump 15, whereby the steam from the blow-off is caused to pass back into the cylinder, and thereby be utilized for heating the water in the tender. Intermediate the blow-off and the pipe 18 the pipe 41 communicates with the ordinary pump 43 for exhausting the air from the brake-setting mechanism.

To permit of the steam entering the pipe at all times, even though its pressure should not be enough to lift the safety valve, a pipe 44 leads from the steam dome 45 to the pipe 41, and is provided with a valve 46, by means of which communication from the dome to the pipe 41 may be controlled.

By providing a locomotive with a steam economizer as above described, it will be seen that all waste of steam is absolutely prevented, or it is utilized for heating water before it enters the cylinder or in increasing the draft, so as to keep up the necessary steam pressure within the boiler. By providing two kinds of pump and also by providing the manual and automatic means for controlling the valve from the piston cylinders to the heater and tender, the apparatus is adapted for use whether the locomotive is standing still or being run upon the road.

As it is a well-known fact that it requires less fuel to maintain a steam pressure from heated water than from cold water, and especially in the northern climates where the cold is excessive, the advantages of my improvement will be at once apparent without further comment.

Having described my invention, I claim:—

In a device of the class described, the combination with a heater system for locomotives, of an exhaust pipe leading to a heater in said system, an exhaust for increasing the draft in the locomotive, a cylinder connected to the locomotive, a spring pressed steam operated piston therein, a valve controlling the exhaust to the heater and to the draft increasing means, links connected to the valve and piston, a bell crank lever inter-connecting said links, means to convey live steam to the heater from the safety valve, and manually controlled means for admitting live steam to said conveying means from the steam dome.

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

WILLIAM WILEY.

Witnesses:
FOSTER G. IDDINGS,
JOHN H. JACKSON.