2 Sheets--Sheet 1.

J. W. GARDNER, T. W. RANSON & E. MARTIN.

Steam-Pumps.

No. 133,847. Patented Dec. 10, 1872.

Fig. 1.

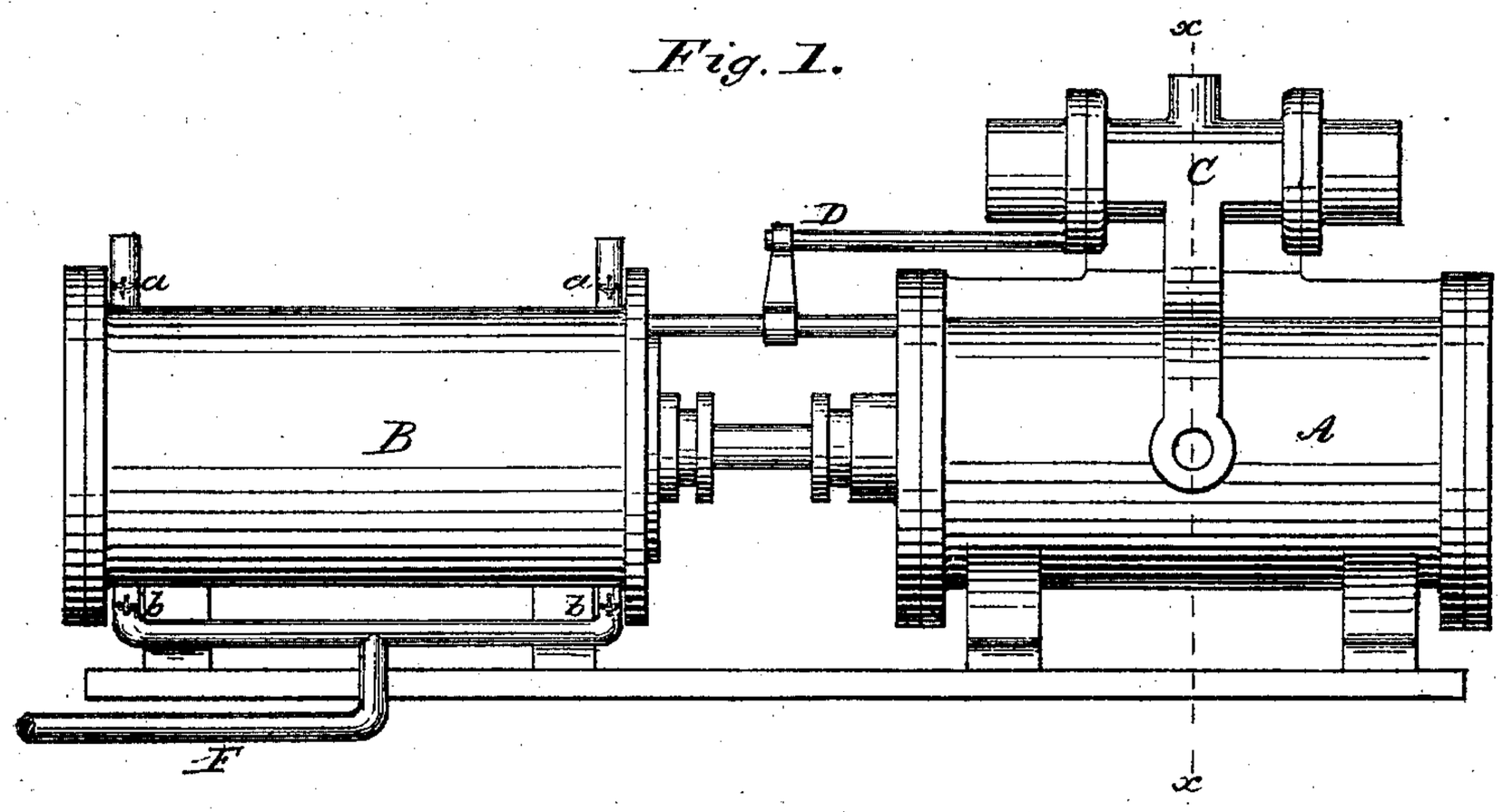
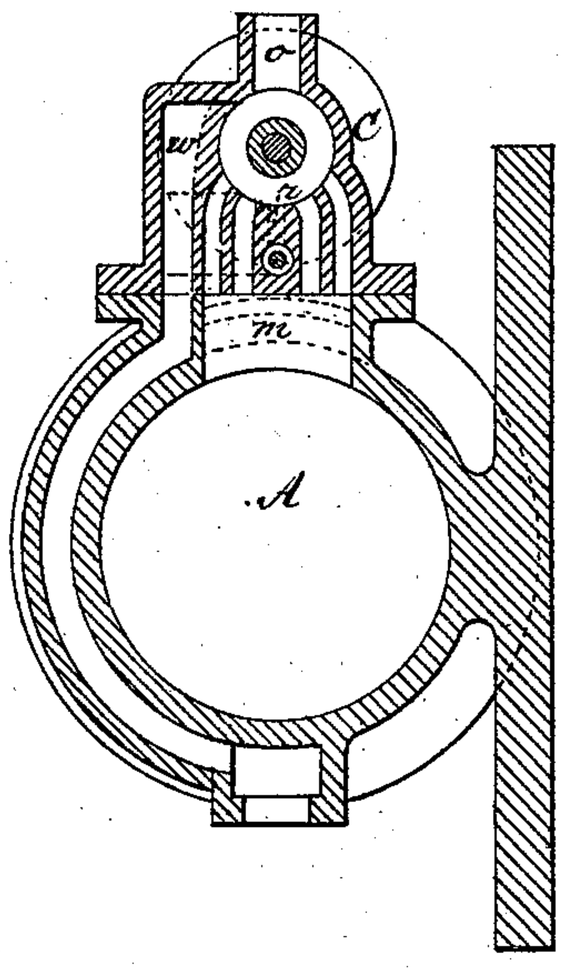


Fig. 2.



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2 Sheets--Sheet 2.

J. W. GARDNER, T. W. RANSON & E. MARTIN.

Steam-Pumps.

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Fig. 3.

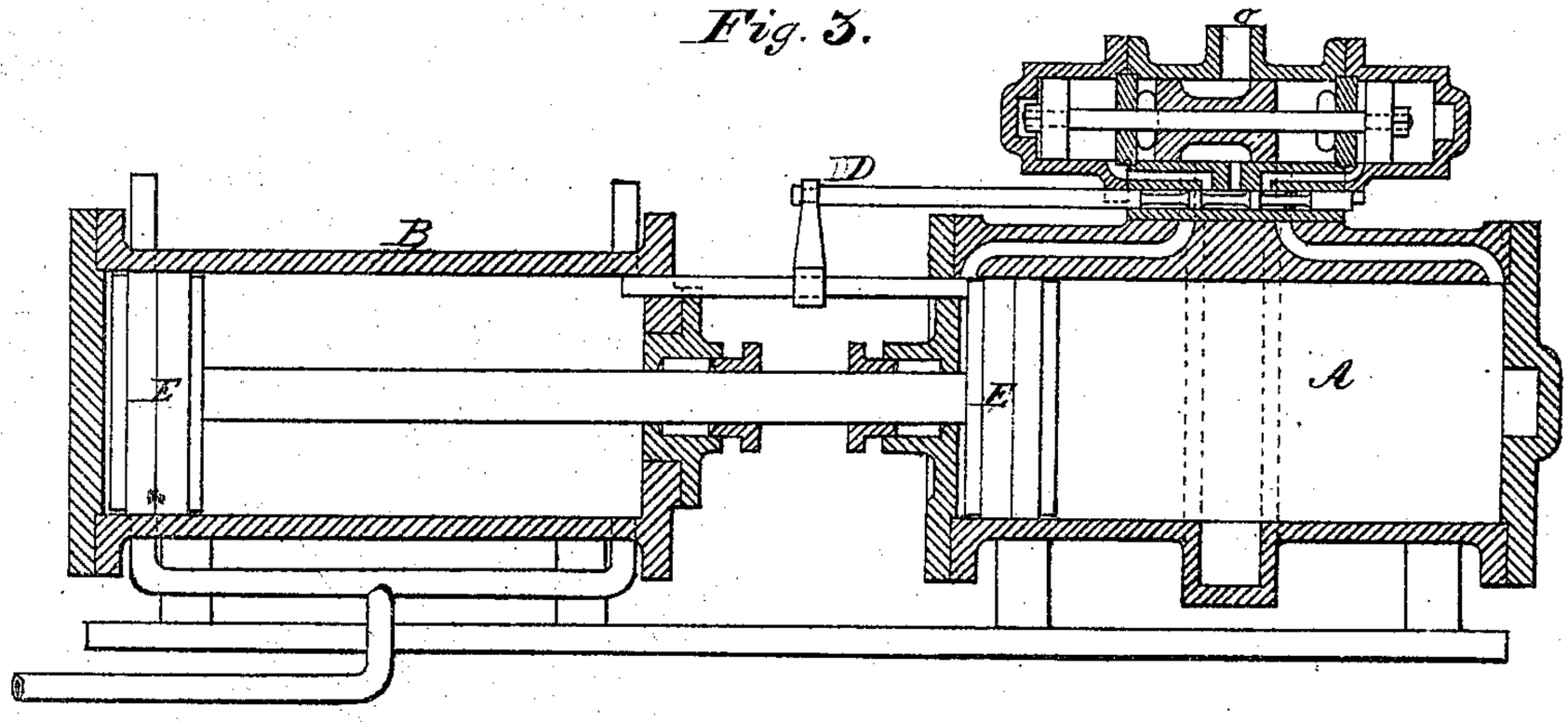


Fig. 4.

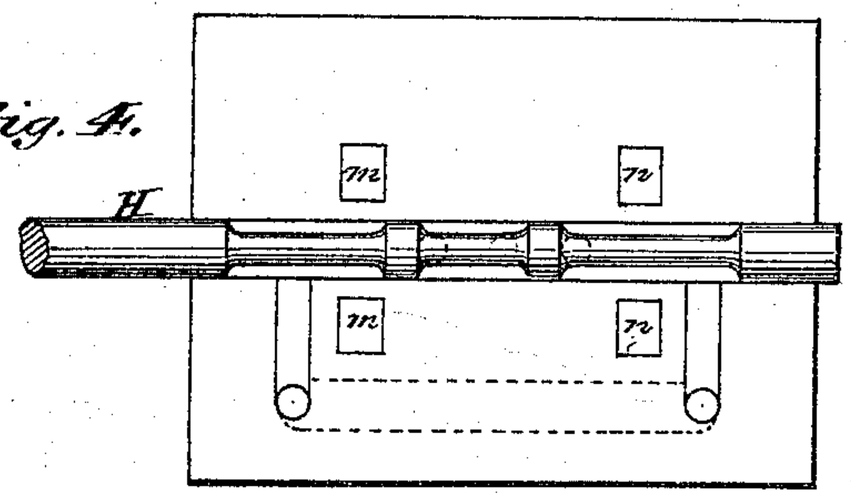
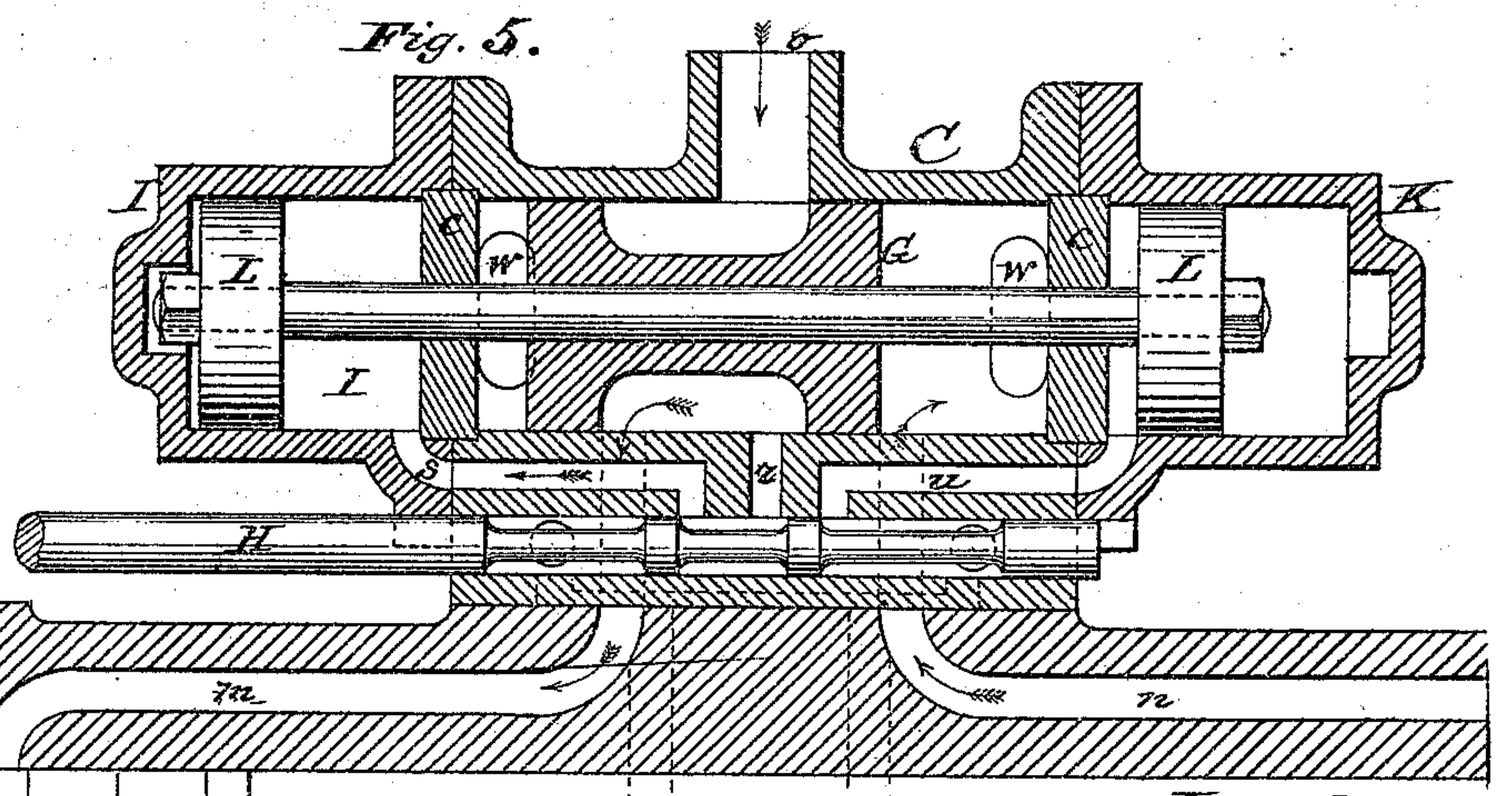


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOHN W. GARDNER, THOMAS W. RANSON, AND EDWIN MARTIN, OF CLEVELAND, OHIO.

IMPROVEMENT IN STEAM-PUMPS.

Specification forming part of Letters Patent No. **133,847**, dated December 10, 1872.

To all whom it may concern:

Be it known that we, JOHN W. GARDNER, THOMAS W. RANSON and EDWIN MARTIN, all of the city of Cleveland, in the State of Ohio, have invented a new Improvement in Air-Pumps, of which the following is a full, clear, and exact description:

This invention has special reference to, and is to be considered as, a kindred invention of the patents for steam and air car-brakes granted to John W. Gardner, January 23, 1872, No. 122,884, reissued April 23, 1872, No. 4,879, and for flexible tube-coupling for steam or air car-brakes, granted to John W. Gardner and Thomas W. Ranson, June 25, 1872, No. 128,220.

The desirable points of utility in the air-pump used in connection with the air-brake for railroad cars are, that it shall be simple in construction, certain in its action, and a pump which will work against accumulating pressure in the air-reservoir with a low pressure of steam in the boiler. A thorough trial of the pump, hereinafter described, resulted as follows: It started with thirty pounds steam pressure, and when this pressure had increased to eighty pounds it pumped seventy-five pounds in the air-reservoir, showing that it worked with less than five pounds of friction when the boiler pressure is one hundred and twenty-five pounds.

This invention consists in the combination of a balanced cylindrical steam-moved main valve and a balanced, cylindrical, mechanically-moved auxiliary valve with the steam-cylinder of an air-pump, the auxiliary valve being operated by a trip-rod preferably arranged between the main steam and air cylinders, so that it is worked in opposite directions by the alternate action of the pistons. It is obvious, however, that, by an extension of the auxiliary valve, two trips could easily be arranged so as to be worked from both ends of the main steam-cylinder.

In the drawing, Figure I is a side elevation; Fig. II, a vertical cross-section on the line *x x;* Fig. III, a longitudinal section; Fig. IV, a plan of the auxiliary valve and the valve-port; and Fig. V, an enlarged view of the valves.

A represents the main steam-cylinder, B the air-cylinder, C the steam-chest, and D the trip-rod for changing the position of the auxiliary valve. E E′, Fig. III, designate the pistons of the steam and air cylinders; they are attached to the same piston-rod and they occupy relative positions to each other in the cylinders. The trip-rod slightly enters both of the cylinders, and it is worked in opposite directions by the alternate action of the pistons. Air enters the cylinder B through the suction-valves *a a*, Fig. I, and is forced out therefrom through the discharge-valves *b b* into the pipe F, which leads to the air-reservoir beneath the foot-board of the locomotive, not shown. In the steam-chest C, Fig. V, there are arranged two valves, G H. The main valve G is steam-moved; the auxiliary valve H is mechanically moved by means of the trip-rod D; and in construction they are both balanced cylindrical valves, the auxiliary valve, by reason of its small diameter and comparatively greater length, being made always of cast-steel. I K represent two steam-chest cylinders, one upon either end of the chest, but each cast separately therefrom and divided from it by means of steam-tight partitions *c c*, these two cylinders also being arranged upon the same plane with the steam-chest. The main valve is located in the outer part of the steam-chest. Upon both ends of the main-valve rod, within each of the steam-chest cylinders, are two pistons, L L, which necessarily operate the main valve so that it opens those ports *m n* which supply steam to the large or main steam-cylinder A. The passages which supply steam to the two steam-chest cylinders containing the pistons which operate the main valve are controlled by a balanced cylindrical auxiliary valve, H, in the inner part of the chest, attached to the trip-rod D, which, in the drawing, is shown as entering both the main steam and air cylinders A B; but, as before remarked, it is obvious, that by an extension of the auxiliary valve two trips may be easily arranged so as to be worked from both ends of the main steam-cylinder. The pump may be arranged in any position suitable to the construction of the locomotive; and it is fed by attaching to the steam-chest a pipe connected to the boiler. Steam is conducted into the steam-chest

through the opening *o*, and to the auxiliary valve through the steam-passage *r*.

In describing the ports and passages of the steam-chest and cylinder, it is necessary to understand the piston of the main steam-cylinder to be at its lower stroke, and that it has moved the trip-rod and thrown the auxiliary valve which opens the passage *s* and admits steam to the cylinder I. Simultaneously the steam-passage *u* is opened, which allows the steam to escape from the cylinder K through an unseen passage, shown in dotted lines in Fig. IV, into the main exhaust, and thereby the main valve is moved. This opens the port *m* and admits steam into the lower end of the main steam-cylinder. At this time the port *n* is opened, so that the steam in the upper end of the main steam-cylinder is permitted to escape through the exhaust-port *w* in the steam-chest into the main exhaust. An upstroke of the pistons will cause the steam ports and passages, which upon the downstroke were opened to the steam, to be opened to the exhaust, and those which were last time opened to the exhaust to be next time opened to the steam.

The main steam-port is always open to start, no matter where the piston stops in the main cylinder. Therefore, starting-bars are unnecessary. Whenever the steam is let on it is impossible to render this pump uncertain in its action.

Although the valve-motion for operating the pistons of this pump has been described minutely and at length, we enter our disclaimer to any invention therein as described in this application, for this valve-motion is the subject matter of a separate and distinct patent, granted December 3, 1872, and numbered 133,525; but—

What we do claim in this invention, and desire to secure by Letters Patent, is—

The combination, with the cylinders A B, of the valves G H, pistons E E′, connected as shown and described, and the trip-rod D, arranged to operate substantially as herein set forth.

In testimony whereof we have hereunto set our hands and seals in the city of Cleveland, in the State of Ohio, this 18th day of November, 1872, each in the presence of two attesting witnesses.

JOHN W. GARDNER. [L. S.]
THOMAS W. RANSON. [L. S.]
EDWIN MARTIN. [L. S.]

Witnesses:
J. D. BYRNE,
R. E. MIX.