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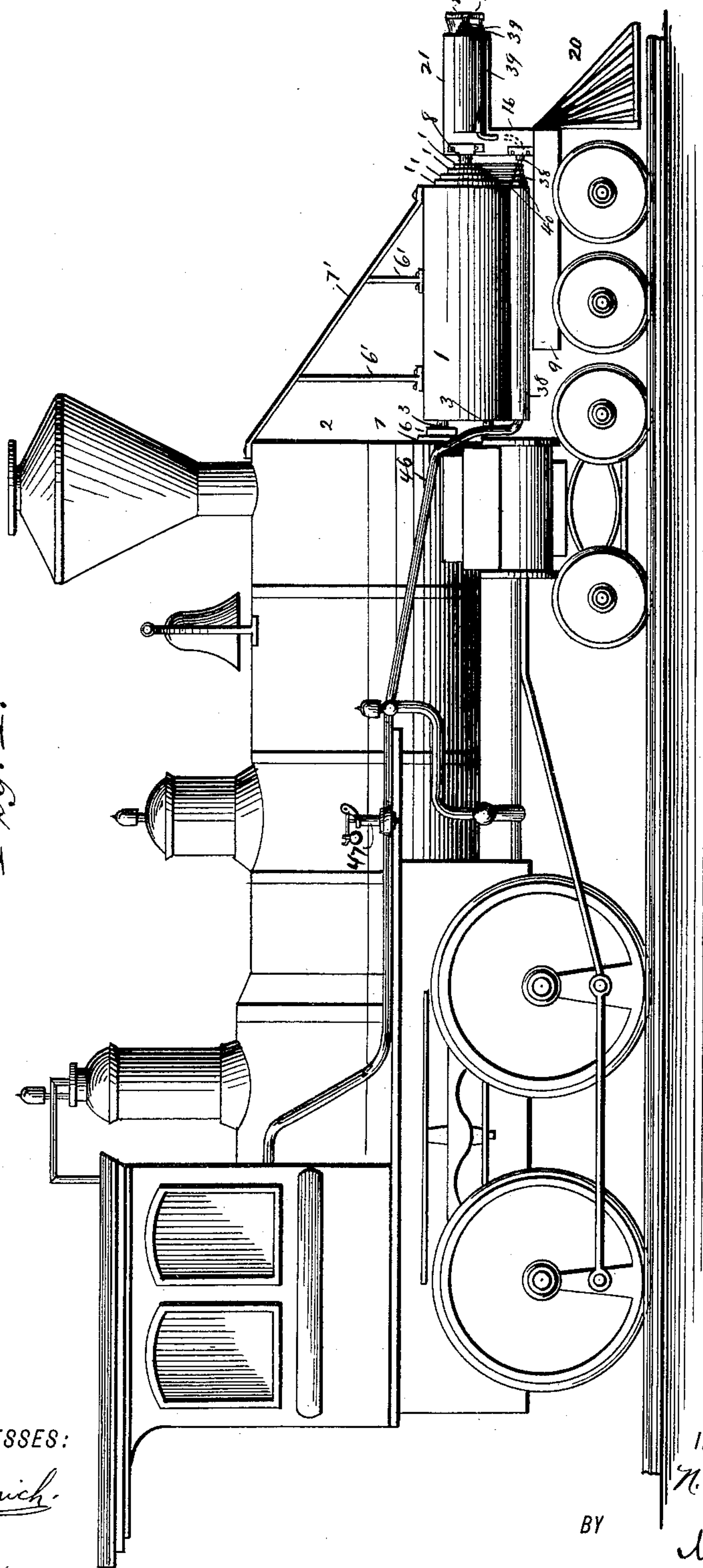
6 Sheets—Sheet 1.

N. S. MUSSEY.  
SAFETY PILOT FOR RAILWAY TRAINS.

No. 407,103.

Patented July 16, 1889.

Fig. 1.



WITNESSES:

*Phil C. Dietrich*  
*C. Sedgwick*

INVENTOR:

*N. S. Mussey*

BY

*Munn & Co*

ATTORNEYS.

(No Model.)

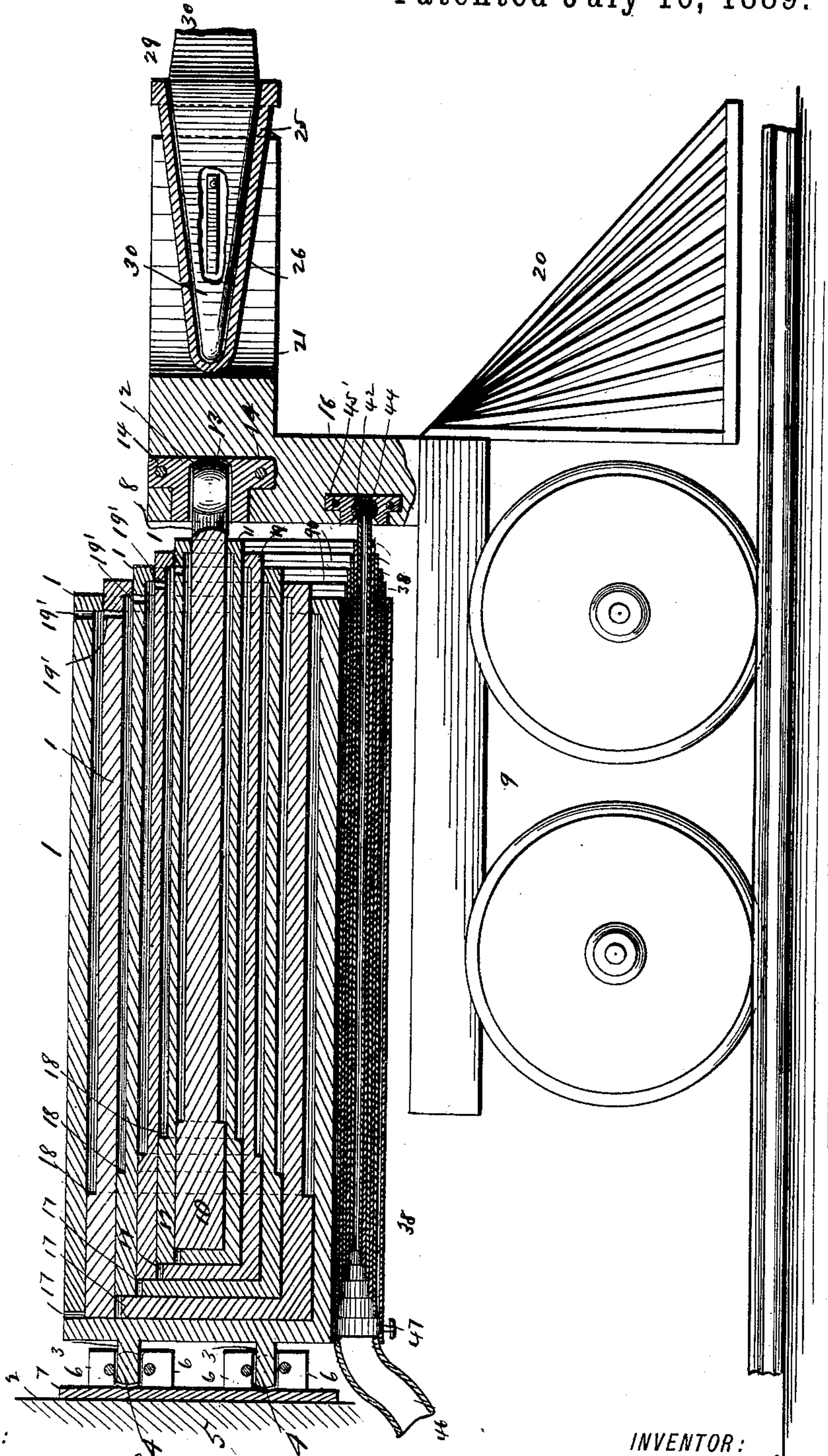
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N. S. MUSSEY.  
SAFETY PILOT FOR RAILWAY TRAINS.

No. 407,103.

Patented July 16, 1889.

Fig. 2.



WITNESSES:

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(No Model.)

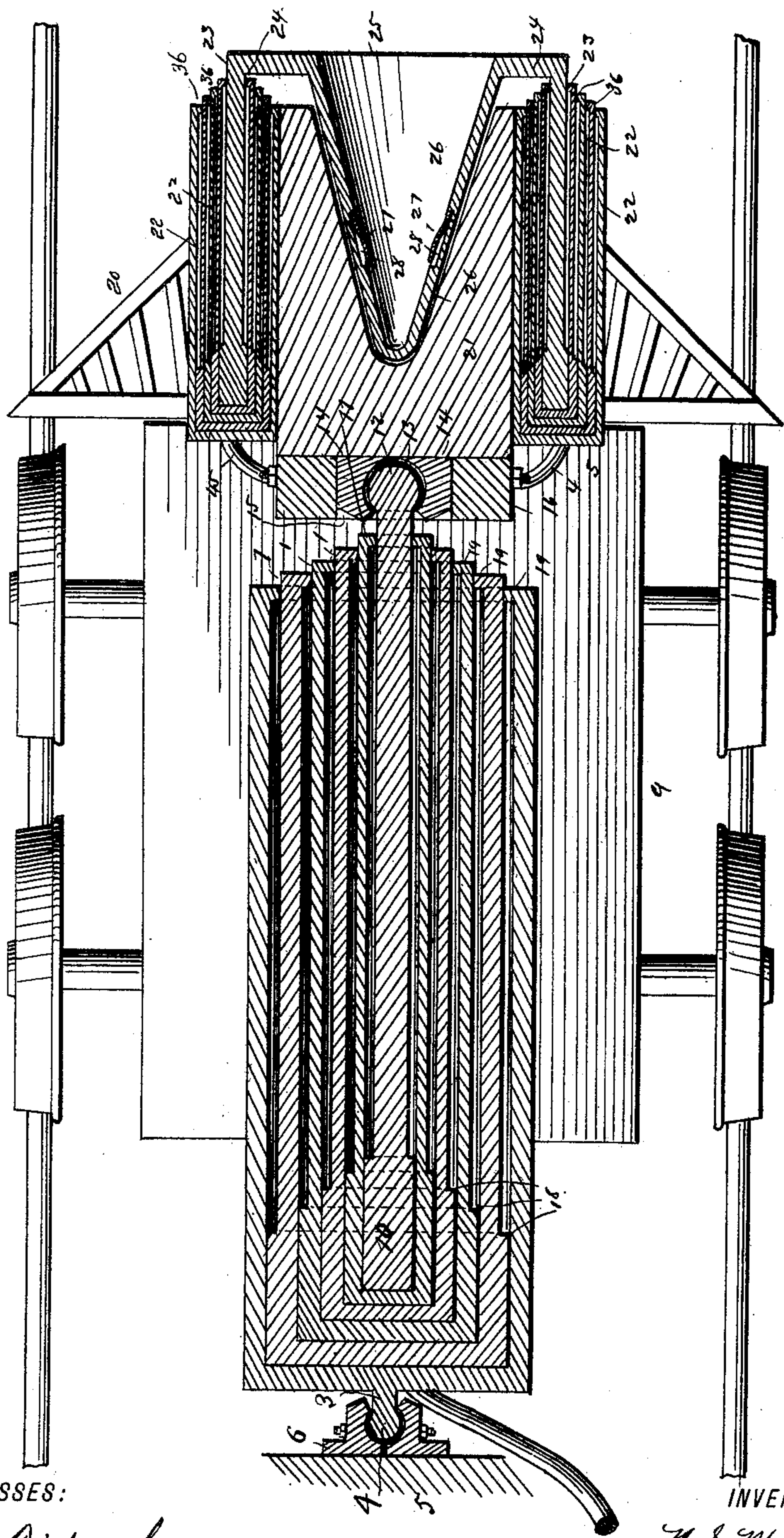
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N. S. MUSSEY.  
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Patented July 16, 1889.

Fig. 3.



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N. S. MUSSEY.  
SAFETY PILOT FOR RAILWAY TRAINS.

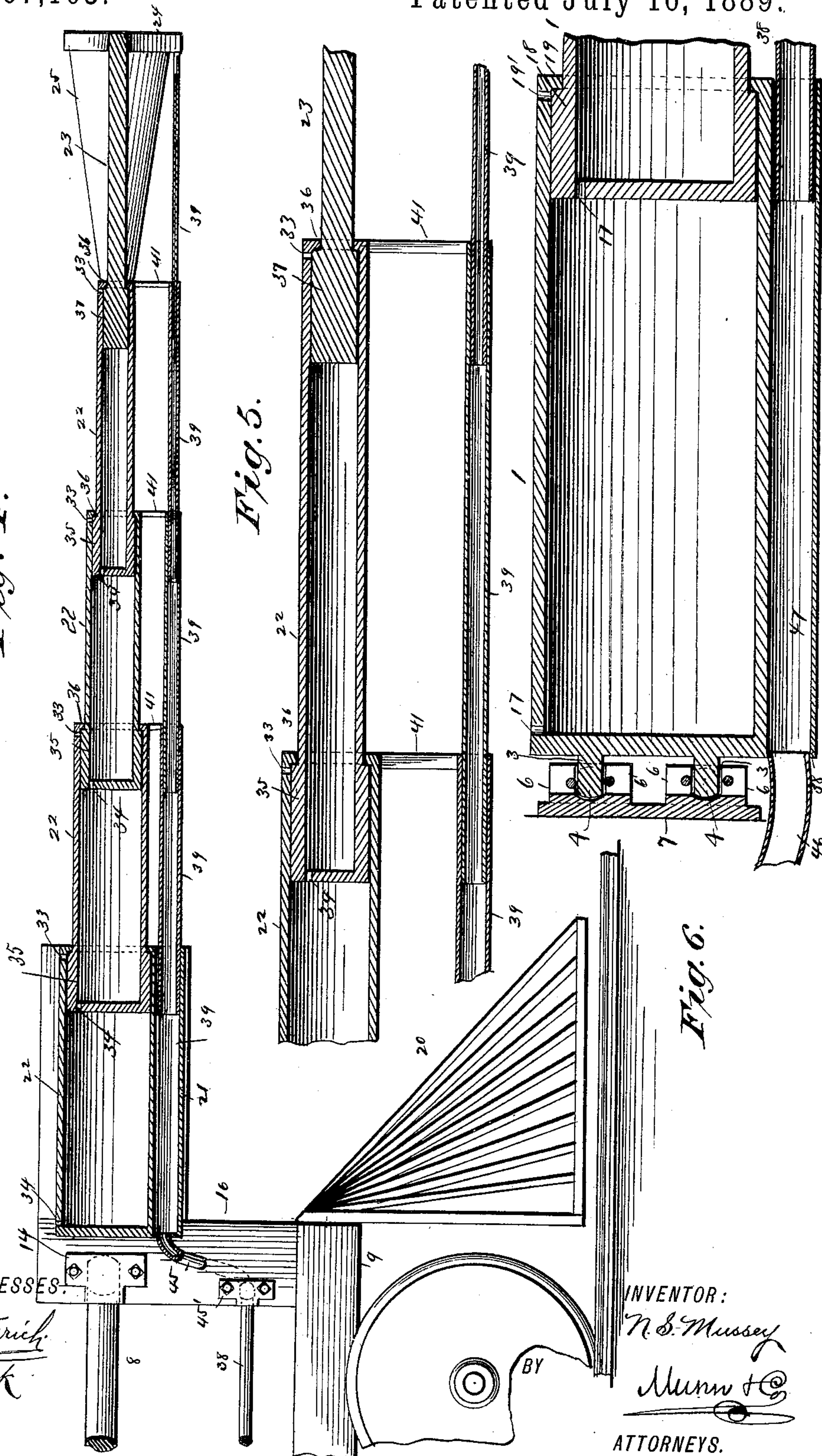
No. 407,103.

Patented July 16, 1889.

Fig. 4.

Fig. 5.

Fig. 6.



WITNESSES.

Phil. C. Dietrich  
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N. S. MUSSEY.  
SAFETY PILOT FOR RAILWAY TRAINS:

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Fig. 7.

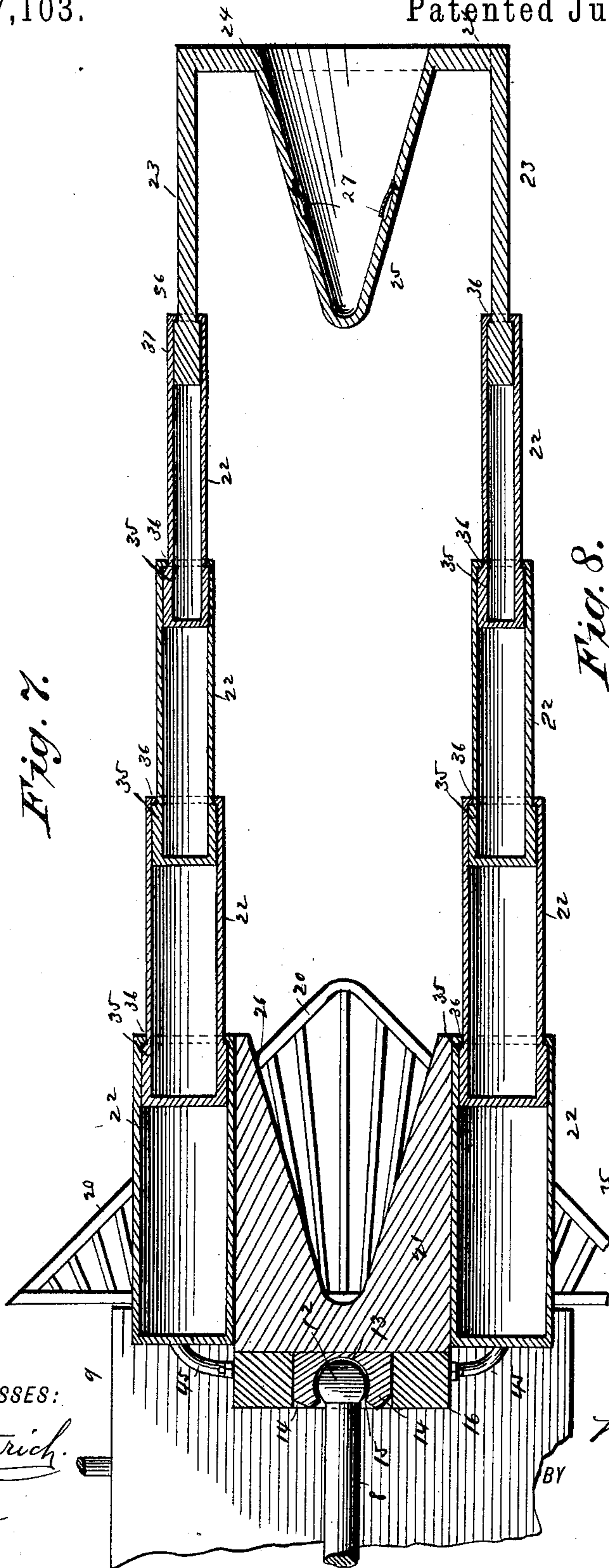
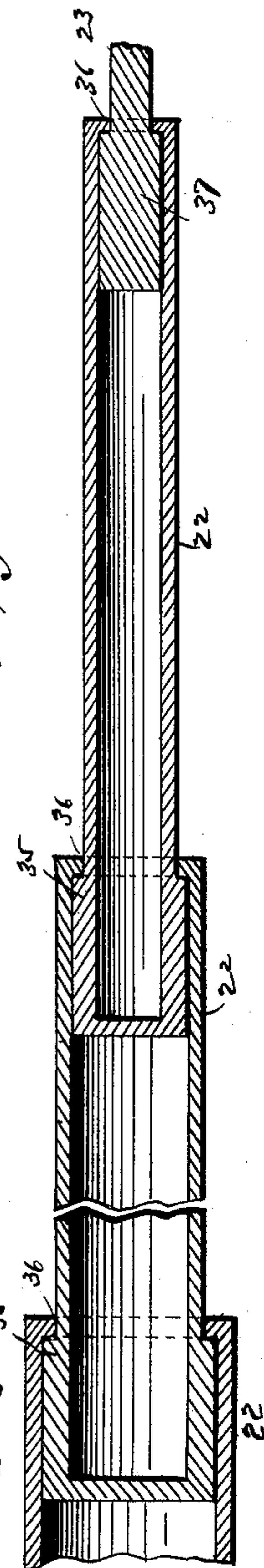


Fig. 8.



WITNESSES:

*Phil. C. Dietrich.*  
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(No Model.)

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N. S. MUSSEY.  
SAFETY PILOT FOR RAILWAY TRAINS.

No. 407,103.

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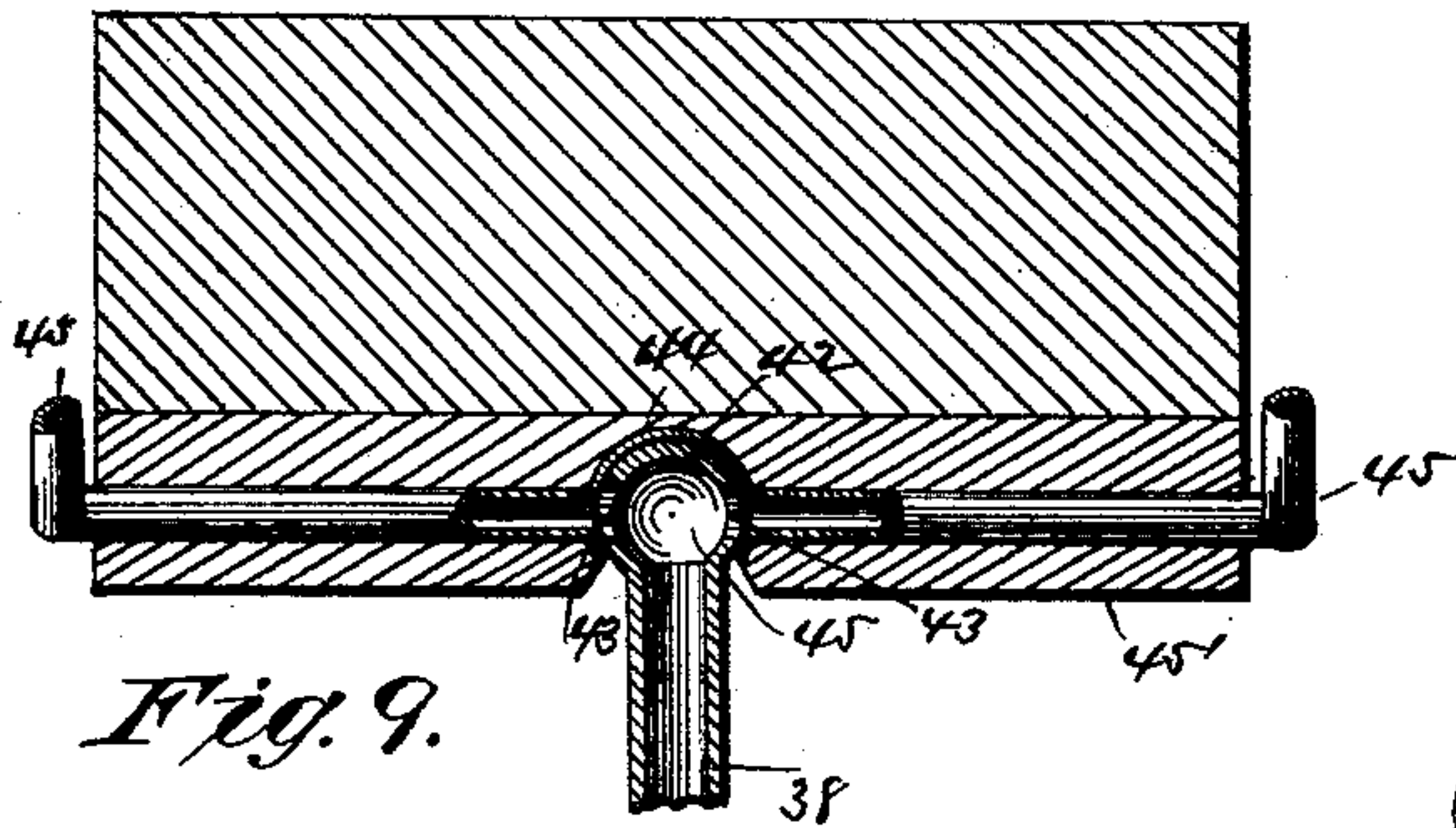


Fig. 9.

Fig. 10.

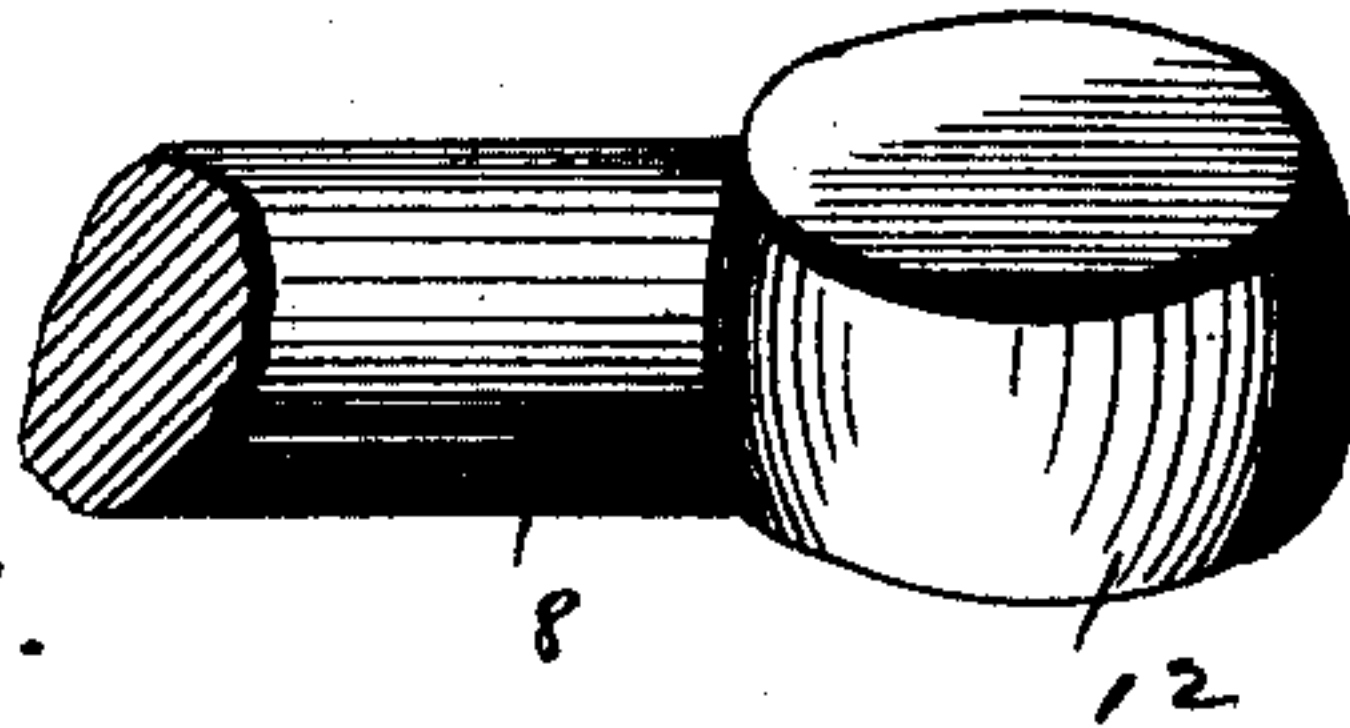


Fig. 11.

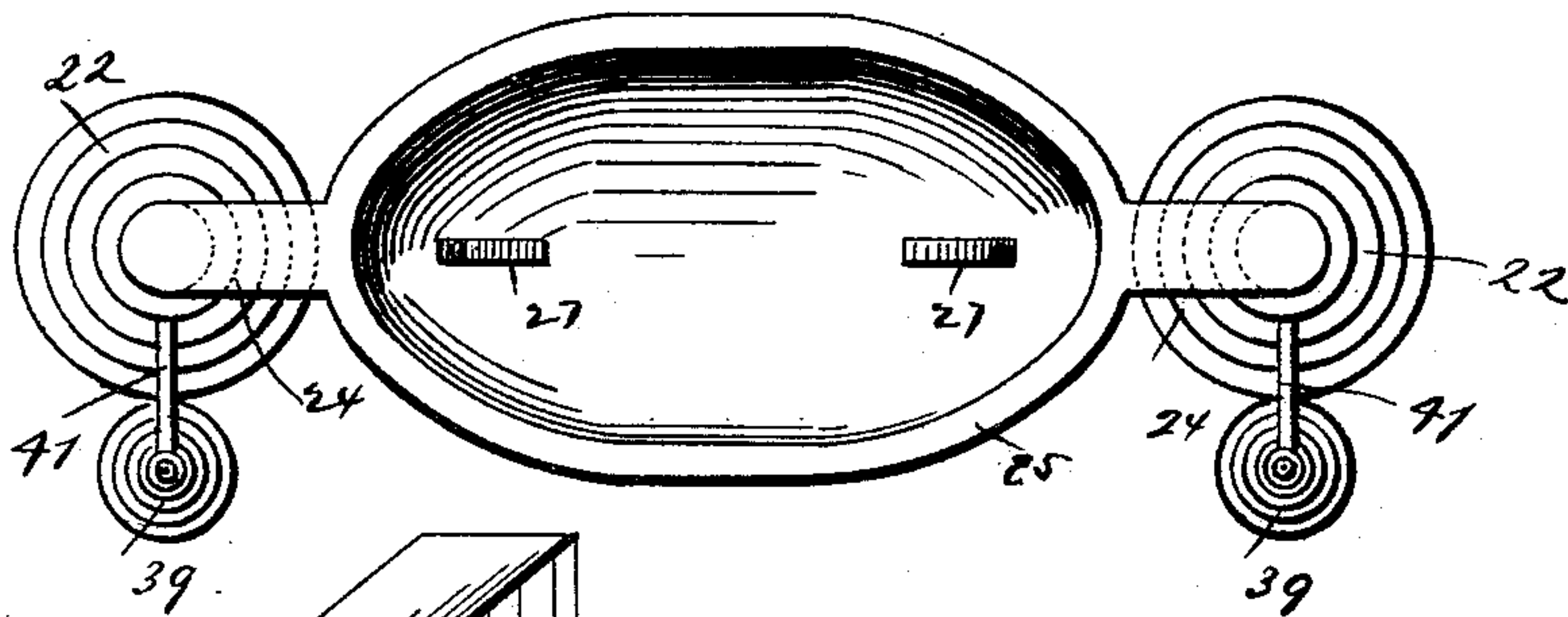


Fig. 12.

Fig. 13.

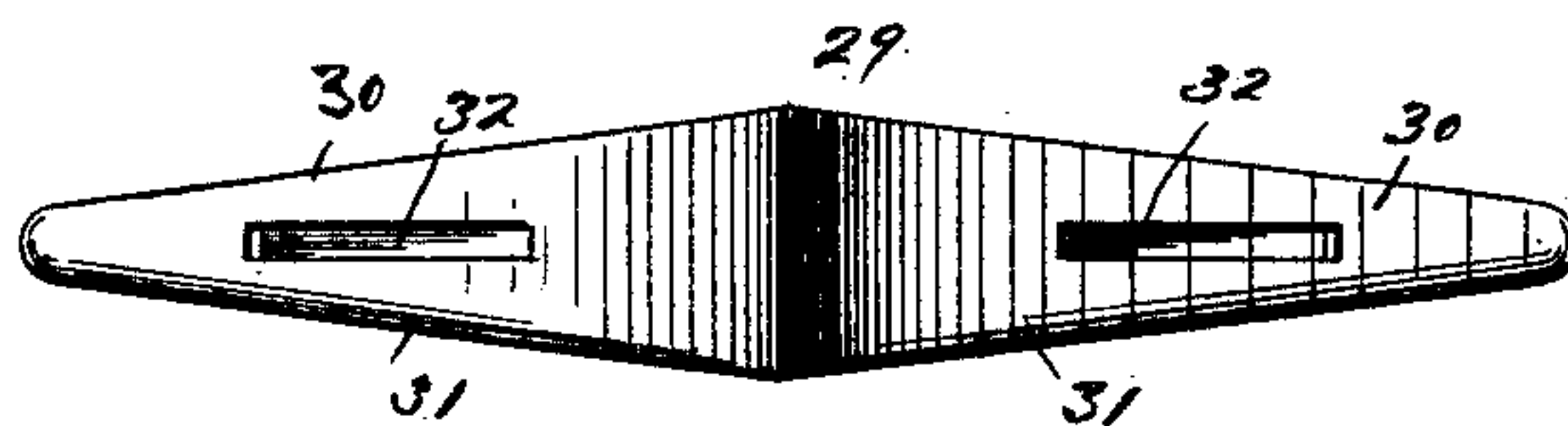
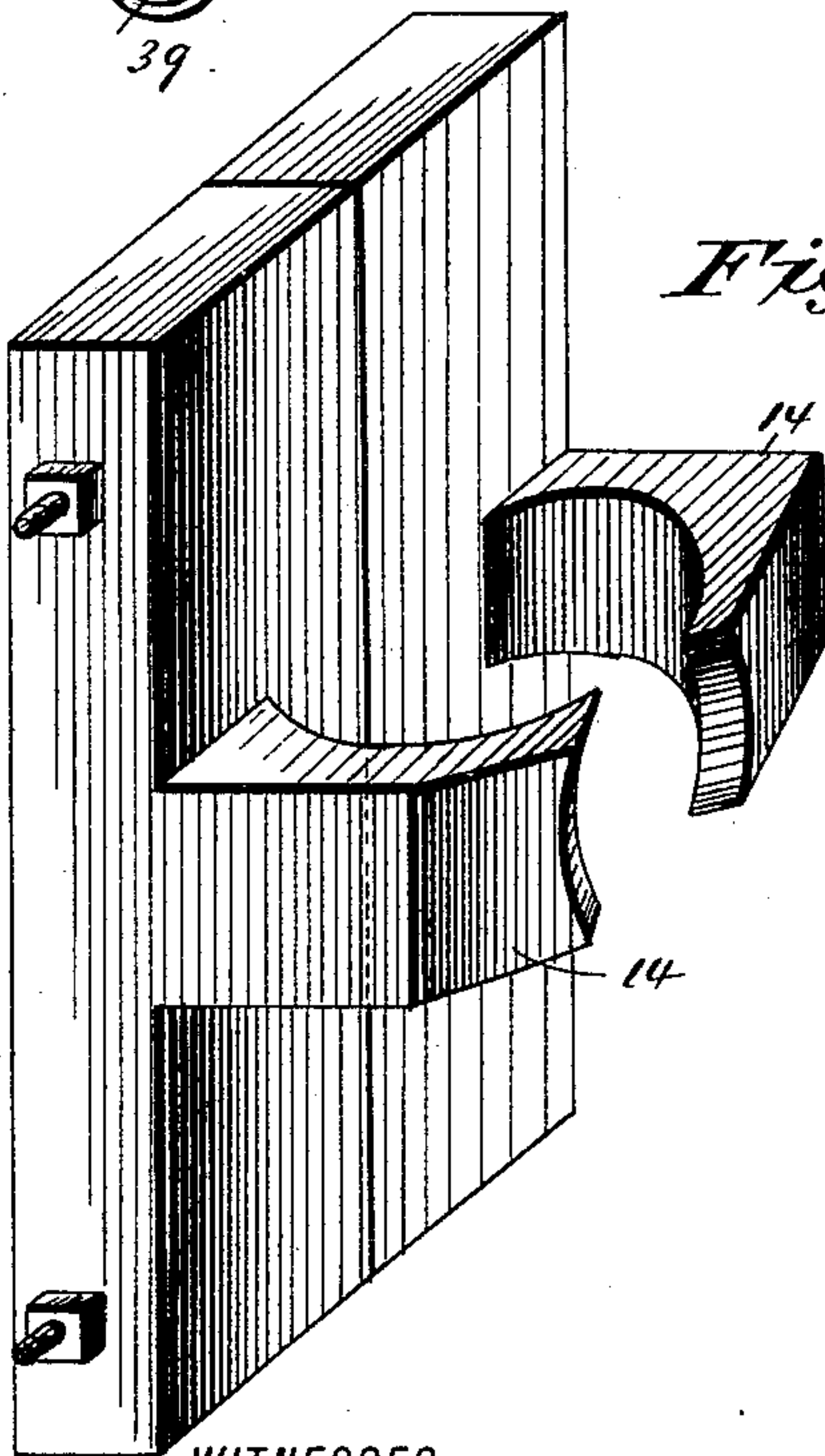
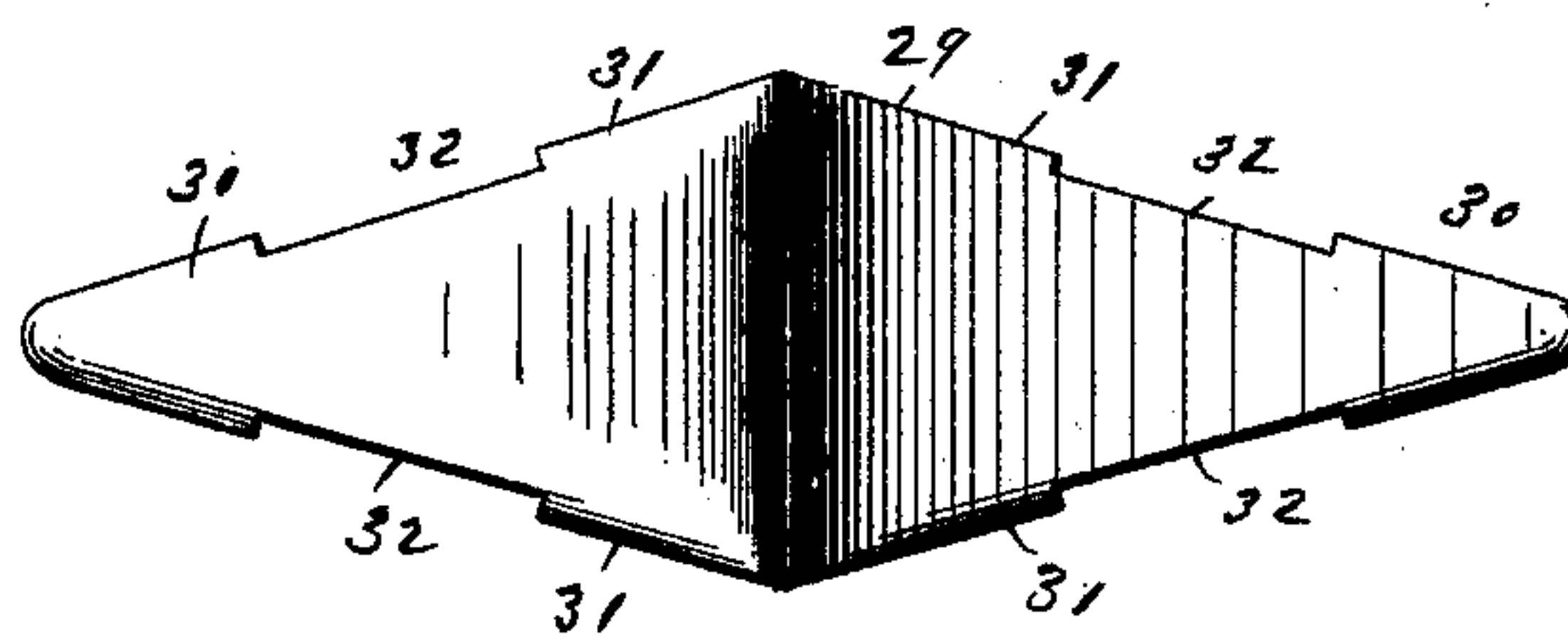


Fig. 14.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

NORMAN S. MUSSEY, OF NEW YORK, N. Y.

## SAFETY-PILOT FOR RAILWAY-TRAINS.

SPECIFICATION forming part of Letters Patent No. 407,103, dated July 16, 1889.

Application filed November 30, 1888. Serial No. 292,270. (No model.)

*To all whom it may concern:*

Be it known that I, NORMAN S. MUSSEY, of the city, county, and State of New York, have invented a new and Improved Safety-Pilot for Railway-Trains, of which the following is a full, clear, and exact description.

This invention has for its object to provide an apparatus to be attached to and propelled in front of a railway-train for the purpose of preventing the derailment and destruction of a train by a collision.

The invention consists in an apparatus attached to the front of a train and propelled thereby, so constructed and arranged that upon colliding with an obstacle or train coming in the opposite direction it will serve as a collapsible cushioning-buffer to remove the shock of the collision from the train and permit it to be brought to a standstill without being injured or derailed.

The apparatus consists, in general, of a series of air chambers or compartments serving as air-cushions, which are connected so as to telescope together or permit the air in the chambers to be gradually driven out, and are mounted on a suitable rolling support, which is brought adjacent to the end of the train to which the apparatus is attached, or removed some distance in advance of the end of the train by the folding or unfolding of the telescoping air-chambers. The telescoping air-chambers are moved into extended position by means of a series of telescoping tubes attached to the telescoping chambers and the end of the train, and operated by steam or compressed air from the latter.

The invention will be set forth in the drawings and following description, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures of reference indicate corresponding parts in all the views.

Figure 1 is a side view of a locomotive, showing the invention applied and in folded position. Fig. 2 is a view of the invention partly in vertical longitudinal section. Fig. 3 is a plan view thereof in horizontal section. Fig. 4 is a detail thereof, showing it partly broken away and an extended telescoping portion in vertical longitudinal section. Fig.

5 is an enlarged detail view of the extended telescoping portion in Fig. 4. Fig. 6 is an enlarged detail view, in vertical section, of a portion of the extended telescoping chambers and pipes in Fig. 2. Fig. 7 is a detail in horizontal section of the extended telescoping portion in Fig. 4. Fig. 8 is a detail showing one of the sectional telescoping series of air-chambers in Fig. 7. Fig. 9 is a detail in horizontal section with parts broken away of the connecting-joint between the rolling support and the telescoping steam or compressed-air pipes connecting it with a train. Fig. 10 is a detail of the coupling-arm connecting the telescoping air-chambers extending from the end of the train with the rolling support. Fig. 11 is a detail of the apparatus, showing the recessed forward end thereof and the telescoping chambers. Fig. 12 is a detail view showing the socket for the coupling-arm in Fig. 10, and Figs. 13 and 14 are side and plan views of a head piece or block which is fastened in the recessed forward end of the apparatus.

In the construction of the apparatus a series of air-chambers 1 are employed, preferably of cylindrical shape, and arranged to telescope together. The rear air-chamber 1 is attached to the front of a locomotive 2 in any suitable manner, and, as here shown, by means of lugs 3, having a ball-shaped head 4, located to turn in a socket 5, formed by means of recessed brackets 6, one of which is formed on a plate 7, bolted to the front of locomotive 2, and the other bolted to the adjacent bracket 6. The rear air-chamber 1 is also secured to the locomotive 2 and braced by vertical rods 6' and an inclined rod 7'.

The front air-chamber 1 is connected by a coupling-bar 8 with a rolling support 9, adapted to run on the tracks in front of the locomotive 2, the bar 8 having a head 10 at one end, movable in the central air-chamber 1, and held from being pulled out of said air-chamber 1 by a flange 11 on the forward end of the latter, and having an oval head 12 at its forward end held to turn in a socket 13, formed by means of recessed brackets 14, located in a recess 15 in an upright 16 on the front of the rolling support 9 and bolted to the upright 16. Any number desired of the



air-chambers 1 may be employed. As here shown, five are used, each of which is of a suitable length—say, on an average, five feet—so that when the series of telescoping air-chambers 1 are drawn out they will extend several feet in front of the train. The air-chambers 1 are also of such diameter—say two feet—beginning with the largest air-chamber, which is the rear one, and gradually diminishing toward the front and smallest air-chamber, as to present a series of air-chambers, by means of which a gradual resistance is afforded in the telescoping of the sections resulting from a collision, which resistance increases as the pressure becomes greater in the last or rear air-chamber. The air-chambers are so connected that, through the ball-and-socket connections at the ends of the series with the locomotive 2 and the rolling support 9, the series of extended telescoping air-chambers 1 are allowed sufficient lateral movement to properly move around curves on the track.

The scale of resistance in all the air-chambers 1 is regulated by means of holes 17 for the escape of air, irregularly located with respect to each other in the rear end of the air-chambers 1 and gradually diminishing in size in each air-chamber from the front to the rear chamber. To give the air-chambers 1 the proper strength to stand the pressure and strain brought to bear on them by the collision of a train advancing in the opposite direction, the air-chambers 1 are preferably made of steel, the rear air-chamber being about two inches in thickness, where five or six air-chambers are employed in the series, and the front air-chamber being about one inch in thickness, with the intermediate air-chambers varying in thickness between the thicknesses of the end air-chambers.

The coupling-bar 8 is about three inches in thickness. The rear ends of the air-chambers 1 are formed with a shoulder 18, which abuts against a flange 19 on the forward end of the air-chambers, and each shoulder 18 is located at such a distance from the rear end of the air-chambers that upon the latter being drawn out to fully-extended position a sufficient rear portion of each air-chamber will remain in the succeeding chamber to form a strong joint for two adjacent air-chambers. In order that the chambers 1 may serve as perfect air-cushions, each chamber is fitted into the succeeding one so as to form an air-tight piston. At the forward end of the air-chambers 1 are irregularly located with respect to each other holes 19', by means of which air is admitted to the front of a chamber about the chamber located in it, and in the case of the bar 8 about the latter in the front air-chamber.

The rolling support 9, as here shown, consists of a low and short platform-car mounted on wheels and of such a height as to run under the air-chambers 1 when telescoped. It

is provided with a cow-catcher 20, so as to prevent being derailed if a low object is located on the track ahead of it. The upright 16 is formed at its top with a projecting piece 21, to the sides of which are secured, by bolts or in any other suitable manner, the rear air-chambers of a second double series of telescoping air-chambers 22, somewhat similar to the series of air-chambers 1. These air-chambers 22 are also preferably made of steel, but are lighter than the air-chambers 1.

As in the case of the air-chambers 1, any number of the air-chambers 22 may be employed. As here shown, four air-chambers are employed in each series, the rear one being two feet four inches long and six and one-half inches in diameter, and the others being of gradually-diminishing proportions from the rear to the front chamber, in which is located a bar 23 two inches thick. The bars 23 are connected at their outer ends to lugs 24 on a cone 25, which fits into a correspondingly-shaped recess 26 in the projecting piece 21 when the chambers 22 are folded within each other. The cone 25, which may be termed a "grappling-cone," is provided on its interior surface with springs to engage and hold a head-piece. As here shown, spring-arms 27 are employed, secured in recesses 28 in the surface of the cone 25, and having their free ends projecting out of the recesses 28 and rearwardly in the cone 25.

The head-piece 29 consists of a block formed with two tapering ends 30 and of such a shape and length that one half of the head-piece 29 fits into the cone 25 and the other half is adapted to fit into a cone corresponding to cone 25 and located at the head of an apparatus similar to the invention herein described and attached to the front of a train advancing in the opposite direction. The sides 31 of the head-piece 29 are provided with shouldered recesses 32, which are adapted on one end to engage the spring-arms 27, and thereby engage and hold the head-piece 29 in the cone 25, with a pointed half of the head-piece 29 projecting therefrom.

The chambers 22 are provided at their forward ends with air-inlet holes 33 of varying size, located irregularly with respect to each other, and with holes 34 at their rear end for the escape of air, of varying size, located irregularly with respect to each other, similarly to the holes 17 and 19' in air-chambers 1. In like manner the air-chambers 22 are formed with shouldered rear ends 35 and flanges 36 at their forward end, as in the case of chambers 1, for the same purpose, the extended portions and the portions remaining in the air-chambers 22 of each air-chamber 22 being of such relative length that when the series of air-chambers 22 are fully drawn out they will be firm and self-supporting, the two series of air-chambers 22 projecting in advance of the rolling support 9 without any means for vertically supporting them. The bars 23 are each



formed with a head 37 at their rear end, which is located in the front air-chamber 22 of each series and serves as a piston.

The double series of air-chambers 22 act in a collision partly as an air-cushioning buffer for the rolling support 9, and in the main similarly as the air-chambers 1, to receive the shock and then gradually transmit it to the series of air-chambers 1 and aid in averting the collision from the train and permitting it to gradually come to a standstill. In order to move the air-chambers 1 and 22 into extended position, means are provided by which they may be operated from the locomotive. As shown, this consists of a series of telescoping tubes 38, connected to the air-chambers 1, and a double series of telescoping tubes 39, connected to the air-chambers 22. The rear tube of the series of tubes 38 is secured to the rear air-chamber of the series of air-chambers 1, and the remaining tubes 38 are connected by rods 40 with the chambers 1, so as to move therewith. The rear tubes 39 are secured to the rear air-chambers of the double series of air-chambers 22, and the remaining tubes 39 of the double series are connected by rods 41 with the chambers 22 to move therewith. The tube 38 at the front end of the series of tubes 38 is formed at its forward end with a ball-shaped head 42, having lateral ports or holes 43, and located to turn in a correspondingly-shaped socket 44 in a plate 45' in the upright 16 on rolling support 9, the socket 44 having lateral branch tubes 45 extending through said plate 45', inserted in upright 16 and connecting with the rear tubes of the double series of tubes 39. The inner ends of the branch tubes 45 register with the ports 43, forming steam-tight joints therewith. By means of the joint formed by the ball-shaped head 42 and socket 44 the parts are permitted to have a lateral movement when the rolling support is rounding a curve. When the series of tubes 38 and 39 are drawn out, they each practically form a continuous tube.

Compressed air or steam may be admitted to the series of tubes 38 and 39 to extend them, and thereby extend the series of air-chambers 1 and 22. In the present instance steam may be admitted from the locomotive 2 by a pipe 46, connected to and of equal diameter with the rear tube 38 and leading to the steam-boiler of the locomotive. As the steam is thrown into the tubes 38 through the pipe 46 when they are in folded position, as shown in Figs. 1 and 2, they are moved out to extended position and thereby extend the air-chambers 1 and the bar 8, the rolling support 9 being carried forward in front of the locomotive. The steam entering the double series of tubes 39 through branch tubes 45 also moves the tubes 39 into extended position in advance of the rolling support 9, and at the same time extends the double series of air-chambers 22 and the bars 23 with cone 25. When the series of tubes 38 and 39 have been moved out by the steam to the fullest extent,

the additional pressure of the steam is relieved by means of a safety-valve 47 in the pipe 46, through which the steam is permitted to escape.

In employing this invention the herein-described apparatus with the head-piece 29 is used with trains moving in one direction on the line and the apparatus without the head-piece 29 is used with trains moving in the opposite direction on the line, so that upon two trains coming in collision the head-piece 29 will strike against and engage the cone 25 on the meeting train, thereby grappling the opposing ends of the opposing apparatus and causing the telescoping air-chambers to be steadily telescoped. In any event, whether the telescoping apparatus collides with another telescoping apparatus or with some other object, the gradually-cushioning effect of the apparatus will prevent the train to which it is attached from being derailed or crushed.

While I have set forth a specific construction of parts, I do not intend to limit myself thereto, as the parts may be varied without departing from the essential features of the invention.

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

1. The combination, with a locomotive, of a series of telescopic air-cushion chambers, a buffer at the outer end of the telescopic air-cushion chambers, and a rolling support for the telescopic chambers, substantially as shown and described.

2. The combination, with a locomotive, of a series of telescopic air-cushion chambers with a buffer at their outer end, a pilot-car for supporting the telescopic air-cushion chambers, and means, substantially as described, for moving the telescopic air-chambers into extended position, substantially as shown and described.

3. The combination, with a locomotive, of a series of telescopic air-cushion chambers with a buffer at their outer end, a pilot-car for supporting the telescopic air-cushion chambers, and a series of telescopic tubes connected with the telescopic air-cushion chambers and with the locomotive and adapted to be projected by means of steam or compressed air, substantially as shown and described.

4. The combination, with a locomotive, of a series of telescopic air-cushion chambers with a buffer at their outer end, a pilot-car for supporting the telescopic air-cushion chambers, and a series of telescopic tubes connected with the telescopic air-cushion chambers and with the locomotive and adapted to be projected by means of steam, the several air-cushion chambers and steam-tubes being flexibly connected with the locomotive and the pilot-car, substantially as set forth.

5. The combination, with a locomotive, of a pilot-car, a series of telescopic air-cushion chambers forming a connection between the



pilot-car and the locomotive, a second series of telescopic air-cushion chambers mounted on the pilot-car with a buffer at their forward end, and means for projecting the first and second series of telescopic air-cushion chambers, substantially as shown and described.

6. The combination, with a locomotive, of a pilot-car, a series of telescopic air-cushion chambers forming a connection between the pilot-car and the locomotive, a double series of telescopic air-cushion chambers mounted on the pilot-car and having a buffer at their forward end, a series of telescopic tubes connected with the several series of telescopic air-cushion chambers and movable therewith and connected with the locomotive to be extended by steam or compressed air, substantially as shown and described.

7. The combination, with a locomotive, of a series of telescopic air-cushion chambers, a buffer at their outer end formed with an open recess having inwardly-projecting spring-clutches, and a rolling support for the telescopic air-cushion chambers, substantially as shown and described.

8. The combination, with a locomotive, of a series of telescopic air-cushion chambers, a

buffer at their outer end formed with an open recess having inwardly-projecting spring-clutches, and a detachable head-piece with lateral slots engaging the spring-clutches and projecting out of the buffer, and a rolling support for the telescopic air-cushion chambers, substantially as shown and described.

9. The combination, with a locomotive 2, of a pilot-car 9, a series of telescopic air-cushion chambers 1, connected to the locomotive 2 and having a piston-rod 8 at their forward end flexibly connected to car 9, a double series of telescopic air-cushion chambers 22, mounted on the pilot-car 9 and having a buffer at their forward end, a series of telescopic tubes 38, connected to air-chambers 1 and connecting by a pipe 46 at their rear end with the boiler of locomotive 2, the pipe 46, having a safety-valve 47, and a double series of telescopic tubes 39, connected to air-chambers 22 and connecting by means of branch tubes 45 with tubes 38, substantially as shown and described.

NORMAN S. MUSSEY.

Witnesses:

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EDGAR TATE.