G. A. WHEELER.

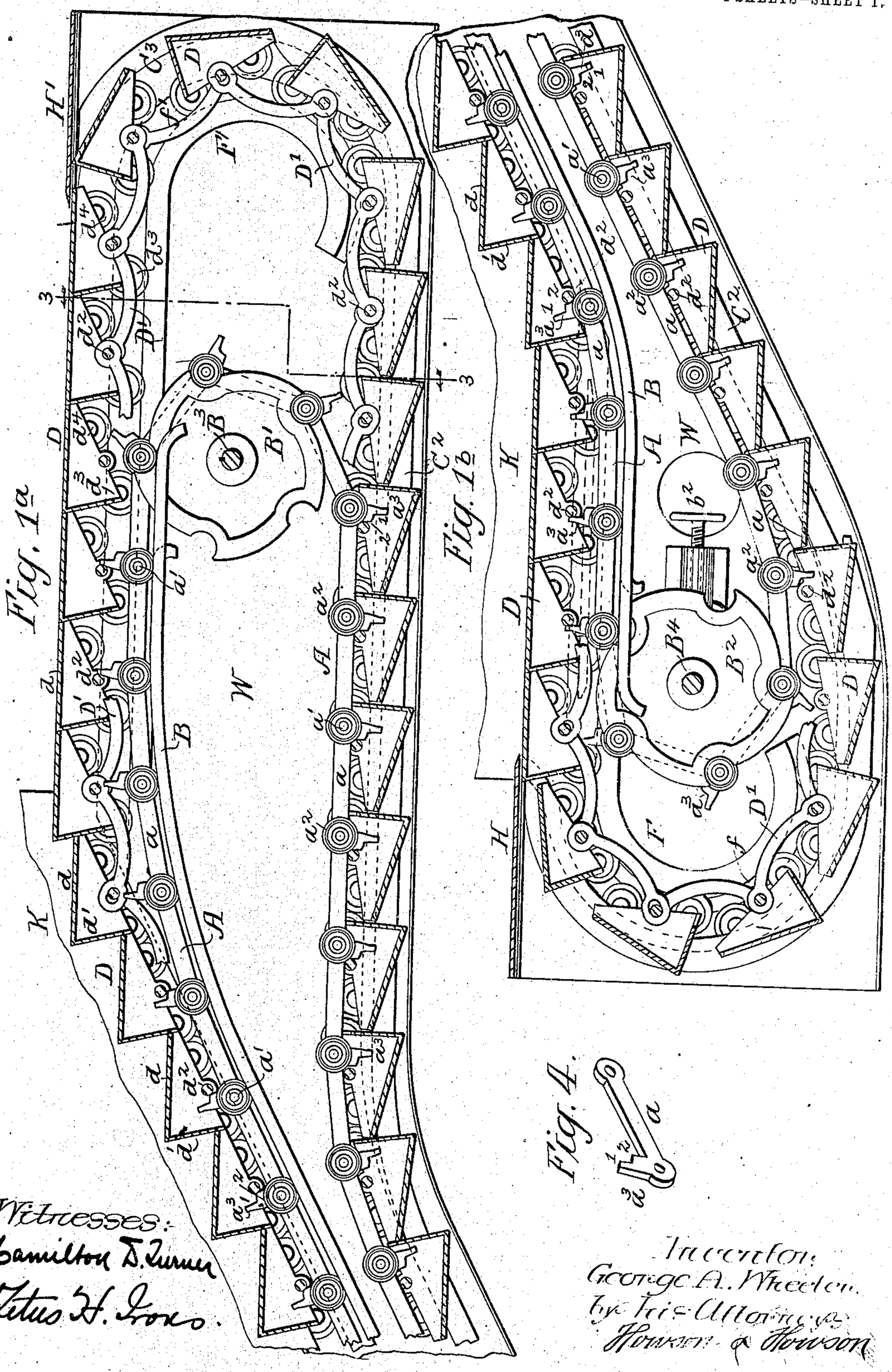
MOVING STAIRWAY.

APPLICATION FILED NOV. 13, 1905.

899,933.

Patented Sept. 29, 1908.

4 SHEETS—SHEET 1.



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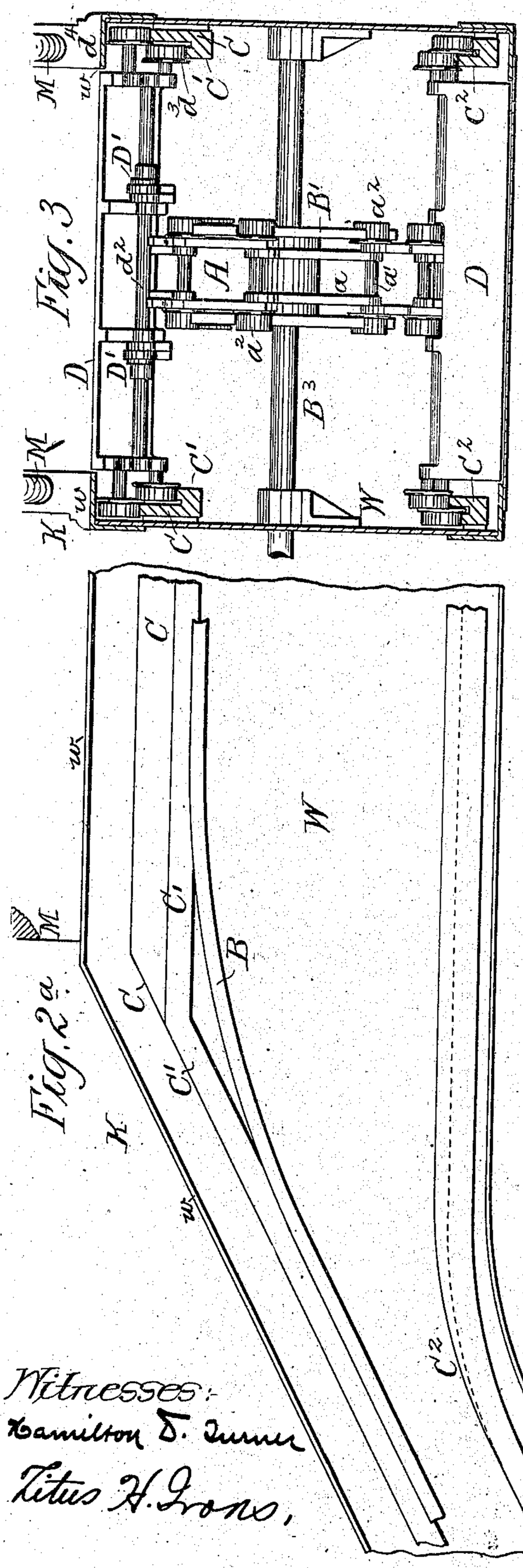

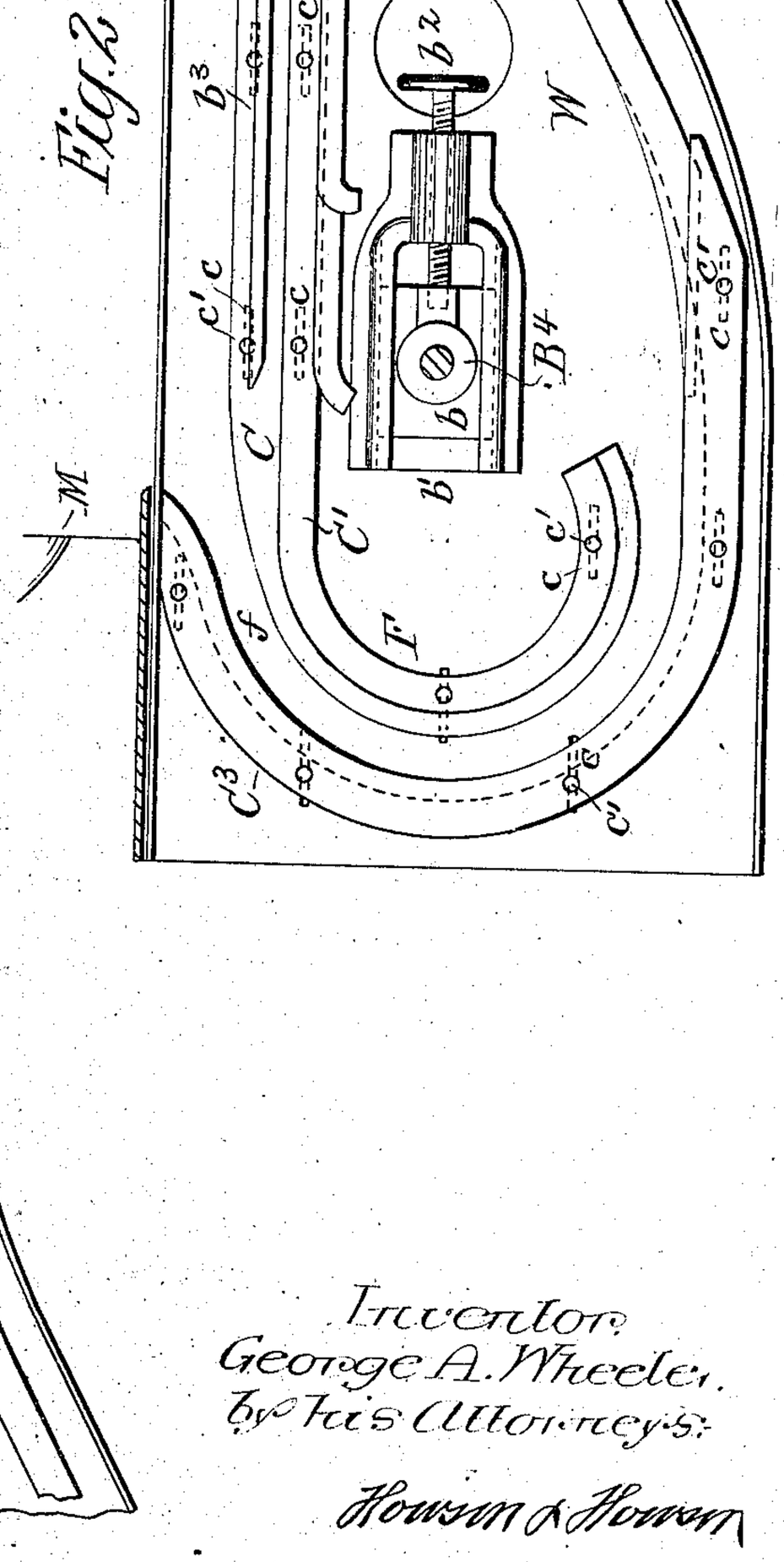

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4 SHEETS—SHEET 3.

Fig. 10.

Fig. 13.

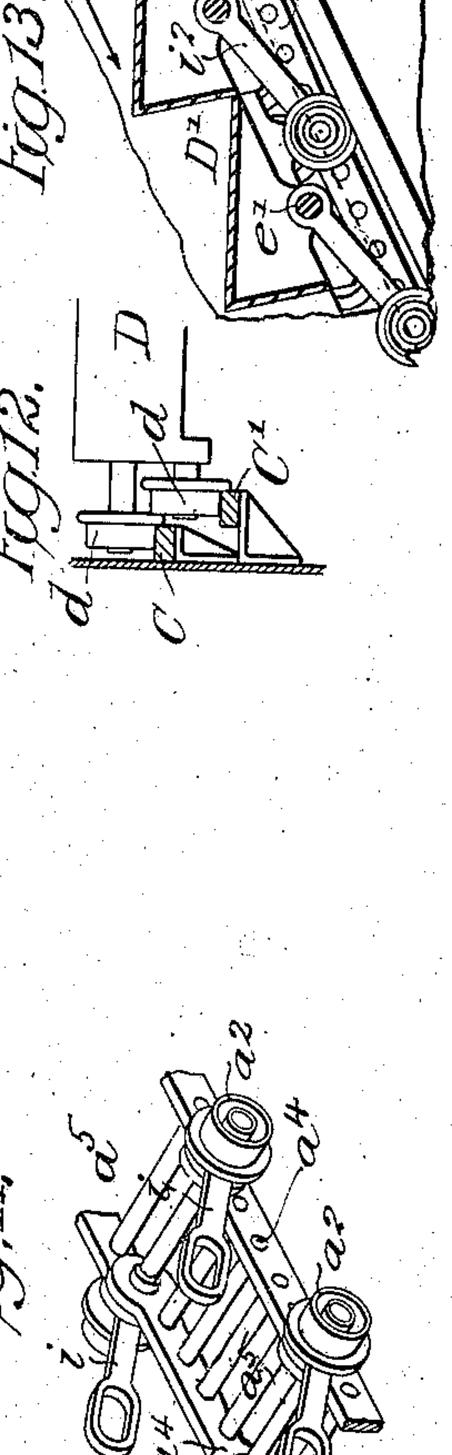

Fig. 12.

Fig. 5a.

Fig. 11.

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4 SHEETS—SHEET 4.

Fig. 9.

Fig. 8.

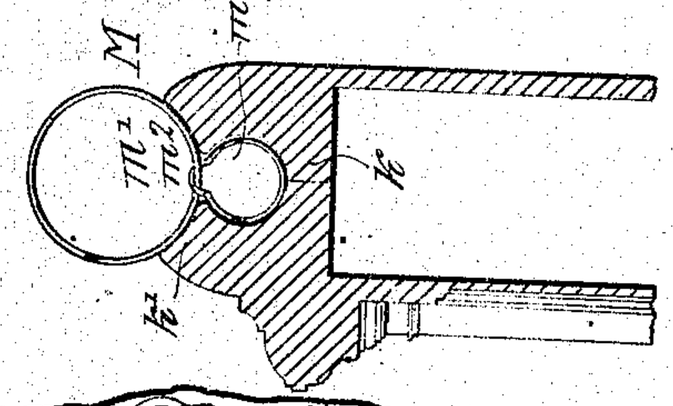


Fig. 6

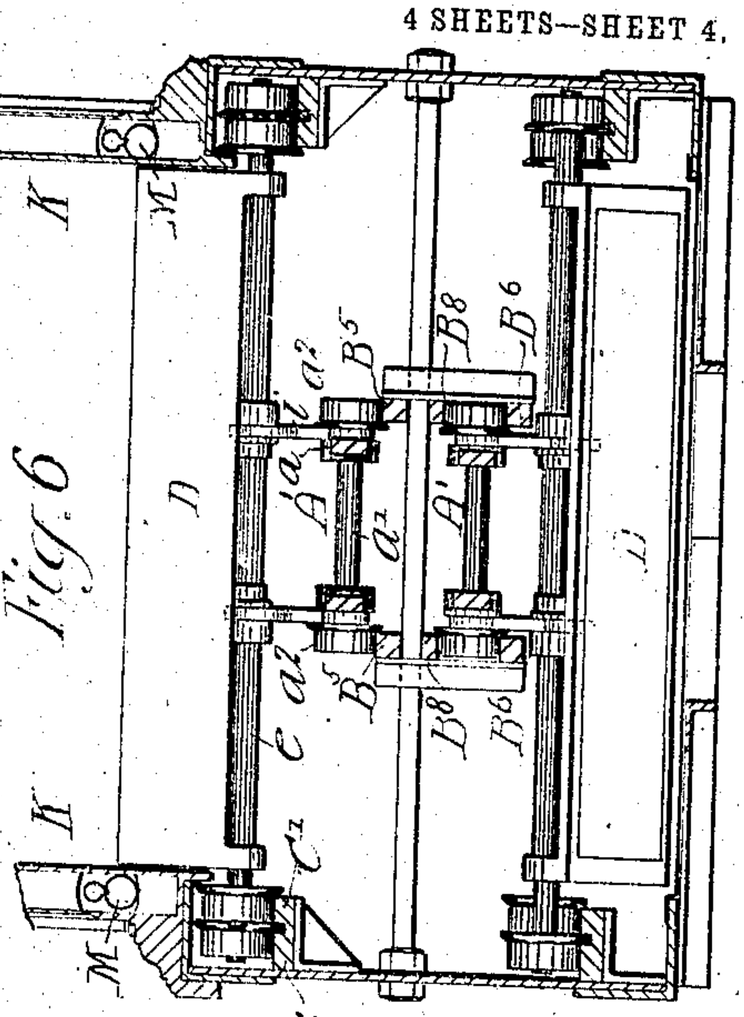


Fig. 7.

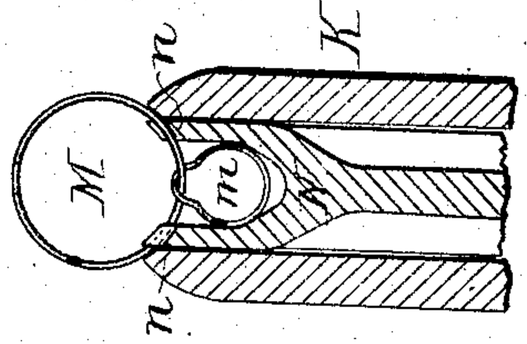


Fig. 5.

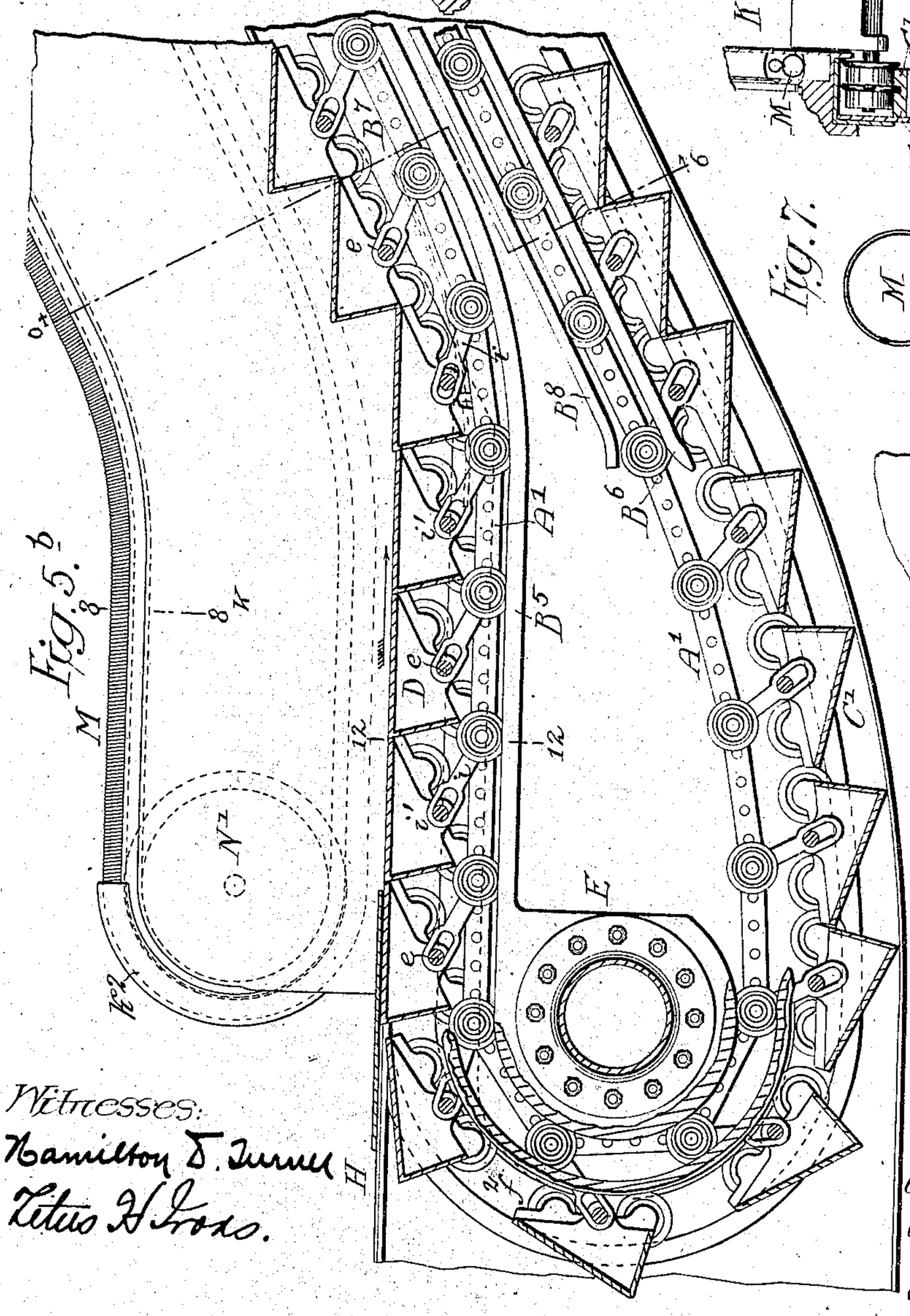
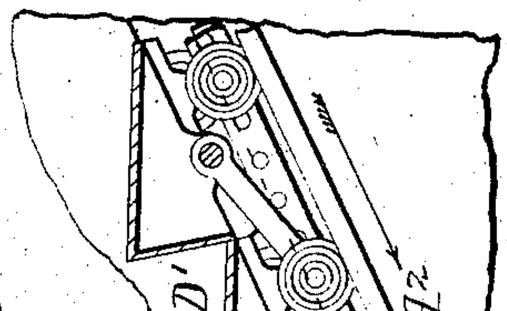


Fig. 14.



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UNITED STATES PATENT OFFICE.

GEORGE A. WHEELER, OF NEW YORK, N. Y.

MOVING STAIRWAY.

No. 899,933. Specification of Letters Patent. Patented Sept. 29, 1908.

Application filed November 13, 1905 Serial No. 287,054.

To all whom it may concern:

Be it known that I, GEORGE A. WHEELER, a citizen of the United States, residing in New York city, borough of Brooklyn, State of New York, have invented certain Improvements in Moving Stairways, of which the following is a specification.

The main object of my invention is to so construct a stairway that its step sections will be always in contact or substantially in contact on the carrying run of the stairway.

A further object of the invention is to support the step sections independent of the drive chain so that the drive chain on the return run can sag without affecting the position of the step sections.

The invention relates still further to the driven hand rail and other detail mechanism which will be described hereafter.

In the accompanying drawings:—Figure 1^a, is a longitudinal sectional view of the upper portion of my improved moving stairway; Fig. 1^b, is a longitudinal sectional view of the lower portion; Fig. 2^a, is a longitudinal sectional view of the upper portion of the structure, the steps and drive chain being removed; Fig. 2^b, is a view of the lower portion of the structure; Fig. 3, is a transverse sectional view on the line 3—3, Fig. 1^a; Fig. 4, is a detached perspective view of one of the links; Fig. 5^a, is a longitudinal sectional view of the upper portion of a stairway illustrating the moving hand rail and a modification of the mechanism for imparting movement to the steps; Fig. 5^b, is a view of the lower portion of the stairway illustrated in Fig. 5^a; Fig. 6, is a transverse sectional view on the line 6—6, Fig. 5^b; Fig. 7, is a sectional view on the line 7—7, Fig. 5^a; Fig. 8, is a sectional view on the line 8—8, Fig. 5^b; Fig. 9, is a side view of a section of a hand rail; Fig. 10, is a perspective view of one of the step sections; Fig. 11, is a perspective view illustrating a portion of the drive chain used in the construction shown in Figs. 5^a and 5^b; Fig. 12, is a sectional view on the line 12—12, Fig. 5^b; and Figs. 13 and 14, are sectional views of a stairway in which the step sections travel in a reverse direction to the sections shown in Figs. 1^a and 1^b.

My stairway is of the type in which the step sections form the incline stepped portion of the stairway and the upper and lower horizontal platforms, the return run of the step sections passing under the carrying run. What I mean by carrying run is that portion of the stairway which is actually used for the carrying of passengers and in this instance consists of the upper and lower platforms and the inclined step portion.

Heretofore it has been a difficult matter to properly construct a moving stairway, of the type illustrated without causing a gap at the point where the lower platform joins the inclined portion and where the inclined portion joins the upper platform. By my invention I am enabled to so assemble the step sections that there will be no appreciable gap at any point throughout the carrying run. And by my improvement I am enabled to make a stairway in which only one step is out of alinement when being transferred from the inclined to the horizontal way, or from the horizontal to the inclined way, and I can use a standard step section in constructing the stairway as I do not have to design the individual step sections according to the height of the stairway.

Referring in the first instance to Figs. 1^a to 4 inclusive, which show an ascending moving stairway, A is the drive chain made up of a series of links a coupled together by pins a'. On the ends of each pin are flanged wheels a^2 which travel on a track B and with which engage the sprocket wheels B′, B^2 which are mounted on shafts B^3, B^4 respectively, having their bearings in the frame of the stairway. In this instance the wheel B′ is the driving wheel. In some instances I may use a guard rail b^3, as shown in full lines in Fig. 2^b, for holding down the chain A as it travels from the lower sprocket wheel to the inclined portion of the stairway. On each link is a lug a^3 having two steps, as shown clearly in Fig. 4, these lugs engage the step sections as fully described hereafter. D, D are the step sections, each step section is so shaped as to form a tread d and a riser d'. The risers are backed off, as illustrated in Figs. 1^a and 1^b, so that the upper edge of one step will overhang the tread of the step section directly below it and the step sections are so proportioned that the inner edge of the tread of each step section will rest against the face of the riser of the adjoining step section, both on the inclined and horizontal portions of the carrying run. Mounted on studs projecting from each end of the step sections are flanged

wheels d^3, d^4, the wheels d^4 projecting beyond the wheels d^3, as clearly illustrated in Fig. 3, and travel on different rails when on the horizontal portion of the runs and travel on rails of the same plane when on the inclined portion of the run, as clearly indicated in the drawings. C, C are the rails for the outer wheels d^4 and C′, C′ are the rails for the wheels d^3. The wheels in passing around the ends of the stairway travel in suitable grooves f, f' in the end guides F, F′. The groove f' is formed by continuations of the rails C, C′ and by a guard rail C^3 which forms a continuation of the rail C^2 for the return run of the step sections. The end guides are secured to the framework of the stairway which may be of any type desired according to the character of the structure erected, and the rails at the lower portion of the stairway forming the return guide f are adjustable so as to take up any slack in the enchained step sections. In the present instance the framework is slotted at c and bolts c' are provided for fastening the rails in their adjusted positions. Other means may be designed for accomplishing this purpose. The shaft B^4 is preferably mounted in an adjustable bearing b mounted in a slideway b' on the framework of the stairway and the bearings can be adjusted by set screws b^2, as clearly shown in Fig. 2^b. In some instances I may substitute sprocket wheels for the fixed guides at the end of the stairway. Mounted under the tread of each step section is a bar d^2 running the full width of the step and in order to enchain the step sections I couple links D′ to the said bars, as shown in Fig. 1^a and one end of each link snugly fits a bar while the other end is slotted as shown, so as to allow each step section to have a certain freedom of motion particularly at the points where the step sections change direction of motion. The bars d^2 are so situated in respect to the chain A that the stepped lugs a^3 will engage the bars and impart motion to the enchained step sections. In some points of the travel one portion of the stepped lug engages the bar, at other points the other portions of the lug will engage the bar and at still another point the lugs project in front of the step sections preventing them spreading. This is particularly the case when traveling to form the upper platform.

It will be noticed in referring to Fig. 2^a that the rails C, C′ on which the step sections travel change from the inclined path to the upper horizontal path at an angle, while the rail B for the chain passes from one to the other on a gentle curve, the same as is the case in Fig. 2^b where the lower horizontal rails join the inclined rails, the rails for the step sections being at an angle while the rail B for the drive chain is on a curve. Thus I am enabled to form a flat platform at top and bottom of the stairway and steps on the inclined portion and transfer the step sections from the horizontal portion to the inclined portion and from the inclined portion to the horizontal portion without jar and without opening spaces between the sections. It will be noticed that the drive chain is not as long as the endless chain of steps, terminating short of each end as it is only essential to control the step sections while on the carrying run of the stairway.

Referring now to Fig. 1^b the lugs a^3 of the chain, which are preferably arranged at the pivot points of the links, rise as the chain passes around the wheel B^2 until the portion 1 of the lug engages the rod d^2 of a step section D pushing the step section forward until it reaches a point where it is about to be transferred from the lower horizontal rails to the inclined rails, then the rail B is so curved that the chain is moved closer to the step sections and as it is traveling in a shorter path the portion 2 of the lug will engage the rod d^2 of the step section pushing the step section up the inclined rails, as indicated in Figs. 1^b and 1^a, the portion 2 of the lug remaining in engagement with the rod d^2 until the step section reaches a point where it is about to be transferred from the inclined rails to the upper horizontal rails, then, owing to the gentle curve in the rail B at this point, the chain A gradually moves away from the step section and consequently the lug a^3 is withdrawn leaving the rod and its step section free from control of the lug and consequently of the chain. As the step section must travel up the inclined rail and be transferred at an angle to the upper horizontal rail its path is longer than the path of the drive chain and as it is perfectly free at this point it is forced forward by the step section following it which is still under the control of the chain and prevented moving too far by the preceding step section, so that it is then at the point where it changes from the incline to the upper horizontal path under the control of the two step sections on each side of it. Thus preventing formation of any space at the point between the upper landing and the inclined steps. Heretofore it has always been a difficult matter to keep the steps in contact at this point. By making each of the links D′ slotted at one end I am enabled to allow each step section, at the points where they change direction of movement, to have a certain amount of independent motion as described above.

In order to prevent the step sections parting while on the upper horizontal run I bring the rail B for the chain to such a position in respect to the step sections that the lugs a^3 will project in the path of the rods d^2 of each step section and, owing to the fact that the enchained step sections travel in a longer path than the drive chain A, the lugs project in front of the rods, as indicated in Fig.

1ª at the upper platform, thus preventing the step sections separating on the upper platform. As soon as the links of the chain A pass around the head wheel the lugs are withdrawn from the path of the rods d^2 and the step sections are free to travel on their rails around the end F′ and return on the rail C². As the step sections pass under the head wheel B′ the portion 2 of the lugs a^3 engage the rods d^2 of the step sections and push them forward on the return run until the step sections free themselves as they pass down the inclined return rail. Thus it will be seen that the stairway is so constructed that the step sections are arranged to travel in a given path and are driven by a drive chain arranged to engage each step section, but the step sections are free of the chain at the points where they change direction of movement on the carrying run of the stairway so as to prevent any gaps or openings at these points, the step sections on the entire carrying run being close together at all times.

H is the lower fixed platform from under which the step sections emerge to form the moving lower platform and H′ is the fixed upper platform under which the step sections pass.

While Figs. 1ª and 1ᵇ illustrate a moving stairway of the ascending type, I may use the same construction for a stairway of the descending type as well, by merely adjusting the drive chain in respect to the step sections so as to bring the lugs on the opposite sides of the rods on the return run from that shown in Figs. 1ª and 1ᵇ in order that the said lugs will engage the step sections on the return run and move them up to allow the steps to descend on the carrying run. The rails and wheels of the step sections are concealed at all points throughout the stairway by sheathing *w* which may form part of the main frame W of the stairway. Upon this sheathing I mount the guards K, K, one or both of which may act as supports for the moving hand rail M.

In Fig. 3, I have shown the guards K and the return runs of the hand rails M, while in Figs. 5ª, 5ᵇ, 7, 8 and 9, I have shown details of the construction of said hand rail. On the upper edge of each guard K is a channel *k* for the passage of the section *m* of the movable hand rail M. The section *m′* of the hand rail is greater in diameter than the section *m* and rests in the groove *k′*, Fig. 8, and the two sections *m*, *m′* of the hand rails are made of spring wire coiled as shown, one section being interlaced with the other, as shown in Figs. 8 and 9. In the present instance the section *m* is bent slightly to form a loop m^2 so that coils of the section *m′* will readily interlace with the said section *m*. This hand rail M passes around sheaves N, N′, at each end of the guard K and, in the present instance, the upper sheave N is the driving sheave. The sheave N may be driven by a chain or belt *n*, as indicated in Fig. 5ª, from the driving shaft for the chain. A casing k^2 is formed at the lower end of the guard K for the purpose of inclosing a portion of the hand rail at this end of the stairway.

The wire from which the spiral hand rail is made is of sufficient strength to prevent the hand rail opening to such an extent as to allow the fingers of the person being carried by the platform catching between the convolutions of the hand rail. In some instances the exposed portion of the hand rail may be provided with a cover without departing from the main feature of the invention. In the present instance, as illustrated in Fig. 7, the driving sheave N has a deep groove to receive the portion *m* of the hand rail and has teeth on each flange *n* which engage the portion *m′* of the hand rail. In some instances however, this construction need not be used as the hand rail, due to its spring, is always under tension and the friction may be sufficient to drive the hand rail. The hand rail is preferably driven at the same speed as the moving portion of the stairway and while it is preferable to have a moving hand rail it will be understood that in some instances this hand rail may be dispensed with.

Figs. 1ª to 4 inclusive, show the preferred form of construction, but I may use the construction illustrated in Fig. 5ª and Figs. 5ᵇ, 6, 10, 11 and 12. The step sections are preferably of the same shape as the step sections illustrated in Figs. 1ª and 1ᵇ and the rails C, C′ are of the same type and bear the same relation to each other. As shown in Fig. 10, the step section has the tread portion *d*, the riser portion *d′* and the two flanged wheels d^3, d^4 similar to the step section previously described. The chain A′ in this instance travels on the rail B⁵ while on the carrying run and on the rail B⁶ while on the return run. There is a certain distance, however, between the upper end of the stairway and the point where the chain turns to descend where it is free to sag, as clearly shown in Fig. 5ª, and also at the point previous to turning from the lower run to the upper run. At other points the chain A′ is under the control of the rails. In this instance there is a guard rail B⁷ at the point where the rail B⁵ curves from the lower horizontal path to the inclined path and there is a guard rail B⁸ above the rail B⁶, as shown in the drawings. In this instance the chain is made up of a series of links a^4 arranged in pairs and each pair spaced a distance apart and connecting the pairs of links are cross bars a^5 which form an endless rack with which engages the driven sprocket wheel G which is mounted on the driven shaft G′. The sprocket wheel is so situated that it engages

the carrying run of the chain directly below the upper platform and also engages the return run of the chain, preferably before it makes the descent on the return run. The form of chain is illustrated clearly in Fig. 11. Links *i* are attached to the pivot pins which connect the links of the chain and these links are slotted at *i'* for the reception of the rods *e* which are mounted on the step sections. These rods are similarly mounted to the rods d^2 shown in Fig. 1^a. By the use of these links the step sections are connected individually to the drive chain A' and are drawn forward by the said drive chain through the medium of the links, but it will be noticed that at the points where the step sections change direction of movement they are free and are moved forward by the succeeding step sections.

Referring to Fig. 5^b the step sections emerge from under the lower platform H and are drawn forward by the drive chain until they reach a point where the step section is to be transferred from the horizontal rails to the inclined rails. The chain in this instance travels on a gentle curve while the rails for the step sections meet at an angle, thus the step sections at the angle are free from the direct control of the chain and are pushed forward by the succeeding step sections, thus closing any gap which would ordinarily occur at this point and will allow the step sections to transfer from one track to another without jar. When the step section is fully on the inclined rail the rod *e* is again engaged by the link and the step section is drawn up the incline tracks until it nears the point where it is to be transferred to the horizontal tracks. At this point the rail B^5 is shaped so as to come closer to the path of the step sections and consequently the rod *e* will travel in the slot *i'* of the links *i*, as indicated in Fig. 5^a, allowing the succeeding step sections to push the step sections at this point until the wheels of the step sections are on the horizontal tracks when the individual steps again come under the control of the chain A'. Thus the step sections are forced close together at the point where the inclined portion of the stairway joins the upper horizontal platform, closing all gaps or spaces. As the step sections turn around the head guide E' they are again free of the chain A and remain free until the wheels of the chain are caught by the rail B^6, the chain being free to sag between the head guide and the rail B^6. At this point of the return run the sprocket wheel engages the chain so as to carry the chain and its step sections forward and allow the step sections to descend by their own weight, having a limited motion irrespective of the chain, the step sections are then free of the chain until the base guide is reached then the chain pulls the step sections up through the base guide, drawing them from under the platform H. The base section E' in which the groove f^2 is formed may be made adjustable in the same manner as the lower portions of the guideways illustrated in Fig. 2^b.

In Figs. 12, 13 and 14, I have shown a stairway in which the travel of the carrying run is in the reverse direction to that shown in Figs. 5^a and 5^b, the stairway being designed for the purpose of carrying a passenger from the upper floor to the lower floor. In this instance in place of the slotted links which allow the step sections to have movement in respect to the chain the links i^2 are connected to the rods *e'* of the step sections D' without lost motion and the links are connected to the chains A^2 without lost motion.

The result attained by the construction heretofore described is attained in this case by curving the rails for the carrying chain at the point where the inclined portion joins the horizontal portion in such a manner that no gaps will be formed between the step sections.

I claim:

1. The combination in a moving stairway, of a series of step sections arranged to travel in a given path, a chain arranged to drive said step sections, said step sections being free to lag at the points where they change direction of movement on the carrying run, substantially as described.

2. The combination in a moving stairway, of step sections, guides therefor, an endless drive chain, guides for said chain, the guides for the steps being at more of an acute angle than the guide for the chain at the point where the direction of movement is changed, substantially as described.

3. The combination in a moving stairway, of step sections, guides therefor, an endless drive chain for the step sections, guides for the chain, the guides for the step sections at the points where the horizontal portions of the stairway join the inclined portions being at an angle and the guides for the drive chain being on a curve, substantially as described.

4. In a moving stairway, the combination of step sections, guides therefor, a drive chain for said step sections, guides for the drive chain, the two guides being so formed that the step sections will travel in a relatively longer path than the drive chain at the point where the direction of movement of the step section is changed, so as to keep the several step sections in contact at this point, substantially as described.

5. The combination in a moving stairway, of step sections, links connecting the sections, a drive chain having portions engaging said sections, guides for the step sections and guides for the drive chain, the guides for the step sections being at an angle at the point where the change of direction of movement occurs, and the guides for the chain being on

a curve at this point, substantially as described.

6. The combination in a moving stairway, of a series of step sections, links connecting the said step sections, a link drive chain having projections arranged to engage the step sections, rails upon which the step sections travel, and a rail upon which the drive chain travels on the carrying run, substantially as described.

7. The combination in a moving stairway, of upper and lower horizontal rails and inclined rails, step sections, wheels on said step sections arranged to travel on said rails, links connecting the step sections, a drive chain, a rail upon which the drive chain travels on the carrying run, and lugs on the chain engaging the step sections, substantially as described.

8. The combination in a moving stairway, of upper and lower horizontal rails, inclined rails, step sections having wheels arranged to travel on said rails, a cross rod on each step section, a drive chain arranged to travel under the step sections on the carrying run, a rail for supporting said chain on the carrying run, wheels around which the chain passes, and lugs on the chain arranged to engage with the rods on the step sections, substantially as described.

9. The combination in a moving stairway, of upper and lower horizontal rails and inclined rails, said inclined rails joining the horizontal rails at an angle, step sections arranged to travel on said rails, an endless drive chain arranged to engage the said step sections, sprocket wheels around which the drive chain passes, a supporting rail for said chain having upper and lower horizontal sections and an inclined section, the joint between the inclined section and the horizontal section being on a curve, substantially as described.

10. The combination in a moving stairway, of upper and lower horizontal rails and inclined rails, step sections arranged to travel on said rails, a bar on each step section, links extending from one bar to the other and forming an endless chain of steps, an endless drive chain, a rail for supporting said drive chain on the carrying run of the stairway, said chain having lugs arranged to engage the bar, substantially as described.

11. The combination in a moving stairway, of upper and lower horizontal rails and inclined rails, step sections arranged to travel on said rails, links connecting the sections to form an endless chain, one end of the links being slotted so as to allow a certain amount of lost motion, and a drive chain by which motion is imparted to the step sections, substantially as described.

12. The combination in a moving stairway, of upper and lower horizontal rails and inclined rails, step sections arranged to travel thereon, a bar on each step section, links extending from one bar to the other, one end of each link being slotted to allow a certain amount of lost motion, an endless drive chain, sprocket wheels around which the said chain passes, a rail for supporting the drive chain on the horizontal run, and lugs on the drive chain arranged to engage the bars and drive the step sections, substantially as described.

13. The combination in a moving stairway, of upper and lower horizontal rails and inclined rails, step sections arranged to travel thereon, a bar on each step section, links extending from one bar to the other, one end of each link being slotted to allow a certain amount of lost motion, an endless drive chain, sprocket wheels around which the said chain passes, a rail for supporting the drive chain on the horizontal run, and lugs on the drive chain arranged to engage the bars and drive the step sections, the said rail for the drive chain being in such relation to the rails of the step sections that the lugs will be disengaged from the step sections at the point where the step sections change direction of movement, substantially as described.

14. The combination in a moving stairway, of step sections, rails upon which said step sections travel, an endless drive chain having lugs thereon, each lug having two steps so that on certain portions of the run one step is in engagement with each step section and at other portions of the run the other step of the lug is in engagement with the step sections, substantially as described.

15. The combination of a moving stairway and a hand rail therefor having its tension member composed of a spirally wound wire coil.

16. A link for a traveling stairway having a projecting lug thereon notched to form two steps, substantially as described.

17. A link for a traveling stairway having a lug at one end, said lug notched to form two steps, substantially as described.

18. The combination in a moving stairway, of step sections, links connecting the step sections so as to form an endless chain of steps, guides and rails so formed that the return run of the step sections will be under the carrying run, a drive chain mounted between the two runs, sprocket wheels around which the drive chain passes, said drive chain being shorter than the endless chain of steps, the said step sections being free to lag at the points where they change direction of movement on the carrying run, substantially as described.

19. The combination of upper and lower horizontal rails, inclined rails, step sections arranged to travel on said rails, a drive chain for driving said step sections, guides at each

end of the stairway for the step sections, the guides at the lower end of the stairway being adjustable, substantially as described.

20. The combination of upper and lower horizontal rails and inclined rails, step sections arranged to travel on said rails, upper and lower return guides for the step sections, means for adjusting said guides, an endless drive chain, sprocket wheels around which the drive chain passes, a rail for supporting the said chain on the carrying run, and adjustable bearings for the lower sprocket wheel, substantially as described.

21. The combination in a moving stairway, of side rails having upper and lower horizontal portions and inclined portions, step sections arranged to travel on said rails, a drive chain centrally situated in respect to the side rails and arranged to engage the step sections to drive the same, sprocket wheels around which the said chain passes, and rails for the said chain arranged at the center of the stairway, substantially as described.

22. The combination in a moving stairway, of rails having inclined and horizontal portions, step sections arranged to travel on said rails, a rod on each step section, a drive chain mounted under the step section on the carrying run and having lugs engaging the rods of the step sections, a rail for the said drive chain, said rail being so arranged in respect to the rails of the step sections that the lugs will engage the rods of the step sections on the inclined carrying run and be drawn away from them as the step sections are transferred from the inclined to the horizontal portion of the rails and then advance in front of the rods, the whole of the step sections being in position while traveling on the upper horizontal portions of the rails, substantially as described.

23. The combination in a moving stairway, of rails having a lower horizontal portion and an inclined portion joining the said horizontal portion at an angle, step sections arranged to travel on said rails, a rod on each step section, an endless chain arranged to travel under the step sections, a rail for the said chain, stepped lugs projecting from the said chain and arranged to engage the rods of the step sections, one step of the lugs engaging the rods of the step sections while the step sections are traveling on the lower horizontal portion of the rails, the other step of each lug engaging the rods of the step sections while on the inclined portion of the rails, substantially as described.

24. The combination of two sets of rails, each having upper and lower horizontal and inclined portions, the said rails being on the same plane on the inclined portion and one set of rails being elevated above the other on the horizontal portion, the horizontal portion of said rail joining the inclined portion at an angle, step sections having wheels arranged to travel on said rails, the forward wheels traveling on one set of rails and the rear wheels traveling on the other set of rails, an endless chain for driving said step sections, a rail upon which the chain travels on the carrying run of the stairway, curved portions uniting the upper and lower horizontal portions of said rail with the inclined portion, the parts being so arranged that each step section will be free at the point where it changes direction of movement, substantially as described.

25. The combination with a moving stairway of a hand rail consisting of an endless belt providing a hand rail gripping surface and consisting of a spirally wound wire coil.

26. The combination in a moving hand rail consisting of two endless spirally coiled sections, one interlaced with the other, one forming the handhold and the other forming a guide, supports for said hand rail and driving means, substantially as described.

27. The combination in a stairway, of a guard at the side of the stairway, a groove in the guard, a hand rail made in two sections, one section less in diameter than the other, the smaller section being mounted in the groove and the large section forming the handhold, and means for driving the hand rail, substantially as described.

28. A moving hand rail consisting of two spirally coiled sections, one interlaced with the other, substantially as described.

29. A moving hand rail consisting of two spirally coiled sections, one section being greater in diameter than the other, the two sections being interlaced, substantially as described.

30. The combination in a moving stairway of guides, a hand rail consisting of a continuous symmetrically wound spiral wire coil, with means for retaining said coil on said guides.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

GEORGE A. WHEELER.

Witnesses:
JOHN J. MCGRONEN,
THOMAS P. EGAN.