(No Model.)

2 Sheets—Sheet 1.

# J. T. HAYDEN.

## AIR BRAKE APPARATUS.

No. 509,898. Patented Dec. 5, 1893.

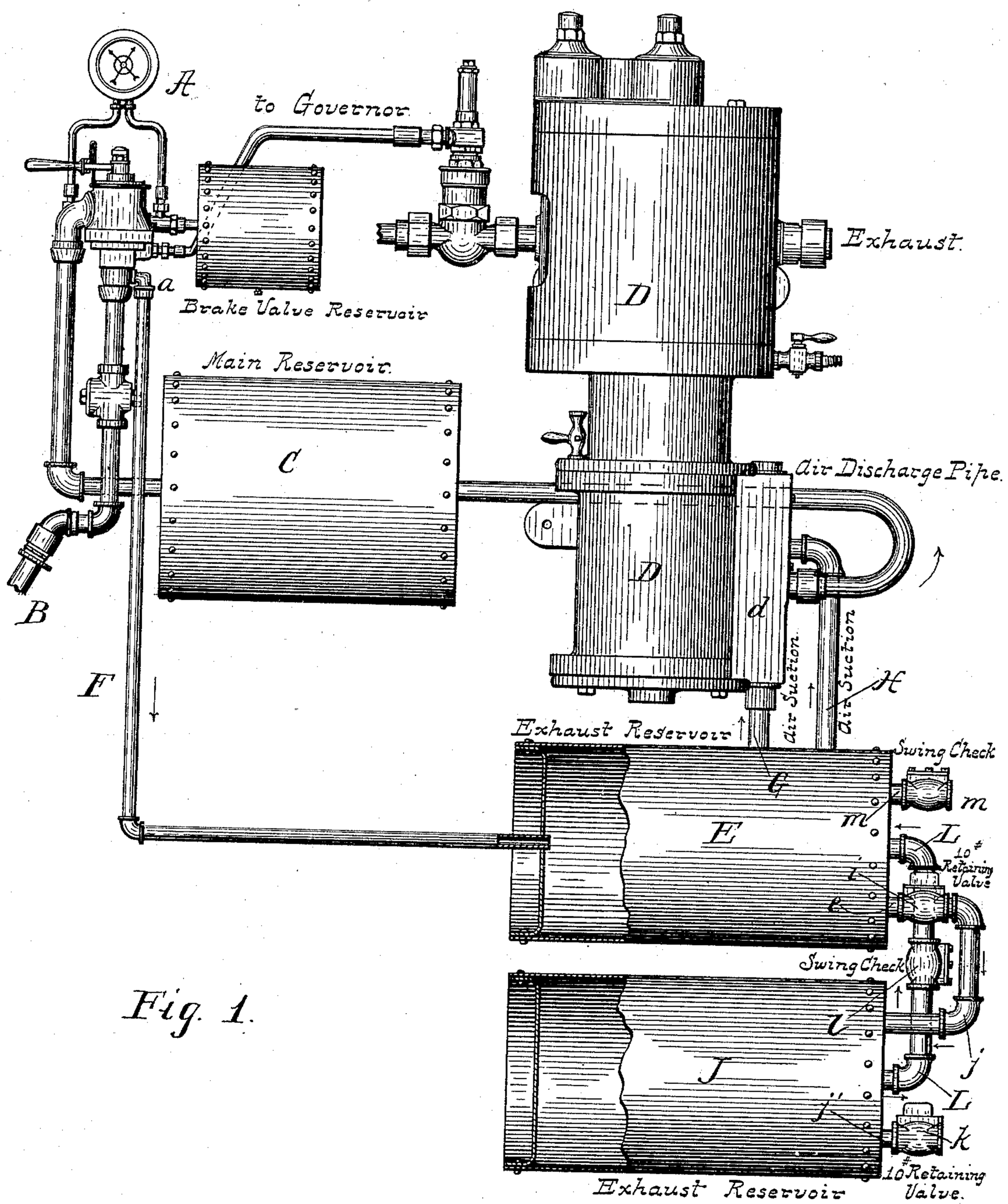


Fig. 1.

Witnesses
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Inventor
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By Coburn & Thacher Attys.

THE NATIONAL LITHOGRAPHING COMPANY.
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(No Model.) 2 Sheets—Sheet 2.

# J. T. HAYDEN.

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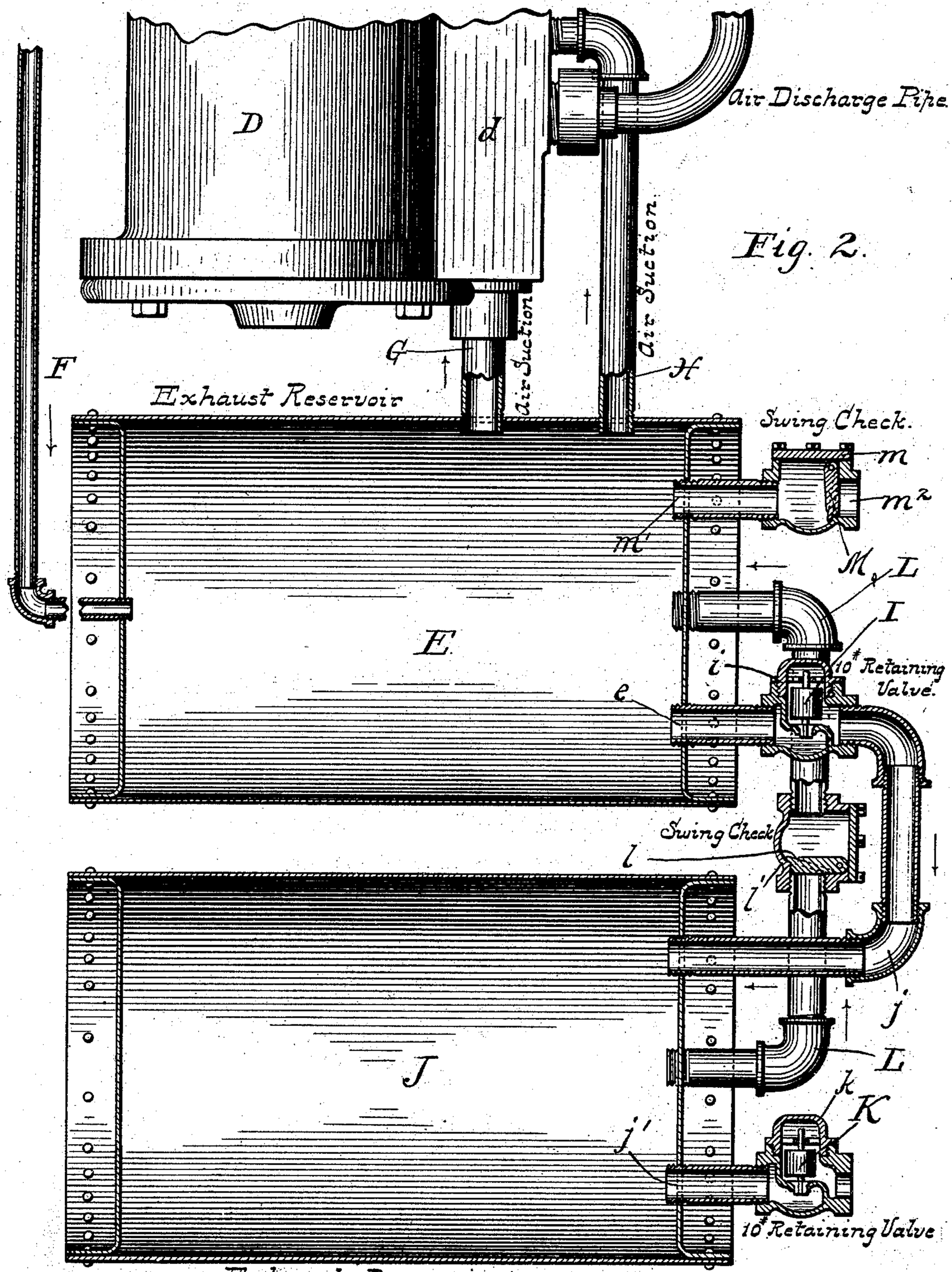


Fig. 2.

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# UNITED STATES PATENT OFFICE.

JAMES T. HAYDEN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE CRANE COMPANY, OF SAME PLACE.

## AIR-BRAKE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 509,898, dated December 5, 1893.

Application filed March 4, 1892. Serial No. 423,728. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES T. HAYDEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Air-Brake Apparatus, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1, represents in elevation a graphic illustration of that portion of air-brake apparatus which is on the engine and with my improvement attached, and Fig. 2, a similar view on an enlarged scale of only a small portion of the same, the main parts being shown in section.

My invention relates to automatic air-brake apparatus, such as is now very generally used on railway cars, especially passenger trains. In an apparatus of this kind as now employed, the action of the mechanism is under the control of the engineer, and the brakes are applied by the turning of a valve generally called the engineer's valve, by which more or less air is exhausted from the main air pipe. The air thus exhausted is of course under pressure, which is nearly the same as that in the main reservoir, and as the exhaust is into the open air, there is an absolute loss of compressed air and consequently a waste of power to the extent of force which has been required to compress the air thus exhausted. It is also a matter of some difficulty to keep up an adequate supply of air compressed to the required degree for efficient work. It is the object of my present invention to overcome these objections and actually utilize the compressed air exhausted. This I accomplish by providing an exhaust storage reservoir or reservoirs, into which the exhaust from the main air pipe is made, and these reservoirs I connect with the air pump so that the air more or less compressed in the exhaust storage reservoirs is pumped directly back into the main reservoir.

I will now describe for the purpose of illustration, the construction and operation of an apparatus embodying my invention in one practical way, and will then point out more definitely in claims the particular improvements which I believe to be new and wish to secure by Letters Patent.

As the invention is connected intimately with the exhaust and pumping devices only of the general apparatus, it is not necessary to show and describe the latter in its entirety; and I have shown, therefore, and shall describe only so much of an air-brake mechanism, as is necessary to an understanding of my invention.

In the drawings, A, represents the engineer's brake valve, B the main air pipe or train pipe, C, the main air reservoir, and D, the air-pump, all of which may be of any ordinary and well known construction, and are connected up and operate in harmony with each other in a manner well known at the present time, and hence requiring no special description here. In the ordinary construction and operation of this apparatus, when the engineer's valve is turned to let out more or less air from the train pipe, in order to apply the brakes, the exhaust is into the open air. I provide an exhaust storage reservoir E, arranged in convenient relation to the engineer's valve and the pump, and connect the exhaust outlet *a*, of the former valve directly with the interior of the reservoir, by means of a pipe F, so that the said reservoir becomes an exhaust storage reservoir, and the said pipe an exhaust pipe. This reservoir is connected by pipes G, and H, with the inlets into the respective ends of the air-pump cylinder *d*, so that, in the working of the latter, air will be pumped directly from the reservoir.

Obviously, there must be provision for keeping the pressure in the exhaust storage reservoir somewhat lower than the pressure in the train pipe; otherwise the exhaust will be interfered with. To effect this result, an outlet for the reservoir is provided, which is controlled by a pressure valve, that is constructed to yield under a certain amount of pressure, and so permit an outlet directly from the reservoir, when the determined pressure is exceeded within the latter. As shown in the drawings, this outlet pipe *e*, is inserted in the head of the cylinder opposite to the exhaust inlet, and connects with the valve case

of a pressure valve I. This valve and its case *i*, may be of any known construction, suitable for the purpose, so that the valve will act as a retaining valve for the reservoir; it is constructed and arranged to resist the escape of air from the reservoir up to a certain limit, say ten pounds pressure, but yields, or is lifted, when this limit is reached, to permit the escape of air from the reservoir, and so keeps the pressure within the latter at its determined point. If the single exhaust storage reservoir is used, the escape from this retaining valve, or its case, is into the open air; but in many instances, perhaps usually, it will be found desirable to use two or more exhaust storage reservoirs. In the drawings I have shown a second such reservoir J, and in this construction the valve case of the retaining valve I, is connected by a pipe *j*, directly with the second reservoir, so that the overflow from the first, under the excess of pressure, will be into the second reservoir, thus providing for a further saving of power. The second exhaust storage reservoir is provided with an outlet pipe *j'*, controlled by a second retaining valve K, in a similar valve case *k*, which opens directly to the atmosphere, as seen in Fig. 2. There is also another pipe L, which connects the two reservoirs directly and is provided with a check valve *l*, mounted in a suitable valve case *l'*, between the two reservoirs and opening only in a direction from the second reservoir to the first, thus providing for taking air from the second reservoir through the first to the pump. The first exhaust storage reservoir is also provided with a check valve M, which is mounted in a valve case *m*, connected by a pipe *m'*, with the said reservoir, and having a port $m^2$, opening to the atmosphere. This check valve is constructed and arranged to open inward only, so that if air is exhausted from the reservoirs, a supply will be furnished to the pump, through this inlet.

The operation is as follows: The retaining valve of the exhaust storage reservoir or reservoirs being set for any desired pressure, say for illustration, ten pounds, it is evident that air exhausted from the train pipe will be collected in this reservoir or reservoirs at about this pressure. Now when the pump is set to work, it will pump air already under a pressure of ten pounds in its work of keeping up the supply in the main reservoir. It is obvious, therefore, that the work required of the pump is thus relieved to the extent of ten pounds pressure, or whatever may be the pressure in the exhaust storage reservoirs. The work required of the pump is therefore lessened to this extent, the required supply of air to the main reservoir is kept up more easily, and the force of the compressed air escaping from the exhaust when the brakes are applied is saved and actually utilized in keeping up the main supply. The brake apparatus is therefore rendered more efficient, and at the same time, cheaper in its operation, by the addition of the simple and cheap devices which constitute my improvements.

I have shown in the drawings and described above, only an illustration of one way in which these devices may be constructed, arranged and applied. There may be a variety of changes in these respects, and I do not wish to be understood as limiting myself to details here shown, or any other details, so long as the main feature of my invention is retained, which is an exhaust storage reservoir connected with the exhaust of the main air, or train pipe, and with an air-pump which supplies the main air reservoir.

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

1. In an air brake apparatus, the main reservoir and train pipe, in combination with a reservoir for the storage of air from the exhaust, the exhaust outlet of train pipe connecting with said exhaust storage reservoir, and an air pump connected with both the main reservoir and exhaust storage reservoir, whereby independently of the action of the pump the exhaust air may be collected and retained within the exhaust storage reservoir and may at will be pumped from the said exhaust storage reservoir to the main reservoir, substantially as described.

2. In an air-brake apparatus, having a main air reservoir, an exhaust storage reservoir, in combination with the train pipe C, engineer's valve A, exhaust pipe F, connecting the exhaust outlet of said valve with the said exhaust storage reservoir, the air-pump D delivering to the main reservoir; and pipes G, and H, connecting the exhaust storage reservoir with the respective ends of the pump cylinder, substantially as described.

3. In an air-brake apparatus provided with train pipe and a main air reservoir, an exhaust storage air reservoir communicating directly with the exhaust of the train pipe, in combination with an outlet from the exhaust storage reservoir, a pressure or retaining valve controlling said outlet, and an air-pump connected up with said exhaust storage reservoir to take air therefrom, and deliver to the main reservoir substantially as described.

4. In an air brake apparatus provided with train pipe and main air reservoir, an exhaust storage reservoir, in combination with an exhaust pipe leading from the train pipe directly to said reservoir, a second or additional exhaust storage reservoir, a conduit connecting the said two exhaust storage reservoirs and controlled by a pressure or retaining valve, and an outlet from the last reservoir to the atmosphere controlled by a pressure or retaining valve and an air pump connected up to take air from said exhaust storage reservoirs and deliver to the main reservoir, substantially as described.

5. In an air brake apparatus provided with train pipe and a main air reservoir, two exhaust storage air reservoirs E, and J, in com-

bination with the exhaust pipe F, connecting the train pipe with one of said reservoirs, the air-pump D, connected up with the same reservoir to take air therefrom, a pipe connecting the two exhaust storage reservoirs, a retaining valve I, arranged to control the passage through said pipe, a pipe L, also connecting said reservoirs, and a check valve *l*, arranged in said pipe and opening only in the direction of the pump, substantially as described.

6. In an air-brake apparatus provided with train pipe and a main reservoir, the train pipe B, in combination with the engineer's valve A, the exhaust storage reservoirs E, and J, the exhaust pipe *a*, the air-pump D, connected to the reservoir E, the pipe *e*, *j*, connecting the said reservoirs, the pressure valve I, arranged in said pipe, the pressure valve K, arranged to control the outlet of the second reservoir J, the pipe L, also connecting said exhaust storage reservoirs, the check valve *l*, arranged in said pipe and opening toward the first reservoir and a check valve M, mounted in an atmospheric inlet to the first reservoir, and arranged to open inward, substantially as described.

JAMES T. HAYDEN.

Witnesses:
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A. M. BEST.