No. 846,528. PATENTED MAR. 12, 1907.

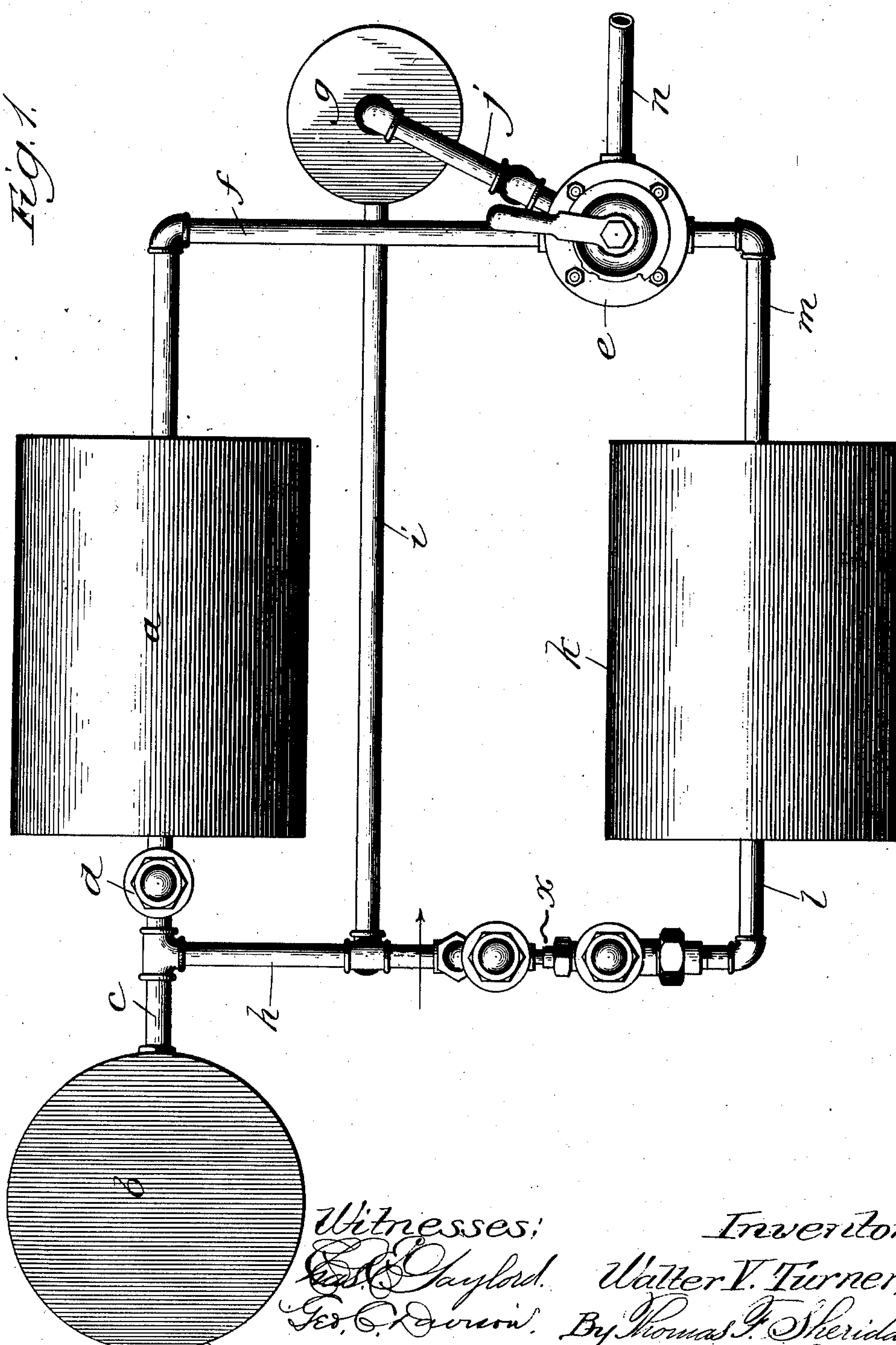
W. V. TURNER.

AIR BRAKE SYSTEM.

APPLICATION FILED AUG. 1, 1903. RENEWED APR. 23, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



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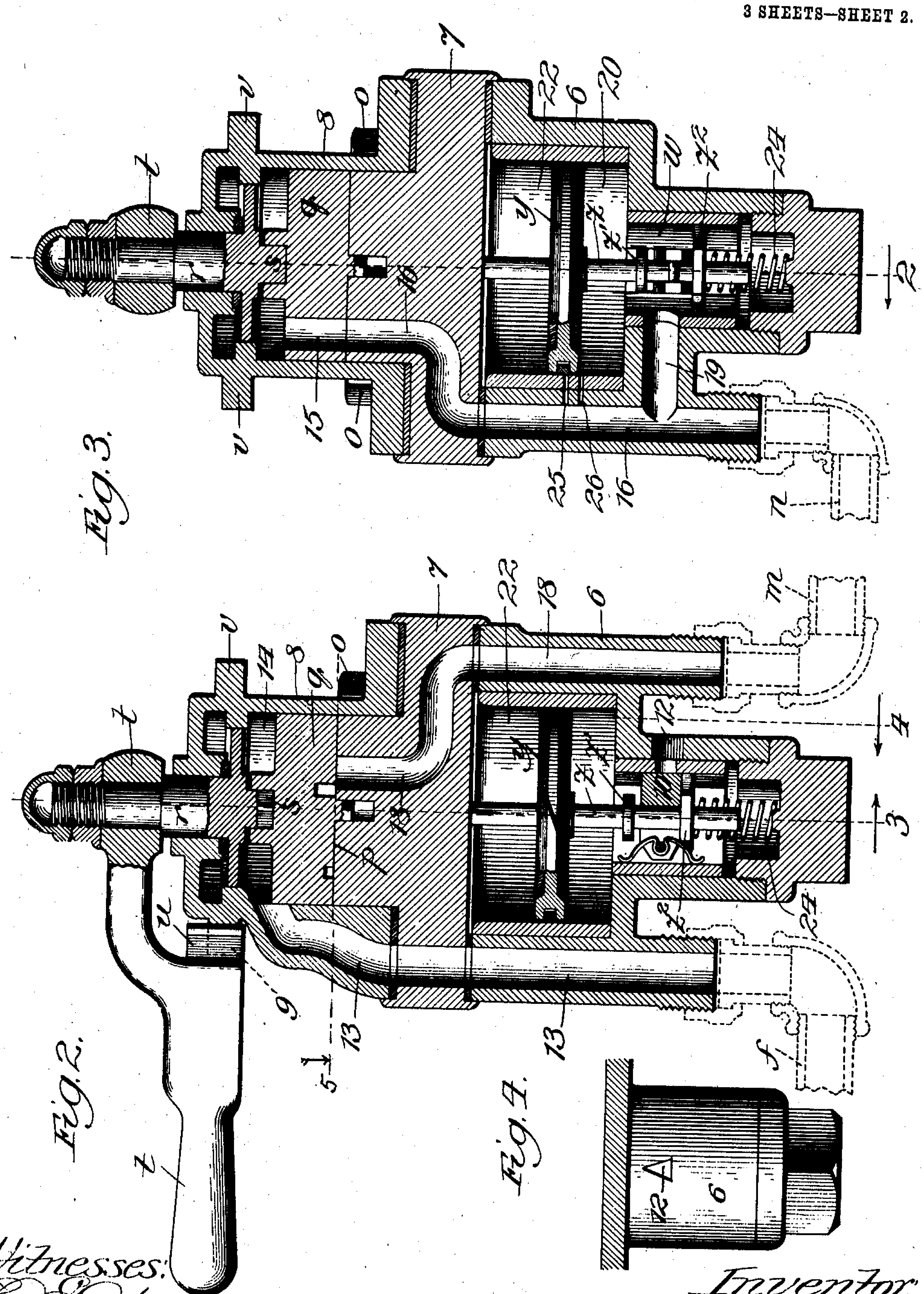

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3 SHEETS—SHEET 3.

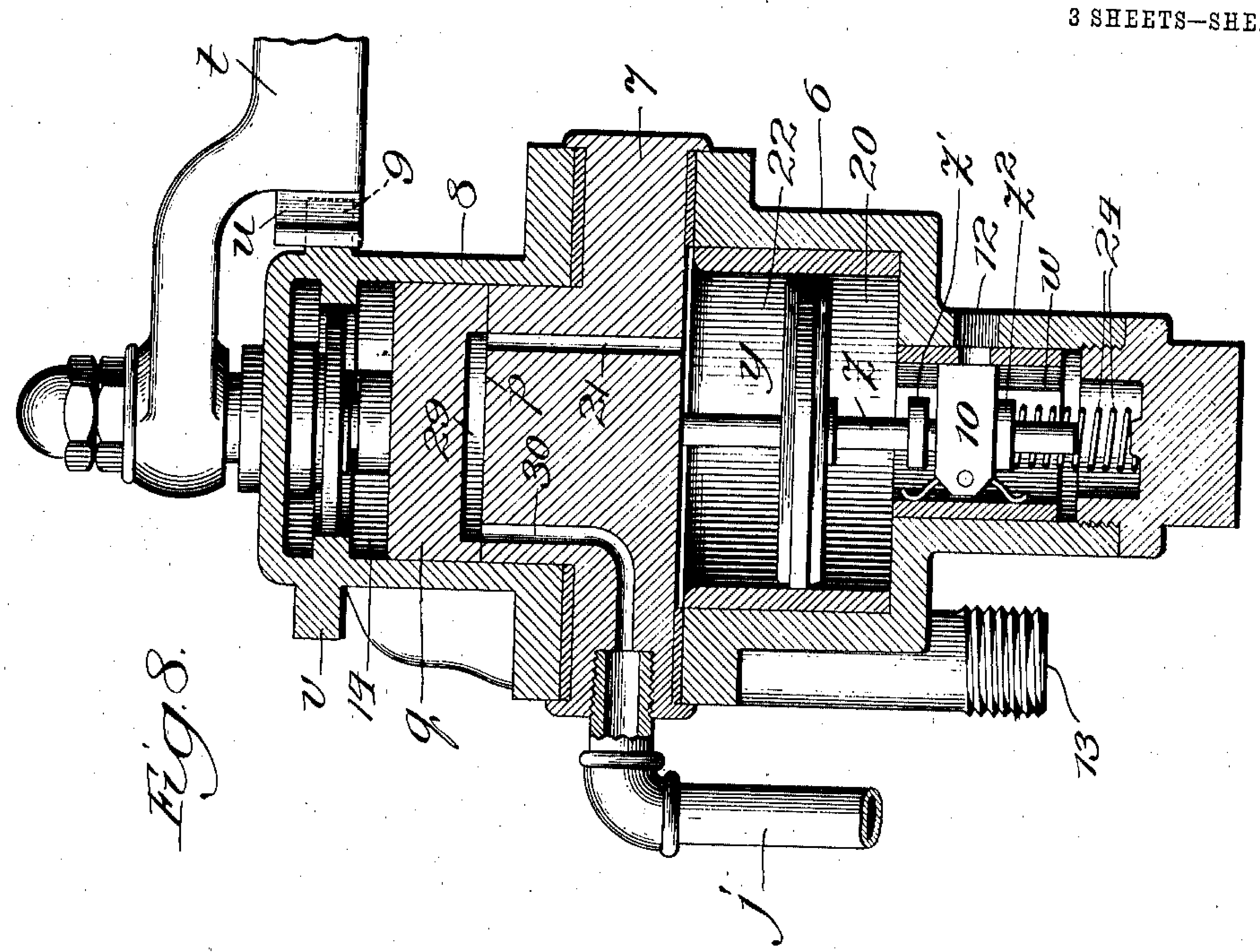

Fig. 8.

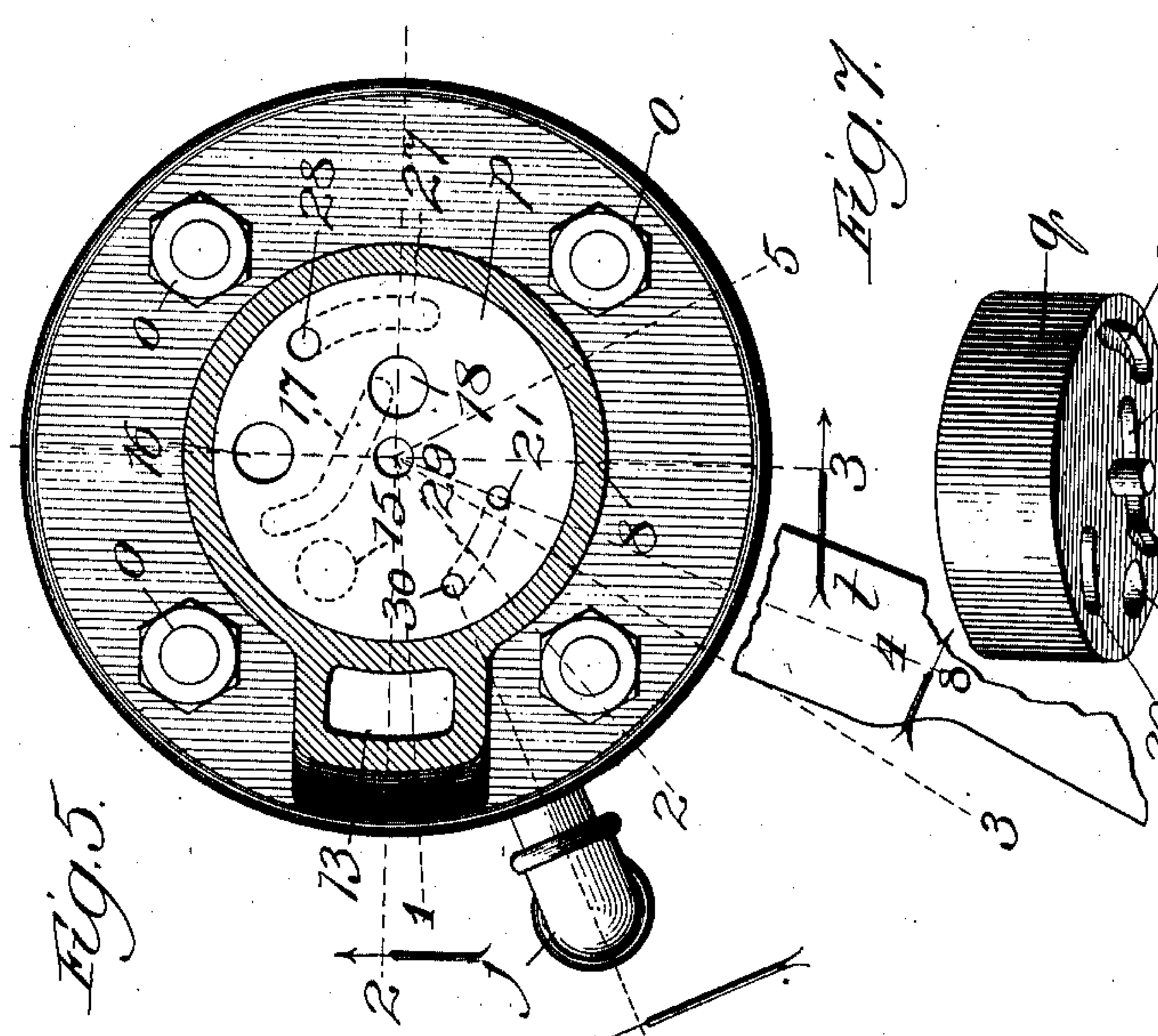

Fig. 5.

Fig. 7.

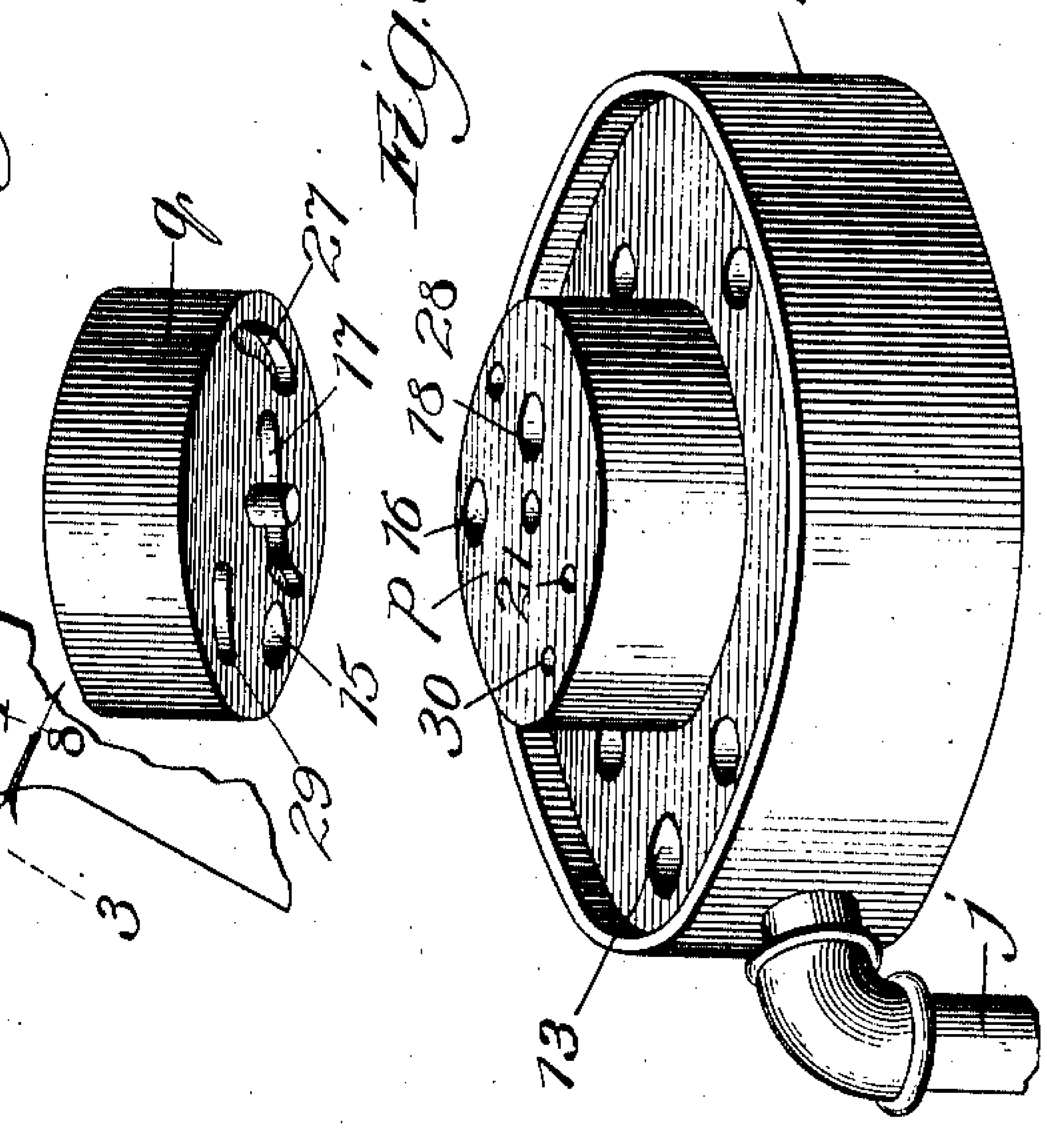

Fig. 6.

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UNITED STATES PATENT OFFICE.

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AIR-BRAKE SYSTEM.

No. 846,528. Specification of Letters Patent. Patented March 12, 1907.

Application filed August 1, 1903. Renewed April 23, 1906. Serial No. 313,320½.

To all whom it may concern:

Be it known that I, WALTER V. TURNER, a citizen of the United States, residing at Wilmerding, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Air-Brake Systems, of which the following is a specification.

This invention relates to that class of air brake systems known as the "Westinghouse" and "New York" air brake systems designed for the generation and distribution of air under pressure in the train pipes of a railway train, and particularly to the arrangement and construction of the different parts, as will more fully hereinafter appear.

The principal object of the invention is to provide a simple, economical, and efficient air brake system. Other objects of the invention will appear from an examination of the drawings and the following description and claims.

The invention comprises principally an air brake system in which there are combined an air pump, main, supply, and application reservoirs connected therewith, a train pipe, and an engineer's valve provided with exhaust valve mechanism for the train pipe and connected with the three reservoirs and with the train pipe to supply air under pressure from the first two reservoirs to pipe and to operate the exhaust mechanism of the train pipe by admitting air from the application reservoir to the exhaust mechanism.

In the accompanying drawings—

Figure 1 is a plan view in diagram of the preferred form of the system, as it appears when constructed in accordance with these improvements;

Figure 2 is a vertical sectional elevation of the brake valve used in connection with this system, taken on line (2) of Figure 3 looking in the direction of the arrow;

Figure 3 is a vertical sectional elevation of the same valve, taken on line (3) of Figure 2, looking in the direction of the arrow;

Figure 4 is a partial elevation of the lower portion of the valve body, to show the service exhaust port;

Figure 5 is a plan sectional view, taken on line (5) of Figure 2, looking in the direction of the arrow and showing the parts of the valve arranged for service position;

Figure 6 is a perspective view of the valve seat for the rotary valve, looking at it from above;

Fig. 7 a perspective view of the rotary valve, looking at it from the under side; and

Fig. 8 a sectional elevation of the brake valve, taken on the V-shaped line 8 8 of Fig. 5 looking in the direction of the arrow.

In illustrating and describing these improvements I have only illustrated and will here describe that which I consider to be new, taken in connection with so much as is old as will properly disclose the invention to others, and enable those skilled in the art to practice the same, leaving out of consideration other and well-known elements, which if set forth herein, would only tend to confusion.

In constructing an air brake system in accordance with these improvements I provide a main reservoir *a* connected with an air pump *b* by means of a pipe *c*, in which an excess pressure valve *d* is employed. This main reservoir is connected with an engineer's brake valve *e* by means of a main reservoir supply pipe *f*.

An application reservoir *g* is provided for holding high pressure and, in fact, any pressure that may be generated by the air pump until it ceases to operate at, say, one hundred pounds to the square inch. This application reservoir is connected to the air pump by means of the pipes *c*, *h*, and *i*, and with the engineer's brake valve by means of pipe *j*. It will be noticed that the connection between the pump and application reservoir is free from any controlling valve, which would prevent fluid pressure as it is generated, from entering said reservoir.

A supply reservoir *k* is provided, and connected with the air pump by means of pipes *c*, *h*, and *l*, and with the engineer's brake valve by means of a pipe *m*.

A train pipe *n* is provided and connected with the engineer's brake valve in proper position. The excess pressure valve *d* is interposed between the air pump and the main supply reservoir, and may be of any construction ordinarily employed for the purpose of maintaining an excess of pressure in the pipes *c*, *h*, and *i*, and the application reservoir *g* of about ten pounds over that in the main reservoir *a*, which excess of pressure in the application reservoir is utilized in the operation of the system, as will hereafter appear. If the desired pressure in the main reservoir is about ninety pounds, the pressure in the application reservoir will be about one hundred pounds.

To control the supply of fluid under pressure in the supply reservoir, a fluid pressure controlling valve *x* is provided and inserted between the pipes *h* and *l*. This fluid pressure controlling valve may be of any usual construction which will permit the desired pressure—say up to seventy pounds to the square inch, to enter the said supply reservoir, and which will cut off the excess supply, the application reservoir by this arrangement taking the preliminary as well as the excess of pressure, above that in both the supply and main reservoirs.

In constructing an engineer's brake valve for use in connection with his system, as shown in Figures 2 to 7, inclusive, I have provided a main valve body formed of three parts; a bottom portion 6, intermediate portion 7, and upper cap portion 8, secured together by means of the bolts *o*. The intermediate portion of the valve body is provided with a valve seat *p*, upon which a rotary valve *q* operates, such valve being operated by means of a stem portion *r*, having a bearing in the upper cap or portion of the valve body, and its lower triangular end *s* fitted in a central recess in the rotary valve. The stem is provided with a valve handle *t*, in turn having a spring-pressed pawl *u* arranged to contact the stops 9 on the flange *v* of the upper part of the valve body, all as are generally used to guide the engineer in positioning the valve.

The lower part of the valve body is provided with an exhaust chamber *w*, in which an exhaust slide valve 10 operates to open and close a triangular service exhaust port 12 for the train pipe. This exhaust chamber connects with the lower part of a piston chamber in which an exhaust piston *y* operates. This piston has a stem *z*, the shoulders z' and z^2 of which operate the exhaust slide valve. It will be seen that these shoulders permit a certain amount of loose play to the piston before the exhaust valve is operated. The exhaust valve piston is operated to close the exhaust both by means of a coiled spring 24; and during active use by fluid pressure contained in the train pipe and below the piston, and to open it by means of superior fluid pressure admitted from the application reservoir above the said piston, all of which will more fully hereinafter appear. The body of the valve is provided with three passages, 13, 16, and 18, which connect respectively with the main reservoir, the train pipe, and the supply reservoir. The passage 13 is adapted to have continuous connection with the chamber 14 at the top of the valve, but the passages 16 and 18 are not so connected, the passage 16 being adapted to be shut off by a turning of the rotary valve *q*, and the passage 18 not having any connection with the chamber 14, but being adapted to be connected with the train pipe 16 by means of the cavity 17 on the under side of the rotary valve *q*. The rotary valve *q* is provided with a passage 15 (Figure 3), by means of which passage the chamber 14 and consequently the passage 13 is connected and disconnected with the passage 16. As clearly shown in Figure 11, the bottom of the rotary valve is provided with a plurality of grooves, 17, 27, and 29, and as shown in Figure 10, the valve seat *p* is provided with a plurality of openings, 21, 30, and 28, in addition to the previously mentioned passages 16 and 18. The grooves in the valve and the passages in the valve seat are so arranged relatively, that by adjustment of the rotary valve, any desired connection may be made, as will be more fully explained hereafter. The purpose of the groove 17 is to connect the passage 16 with the passage 18, thereby admitting pressure from the supply reservoir to the train pipe. The purpose of the groove 29 is to connect the top of the passage 21 in the valve seat with the top of the passage 30 in the valve seat, which passage 30 has connection to the application reservoir. When this connection is made, pressure is admitted from the application reservoir to the upper side of the piston *y*, thereby forcing it down and opening the exhaust 12. The groove 27 connects the top of the passage 16 with the top of the exhaust port 28. This exhaust-port, as indicated in Figure 6, extends vertically through the valve seat and then turns at an angle and leads to the outer air. When the rotary valve is in the proper position to connect the passage 16, and the exhaust port 28, by means of the groove 27, while the other passages are blanked, a very rapid exhaust is allowed from the train pipe to the outer atmosphere, giving the emergency application of the brakes. The relative position and function of the various passages will be more fully appreciated when taken in connection with the recital of the operation, which follows.

Describing the operation of the system when the handle of the engineer's brake valve is in its first position, (viz., release position—line 1 of Fig. 5, see also Figs. 2 and 3) or that assumed when the brakes are released by the admission of fluid pressure to the train pipe, and to obtain a direct recharging of the train line system from the main reservoir, the valve-body is provided with a port or passage 13 connected with the main reservoir pipe *f* and leads to a chamber 14 above the rotary valve, so that air under pressure contained in the main reservoir passes down through a passage 15 in the rotary valve, which is registering with passage 16 in the valve seat and body—see Fig. 3—and is guided through these passages into the train pipe *n*, and the train pipe charged or re-charged directly from the main reservoir and at the pressure contained therein in a manner to quickly charge the train pipe and release the brakes.

When the engineer places the valve handle in its second or running position—as shown at line 2 in Fig. 5—the passages 15 and 16 are disconnected, or, in other words, using the technical term, "blanked." At the same time a groove 17 in the under face of the rotary valve connects the supply reservoir passage 18 with the passage 16, which, in turn, is connected with the train pipe *n* (see Fig. 3), so that air under pressure of seventy pounds from the supply reservoir is fed through these passages 18, 17, and 16 to the train pipe and the train pipe pressure maintained at the desired amount, viz., seventy pounds to the square inch, while all other ports and passages in the engineer's valve are blanked. At the same time it will be seen (see Fig. 3) that by means of a by-pass 19 air under pressure is fed into the exhaust chamber *w* and into the piston chamber 20 below exhaust valve piston *y* to keep the same at its upper limit of movement and close the exhaust passage 12 between the exhaust chamber and the atmosphere, and also thereby between the atmosphere and the train line. The system is now arranged in such manner that there are ninety pounds' pressure in the main reservoir and seventy pounds pressure (to the square inch) in the supply reservoir.

When the valve handle is placed in the third or "lap" position—as shown at line 3 in Fig. 5—all ports and passages in the rotary valve seat and rotary valve are blanked.

When the handle of the engineer's valve is on line 4, namely, is placed in the fourth or "service" position (as shown particularly in Fig. 8), a small service application port 21 in the valve seat—and which leads therefrom down into the piston chamber 22 above the exhaust piston—is, through the instrumentality of groove 29 on the under side of the rotary valve, brought into communication with a passage 30 extending through the valve body and connected with the application reservoir so that superior fluid pressure is free to pass from the application reservoir through pipe *j*, passage 30, groove 29, and passage 21 to said piston chamber 22, above the piston therein, to depress it against the tension of helical spring 24. When the loose play between the shoulders on the piston stem is taken up, the exhaust slide valve is moved downwardly so as to gradually uncover the triangular shaped service exhaust opening 12, thereby connecting the train pipe with the atmosphere, so as to make a train line reduction in a gradual manner. The engineer holds the valve at "service" position until the required reduction is made in the train pipe, and then returns it to "lap" position, blanking the application ports or passages above described. At the same time two small passages, 25 and 26, which connect the upper part of the piston chamber 22 with the train line passage 16 are open, so that an equalizing effect can take place between the pressure in that chamber and in the train pipe. The pressure in the chamber 22 is thus gradually reduced to that contained in the train pipe, and the piston, with the assistance of the helical spring 24, is gradually raised to first blank the passage 26, which partly retards the movement of the piston and finally blank passage 25, as shown in Fig. 3. This also closes the triangular shaped exhaust passage in a gradual manner, which, on account of its peculiar shape, provides for a gradual cut-off of the train line reduction, thereby preventing any "surge" of air in the train pipe, as might result were the train line exhaust to be cut off suddenly. If other reductions are required, it will be seen that the engineer may make it by repeating the application and moving the rotary valve to service position as often as required.

The release of the brake valves may be accomplished by putting the valve in the first or "release" position, as described above, and again permitting air under pressure from the main reservoir to flow directly to the train pipe and restore the pressure therein.

When an emergency application of the brakes is required, the rotary valve handle *t* is moved to the fifth or emergency position, as shown at line 5—Figure 5. In this position all the ports and passages from the main reservoir to the train pipe are blanked, as are the ports and passages from the supply reservoir, but the rotary valve seat is moved to such position that a groove 27 in the lower face thereof connects the train line passage 16, as shown, with a supplementary large emergency exhaust passage 28 in the valve seat, thereby permitting a reduction of the train line pressure through large passages and direct to the atmosphere.

Having thus described my invention and illustrated its use, what I claim as new, and desire to secure by Letters Patent, is the following:

1. In combination, a main reservoir for relatively high pressure, a supply reservoir for relatively lower or train line pressure, an application reservoir for a higher pressure than that of the main reservoir, means for maintaining the desired pressures in these reservoirs, a train pipe and an engineer's valve provided with service exhaust means and having connection to the three reservoirs and train pipe, and adapted to connect the main and supply reservoirs to the train pipe,

and to connect the application reservoir to the service exhaust means, whereby such means are operated.

2. In combination, a main reservoir for relatively high pressure, a supply reservoir for relatively lower or train line pressure, an application reservoir for a higher pressure than that of the main reservoir, means for maintaining the desired pressures in these reservoirs, a train pipe and an engineer's valve provided with service exhaust means and a direct exhaust and having communication to the reservoirs and train pipe adapted to connect the main and supply reservoirs to the train pipe to connect the train pipe to the direct exhaust and to connect the application reservoir to the service exhaust means whereby such means are operated.

3. In combination, a main reservoir for relatively high pressure, a supply reservoir for relatively lower or train line pressure, an application reservoir for a higher pressure than that of the main reservoir, means for maintaining the desired pressures in these reservoirs, a train pipe and an engineer's valve connected to the three reservoirs and the train pipe and having a direct exhaust port and a service exhaust valve comprising a piston for governing the service exhaust valve, and a rotary valve with connections whereby the main and supply reservoirs may be connected to the train pipe and the train pipe to the direct exhaust, and whereby connection between the application reservoir and the service exhaust cylinder is made for opening the service exhaust valve.

4. In combination, a main reservoir for relatively high pressure, a supply reservoir for relatively lower or train line pressure, an application reservoir for a higher pressure than that of the main reservoir, means for maintaining the desired pressures in these reservoirs, a train pipe and an engineer's valve connected to the three reservoirs and the train pipe and having a direct exhaust port and a service exhaust valve and comprising a piston for governing the service exhaust valve continuously exposed on one side to train pressure to keep the valve closed and having a connection on the other side whereby it may be connected to the application reservoir to open the valve, and a rotary valve with connections whereby the main and supply reservoirs may be connected to the train pipe and the train pipe to the direct exhaust, and whereby connection between the application reservoir and the service exhaust cylinder is made for opening the service exhaust valve.

5. In an air brake system, the combination of an air pump, main supply and application reservoirs connected therewith, a train pipe, and an engineer's valve provided with exhaust valve mechanism for the train line and connected with the three reservoirs and with the train pipe to supply pressure from the first two reservoirs to the train pipe and to operate the exhaust valve mechanism of the train pipe by connecting the application reservoir therewith, substantially as described.

6. In an air brake system, the combination of a main reservoir, a supply reservoir, an application reservoir, a train pipe, an engineer's valve body provided with four passages connected with the main, supply, and application reservoirs and train pipe, an exhaust chamber provided with a service exhaust, an exhaust valve in the exhaust chamber, a piston connected therewith, and a rotary valve provided with one passage to connect and disconnect the main line reservoir and train pipe, a second passage to connect and disconnect the supply reservoir and train pipe, and a third passage or groove to connect and disconnect the application reservoir with the chamber on one side of the exhaust valve piston so as to operate the exhaust valve and open the service exhaust by the superior pressure in the application reservoir, substantially as described.

7. In an air brake system, the combination of a main reservoir, a supply reservoir, a train pipe, an application reservoir, an engineer's valve body provided with an emergency exhaust and passages therethrough connected with the main, supply, and application reservoirs and train pipe and provided with an exhaust chamber having a service exhaust, an exhaust valve in the exhaust chamber provided with a piston for operating the same, and a rotary valve in the valve body provided with one passage to connect and disconnect the main reservoir and train pipe, a second passage to connect and disconnect the supply reservoir and train pipe, a third passage to connect the application reservoir with the chamber on one side of the exhaust valve piston to operate the same and open the service exhaust, and a fourth passage to connect the train pipe with the emergency exhaust, substantially as described.

8. In an air brake system, the combination of an air pump, main and supply reservoirs connected therewith, controlling valve mechanism in the connections between the air pump and the said reservoirs, an application reservoir having free communication with the air pump, a train pipe, an engineer's brake valve connected with all of said reservoirs and train pipe and provided with an exhaust chamber having a service exhaust, a slide valve for opening and closing said exhaust service, a piston connected with said slide valve and exposed on one side to train line pressure for operating said slide valve, and a rotary valve in said engineer's valve body for connecting and disconnecting the main and supply reservoirs with the train pipe and the application reservoir with the

other side of the exhaust valve piston, substantially as described.

9. In an air brake system, a train pipe, means including a main reservoir for supplying pressure therefor, an engineer's valve provided with service exhaust means, an application reservoir for operating such service exhaust means, and means whereby a higher pressure is maintained in the application reservoir than in the main reservoir.

10. In combination, a reservoir for supplying pressure to the train line, an application reservoir, means whereby a higher pressure is maintained in the application reservoir than in the first reservoir, a train pipe and an engineer's valve provided with service exhaust means and having connection with the two reservoirs and adapted to connect the first reservoirs with the train pipe and to connect the application reservoir with the service exhaust means whereby such means are operated.

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