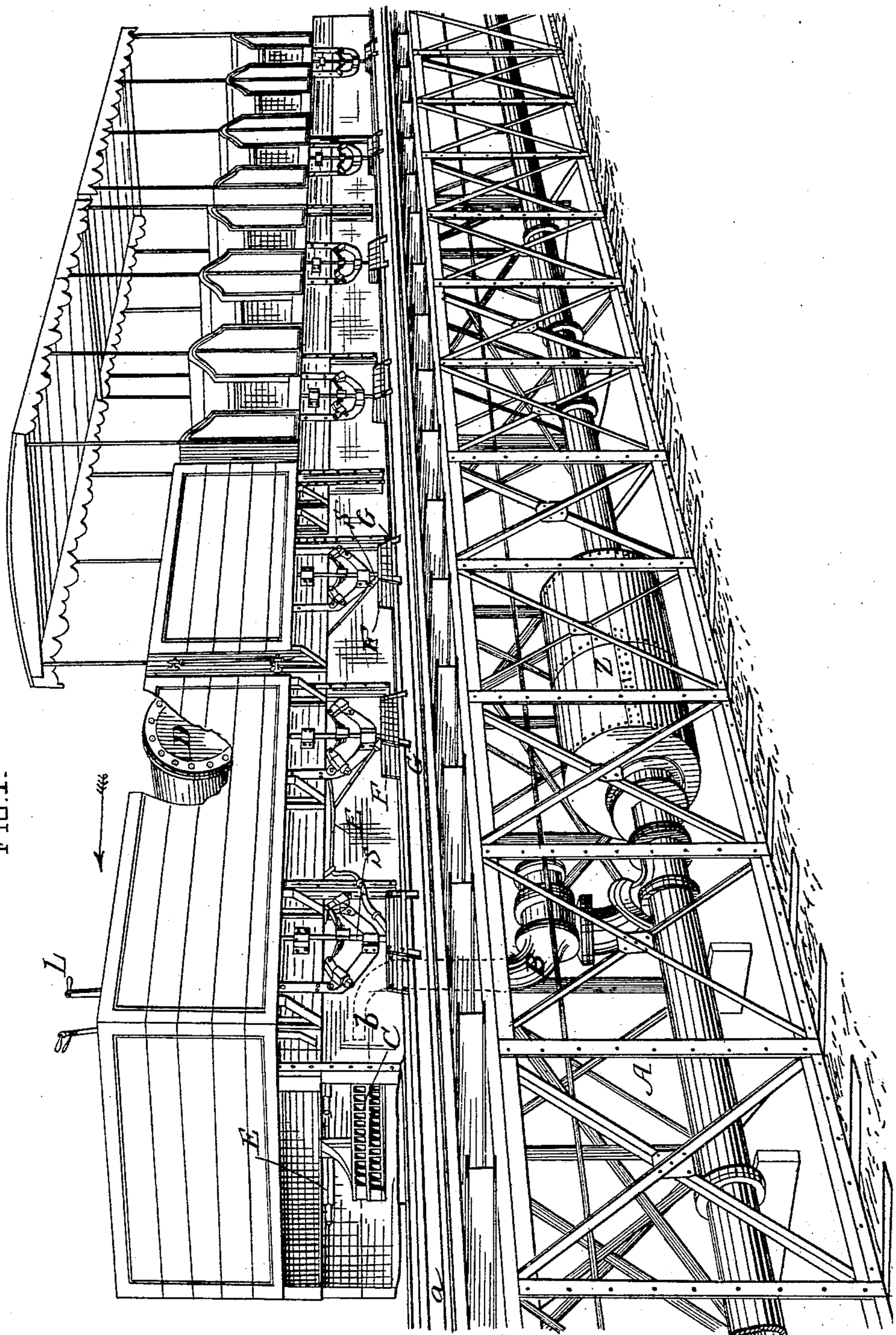
(No Model.) 2 Sheets—Sheet 1.

C. A. BARRE.

SLIDING RAILWAY.

No. 465,151. Patented Dec. 15, 1891.

FIG. 1.



WITNESSES
Fred J. Dieterich
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INVENTOR
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ATTORNEYS

(No Model.) 2 Sheets—Sheet 2.

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FIG. 2.

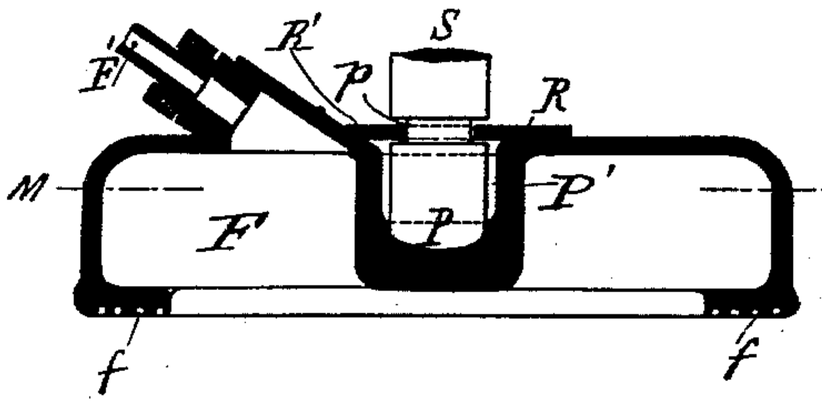

FIG. 3. 3a

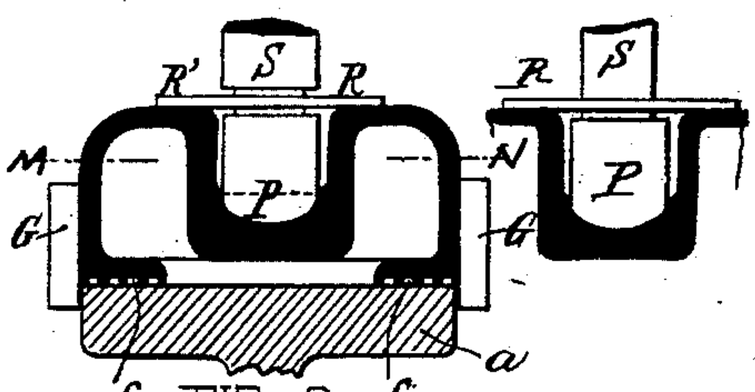

FIG. 4.

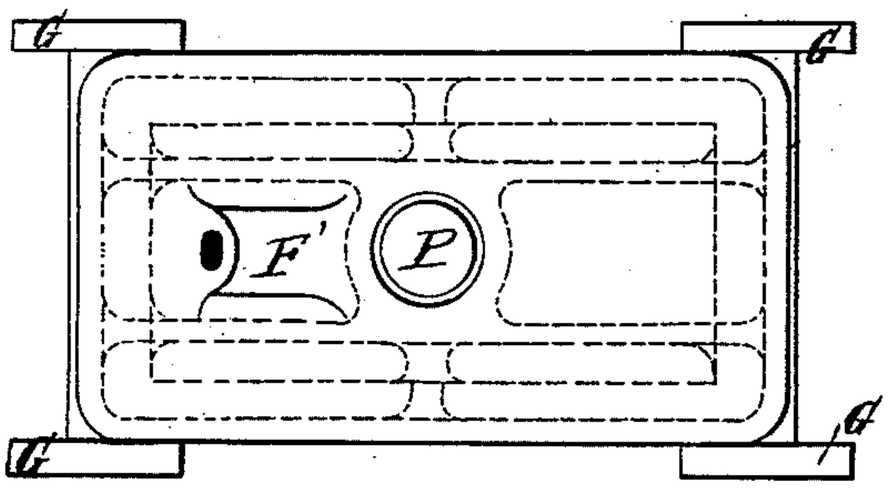

FIG. 6.

FIG. 5.

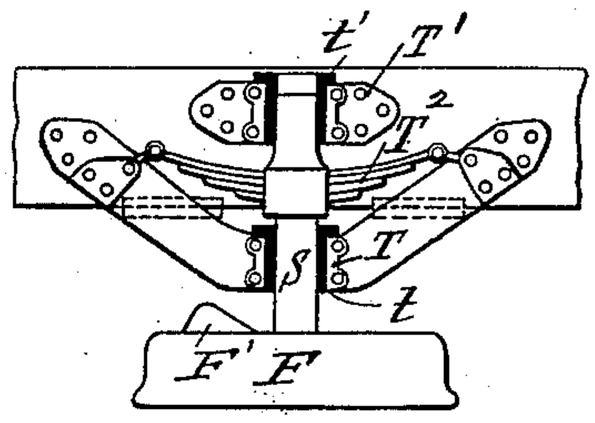

FIG. 7.

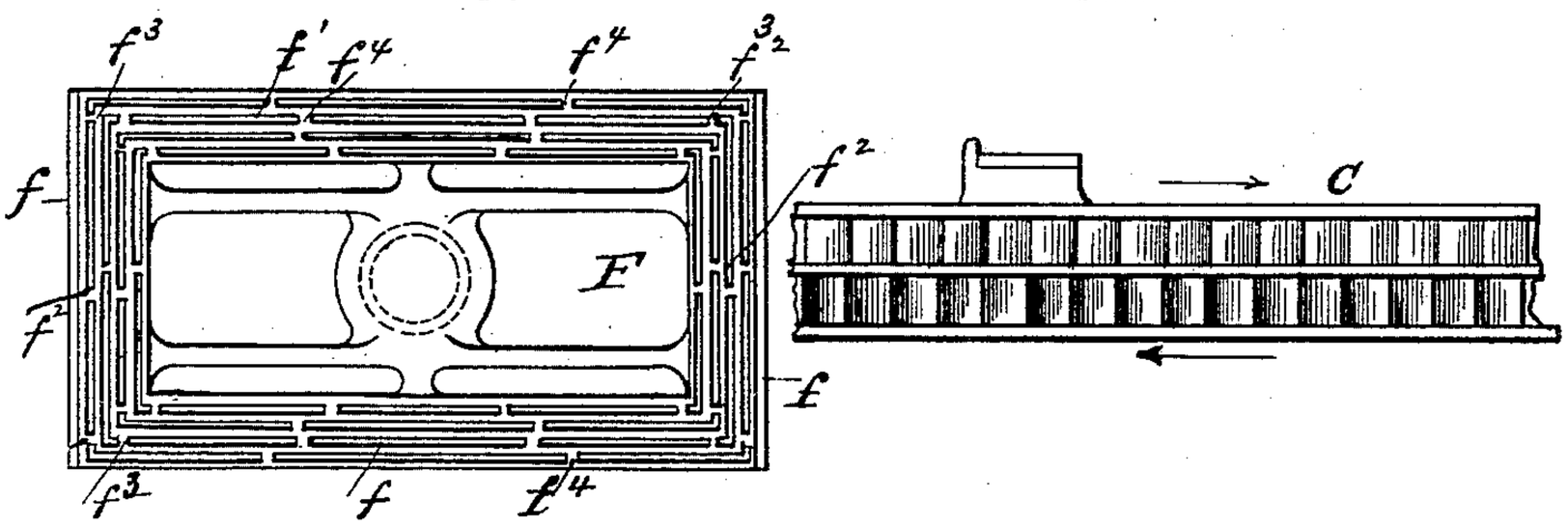

FIG. 8.

WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES ARMAND BARRE, OF PARIS, FRANCE, ASSIGNOR TO THE SOCIÉTÉ DE FONDATION DES CHEMINS DE FER GLISSANTS PERFECTIONNÉS, OF SAME PLACE.

SLIDING RAILWAY.

SPECIFICATION forming part of Letters Patent No. 465,151, dated December 15, 1891.

Application filed August 14, 1888. Serial No. 282,750. (No model.) Patented in France January 26, 1886, No. 173,726; in Belgium July 3, 1888, No. 82,416; in England July 6, 1888, No. 9,862; in Germany August 18, 1888, No. 46,847; in Spain September 28, 1888, No. 8,535; in Italy September 30, 1888, XLVII, 88; in Brazil May 25, 1889, No. 695, and in Portugal November 27, 1889, No. 1,400.

To all whom it may concern:

Be it known that I, CHARLES ARMAND BARRE, of Paris, France, have invented certain new and useful Improvements in Sliding Railways, (for which patents have been granted me in the following countries: France, No. 173,726, dated January 26, 1886; Belgium, No. 82,416, dated July 3, 1888; England, No. 9,862, dated July 6, 1888; Germany, No. 46,847, dated August 18, 1888; Italy, No. 88, Vol. XLVII, dated September 30, 1888; Spain, No. 8,535, dated September 28, 1888; Brazil, No. 695, dated May 25, 1889, and Portugal, No. 1,400, dated November 27, 1889,) of which the following is a specification.

My invention relates to that class of sliding railways known as "hydraulic-propulsion railways," and it refers more particularly to the S. D. Girard type; and it consists in the peculiar combination and novel arrangement of the several parts hereinafter fully described in the annexed specification, and particularly pointed out in the claims, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of a hydraulic-railway system with my improvements applied. Fig. 2 is a longitudinal section of one of the slides or skates. Fig. 3 is a transverse section of the same, taken on the line 3 3, Fig. 2. Fig. 4 is a top and Fig. 5 is a bottom view of one of the slides or skates. Fig. 6 is a side view of one of the skates, showing the manner in which it is connected with the frame of the car; and Figs. 7 and 8 are detail views hereinafter referred to.

For the sake of a clear understanding of my invention I shall first describe in a general way my invention and its application to the Girard system of propulsion and then point out the essential features of my invention in detail.

By referring to Fig. 1 of the drawings it will be observed that the tracks or rails are mounted upon an elevated structure A, on which is supported and extends its length a main or conduit pipe, which carries water under a great pressure and which at suitable intervals is formed with a series of upwardly-projecting laterals or branch pipes B, which are termed "propellers," which have their mouths or discharge ends contracted and disposed at a convenient point above the tracks, as shown at *b* in said Fig. 1, such end being also extended in the direction of the movement of the cars, which in the present instance is in the direction indicated by the arrow. These propellers are arranged at suitable intervals along the road, and in practice are automatically operated by suitably-arranged shifting-levers on the car, (not shown) which serve to open the propellers as the car reaches them and turns them off as the cars pass them. It might also be stated that in the Girard system these propellers are arranged in two series, the discharge ends of which project in reverse directions to engage a double-pocketed longitudinal turbine or water flume C, arranged to extend the entire length of the train, and whereby, when desired, either series of propellers can be brought into operation, so as to move the train backward or forward. By reference to Figs. 7 and 8, the arrangement of the turbine or water-buckets will be readily understood.

Upon the train, usually upon the front or tender car, are held one or more reservoirs D, arranged to hold water under pressure, with which connects a main supply-pipe E, with which connects the conductor's lever L, which serves to operate a valve of any well-known construction to turn on or off the water from the reservoir to main pipe, such pipe having a number of laterals which connect with a series (preferably four for each car) of chambered slides or skates, which are held to slide on the tracks *a*, and which when the train is at rest have a metallic contact with such rails; but when the water under pressure is turned on from the reservoir D it (the water) will enter the chambered slides, and owing to their peculiar construction will be prevented from escaping, thereby accumulating in such slides and compressing the air therein, which, when at the proper ten-

sion, serves to lift the slides from the rail and allows of the formation of a thin layer or water-film between them and the track, which film continues so long as the pressure is maintained in the pipe E. It should be stated that the train when stopped is always over one or more of the propellers, and after the slides have been raised from contact with the rails, as stated, it is only necessary for the conductor to turn on the propeller under the train, which will then discharge a stream under great pressure against the longitudinal arranged water-buckets or turbine C, and thus start the train, which can be stopped quickly and without jar by simply turning off the water-supply from the pipe E, which allows the shoes to fall back onto the rails, they serving as an effectual brake.

Having thus in a general way outlined the arrangement and operation of my improved slide-railway, I shall now in a more detailed manner refer to the more essential features of my invention.

Heretofore in the practical application of a hydraulic railway of the Girard type great trouble has been encountered in obtaining a proper, even, and positive operation of the shoes or skates, as upon them depends in general the practicability of the system. I have found from practical experience that to obtain a positive maintenance of the film the slide or skate must at all times have its contact-face on the same horizontal plane with the face of the rail, and, furthermore, the means for holding the water in the slide, so as to prevent the possibility of a discharge-current, must also be positive, and, again, the discharge or weight on the train may be distributed unevenly, more to one side than the other, and as the slides must all maintain the same contact relation with the tracks such slides must be capable of independent movement in their connection with the truck-frame of the car. I have found from practical experience that to obtain the results desired a slide or skate must be capable of, first, always maintaining its proper parallel contact with the rail-face, irrespective of any unevenness of such rail-face; second, to be capable of vibrating laterally to give to such unevenness; third, each to move vertically and independent of the others; fourth, to oscillate on its bearing to accommodate it to curves or uneven bends in the rail, and, fifth, to be provided with a contact or slide face which will effectually hold the water from a free discharge, irrespective of the plane of such face to the vertical axis or bearing-point of the slide. With these objects in view I have provided the slide or skate which is most clearly illustrated in Figs. 2 to 5, inclusive, and which consists of an inverted-cup-shaped body F, having four contact or slide faces *f f*, in which are formed a series of grooves or channels *f′ f′*, arranged alternately or "staggered" in a methodical manner, preferably as shown in Fig. 4, the said grooves being joined at each extremity of the large axis at f^2 at each of the four corners of the slide, as at f^3, and twice on each of the long sides, as at f^4 f^4. This arrangement prevents a continuous current of water in grooves on the short sides as well as on the long sides, thus adding greatly to the stability of the slide under pressure. The water, as it rushes from the reservoir D under pressure, passes into the main pipe E and the branches *e* through the joint F′ into the interior of the chambered slide F, and, seeking to escape, passes under the inner edges of the contact-faces *f* and enters the first or inner row of grooves or channels, where its speed is momentarily checked or decreased, and consequently the pressure within the slide proportionately increased, such operation being repeated as the water finds its way into the second, third, and fourth rows of grooves, at which time the pressure of the water and the tension of the air within the chamber will be sufficient to raise the slide from the rail, thereby forming a thin film of water between it and the rail, which is continued so long as the water-pressure is maintained. It will be practically noticed that the lower rectangular opening in the slide is the section of the point of the support of the water on the rail, and corresponding to it in the upper part of the slide is a horizontal projection, on which the water exerts its reacting or back-pressure force, either directly or by the compressed air within the chamber. This reaction is the thrust which raises the slide from the rail. It acts on the surfaces, which are at different heights—viz., on the under side of the bearing P, which supports the suspension-rod S and which extends down into the chamber to a point nearly down to the contact-face of the slide on the ridge which connects it with the walls of the slide and then on the upper side of the slide. Its effect would, however, be just the same if it acted on one level horizontal surface like the opening in the bottom and passing through the center of thrust.

The arrangement of the slide described is such that the center of thrust is in a horizontal plane M N, always situated above the point of the support P of the suspension-rod S. This fundamental principle is indispensable to the stability of the equilibrium of the slide when it is submitted to the internal thrust acting from the bottom to the top; but it alone is not sufficient for the purpose stated. It is also necessary that the slide should oscillate around the point of the support P, in order that the resultant of the thrust, the point of application of which is the center of the thrust, can constantly return the latter to its normal position on the rail, which passes through the point P. The bearing P referred to has an enlargement P′ and a seat P^2, in which the lower end of the suspension-rod S rests, which rod passes up through the enlarged portion P′ and which is provided with an annular groove *p*, in which fit the plates R R′, which serve to hold the

slide steady on rod S. If desired, the groove *p* may be avoided, and the rod made with an enlargement at its lower end, as shown at S′ in Fig. 3ª, on which enlargement the plates project, as shown. This latter construction provides for an oscillating or vibratory movement of the slide without weakening the suspension-rod with an annular groove.

As hereinbefore stated, the slides are arranged for independent vertical movement, and to provide for such operation the suspension-rods S are supported in a bearing *t* on a guard-plate T and a bearing *t′* in a plate T′, said plates being fixedly held on the beam *i*, as shown. Said bearings *t t′*, while allowing of a free vertical movement of such rod, hold it from deviating from its normal position.

Between the plates T T′ is interposed a laminated spring T², connected to the guide-plate, which bears down on the rod S and permits an easy and equal division of the charge or weight on the slides.

Slides constructed according to my invention present several important advantages over the Girard slides. These latter have the point of suspension-rod placed always above the plane M N, passing through the center of the thrust. They are therefore unstable by principle of construction. The suspension-rod has no play in its socket, which necessitates an exact and perfectly horizontal position of the rails, as unevenness of the rails would cause a vibrating or lateral movement of the shoe on the rail, while by my arrangement the sides are always in a state of perfect equilibrium, although the upper surfaces of the rails may not be perfectly horizontal. Besides, no current can be formed in the water, no friction can be produced during the operation of traveling, and the coefficient of the resistance to the sliding motion is reduced to a minimum.

Having thus described my invention, what I claim is—

1. A shoe or skate for sliding railways, arranged for an oscillatory and vibratory movement on its support or bearing-axle, as and for the purpose described.

2. A shoe or skate for sliding railways, having its point of suspension or bearing below its plane of thrust, substantially as and for the purpose described.

3. In a sliding railway, the combination, with the rail, of a shoe or skate having its contact-face of equal width as the rail, whereby the waste water will discharge at the outer meeting edges of such shoe and the rail, as and for the purpose described.

4. In a sliding railway, the combination, with the rail having a smooth bearing-face, of a shoe or skate having a contact-face of equal width as the rail, and depending guides arranged to hold the shoe from lateral displacement on the rail, as and for the purpose described.

5. A shoe for sliding railways, having a water-receiving chamber open at the bottom and contact or slide faces surrounding such opening, said faces having a series of grooves arranged alternately or staggered, as shown, and for the purpose described.

6. The combination, with the car-frame, and the support or rod S, held thereon for vertical movement, of the hollow shoe F, having a central depending bearing adapted to fit on the lower end of the rod S, the point of suspension being at a point below the center of the shoe, and said shoe being held on said rod for a vibratory and oscillatory movement, substantially as and for the purpose described.

CHARLES ARMAND BARRE.

Witnesses:

R. J. PRESTON,

ALBERT MOREAU.