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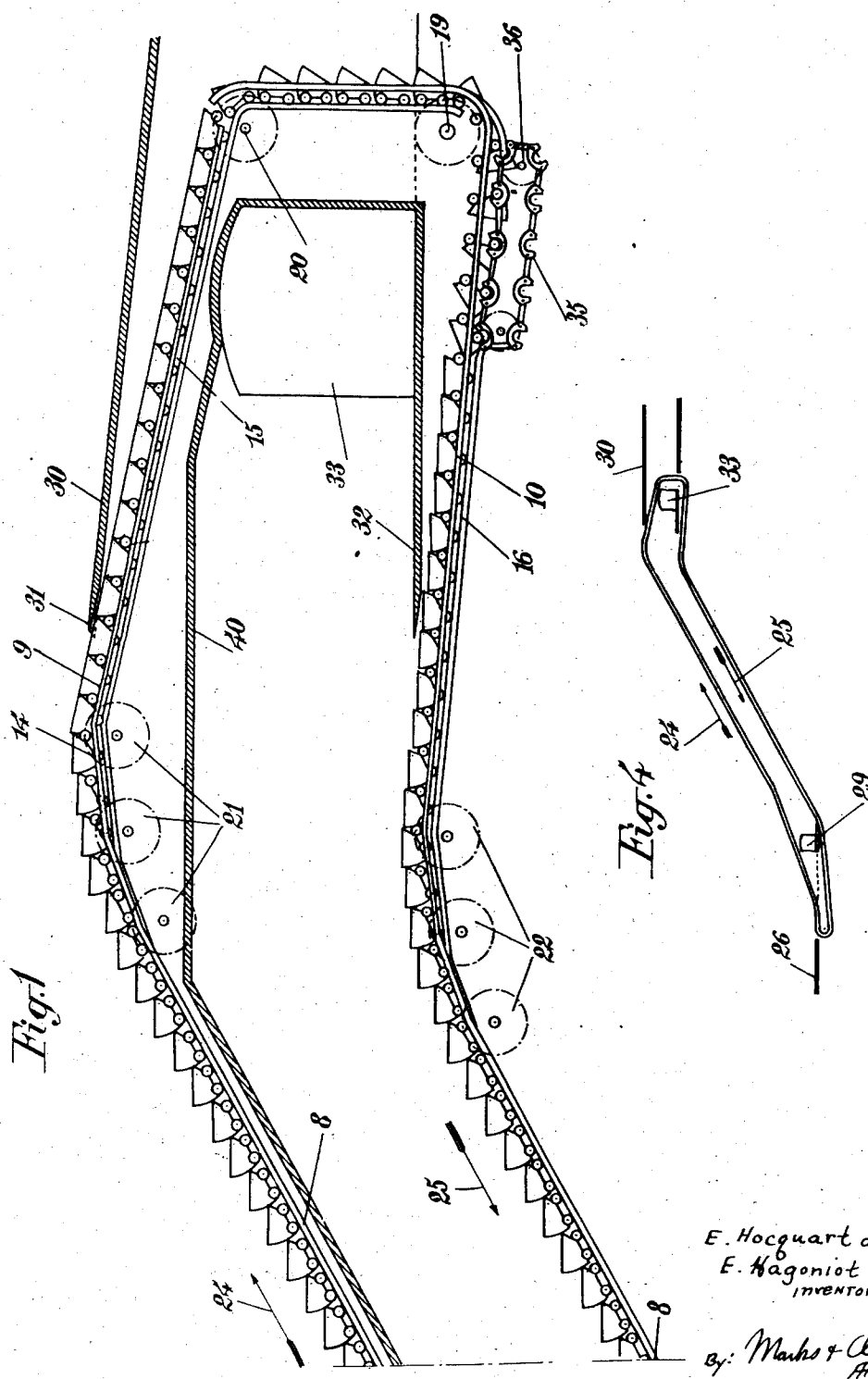
E. HOCQUART ET AL

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MOVING STAIRCASE OF THE ASCENDING AND DESCENDING TYPE

Filed May 22, 1925

3 Sheets-Sheet 1



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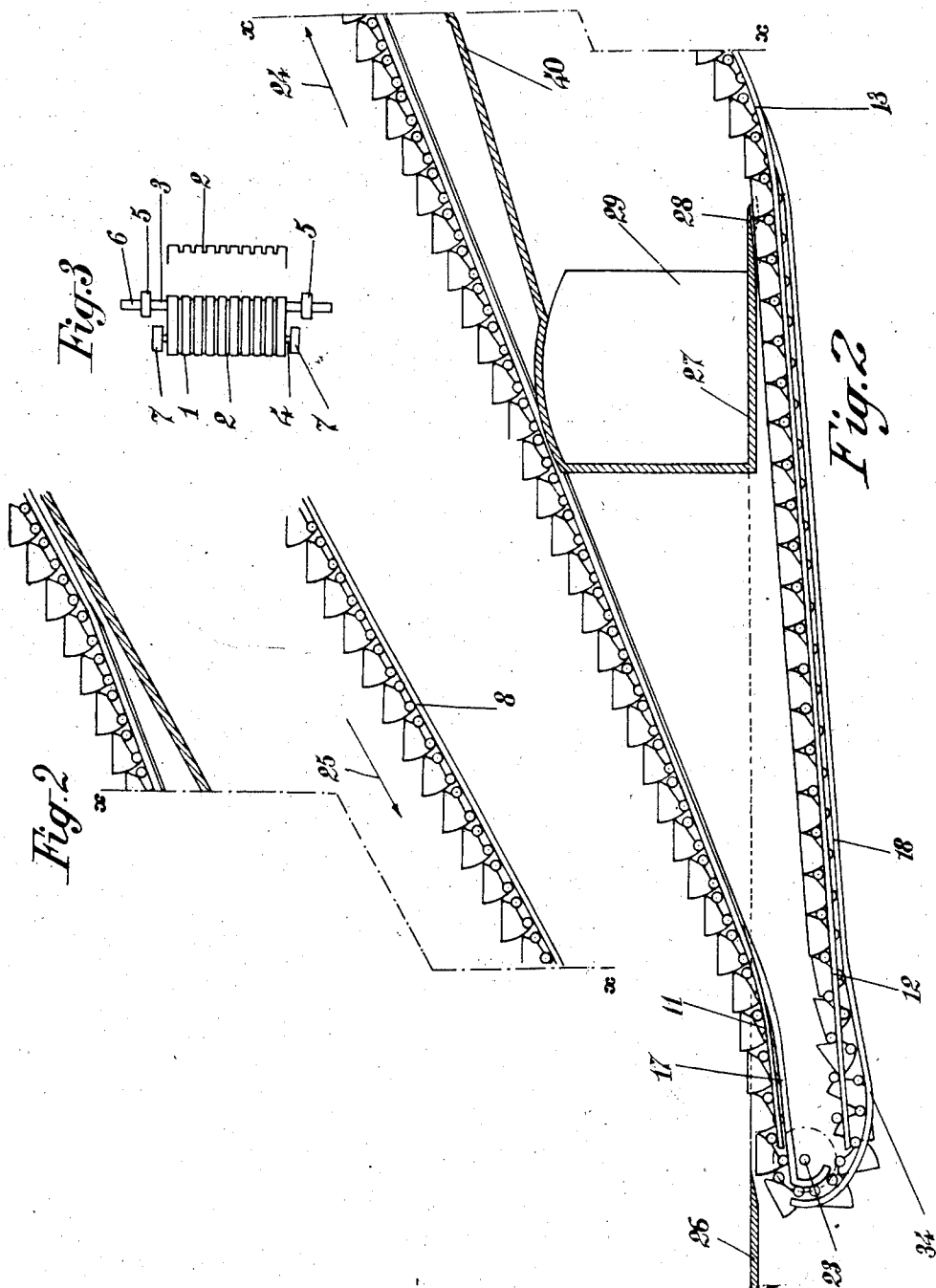
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3 Sheets-Sheet 3

Fig. 5.

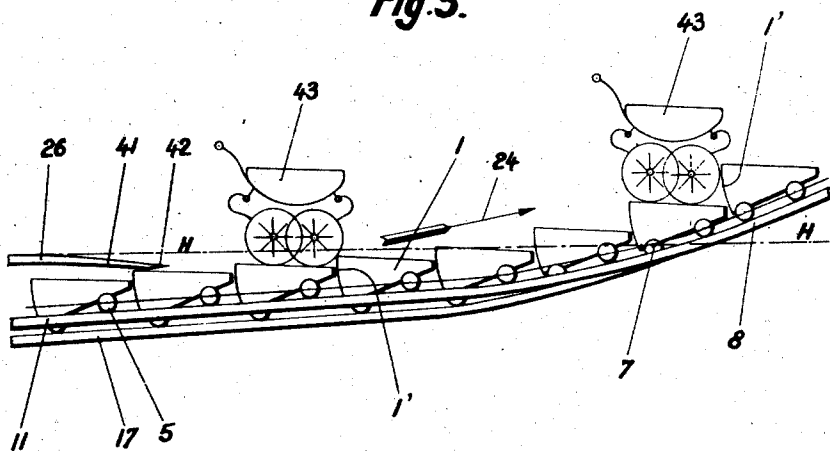


Fig. 6.

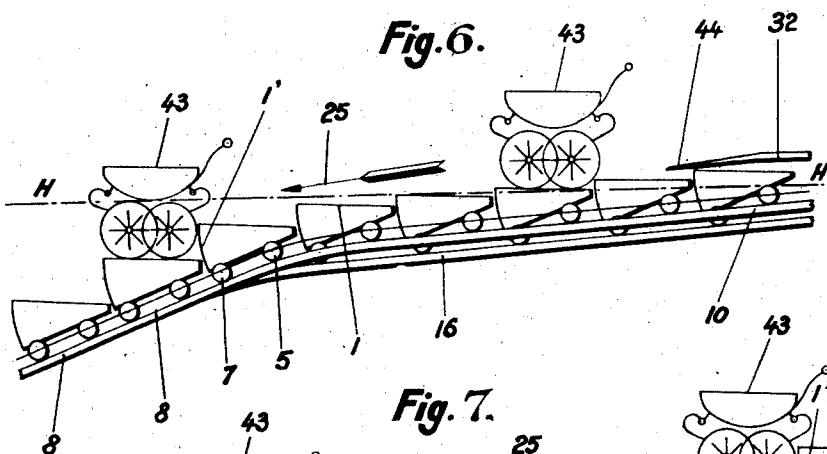
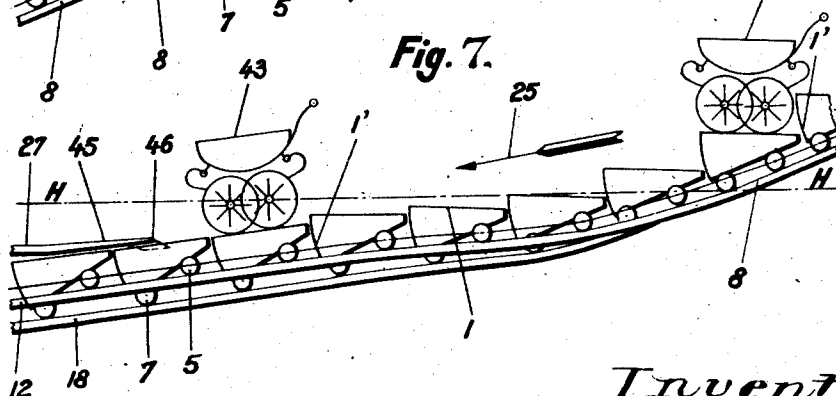


Fig. 7.



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MOVING STAIRCASE OF THE ASCENDING AND DESCENDING TYPE.

Application filed May 22, 1925, Serial No. 32,201, and in France August 26, 1924.

Our invention relates to moving staircases, and has chiefly for its object a moving staircase wherein the movable steps which serve for the ascent are suitably tilted when at the end of their ascending course and are then employed for the descent, and are subsequently tilted at the end of the descending course and are again employed for the ascent, the said staircase being adapted for the transportation of persons or for small vehicles such as handcarts, bicycles, wheelbarrows, children's carriages and the like.

The said invention is hereinafter described in detail with reference to the appended diagrammatic drawings which show by way of example a constructional form of moving staircase of the ascending and descending type serving for the transportation of persons, and a second constructional form of a moving staircase adapted for the transportation of small vehicles.

In the said drawings:

Fig. 1 is a sectional view of a staircase for the transportation of persons, showing the means employed for proceeding from the ascent to the descent, as well as the approaches to the said staircase.

Fig. 2 is a sectional view of the said staircase showing the means for proceeding from the descent to the ascent, and the approaches to the staircase.

Fig. 3 is a plan view of the movable step.

Fig. 4 is an elevational view of the entire arrangement.

Fig. 5 is a side elevation of the departure platform together with the ascending element of a staircase for the transportation of small vehicles such as children's carriages.

Fig. 6 is a side elevation of the departure platform together with the descending element of the staircase.

Fig. 7 shows the descending element corresponding to Fig. 6, with the arrival platform.

In the said figures, and as concerns the moving staircase employed for the transportation of persons (Figs. 1 to 4) the movable step consists of a top plate 1 having the set of grooves 2 and mounted on the two axles 3 and 4. The front axle, which is nearest the top of the staircase, carries the

rollers 5, 5 and its journals 6 engage in the two respective driving chains; the rear axle 4 carries the rollers 7, 7 which are closer together than the rollers 5.

The step which is actuated by the two chains is loosely revoluble on the front axle and may assume any desired position during the travel, the amount of rotation being determined by a suitable difference in height between the rail of the roller 7 and the rail of the roller 5. In the operative portion of the said staircase, as at 8—8 the rails are situated in the same horizontal plane, but in the parts adjacent the upper and lower level portions, the rollers 5 travel on the rails 9, 10, 11, 12, 13 and the rollers 7 on the rails 14, 15, 16, 17, 18.

The said chains are actuated by the driving shaft 19. A suitable number of supporting shafts 20, 21, 22 provided with chain wheels are disposed at the point at which the chain changes its direction. The return shaft 23 is mounted on a sliding device, and the wear of the chain is taken up by a stretcher. The direction of travel of the steps is shown by the arrows 24 and 25.

The approaches to the moving staircase comprises the following elements. At the lower part we provide a departure platform 26 for the ascending portion of the staircase, and an arrival platform 27 for the descending portion which ends in a comb-shaped member 28 and is provided with the lateral exit door 29. At the upper part, we provide an arrival platform 30 for the ascending portion of the staircase which ends in the comb-shaped member 31, and a departure platform 32 for the descending portion of the staircase, access being afforded by the lateral door 33. The teeth of the said comb-shaped members engage in the grooves 2 in the platforms of the steps.

The platforms 26 and 27 are disposed as a rule at the same level, although this is not essential; the platforms 30 and 32 occupy two different levels. The platforms 30 may be horizontal (Fig. 4) or inclined (Fig. 1).

The entrance and exit of persons using the said staircase are facilitated by the relative disposition which is given to the top plates

of the several steps at the point adjacent the arrival and departure platforms, this result being obtained by the use of a suitable shape for the roller rails.

When adjacent the departure ends 26 and 32, the top plate of each step is horizontal and is somewhat displaced in height relatively to the tops of the adjacent steps, so that the passengers will clearly observe the line of separation between the consecutive steps. The top line of each step comes as close as possible to the pointed edge of the departure platforms. At a short distance from this edge, the vertical displacement of the steps is gradually increased, up to the normal value.

When adjacent the arrival platforms 27 and 30, the tops of the consecutive steps will in the first place come gradually nearer together, and then assume the inclined position and in line with each other; the resulting inclined plane then comes quite close to the said comb-shaped member whose teeth engage in the grooves in the top plates of the steps and thus prevent the formation of a continuous empty space along the width of the staircase.

As concerns the direction of travel of the portions of the staircase, it should be noted that in the ascending part, the front axle precedes the rear axle, but in the descending part the rear axle precedes the front axle, so that when a given step has disappeared below a comb 28 or 30 it must be given a particular movement whereby it will assume the proper position when issuing from the departure platforms 26 and 32.

At the lower part, at which the rear axle is to be set back, we obtain this result by simply curving the rail 34, as shown in Fig. 2. At the upper part, a suitable mechanism is necessary in order to increase the speed of the rear axle and to place it forwardly of the front axle (Fig. 1), and we obtain this movement by the use of a chain having links 35 of special shape, which is disposed between the two chain wheels 36, one of the said wheels being actuated by the driving shaft 19 at a suitable speed and in the proper direction. The curved parts of the said chain will seize the roller 7 of each step and will place it upon the rail 16.

The ascending and descending elements of the staircase are separated by a ceiling portion 40.

Due to the prevailing conditions of a given installation, it may prove necessary to bring the two elements of the staircase nearer together, in which event the exit 29 would not longer have a sufficient height; in this case, we no longer maintain a constant slope for the two elements, but increase their spacing by approaching the bottom, either by employing a smaller slope for the ascending element upon a given length of the same, or

by employing an increased slope for the descending element, or by the combined use of these two means; it will be essential to design the profile of the steps in consequence, in order to obviate all prejudicial space between the front part of one step and the rear of the next.

Referring to the construction of a moving staircase which is adapted for use with small vehicles (Fig. 5 to 7) we modify the above mentioned apparatus chiefly:

(a) by the use of steps having the proper width for the transportation of such vehicles.

(b) by giving to the top plates of the steps a slight rearward inclination, and when adjacent the arrival combs, we incline them towards the latter;

(c) by giving a slight inclination to the arrival combs and to the departure platforms;

(d) by giving a suitable spacing in height to the steps adjacent the departure platforms whereby the said vehicles will have a ready access to the steps and will have a steady position upon the latter during the travel, and will also be enabled to descend with facility upon the arrival platforms.

In Figs. 5 to 7, the horizontal plane is shown by suitable lines, and the arrows 24 and 25 indicate the direction of travel of the staircase. 8, 10, 11 and 12 are the guide rails for the rollers 5; and 8, 16, 17, 18 the like rails for the rollers 7 of the steps whereof the top plate 1 has a sufficient size to accommodate one of the said vehicles.

The rails and steps are so disposed that the surface of the top plate shall be somewhat inclined towards the thinner front part of the step 1, so that when the apparatus is in motion the vehicle will always tend to bear upon the rear part 1' of the adjacent step. The departure platform 26 for the ascending element of the staircase (Fig. 5) is somewhat inclined at 41 and comprises a sharp edge 42 at the front which comes close to the forward end 1 of the steps, so that, when the vehicle 43 is pushed upon the first step it will continue to descend upon the sloping of the top plate and will about against the rear end 1' of the forwardly situated step; the latter will in fact form at this time a small raised portion which soon after increases and attains the normal height of the step, and then diminishes before attaining the comb of the arrival platform which is slightly inclined towards the exit end.

As regards the departure platform 32, for the descending element of the staircase (Fig. 6) it is also terminated by an inclined plane 44, so that the vehicle can descend this incline and take its position upon the step, but since the top plate of the step is inclined in the contrary direction, the vehicle will at

once return to the rear and will abut against the next step 1' and will thus remain in place during the whole period of travel.

As concerns the arrival platform for the descending element (Fig. 7), this comprises a plane 45 which ends in the comb 46 and descends on a slight slope towards the exit; the teeth of the said comb are engaged in the grooves in the top plate of the step. Herein the last steps, upon approaching the arrival platform 27, will be inversely inclined, i. e. towards the exit; so that before the end of the course, the vehicle 43 will descend by its own means from one step to the other by reason of this inverse inclination of the steps, and thence upon the comb 46, and finally upon the platform 27, whereby the transfer from the moving staircase to the permanent platform will be much facilitated.

It will be thus observed that in virtue of the modifications made in the moving staircase whereby the steps have a larger size and a certain inclination and whereby the comb-shaped members of the departure and the arrival platforms shall be suitably inclined, we facilitate the engagement and the transportation of the small vehicles upon the said staircase as well as their transfer to the arrival platforms.

What we claim is:

1. In a mechanical staircase, an endless carrier including steps, guide means for the carrier providing ascending and descending portions, and means for altering the positions of the steps in the carrier during travel of the latter over the guide means, said last mentioned means including a movable chain.

2. A mechanical staircase as claimed in claim 1 characterized by the provision of means for imparting movement from the carrier to the chain.

3. In a mechanical staircase, an endless carrier including a plurality of steps each pro-

vided with pairs of supporting rollers, guide means for the rollers of the steps, and means for altering the position of the steps in the carrier during travel of the latter over the guide means, said last mentioned means including a movable chain.

4. A mechanical staircase as claimed in claim 3 characterized by the provision of means for transmitting movement of the carrier to the chain.

5. A mechanical staircase as claimed in claim 3 characterized in that said chain is provided with recesses arranged to receive and guide certain of the rollers of the steps.

6. A mechanical staircase as claimed in claim 3 characterized in that at one point in its length, said guide means is interrupted and the chain is located at the point of interruption.

7. In a mechanical staircase, an endless carrier including steps, each provided with sets of supporting rollers, guide rails for the respective sets of rollers, certain of the guide rails being interrupted, and means for altering the position of the steps in the carrier during travel of the latter over the guide rails, the last mentioned means including a chain placed at the point of interruption of the guide rail.

8. A mechanical staircase as claimed in claim 7 characterized by the provision of recesses in the chain adapted to receive certain of the sets of rollers.

9. A mechanical staircase as claimed in claim 7 characterized by the provision of recesses in the chain adapted to receive certain of the sets of rollers, and means for transmitting movement of the carrier to the chain.

In testimony whereof we affix our signatures.

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EMILE HUGONOT.