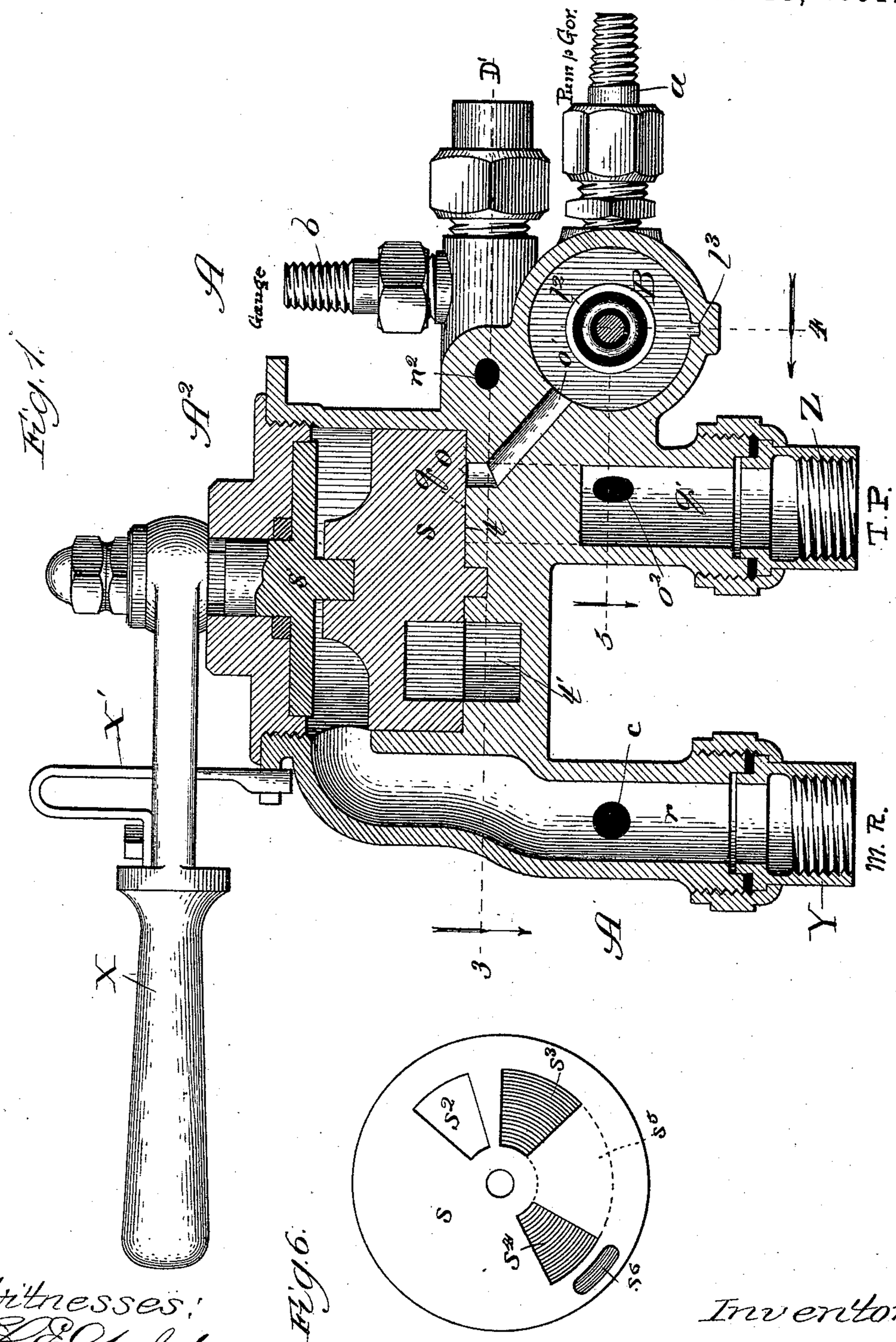
(No Model.)

3 Sheets—Sheet 1.

H. R. MASON.

ENGINEER'S BRAKE VALVE.

No. 461,170. Patented Oct. 13, 1891.



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(No Model.)

3 Sheets—Sheet 2.

H. R. MASON.

ENGINEER'S BRAKE VALVE.

No. 461,170. Patented Oct. 13, 1891.

Fig. 2.

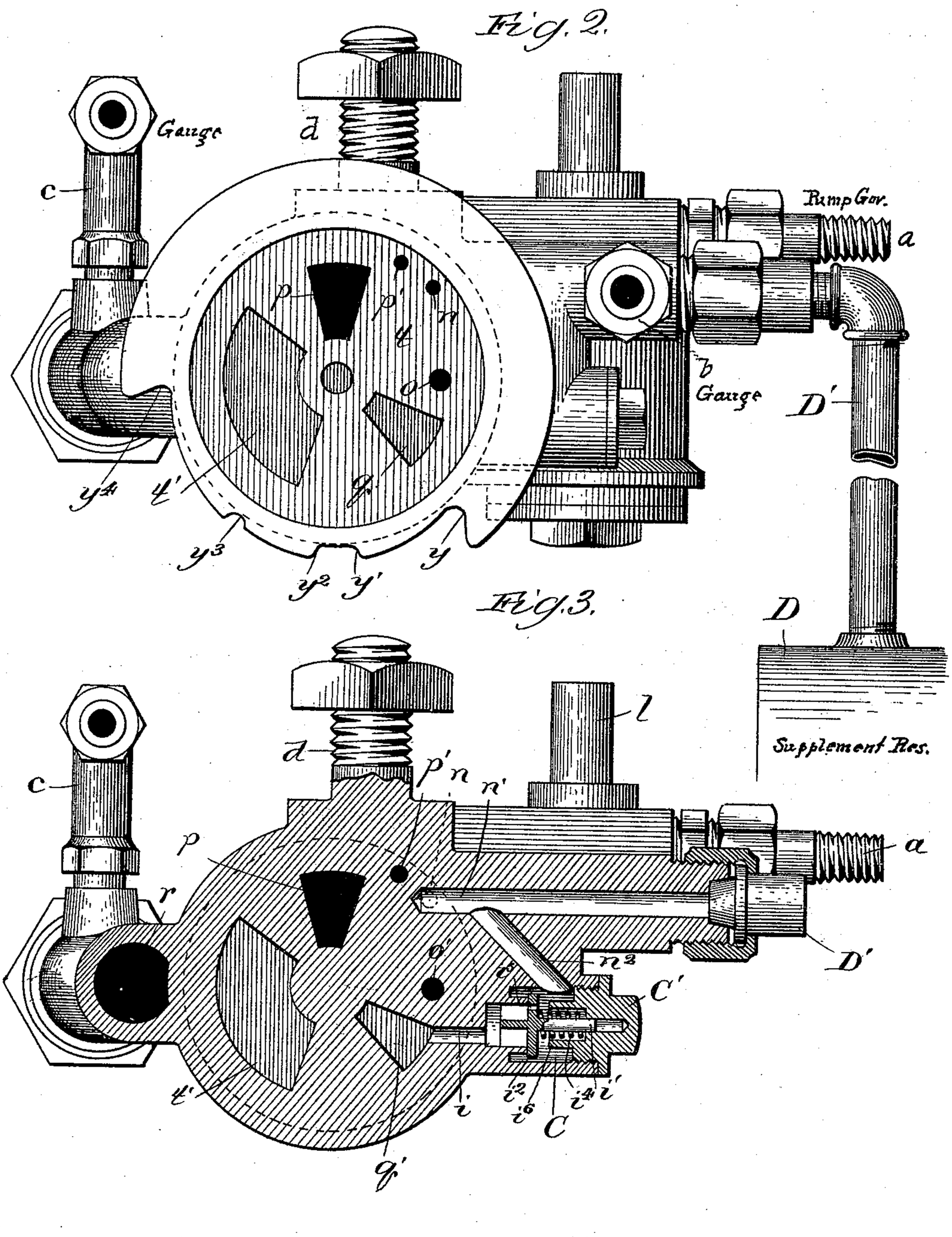

Fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

H. R. MASON.

ENGINEER'S BRAKE VALVE.

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Fig. 5.

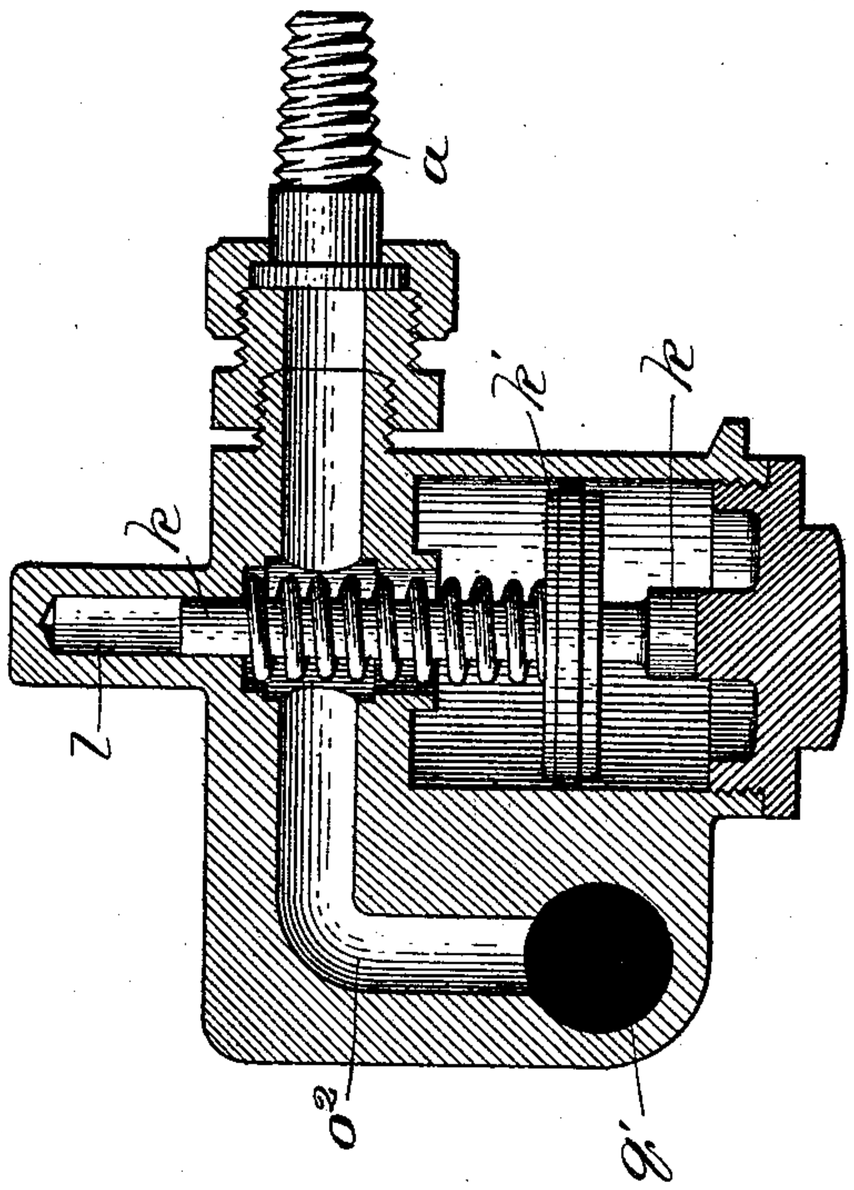
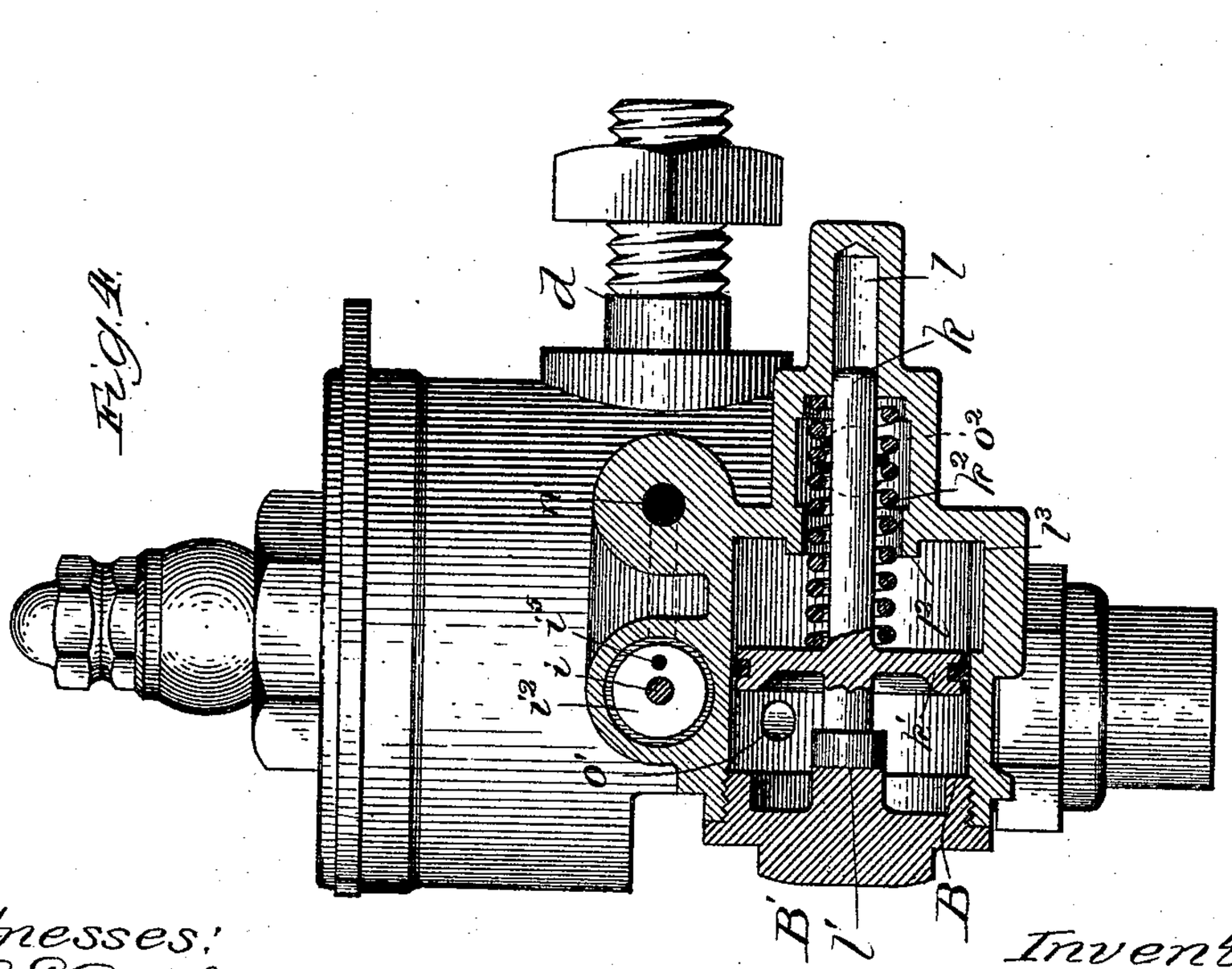


Fig. 4.



Witnesses:
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UNITED STATES PATENT OFFICE.

HARRY R. MASON, OF CHICAGO, ILLINOIS.

ENGINEER'S BRAKE-VALVE.

SPECIFICATION forming part of Letters Patent No. 461,170, dated October 13, 1891.

Application filed July 9, 1891. Serial No. 398,928. (No model.)

To all whom it may concern:

Be it known that I, HARRY R. MASON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Engineers' Brake-Valves, of which the following is a specification.

My invention relates more particularly to improvements in engineers' brake-valves adapted for use upon the air-brake systems now generally employed upon railway-trains, wherein the brakes are applied automatically by reducing the pressure of air in the train-pipe and automatically released by increasing the air-pressure therein.

This invention is in the nature of an improvement upon an engineer's brake-valve forming the subject-matter of Letters Patent of the United States No. 450,332, granted to me April 14, 1891; and my object is to provide for certain changes in the construction of the said patented engineer's brake-valve, adapting it more perfectly to its purpose.

My object is, further, to so construct the valve that when it is turned to "running" position it will be capable of maintaining in the main reservoir a pressure somewhat in excess of that in the train-pipe to be held in reserve for use when the valve is turned to "release" position.

My object is still further to provide an engineer's brake-valve in the use of which there shall be no danger of a rebound of pressure when the escape of air from the train-pipe is suddenly cut off.

In the drawings, Figure 1 is a central sectional elevation of my improved engineer's brake-valve. Fig. 2 is a broken top plan view showing the lower stationary part or valve-seat of the valve, the upper movable part being removed, and showing also the supplemental reservoir; Figs. 3, 4, and 5, sections taken, respectively, on lines 3, 4, and 5 of Fig. 1 and viewed as indicated by the arrows; and Fig. 6, a bottom plan view of the regulating-valve.

The shell or casing of the valve is formed in two separable parts A' A². The lower section A' affords the main valve-chamber and the upper section A² a screw-cap therefor. In the lower section is a valve face or seat *t* for a rotary regulating-valve *s*. The valve *s* is held down against the seat *t* by the pressure which is exerted against it by the air from the main reservoir entering through the passage *r*. The regulating-valve *s* is provided with a stem *s'*, which extends through the cap A² and is provided with a handle X. The passage *r* is cored in the valve-shell and enters the valve-chamber above the regulating-valve, and it communicates at its outer end with a pipe Y, which extends to the main reservoir. (Not shown.) In the valve-seat *t* is a port *q*, which is the "direct release and exhaust port," and leads to a passage *q'*, communicating with the train-pipe Z. Also in the valve-seat *t* are a large exhaust-port *p* and small exhaust-port *p'*, both leading to the outside air, and a "service-feed" or "running-position" port *o*, and a "service-stop inlet-port" *n*. In the face of the valve-seat *t* is a segmental recess or cavity *t'*. Extending through the regulating-valve *s* is an opening s^2, and in the lower face of that valve are two segmental recesses or cavities s^3 s^4, which communicate with each other through a cored passage s^5 (indicated in Fig. 6 by dotted lines) and a recess or cavity s^6

On the handle X is a spring-catch or indicator X', and in the rim of the section A' are notches and stops, which the indicator X' is intended to engage. The stop *y* is the "emergency stop;" *y'*, the service stop; y^2, the "on-lap position;" y^3, the running position, and y^4 the release position. The relative arrangement of the ports and recesses in the valve-seat *t* and regulating-valve, the direction of extension of the handle carrying the indicator X, and the stops on the rim of the valve-shell are such that the regulating-valve will be turned to the respective positions set forth when the handle is turned to bring the catch to the respective stops, as described.

In the valve-shell A is a valve-chamber B, provided in one end with a screw-cap B' and at its opposite end with a guide *l* for a valve-stem *k*, which carries a valve *k'*. The valve *k'* fits closely the inner wall of the chamber B and is held normally forward in the position shown in Figs. 4 and 5 by a spring k^3. When in the position described, the forward end of the valve-stem *k* abuts against the seat *l'*, formed on the cap B'.

In the valve-chamber B is a seat l^2 for the

valve k' to lodge against when pressed in that direction against the resistance of the spring k^2. Between the normal position of the valve k' and the end of the chamber carrying the guide l is a longitudinal groove l^3, which is formed in the inner face of the wall of the chamber. A service-feed passage o', cored into the valve-shell, extends from the feed-port o in the valve-face t to the forward end portion of the valve-chamber B, and a passage o^2 extends from the opposite end portion of the valve-chamber B to the passage q', which, as before stated, communicates with the train-pipe Z.

In the valve-shell A is a second valve-chamber C, communicating at its inner end with the passage q' through a passage i. The chamber is closed at its outer end by a screw-cap C', which also affords a guide for the stem i' of a valve i^2.

Within the inner end of the chamber C is a seat i^3 for the valve i^2, and the said valve is maintained normally against its seat i^3 by a spring i^4 of slight resistance. Extending through the valve i^2 is a small always-open passage i^5. When opened against the resistance of the spring i^4, the valve i^2 seats against the inner end i^6 of the screw-cap C'.

Extending from the service-stop inlet-port n in the valve-face t is a passage n', cored in the shell and communicating with a pipe D', which extends to a supplemental reservoir D. A passage n^2, cored in the shell, communicates at one end with the passage n' and at its opposite end enters the valve-chamber C adjacent to the screw-cap C'.

In operation, when the indicator is turned to y^4—the release position—the opening s^2 through the regulating-valve registers with one end portion of the recess t' in the valve-seat t, the recess s^3 in the valve s registers with the recess t' toward the opposite end of the latter, and the recess s^4 in the valve s registers with the direct-release port q, the ports o, n, p', and p being closed. When the valve is in this condition, air from the main reservoir enters through the passage r and passes thence through the opening s^2, recess t', and passage s^3 s^5 s^4 to the port q, and thence through the passage q' to the train-pipe, causing the latter to become rapidly charged with the pressure from the main reservoir to release the brakes and charge the auxiliary reservoirs along the train.

When the indicator X' is turned to y^3, the valve is at running position, the opening s^2 and recess s^3 of the valve s registering with the recess t', and the recess s^4 of the valve s registering with the port o, the ports q, n, p', and p being closed. When the valve is in this position, air from the main reservoir passes through the regulating-valve to the port o and thence through the passage o' to the chamber B. The valve is never brought to this position, except from the direct-release position described, when the train-pipe has become charged with substantially the same pressure as that in the main reservoir. In practice the maximum pressure maintained in the main reservoir is usually about ninety pounds, while seventy pounds is the pressure necessary to be established in the train-pipe to hold the brakes released. It will be understood that in charging the train-pipe to release the brakes the pressure in the main reservoir is temporarily reduced, being afterward raised again to standard by the action of the pumps, which are controlled automatically by the "pump-governor." The spring k^3 in the chamber B has a resistance of twenty pounds, and when the valve is in its forward position (shown) it shuts off communication between the passage o' and o^2. When the valve is turned to running position the valve k' holds back about twenty pounds of pressure in the main reservoir over that in the train-pipe to insure a quick release of the brakes after they have been applied. Whenever the pressure in the train-pipe from any cause is reduced below seventy pounds, the pressure from the main reservoir through the passage o', which, as stated, is raised to ninety pounds, will drive the piston k' in the direction of the seat l^2. If the reduction of pressure is due to breakage of the train-pipe or parting of a coupling between cars, the sudden venting of the train-pipe will cause the pressure from the main reservoir to drive the piston k' against the seat l^2, and thus shut off all escape of pressure from the main reservoir to the train-pipe. If the pressure in the train-pipe is reduced slightly below seventy pounds by ordinary leakage in the system or by the slight venting of air therefrom for signaling or other purposes, the valve k' will be moved only part way to its seat l^2 and will open the passage l^3 around the valve to permit pressure from the main reservoir to overcome the reduction in the train-pipe.

When the indicator X' is moved to stop y^2, the recess s^3 is moved beyond the recess t' and shuts off the entrance of air from the main reservoir. When in this condition, the ports q, o, n, p', and p are closed and the valve is on lap, as stated, which causes the pressure in the train-pipe to be "held."

When the indicator X' is moved to the stop y'—the service stop—it causes the recess s^6 to register with ports p' and n. This causes a retrogression of pressure from the train-pipe through the passage q' and i to the chamber C, forcing the valve i^2 to its seat i^6, and the pressure passes thence through the channel n^2 n' to the port n and escapes through the recess s^6 and port p' to the outside atmosphere. When the valve is at "direct-feed" or at running position, the pressure which is fed through the passage q' to the train-pipe also passes through the channel i, opening the valve i^2, and thence through the chamber C and passage n^2 n' and pipe D' to the supplemental reservoir D, so that the latter becomes charged with the same pressure as the train-pipe. The small opening i^5 through the valve

i^2 permits the air to pass through it in either direction, whereby the pressure in the supplemental reservoir and train-pipe is always maintained substantially equal. When the valve is turned to service stop, as described, to produce a comparatively slow venting of the train-pipe, the pressure in the supplemental reservoir will be vented at the same time as the train-pipe.

When approaching a station or descending a grade, the engineer will in practice turn the valve to the service-stop position to reduce the pressure in the train-pipe sufficiently to cause the brakes to be gently applied, and he will then, when the desired degree of application of the brakes is effected, turn the valve to on lap to hold the pressure thus established in the train-pipe. The sudden shutting off of the escape of pressure from the train-pipe produced by turning the valve from service stop to on lap is apt to produce a rebound of pressure in the train-pipe, which has at times been sufficient to release the brakes on the forward cars. The check-valve i^2 in the chamber C will tend alone to obviate this difficulty, because the rebound of pressure from the regulating-valve *s* will, to a great extent at least, be neutralized by the valve i^2, depending in a measure upon the volume of air in the passage between the valves *s* and i^2. The pressure of the supplemental reservoir D overcomes all danger of a rebound of pressure in the train-pipe, because when the escape of air is suddenly shut off, as described, the retrograde pressure will pass into the reservoir D and be cushioned therein. Furthermore, when the valve is turned to service stop the venting of pressure from the train-pipe is retarded by the simultaneous escape of air from the reservoir D through the valve C and renders the application of the brakes more easy to control. When the valve is turned to emergency stop, the pressure in the reservoir D is held by the valve i^2 against escaping to any material degree into the train-pipe to retard the application of the brakes.

When the indicator X′ is turned to stop *y*, the recess s^3 registers with the port *q* and the recess s^4 with the large exhaust-port *p*, all the other ports being closed. This, as described, is the emergency stop and produces a rapid venting of the train-pipe, causing the brakes to be quickly applied with all the force of the pressure in the auxiliary reservoirs on the cars.

In the drawings, the reference-letter *a* represents the place of attachment for the pipe leading to the pump-governor, *b* the place of attachment for the train-pipe pressure-gage, and *c* a pipe to which the main-reservoir pressure-gage is attached, all of which attachments are common to engineers' brake-valves. The device is secured to its support in the engine-cab by means of the threaded lug *d*.

The means described for preventing a rebound of pressure in the train-pipe when the escape of pressure therefrom through the service-stop passage is shut off are the same in substance as described and claimed in Letters Patent No. 450,334, granted to me April 14, 1891. In the present construction, however, they are combined in a single valve-casing in a way which makes a more desirable construction, particularly when the signaling mechanism forming one of the features of that patent is not present.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an engineer's brake-valve device having the direct-feed passage and the service-feed passage and a normally-closed by-passage between the main reservoir and the train-pipe, a spring-controlled pressure-valve in the service-feed passage exposed to pressure from the main reservoir and to back-pressure from the train-pipe and located with relation to the by-passage to open and then to close the by-passage in its movement against the resistance of its spring on a preponderance of pressure from the main reservoir, substantially as described.

2. The combination, in an engineer's brake-valve device, of a direct-feed passage and a service-feed passage between the main reservoir and train-pipe, a regulating-valve operative at will to direct the air-pressure through either said passage, and a pressure-reducing valve in the service-feed passage controlled by a spring supplemented by the back-pressure from the train-pipe directed against the pressure-reducing valve to maintain the said passage normally closed, the said pressure-reducing valve operating by slight reduction in the train-pipe pressure to admit sufficient pressure into the train-pipe to compensate for such reduction and by the brake applying a degree of pressure reduction in the train-pipe to close the service-feed passage, substantially as described.

3. The combination, in an engineer's brake-valve device, of a direct-feed passage and a service-feed passage between the main reservoir and train-pipe, a regulating-valve operative at will to direct the pressure from the main reservoir to the train-pipe through either said passage, a valve-chamber interposed in the service-feed passage, a spring-controlled pressure-reducing valve exposed to back-pressure from the train-pipe, a seat for the pressure-reducing valve in the direction of the main reservoir, against which seat said valve is normally held by its spring and the back-pressure from the train-pipe to close the said passage, a seat for the pressure-reducing valve in the direction of the train-pipe, against which seat said valve is driven by preponderance of pressure from the main reservoir to close said passage, and a by-passage between the main reservoir and train-pipe opened by the unseating of the pressure-reducing valve and closed by the seating thereof in either direction, substantially as described.

4. In an engineer's brake-valve, the combination, with the service-feed passage, of a valve-chamber B, interposed therein, having the inlet o' and outlet o^2 to the train-pipe, a spring-controlled pressure-reducing valve in the chamber B, exposed to back-pressure from the train-pipe, a seat for the valve in the direction of the inlet o', against which the valve is normally held by its spring and the back-pressure from the train-pipe to close the passage, a seat for the valve in the direction of the train-pipe, against which the valve is driven by preponderance of pressure against it from the main reservoir, and a by-passage l^3 between the said inlet and outlet opened by the valve when it is unseated and closed by the valve when it is seated in either direction, substantially as and for the purpose set forth.

5. In an engineer's brake-valve, the combination, with the feed-passage q' to the train-pipe, of a service-stop passage extending therefrom to the service-stop inlet-port of the valve, and a check-valve interposed in the said service-stop passage and seating in the direction of the said feed-passage, the said parts being all combined in the valve-shell, substantially as described.

6. In an engineer's brake-valve, the combination, with the shell A of the valve, of a feed-passage q' therein, communicating with the train-pipe, a service-stop passage extending from the passage q' to the service-stop inlet-port of the valve, a check-valve interposed in the said service-stop passage, seating in the direction of the passage q', and operating when seated to only partly close the service-stop passage, a branch passage communicating with the said service-stop passage, and a supplemental reservoir communicating with the said branch passage, substantially as and for the purpose set forth.

HARRY R. MASON.

In presence of—
J. W. DYRENFORTH,
M. J. FROST.