

A. CHAMBERS.

Pneumatic Railway-Signaling Apparatus.

No. 163,152.

Patented May 11, 1875.

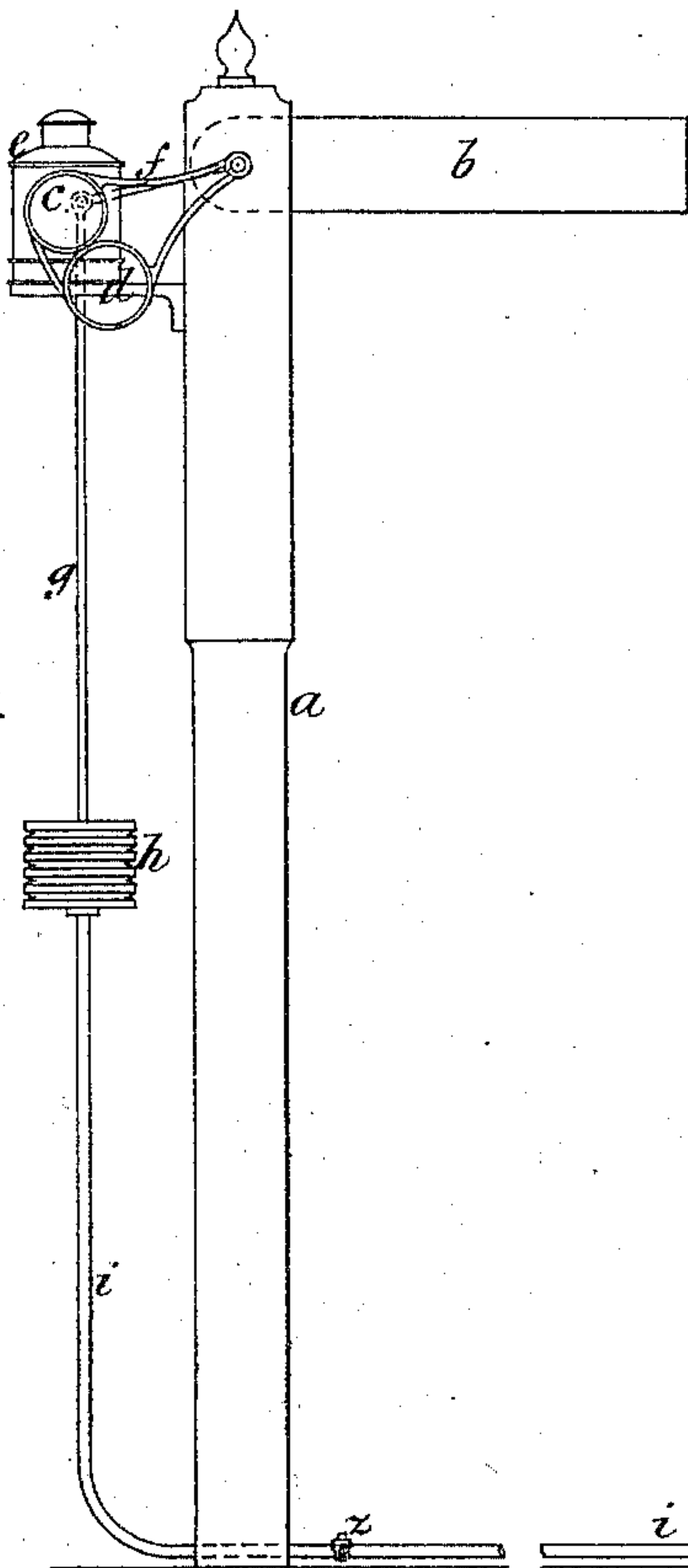


FIG. 1.

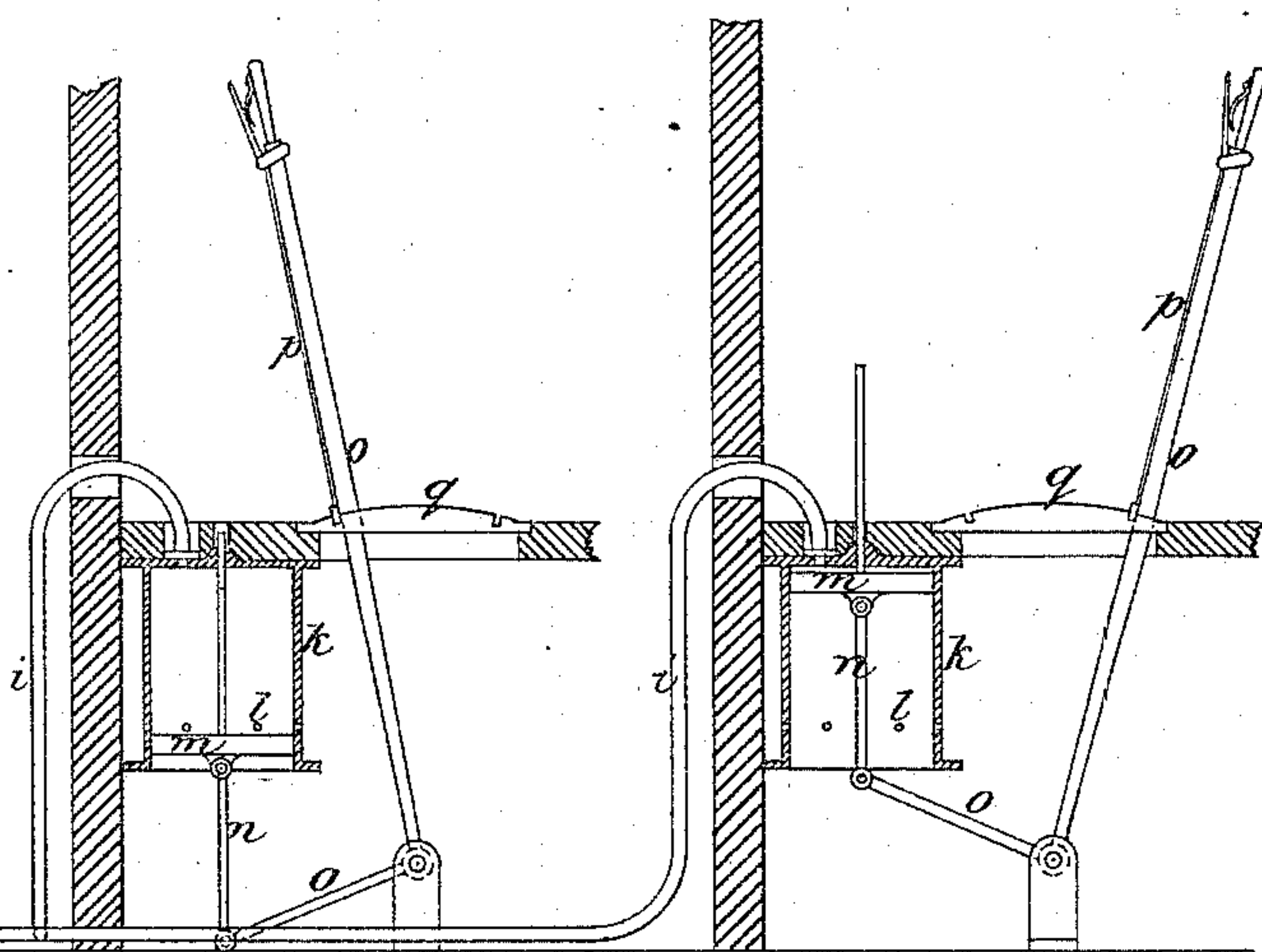
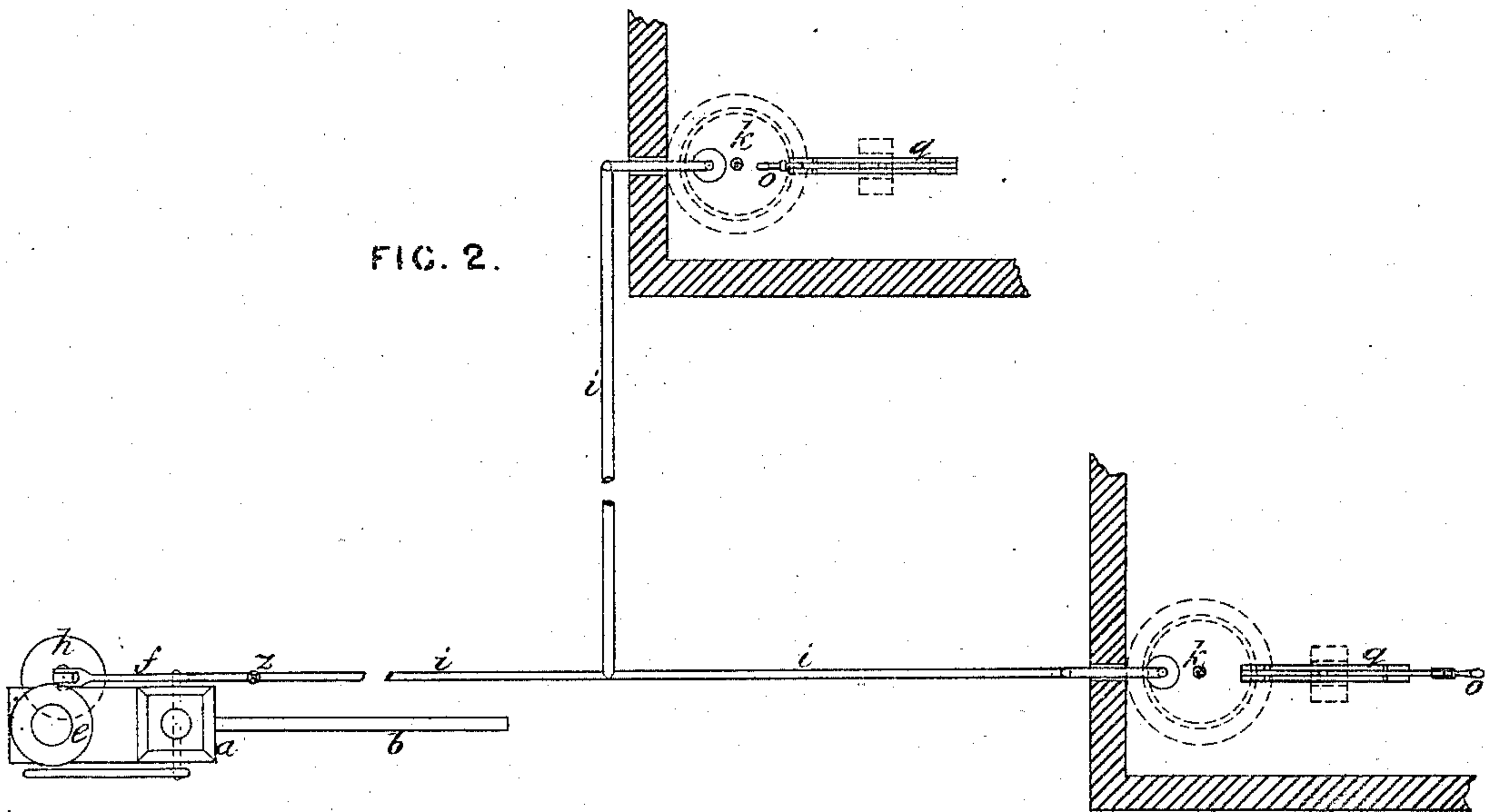


FIG. 2.



Witnesses: *Harry Smith*  
*Hubert Howson*

*Austin Chambers*  
*by his Atty.*  
*Stewart and Son*



# UNITED STATES PATENT OFFICE.

AUSTIN CHAMBERS, OF NO. 258 MARYLEBONE ROAD, GREAT BRITAIN.

## IMPROVEMENT IN PNEUMATIC RAILWAY-SIGNALING APPARATUS.

Specification forming part of Letters Patent No. **163,152**, dated May 11, 1875; application filed September 2, 1874.

*To all whom it may concern:*

Be it known that I, AUSTIN CHAMBERS, of No. 258 Marylebone Road, in the county of Middlesex, Kingdom of Great Britain and Ireland, have invented certain Improvements in Railway Signaling and Apparatus therefor, of which the following is a specification:

This invention is designed to supply a simple, efficient, reliable, and economical system of railway-signaling, and to enable railways to be worked in foggy or misty weather with greater safety than heretofore, and without the augmentation of staff, necessitated when signaling in foggy weather by the method at present commonly practiced. To this end, I suppress or dispense with the wires or metal-rod connections usually employed as mediums of communication between the signaling-boxes, stations, or places, and the semaphores and lamps; and in lieu of actuating or changing the positions of such signaling bodies or objects by the direct application thereto of mechanical means, I actuate them pneumatically—that is to say, I establish communication between the signaling bodies or objects and the boxes, stations, or places whence the same are to be operated by suitable pipes, tubes, passages, or vessels, and I effect the necessary movements or changes of position of the said signaling bodies or objects by changing the density or pressure of a volume (or volumes) of air or other elastic fluid contained in such pipes, tubes, passages, or vessels.

In apparatus according to my invention the ordinary or, what I will call, the normal pressure in the pipes, tubes, passages, or vessels is that of the external atmosphere for the time being or thereabout, and when this pressure prevails in the said pipes, tubes, passages, or vessels the signaling bodies or objects are invariably in the positions indicating danger, their movement into or toward the positions indicating safety or caution, being affected by augmenting or diminishing the pressure of the elastic fluid in the pipes, tubes, passages, or vessels.

And in order that others skilled in the art may be enabled to make and use my invention, I now proceed to describe the manner of carrying the same into practical effect, with

reference to the accompanying drawings, in which—

Figure 1 is a sectional elevation of apparatus, according to my invention. Fig. 2 is a plan.

*a* is a signal-post, carrying a semaphore, *b*, colored lenses *c* *d*, and a lantern, *e*. To the semaphore *b* is attached an arm, *f*, connected by a rod, *g*, to one end of a collapsible vessel, *h*, whence a pipe, *i*, communicates with a cylinder or vessel, *k*, having apertures *l*, communicating with the external atmosphere. This cylinder or vessel is accurately fitted with a piston, *m*, to which is jointed a rod, *n*, connected to a bell-crank lever, *o*, which is provided with a catch-rod, *p*, operating in conjunction with a notched curved bar, *q*. This apparatus is so arranged that when the normal or ordinary atmospheric pressure prevails in the pipe *i*, the weight of the arm *f* and its connections preponderates over the semaphore *b*, which is thereby kept in the horizontal or danger position, with the danger-lens *c* opposite to the lens of the lantern *e*, the collapsible vessel *h* being collapsed. This is the position represented in Figs. 1 and 2, which illustrates my invention, as arranged to meet the requirements of a case in which the concurrence of two signal-men, stationed at different points, is needed to move the signaling object into the position indicating that a train may pass. In these figures the right-hand lever and its piston are shown as having been moved into the safety or "pass on" position, but their movement into this position has not altered the position of the semaphore or lenses, owing to the escape provided by the apertures *l* of the left-hand cylinder or vessel *k* for the displaced elastic fluid, but on now moving over the left-hand lever *o*, on its piston passing the apertures *l* of its cylinder or vessel *k*, all means of escape will be cut off for the inclosed elastic fluid, which will consequently be compressed until by its pressure it will cause the collapsible vessel *h* to expand or open out, thereby raising the rod *g*, arm *f*, and safety or "pass on" lens *d*, and lowering the semaphore *b* into the position indicating that a train may pass on.

A collapsible vessel, which may be of india-rubber with metal ends, may be substituted for



the cylinder *k* and the piston *m*, already described.

It will be evident that by applying the arm *f* and rod *g* on the opposite side of the semaphore *b* to that shown in Fig. 1, and arranging the apparatus so that when the semaphore *b* is in the stop or danger position the collapsible vessel *h* shall be expanded and the piston *m* raised, the semaphores will be moved down and lenses up into the safety or pass-on position by rarefying or reducing the pressure of the elastic fluid in the pipe *i* on moving over the lever *o*. It will also be evident that other arrangements of apparatus may be employed for effecting the augmentations or diminutions of pressure, as required. For example, the compressors, exhausters, or rarefiers, may be in the form of gas-holders or governors connected with the signaling levers, handles, or equivalent apparatus, so as to be actuated for compressing or rarefying the elastic fluid when such levers or handles are moved; or accumulators or reservoirs of compressed air or elastic fluid, or exhausters or vessels in which a partial vacuum or reduced pressure has been established and is maintained, may be used in conjunction with the pipes, tubes, passages, or vessels communicating with the signaling bodies or objects, as aforesaid, and the temporary augmentations or diminutions of pressure in the said pipes, tubes, passages, or vessels may be effected by the opening of suitable cocks or ways establishing communication with such accumulators or reservoirs of such air or elastic fluid, or with the exhausters or rarefiers, as the case may be, so as to admit compressed air or elastic fluid into the pipes, tube, passages, or vessels, or to partially exhaust therefrom the air or elastic fluid they contain.

When applying a reservoir of compressed air or elastic fluid, I connect the pipe, tube, or passage leading from the signaling object or body with an air-tight tank or vessel provided with a feed-pump for maintaining the requisite pressure of air or elastic fluid in the tank or vessel. With the pipe, tube, or passage, and the store tank or vessel, I combine an ordinary two-way cock or equivalent device, which, in one position, will establish communication between the interior of the pipe, tube, or passage, and the store tank or vessel, while in another position of the said cock, such communication will be closed, and the pipe, tube, or passage opened to the external atmosphere for bringing the signaling object or body to the danger position, as already explained.

This arrangement will be readily understood without further description.

For moving the signaling object or body into the safety position, by reducing the pressure of the elastic fluid in the pipe, tube, or passage, a similar arrangement may be used, except that the pump, instead of feeding air or elastic fluid into the air-tight tank or vessel, will be arranged to withdraw air there-

from, so as to maintain therein the required partial vacuum or reduced pressure.

By arranging the apparatus so that at the normal pressure all the signaling bodies or objects shall be in the position indicating danger, as above described, I effectually guard against accident arising from any leakage or other defect in the apparatus, inasmuch as any undue diminution or increase of pressure will tend to move the signaling bodies or objects into, or will have the effect of allowing them to resume, the position indicating danger, thus preventing the passage of trains until the defect has been made good.

My invention is applicable for signaling in various situations; and may be used with great advantage for working distance-signals and junction-signals, as well as for signaling on railways where the traffic is worked upon what is known as the block system. It will enable distance-signals to be worked with facility at much greater distances than by the ordinary method of actuating the semaphores by wires or metal-rod connections, thus obviating the employment, in foggy or misty weather, of chains of men communicating signals along the line beyond the distance-signals, as now commonly requisite. In the pipes, tubes, or passages communicating with distance-signals I, in some cases, provide cocks *z*, or equivalent means, at intervals, whereby the guard of a train or other official may, when necessary—as, for example, when a train has passed, and stopped within a distance-signal, and it is desired to stop other trains following—reduce or increase the pressure in the pipe, tube, or passage leading to the distance and home signals, and thereby cause the same to assume the positions indicative of danger.

I provide similar arrangements, in conjunction with indicators actuated by the change of pressure in the pipes, tubes, passages, or vessels at railway-stations, for the use of station-masters, platform-foremen, and other officials. In such an arrangement a branch pipe is carried from the pipe *i*, and is provided with a cock and with a gage for indicating the pressure of the fluid in the branch. In this way my invention will afford a simple and efficient check upon the signalmen in the boxes away from the station, at the same time giving the officials at either of these places power to alter the pressure in the pipes, tubes, passages, or vessels in such manner as to allow the signals to resume the danger position.

My invention may be advantageously applied at junctions, or in other situations where it is requisite that three or four signalmen, acting independently, should move their respective levers before the semaphore or signaling body or object can be caused to assume the position indicating safety. For this purpose I use the arrangement shown in, and described with reference to, Figs. 1 and 2, providing an orifice or airway, *l*, in the cylinder *k* of each



pump at the inner side of the piston, so that until the pistons of all the pumps are moved inward past the orifices or airways in their cylinders no augmentation or diminution of the normal pressure in the pipes, tubes, or passages leading to the signal can be maintained.

In lieu of the orifices or airways as above described, taps or cocks may be arranged to be opened and closed, as required, by the movements of the signaling-lever, as will be readily understood.

I claim—

1. The combination, in a railway-signaling apparatus, of a semaphore - arm, lamp, and lenses, a pipe, passage, or vessel charged with elastic fluid, and appliances for changing the pressure of such fluid, whereby the said arm is retained in a predetermined position whenever and so long as the pressure of the said elastic fluid is the same as that of the external atmosphere.

2. The combination of a signal, or single series of signals, a pipe, passage, or vessel charged with elastic fluid by the compression or expansion of which the signal appliances are operated, and two or more pumps or compressors communicating with said passage or vessel, and constructed to permit the escape of said fluid, except when all said pumps or compressors are or have been arranged or operated to force the fluid toward the signaling apparatus, as set forth.

AUSTIN CHAMBERS.

Witnesses:

F. J. BROUGHAM,

*Clerk to Mr. W. Lloyd Wise,*

*Patent Agent, London.*

M. E. BAGNALL,

*Chandos Chambers, Adelphi, W. C.*