(No Model.) 3 Sheets—Sheet 1.

R. SOLANO.

VACUUM RAILWAY BRAKE.

No. 351,473. Patented Oct. 26, 1886.

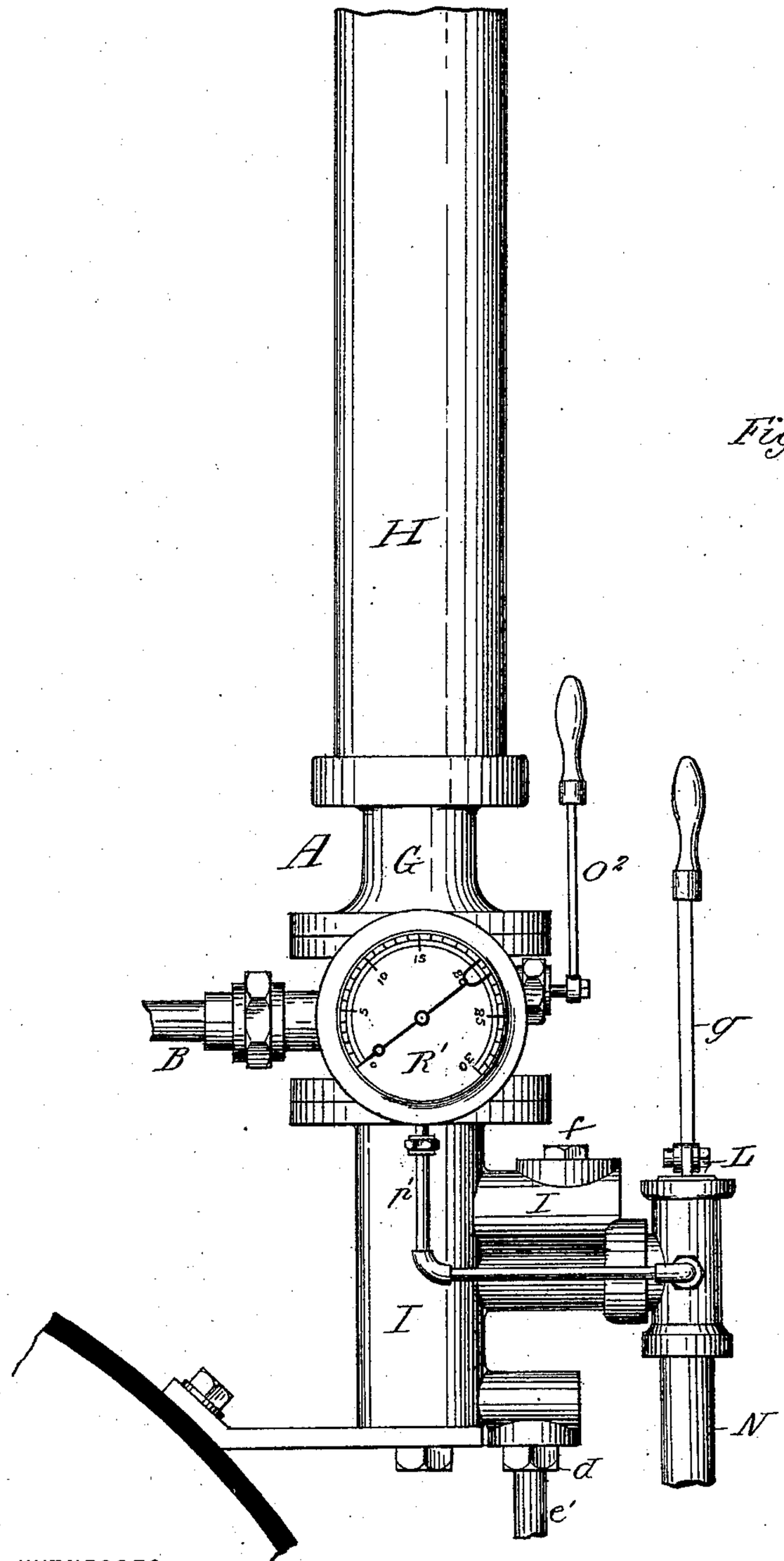

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

R. SOLANO.

VACUUM RAILWAY BRAKE.

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Fig. 2.

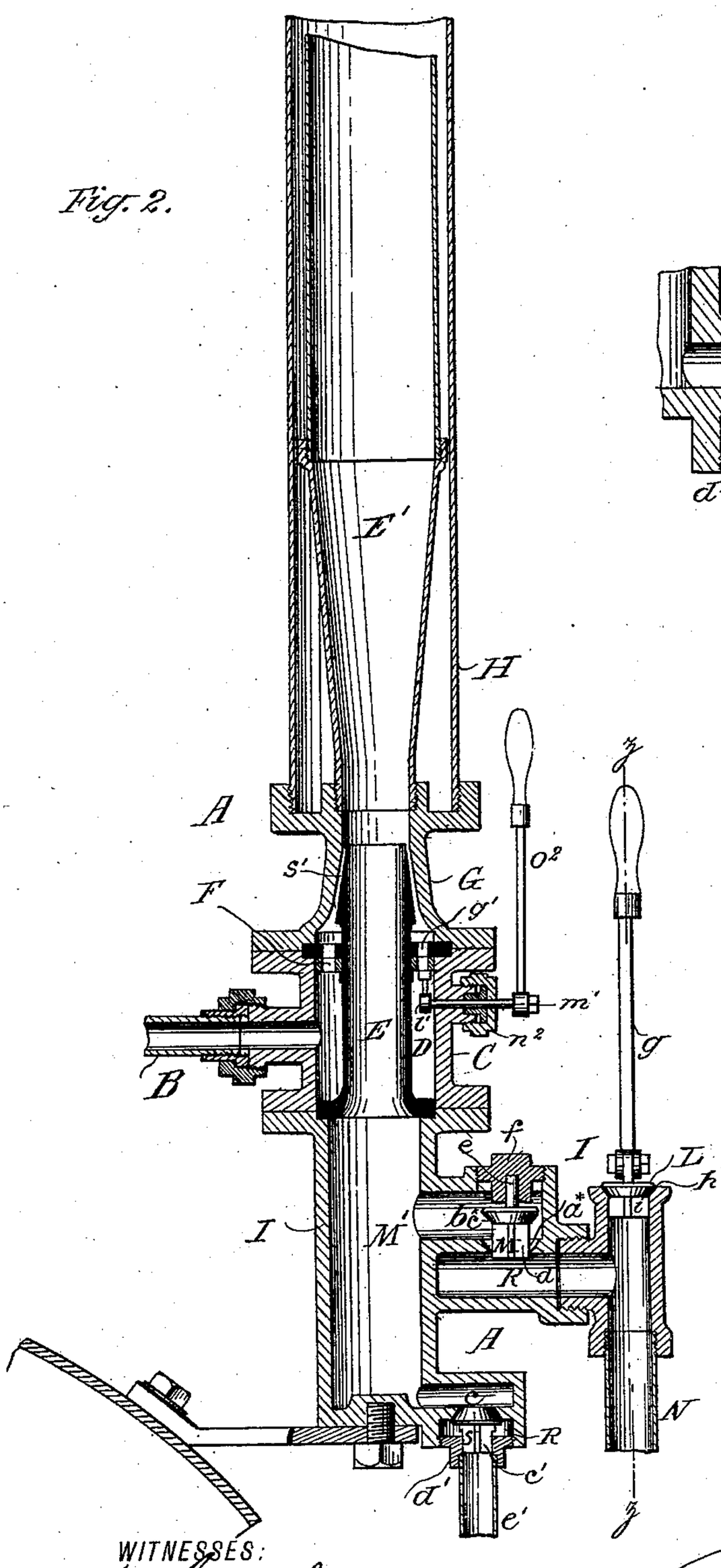


Fig. 4.

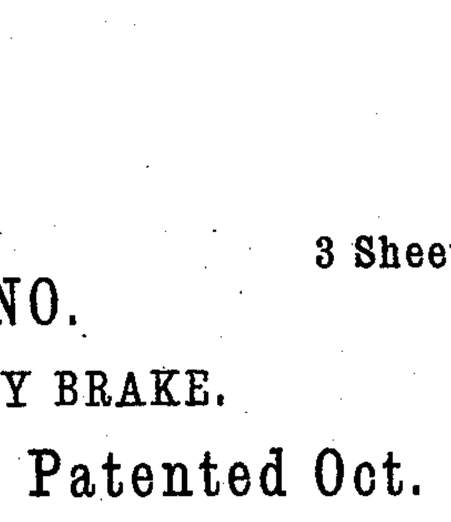
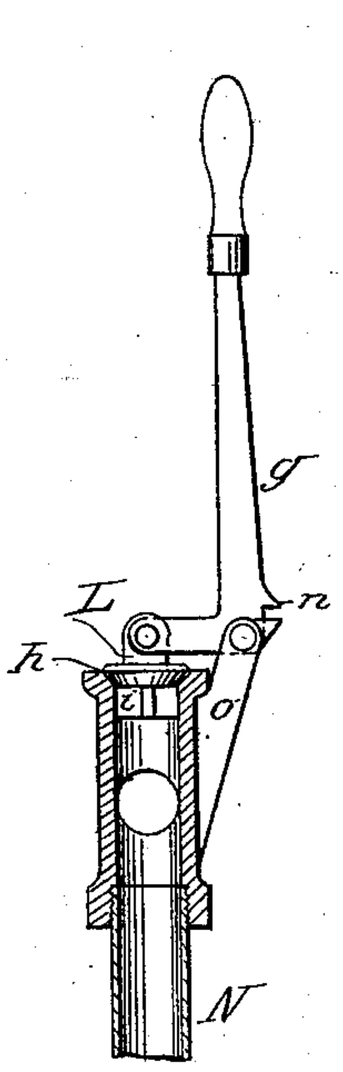


Fig. 3.



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(No Model.) 3 Sheets—Sheet 3.

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VACUUM RAILWAY BRAKE.

No. 351,473. Patented Oct. 26, 1886.

Fig. 5.

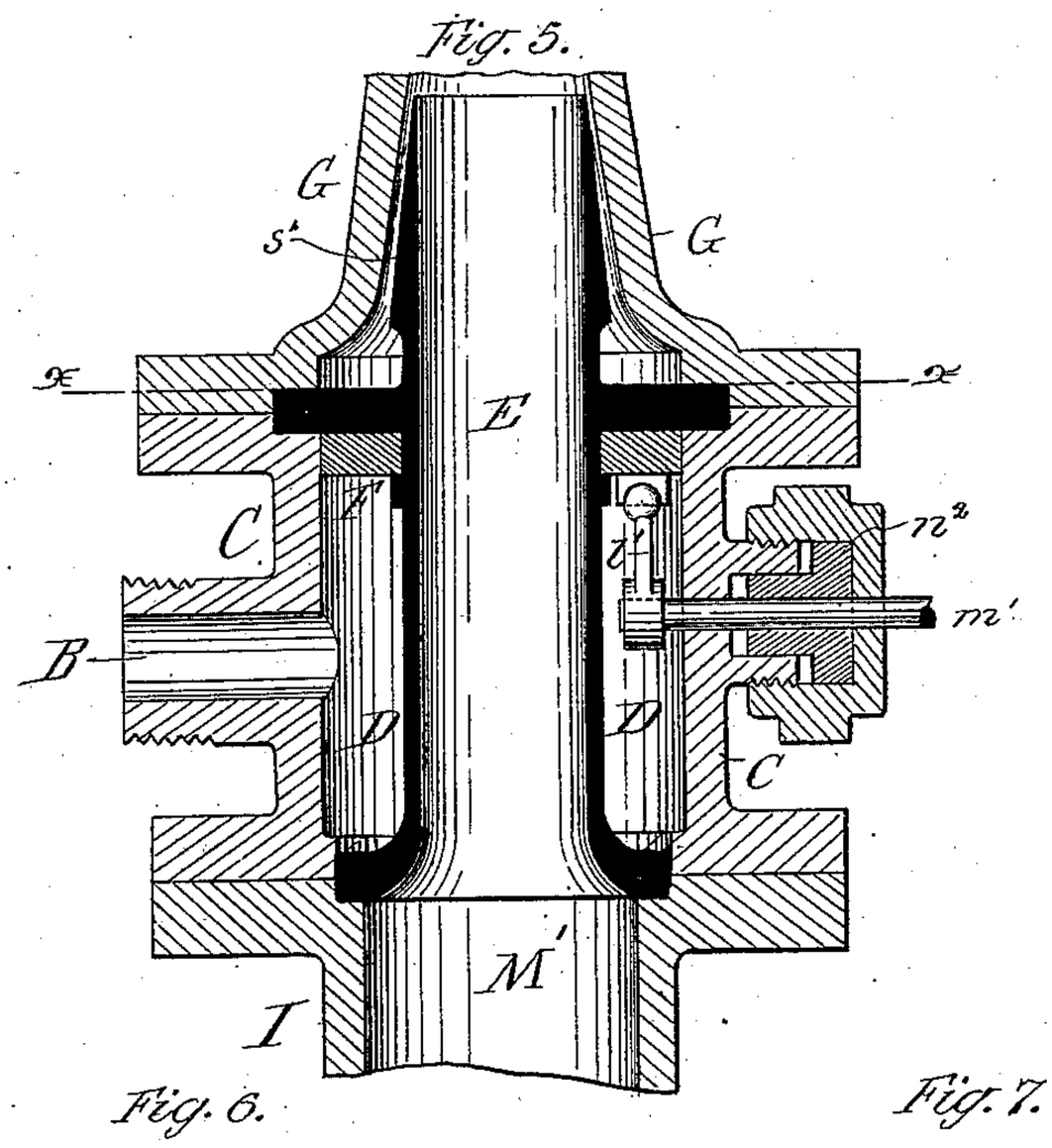


Fig. 6.

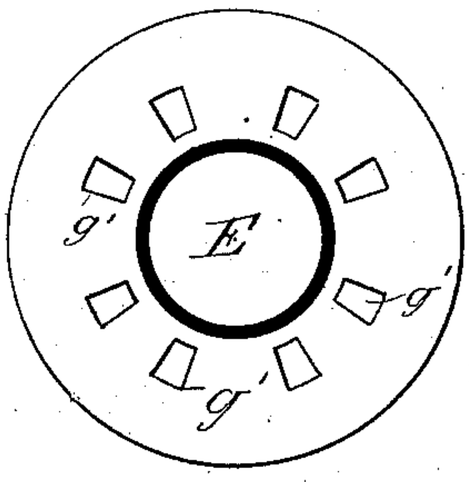


Fig. 7.

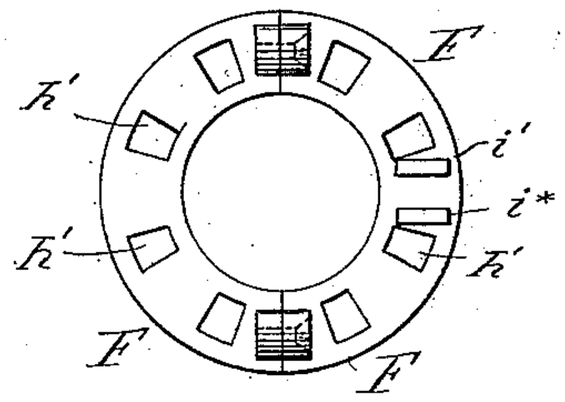
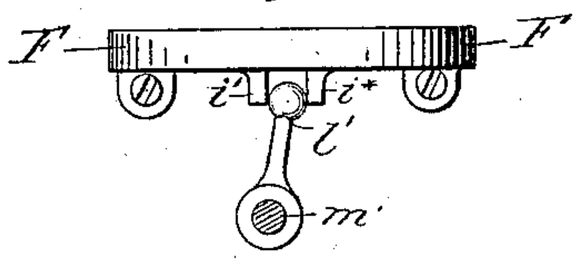


Fig. 8.



WITNESSES:

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UNITED STATES PATENT OFFICE.

RENALDO SOLANO, OF BROOKLYN, NEW YORK, ASSIGNOR OF TWO-THIRDS TO JOHN W. HOWARD AND DAVID R. MORSE, BOTH OF SAME PLACE.

VACUUM RAILWAY-BRAKE.

SPECIFICATION forming part of Letters Patent No. 351,473, dated October 26, 1886.

Application filed July 31, 1886. Serial No. 209,610. (No model.)

To all whom it may concern:

Be it known that I, RENALDO SOLANO, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Vacuum Railway-Brakes, of which the following is a specification, reference being had to the accompanying drawings, forming a part of the same, in which—

Figure 1 is a front elevation of a device embodying my invention; Fig. 2, a vertical section showing the position of the valves and ejector-nozzle; Fig. 3, a vertical section of the relief-valve on the line *z z*, Fig. 2; Fig. 4, an enlarged sectional view of the drip-valve; Fig. 5, an enlarged vertical section of the combined nozzle and graduating-valve seat; Fig. 6, a cross-sectional view of the combined nozzle and graduating-valve seat on the line *x x*, Fig. 5; Fig. 7, a plan view of the under side of the graduating-valve, having ports that correspond with those in the valve-seat; and Fig. 8, a side view of the graduating-valve, showing the lever and ball-and-socket connection to operate the same.

Similar letters of reference indicate corresponding parts in the several figures.

My improvement relates to the ejector-nozzle and a combined graduating-valve, whereby the expansion of steam takes place only at the end of the nozzle, thus creating an efficient vacuum by drawing the air through the nozzle, and at the same time to obtain a clear and uninterrupted passage from the muffler, generally located on the top of the ejector apparatus, to the drip-valve at the bottom, so that all the condensation of steam into water will escape automatically.

In the drawings, A represents the ejector with its valve attachments; B, the pipe that connects the upper part of the boiler of a locomotive with steam-chamber D, formed by the casing C, that encircles the combined ejector-nozzle E and graduating-valve F. The graduating-valve F is of annular form and surrounds the nozzle E.

G is a casing that forms a very narrow passage above the graduating-valve seat and around the end of the ejector-nozzle E, and supports the protecting-jacket H, that encircles the gradually-increasing-diameter expansion-pipe E′.

I is a lower casing, forming the chamber M′, the side check-valve chamber, *b*, and the drip-valve chamber *c*.

M is a check-valve within the chamber *b*, which covers a valve-port, *a″*, communicating with a vacuum-chamber, K, connected to the vacuum-pipe N and to the brakes, this valve M being provided with a ground seat, *c″*, and with guiding-wings *d* and stop-spindle *e*, that projects into the screw-cap *f* in the casing I.

L is a relief-valve, which serves to open the communication between the vacuum-pipe N and the atmosphere, so as to admit air into the pipe and destroy the vacuum. The relief-valve L is opened by the hand-lever *g*, so arranged that the weight of the valve L will keep itself seated, said valve being provided with a ground seat, *h*, and with lower guide-wings, *i*. To prevent this relief-valve L from lifting too far, the lever *g* has a stop, *n*, that strikes the supporting-frame *o* of the lever. At the lower part of the casing I is a small drip-chamber, R, that contains the automatic valve S with lower side wings, *c′*, which work in the screw-cap *d′*, said wings projecting farther at the upper end, so that in falling upon the screw-cap *d′* a clear space is left underneath, so that the water will run out through the drip-pipe *e′*, thus keeping the ejector free of water.

The valve S is provided with a ground seat, so that when a vacuum is established there will be no leak.

The combined nozzle and graduating-valve seat E are cast in one piece, so that the lower part will slip into the casing C and be bound and held in position by the casing G with suitable bolts, the valve-seat having ports *g′*, of which there may be any suitable number. The graduating-valve F is made in two parts, which are screwed together around the nozzle E, and has a corresponding number of ports, *h′*, with the valve-seat, the valve being placed on the under side of the combined valve-seat and nozzle E, as shown. The valve F has two depending lugs, *i′ i×*, between which a ball-and-socket lever, *l′*, is fitted, said lever being

connected to a small spindle, m', that passes through the casing C and stuffing-box n^2, and to a hand-lever, O^2, with which the engineer operates the valve to admit or cut off the steam gradually, thus having perfect control of the train in operating the brakes by creating a vacuum.

Having described the essential parts constituting the apparatus, I now will proceed to describe its operation.

When the steam has been admitted to the ejector, by turning a valve on any suitable part of the pipe B, this live steam is retained in the chamber D and around the nozzle E, and when the engineer wishes to apply the brake he turns the hand-lever O^2, when the spindle n' will turn the ball-and-socket lever l', and that in turn will operate the graduating-valve F, so that the ports h' and g' will open, thus allowing the steam to rush through the narrow passage s' around the nozzle E and pass upward, forming a hollow or annular column around the end of nozzle E, thus creating a very powerful current and a consequent vacuum, which lifts the check-valve M in the chamber b, and opens communication through the chamber c and the brake-pipe N to all the brakes on the train, at the same time closing the drip-valve S at the lower part of casing I. On shutting off the steam the check-valve M closes, thus retaining a vacuum in the brake-pipe N and all its connections for holding the brakes. The drip-valve S will drop to its resting-place and allow the water that may have collected in the ejector to escape. The power applied on the brakes is indicated by the vacuum-gage R', which is connected to the brake-pipe N by a small pipe, p'. For releasing the brakes the engineer destroys the vacuum in the brake-pipes and all its connections by admitting air into the pipe N through the relief-valve L.

Having thus fully described my invention, what I claim is—

1. In a vacuum-brake apparatus, the combination of an ejector-nozzle and an annular graduating-valve and arranged around the nozzle to form an annular current, substantially as described.

2. In a vacuum-brake apparatus, the chamber M', located beneath the ejector-nozzle E, forming an unobstructed passage to the drip-valve s, and a separate communicating chamber containing a check-valve, M, substantially as described.

RENALDO SOLANO.

Witnesses:
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