No. 676,871. Patented June 25, 1901.

A. BRÜGGEMANN.

PNEUMATIC RAILWAY BRAKE APPARATUS.

(Application filed Aug. 2, 1900.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

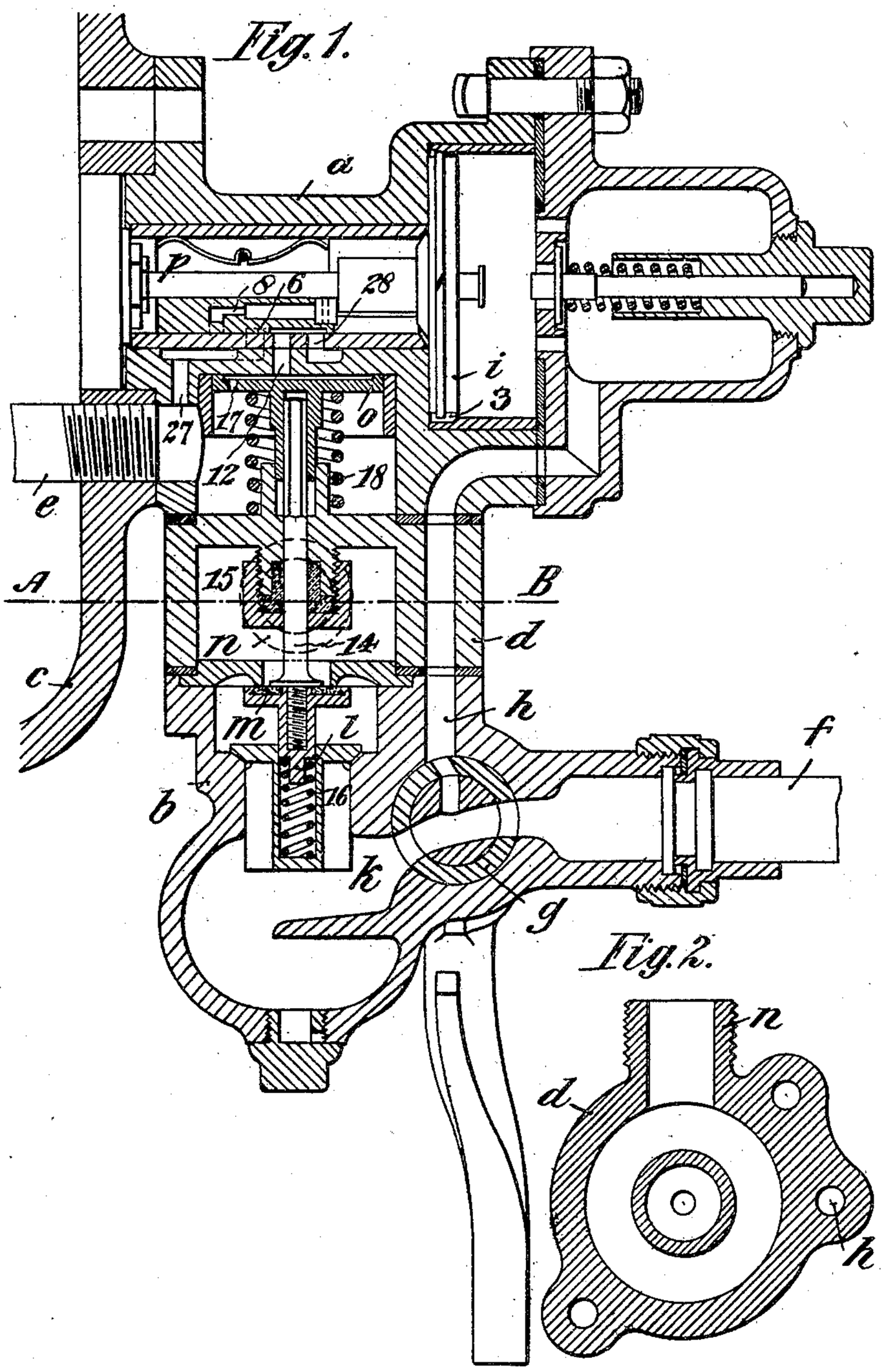

Fig. 2.

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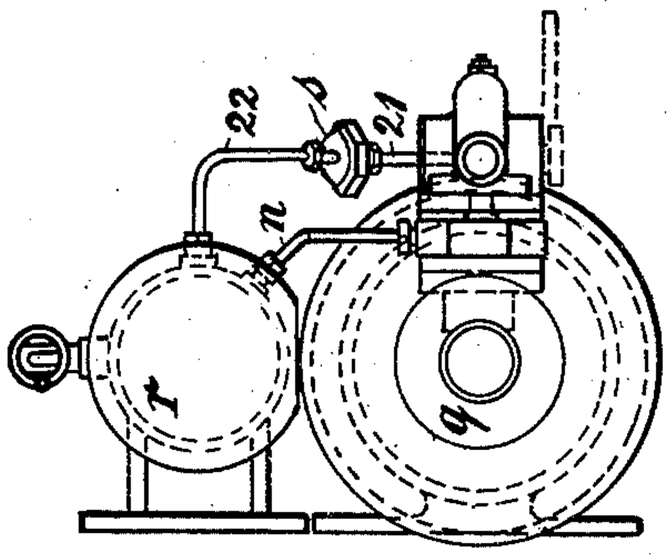

Fig. 7.

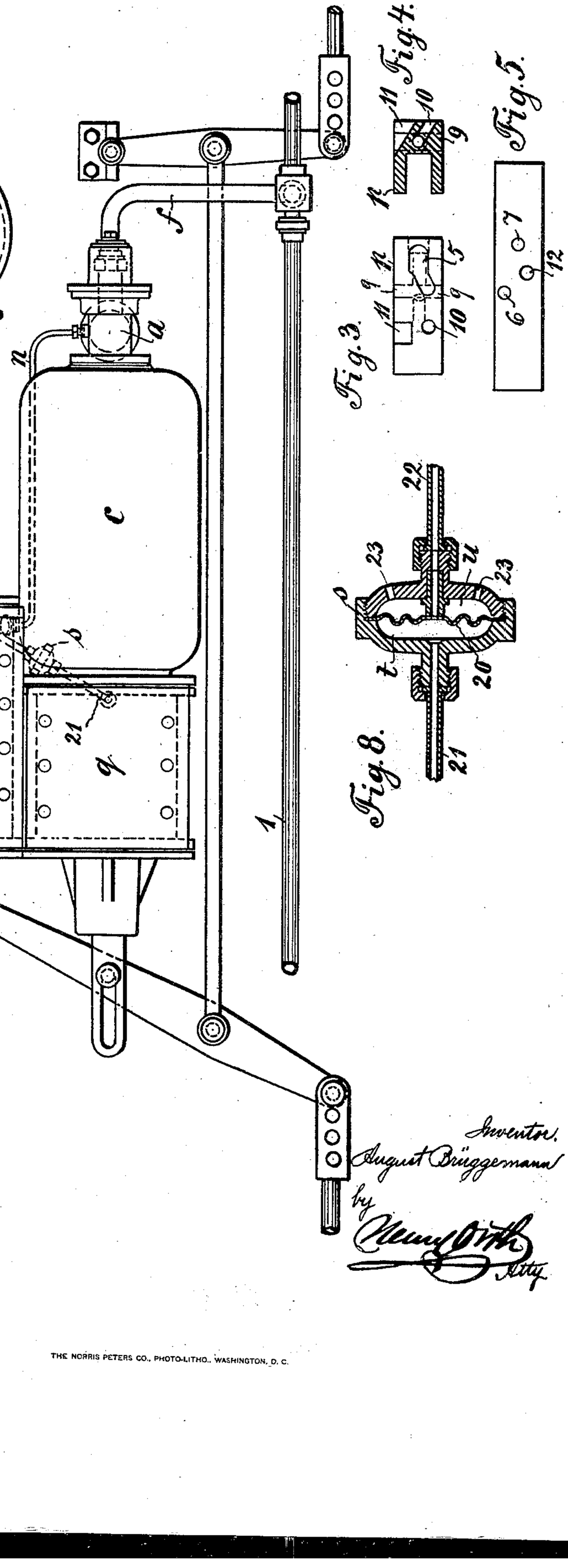

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 8.

Fig. 6a.

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(No Model.) 3 Sheets—Sheet 3.

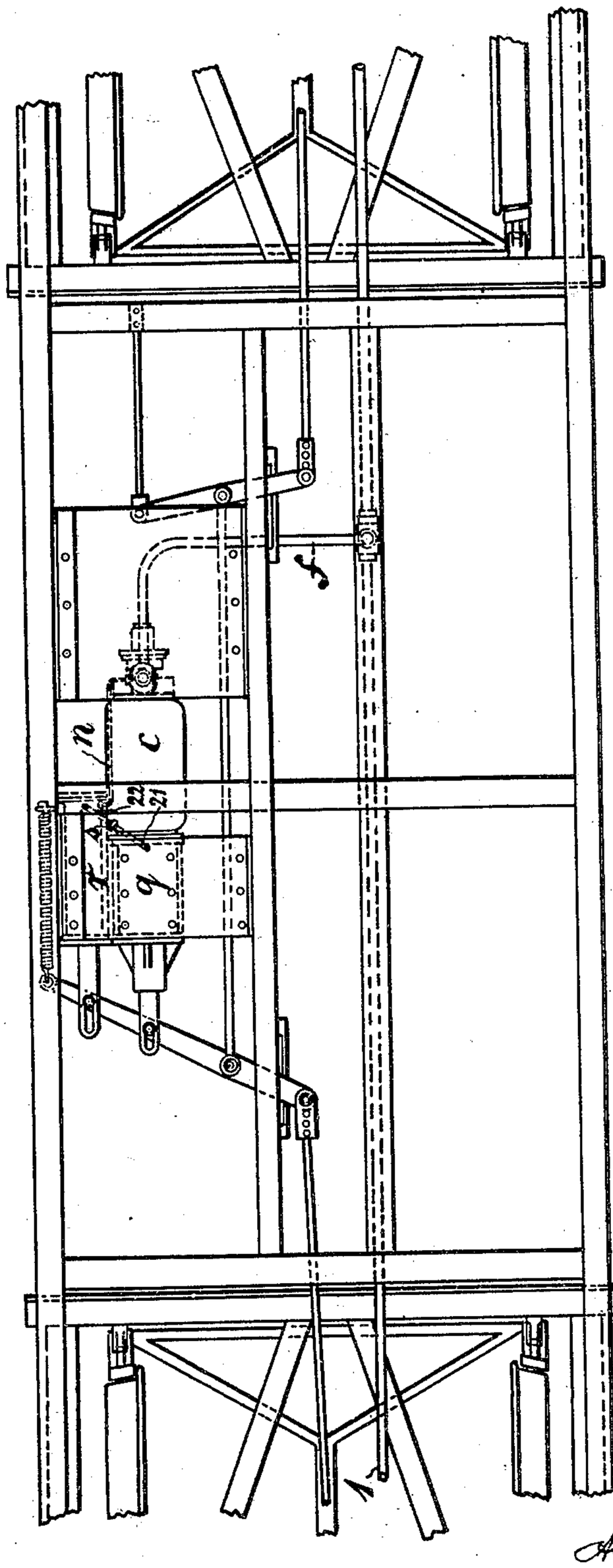

Fig. 6.

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UNITED STATES PATENT OFFICE.

AUGUST BRÜGGEMANN, OF BRESLAU, GERMANY, ASSIGNOR TO THE DEUTSCHE WAFFEN-UND MUNITIONSFABRIKEN, OF CARLSRUHE, BADEN, GERMANY.

PNEUMATIC RAILWAY-BRAKE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 676,871, dated June 25, 1901.

Application filed August 2, 1900. Serial No. 25,669. (No model.)

To all whom it may concern:

Be it known that I, AUGUST BRÜGGEMANN, a subject of the King of Prussia, Emperor of Germany, and a resident of Breslau, Germany, have invented certain new and useful Improvements in Pneumatic Railway-Brake Apparatus; and I do hereby 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to pneumatic railway-brake apparatus of the Westinghouse automatic type, and has for its object to enable a greatly-increased braking effect to be obtained in cases of emergency.

The invention consists, essentially, in the combination, with the ordinary Westinghouse automatic brake apparatus, of a second or supplementary brake-cylinder operated on emergency by the pressure of the air in the train-pipe, the air being admitted to said cylinder by means of a valve operating (like the ordinary supplementary or emergency valve for admitting compressed air from the train-pipe to the ordinary brake-cylinder) under the control of the "triple valve" in such manner that while under ordinary service conditions a comparatively slight reduction of air-pressure in the train-pipe has for effect to bring the ordinary brake-cylinder alone into operation a further reduction of pressure in the train-pipe results in the emergency-valve being so operated as to admit air from the train-pipe to the supplementary brake-cylinder, the pressure transmitted by whose piston is thus superadded to the pressure transmitted by the piston of the ordinary brake-cylinder.

The invention will be described with reference to the accompanying drawings, wherein—

Figure 1 is a longitudinal vertical section of the valve apparatus, whereby the above-described effects are produced. Fig. 2 is a cross-section on line A B. Fig. 3 is an under side view of the valve *p*. Fig. 4 is a section of the same; Fig. 5, a top view of the valve-seat. Fig. 6 is a top plan view of the device, showing it applied to a car. Fig. 6ª is a view showing the main and auxiliary brake-cylinders with their connections. Fig. 7 is an end view, and Fig. 8 is a valve for controlling the exhaust from the auxiliary brake-cylinder.

a is the casing in which works the ordinary Westinghouse triple valve.

b is the casing of the emergency-valve, and *c* the usual auxiliary reservoir, to which compressed air is supplied through pipe *f* from the train-pipe under the control of the triple valve and from which compressed air is supplied under the control of the triple valve through pipe *e* to the ordinary brake-cylinder *q*. The pipe *f* is connected, through the three-way cock *g*, with the chamber *k* of casing *b* and with passage *h*, leading to the cylinder, in which the piston *i* of the triple valve works.

l is the spring-pressed valve opening upward from chamber *k* to valve *m*, on the stem of which valve *l* is guided.

For the purpose of this invention the chamber between the emergency-valve *m* and its operative piston *o* is divided transversely by a diaphragm, (carried by an intermediate piece *d*, interposed between the casings *a* and *b* and provided with a stuffing-box, through which the spindle of valve *m* passes,) the space above the diaphragm, in which piston *o* works, being in communication with the ordinary brake-cylinder by pipe *e*, as usual, while the space below the diaphragm, into which the emergency-valve *m* opens, is connected by a pipe *n* with a second or supplementary brake-cylinder *r*. The ordinary brake-cylinder *q* will therefore be supplied with compressed air for ordinary working from the reservoir *c* only, while the supplementary brake-cylinder *r* will be supplied through pipe *f* with compressed air directly from the train-pipe, so as to supplement by its action the working of the ordinary brake-cylinder in cases of emergency. The effect of the combination is that, whereas a slight reduction of pressure in the train-pipe will cause the sliding part *p* of the triple valve to be so moved as to cause air to be ad-

mitted from the reservoir *c*, side ports 9 and 10 in the valve *p*, port 6, and by-pass 27 directly through pipe *e* to the ordinary brake-cylinder *q* for ordinary working, a somewhat greater reduction of pressure will cause the part *p* of the triple valve to be further moved, so that air from the container *c* will be admitted through the cut-out portion 11 of the valve *p*, port 12, to the space above the piston *o* of the emergency-valve *m*, which will be caused to open, whereupon the valve *l* will also be caused to open under the superior pressure in the train-pipe, and compressed air will then be admitted from the train-pipe directly through pipe *n* to the second or supplementary brake-cylinder *r*. As soon as the pressure in the supplementary brake-cylinder has risen to that in the train-pipe the valve *l* will be moved to closed position by reason of spring 16 and back pressure from the supplementary brake-cylinder *r* prevented. After closure of this valve *l* and the return or partial return of the piston compressed air from the auxiliary reservoir *c* will still pass through the cut-out portion or notch 11, port 12, and perforation 17 in said piston *o* to the main brake-cylinder *q* until the pressure in this cylinder and the auxiliary reservoir be equalized. As the opening governed by the valves *l* and *m* is comparatively large, there is a rapid flow of air to the supplementary brake-cylinder, with a corresponding decrease of pressure in the train-pipe, whereby not only will a rapid braking be accomplished, but the reduction of pressure will be carried from car to car in the direction of travel with extraordinary rapidity.

By using an auxiliary brake-cylinder connected as described it is possible to apply emergency-brakes after ordinary braking has been applied, thereby throwing into operation the piston of the second brake-cylinder *r* after the first one *q* has been filled with compressed air from the auxiliary reservoir.

Between the two brake-cylinders *q* and *r* is a valve connected to the cylinder *q* by pipe 21 and to the cylinder *r* by pipe 22, the latter extending into the valve-casing *s* and arranged so that a flexible diaphragm 20 can close it when forced against its end, which is formed into a suitable seat for said diaphragm 20 divides the casing *s* into two chambers *f* and *u*, the latter open to the atmosphere by ports 23. Air-pressure in the main brake-cylinder *q* will force the diaphragm against the end of the pipe 22 to the supplementary brake-cylinder *r* and will be held against it and the train-pipe pressure therein when emergency-brakes are applied.

In order to release the brakes, air is let into the train-pipe 1 from the main air-reservoir on the engine through passage *h* to the piston *i*, which will be moved to the left to the position shown in Fig. 1.

The passage 5 in valve *p* will connect ports 6 and 7 to allow exhaust from the brake-cylinder *q* through pipe *e*, port 17 of the emergency-valve, piston *o*, port 12, and port 28 to the atmosphere, while train-pipe air is vented through the notch or passage 3, behind the piston *i*, past the valve *p* into the auxiliary reservoir *c*. Pressure being released in the main brake-cylinder *q*, the diaphragm 20 will be free to be displaced by train-pipe pressure left in the supplementary brake-cylinder *r* if emergency-brakes had been applied so as to have placed this cylinder and its piston in operation, and the air therein will be free to flow from said cylinder *r* into chamber *u* of valve *s* and through the ports 23 to the atmosphere. Thus for ordinary working only the ordinary brake-cylinder *q* is operated, while in cases of emergency the supplementary brake-cylinder coacts with the ordinary brake-cylinder to apply the brakes, with the result that instead of the maximum available pressure being applied to act on the piston of only a single cylinder, as hitherto, two rather lower pressures are applied to act on the pistons of two separate cylinders, the sum of the pressures thereby transmitted greatly exceeding the maximum pressure transmitted by the piston of the single cylinder.

The difference, expressed in figures, between the two cases is as follows: Assuming a pressure of five atmospheres in the pipes, the maximum pressure available in case of emergency in a single brake-cylinder is 4.2 atmospheres, which, acting on a piston area of one hundred square centimeters, (100×4.2,) equals four hundred and twenty atmospheres. With the two brake-cylinders of equal area the pressure available in case of emergency in the ordinary brake-cylinder, which is supplied from the air-reservoir, equals 3.8 atmospheres, while the pressure available in the supplementary brake-cylinder, which is supplied solely from the train-pipe, equals 3.5 atmospheres. The braking pressure of the two cylinders (each of one hundred square centimeters area) is therefore $100 \times (3.8+3.5)=730$ atmospheres. The ratio of braking power in case of emergency in the two cases is therefore as four hundred and twenty is to seven hundred and thirty. Thus a gain of three hundred and ten atmospheres (or about seventy-five per cent.) is obtained by means of the present invention.

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

1. In an air-brake system, the combination with the triple and emergency valves, of a second brake-cylinder controlled by said emergency-valve, substantially as set forth.

2. In an air-brake system, the combination with the triple and emergency valves, of a second brake-cylinder and a piston therein operated by train-pipe air and controlled by said emergency-valve, substantially as set forth.

3. In an air-brake system, the combination with the triple and emergency valves, of a chamber interposed between them, a port therein closed by the emergency-valve and an

emergency brake-cylinder connected to said chamber to receive train-pipe air through the emergency-valve, substantially as set forth.

4. In an air-brake system, the combination with the triple and emergency valves, of a chamber below the emergency-valve piston, a port therein controlled by said emergency-valve, the rod connecting said piston and emergency-valve passing through said chamber, and a supplementary air-operated brake-piston connected to said chamber, substantially as described.

5. In an air-brake system, the combination with an auxiliary reservoir and a triple valve, of a brake-cylinder organized to receive air only from said reservoir through said valve, an emergency-valve and a supplementary brake-cylinder, arranged to receive train-pipe air through said emergency-valve only, substantially as described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

AUGUST BRÜGGEMANN.

Witnesses:
CARL KYSKO,
HERMANN BARTSCH.