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G. A. WHEELER.

ELEVATOR.

No. 479,864. Patented Aug. 2, 1892.

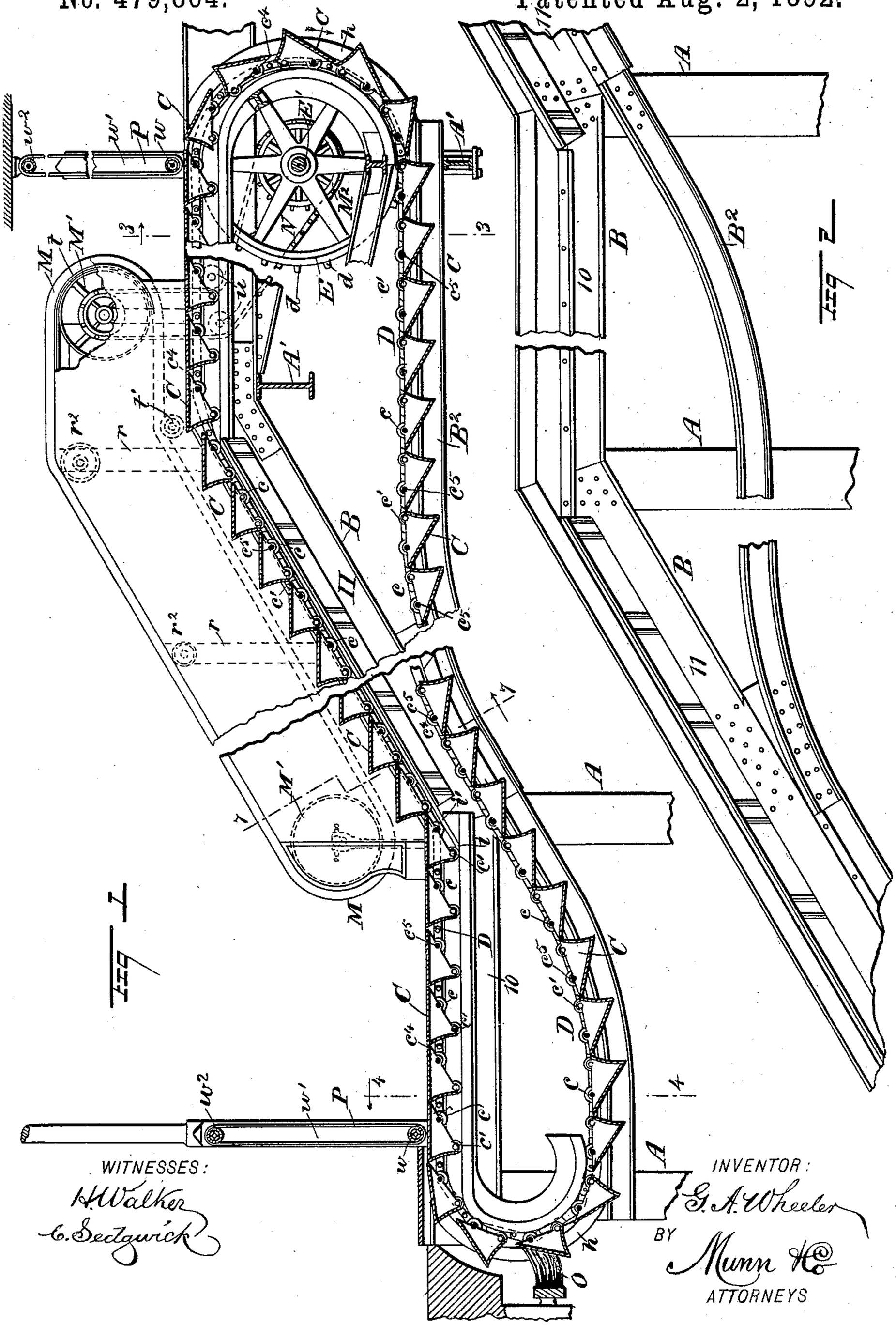

Fig. 1.

WITNESSES:

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ELEVATOR.

No. 479,864. Patented Aug. 2, 1892.

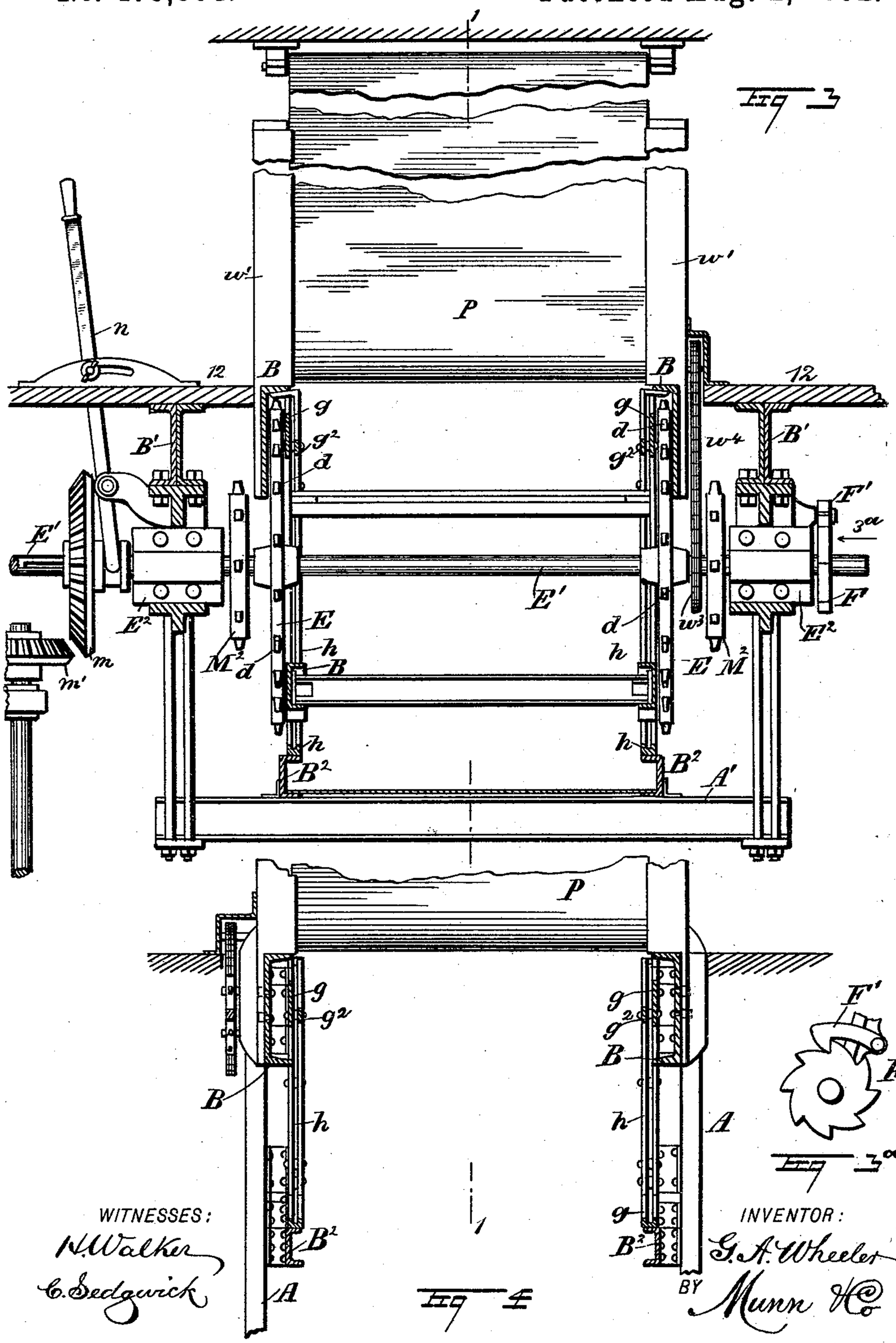

Fig 3

Fig 4

Fig 3ª

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G. A. WHEELER.

ELEVATOR.

No. 479,864. Patented Aug. 2, 1892.

Fig 9

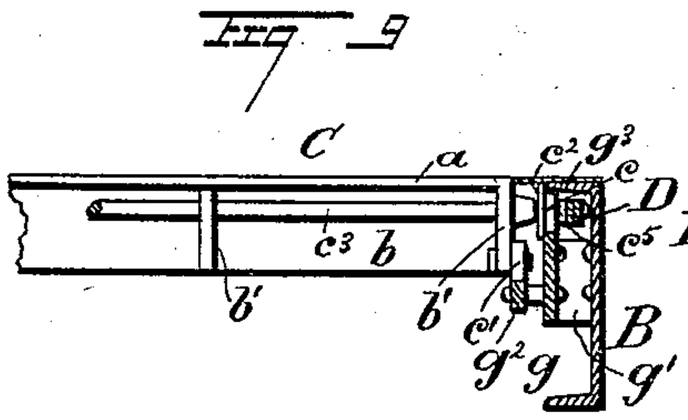
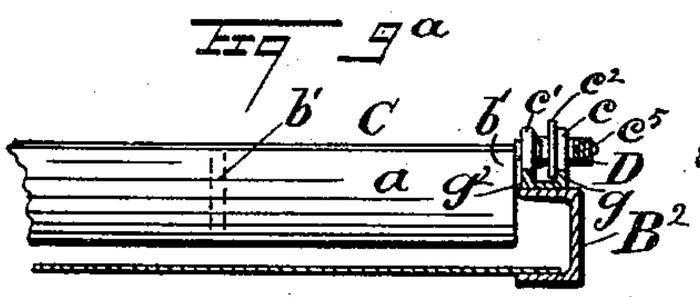


Fig 9a



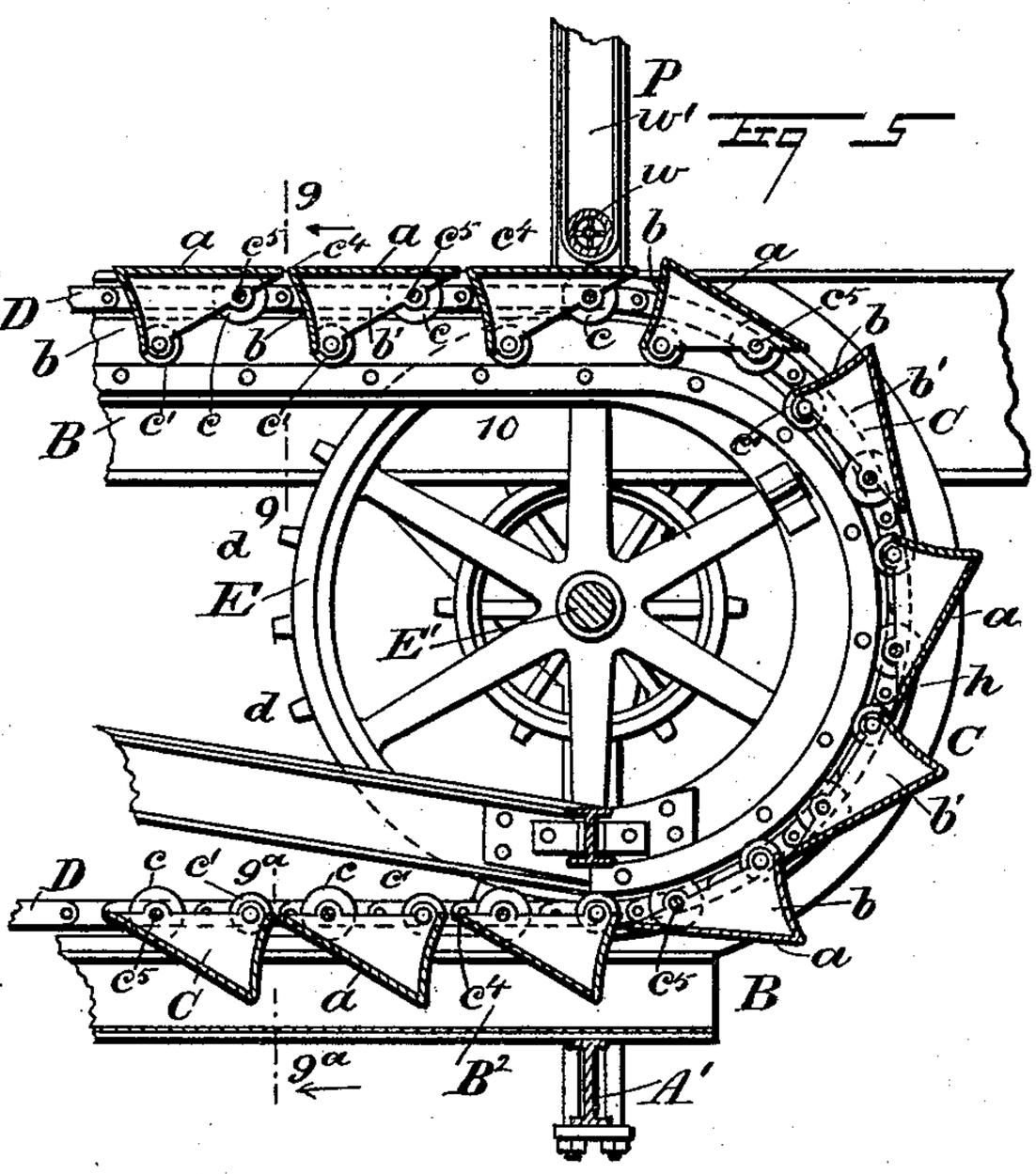


Fig 6

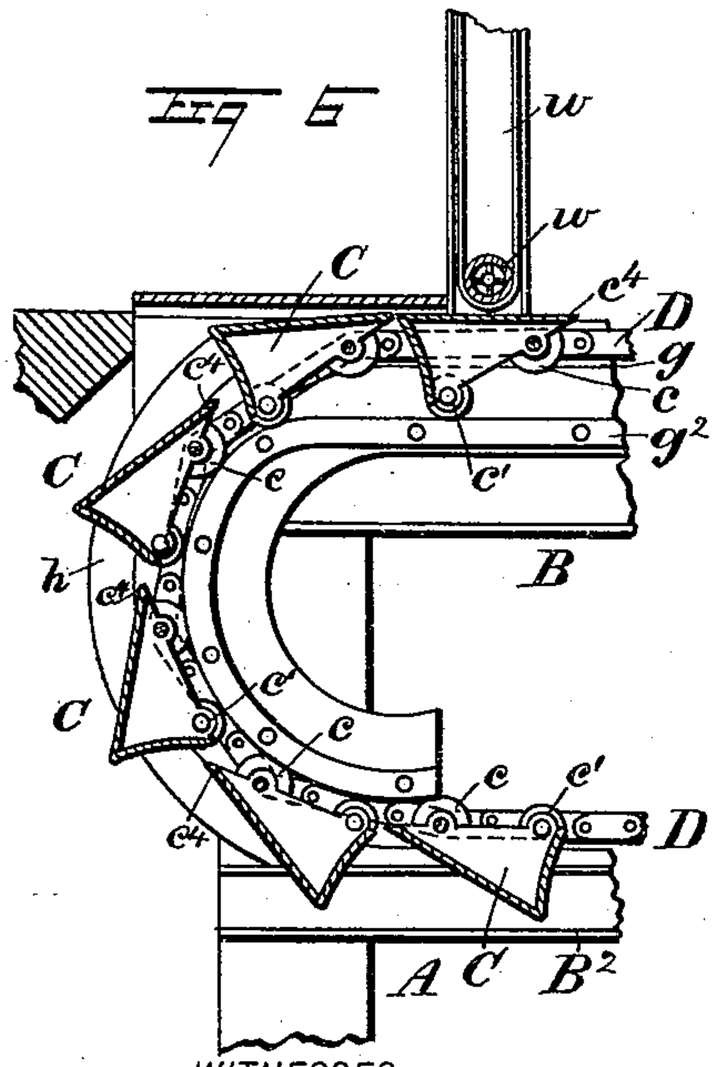


Fig 6a

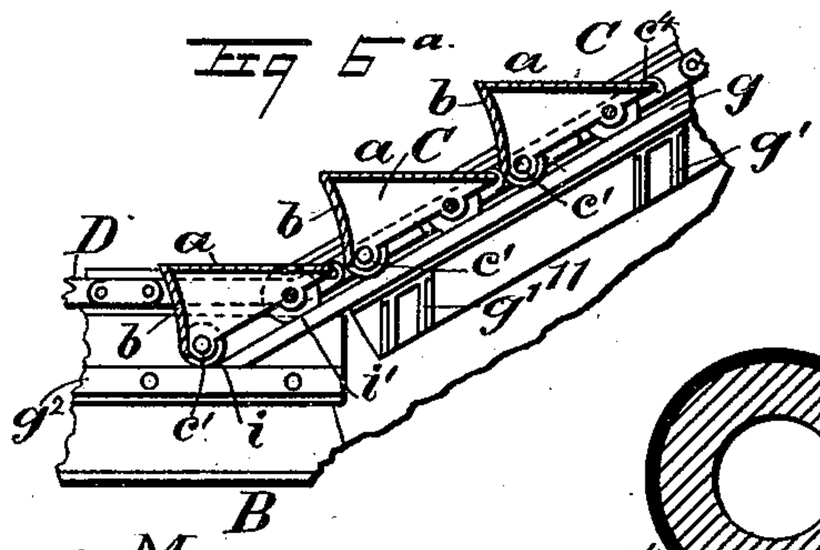


Fig 8

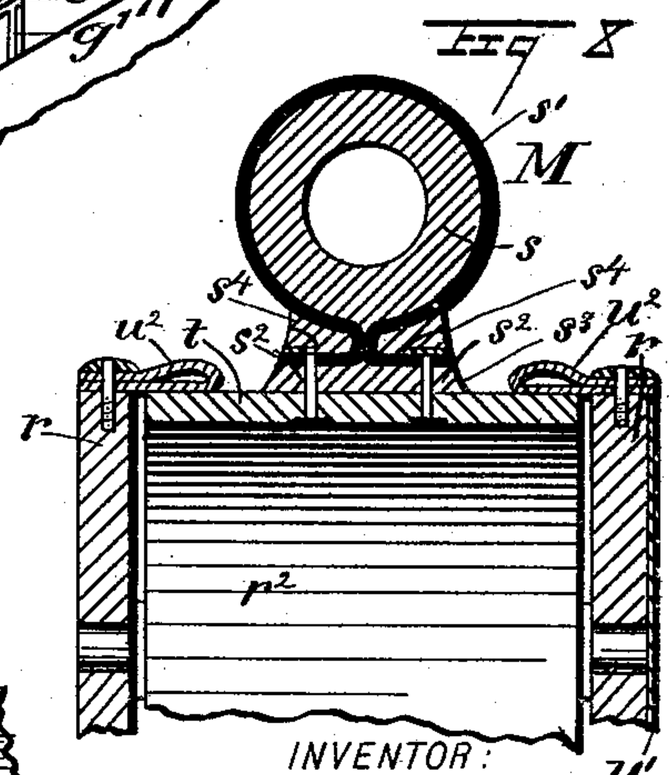
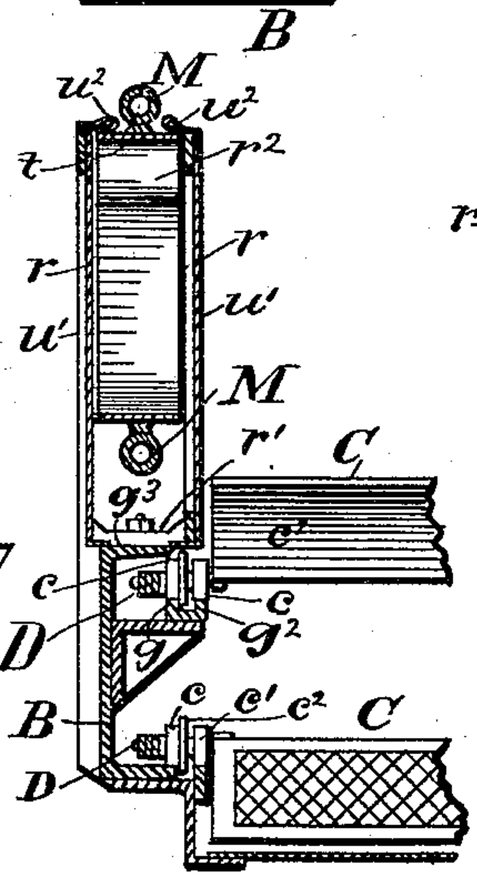


Fig 7



WITNESSES:

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ELEVATOR.

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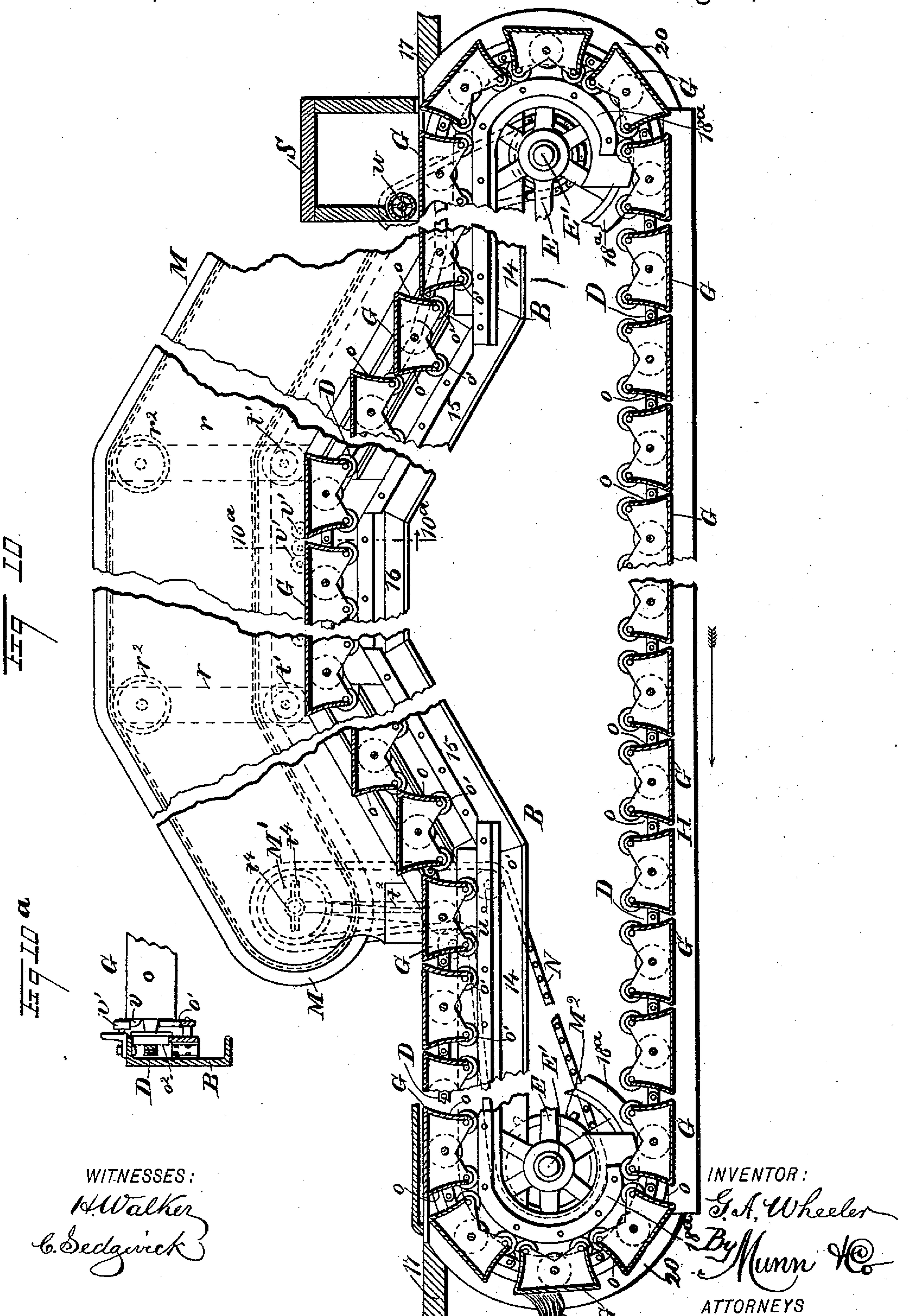

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Fig. 11

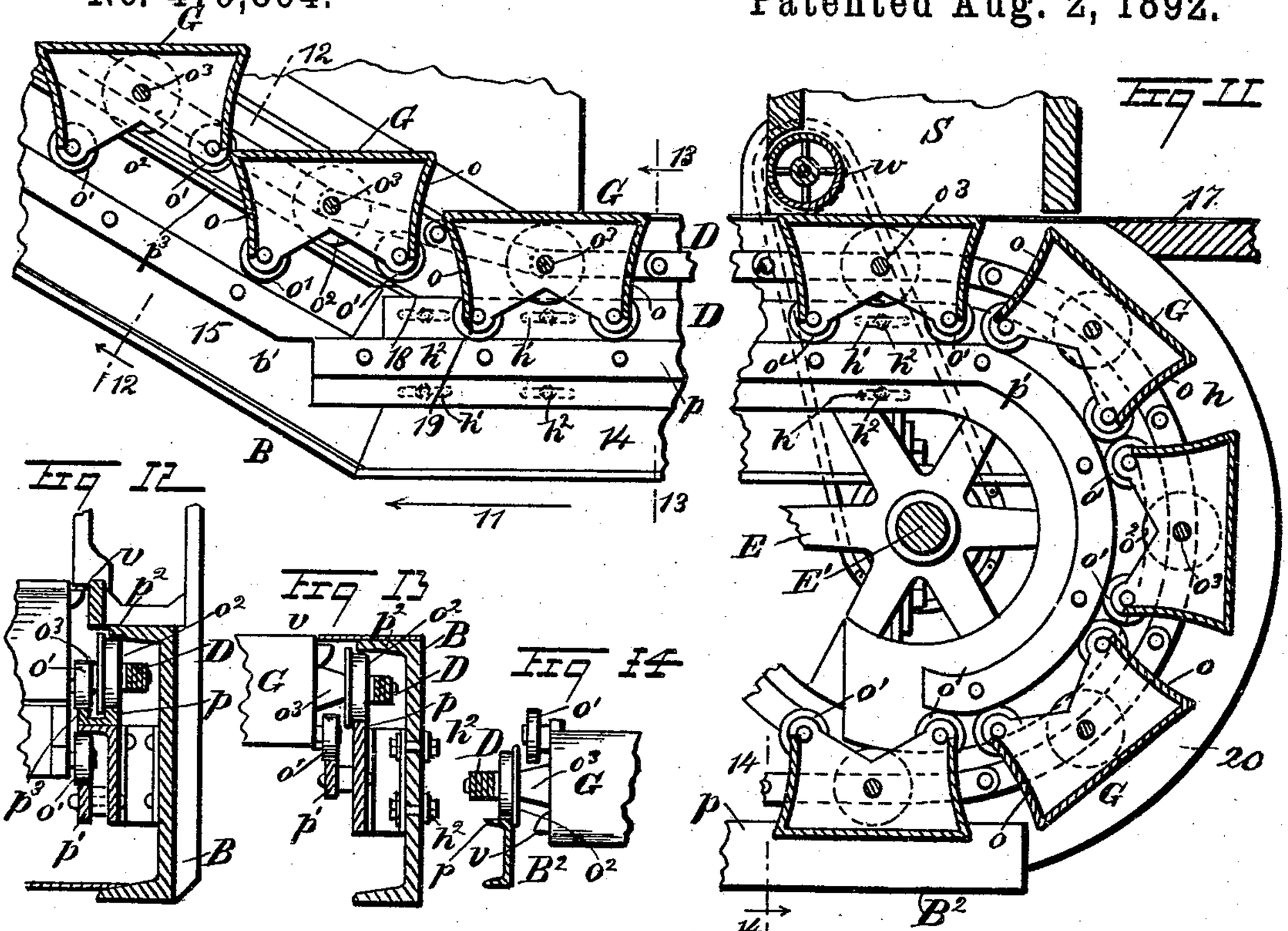


Fig. 12

Fig. 13

Fig. 14

Fig. 16

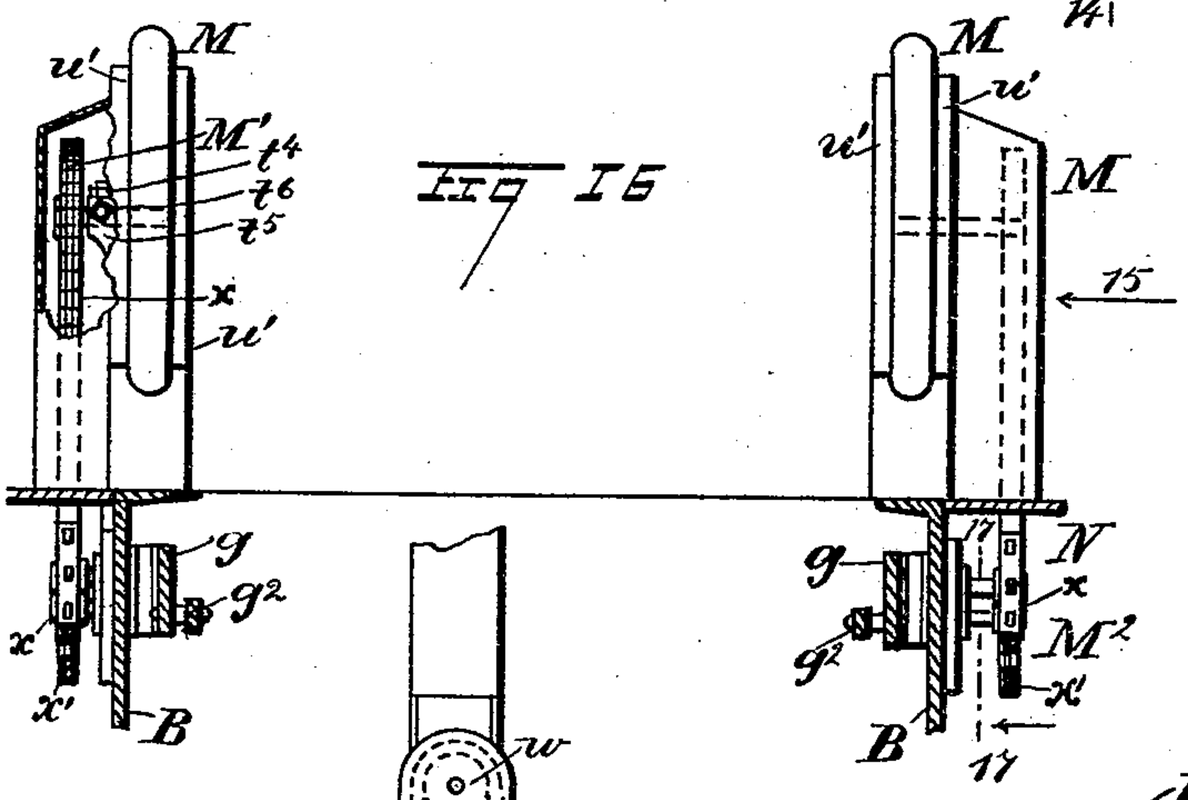


Fig. 15

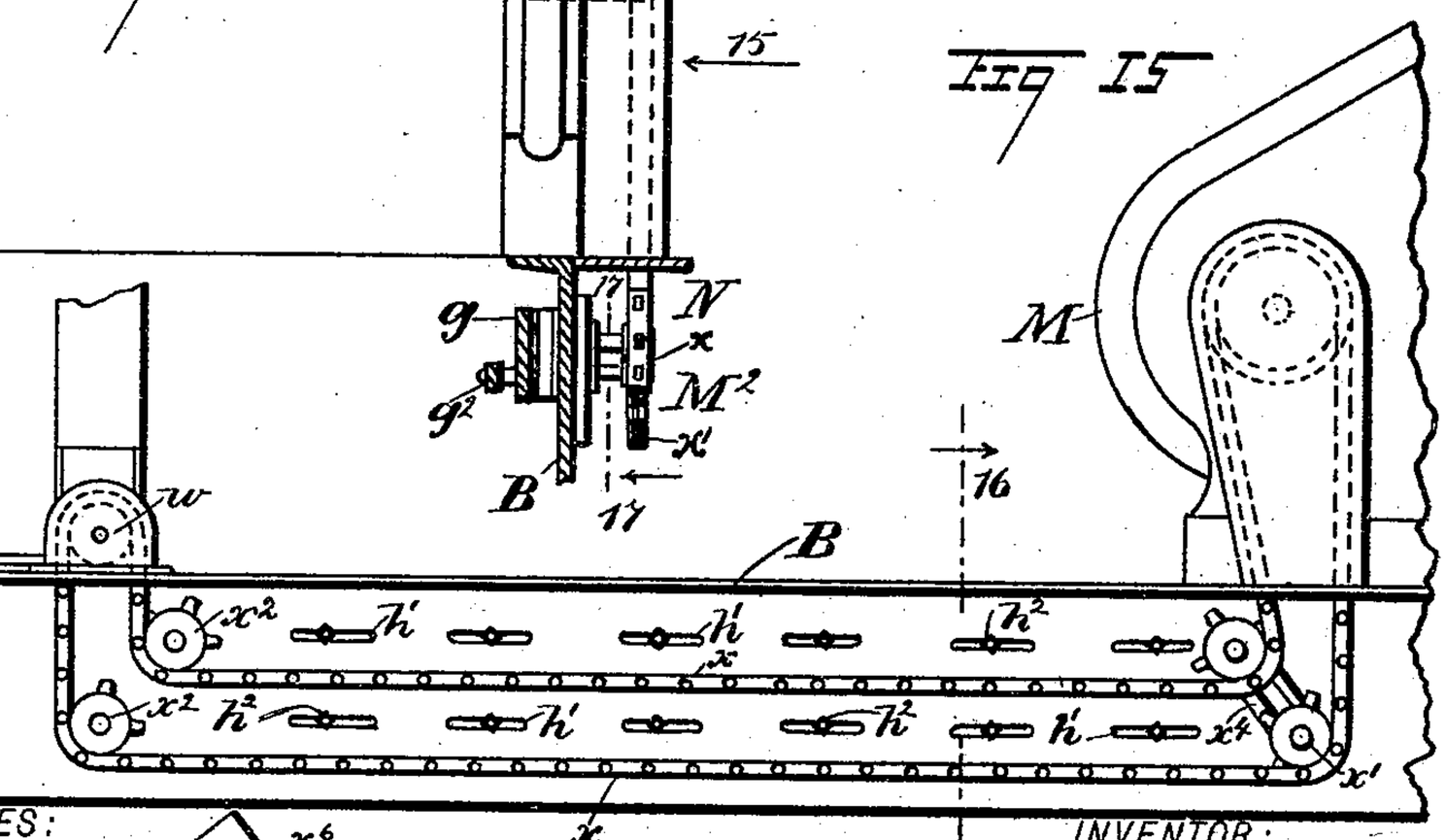


Fig. 17

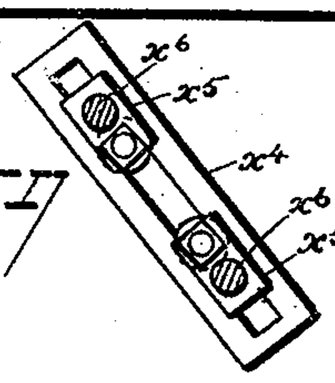
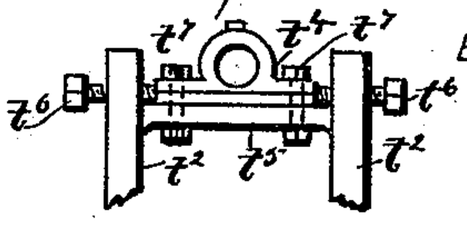


Fig. 18



WITNESSES:

H. Walker

C. Sedgwick

INVENTOR:

G. A. Wheeler

BY Munn & Co

ATTORNEYS

UNITED STATES PATENT OFFICE.

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

ELEVATOR.

SPECIFICATION forming part of Letters Patent No. 479,864, dated August 2, 1892.

Application filed March 5, 1891. Serial No. 383,878. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. WHEELER, of New York city, in the county and State of New York, have invented a new and useful Elevator, of which the following is a full, clear, and exact description.

This invention relates to improvements in passenger-elevators preferably employed for stations on elevated railways, but also applicable to other locations, and has for its objects to provide a safe, capacious, and convenient device which will afford a stairway for travel as well as a continuously-movable elevator.

To these ends my invention consists in certain features of construction and combinations of parts, as is hereinafter described, and pointed out in the claims.

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

Figure 1 is a broken sectional side elevation taken on the center line 1 1 in Figs. 3 and 4, showing the preferred form for the construction of the improvement when a single flight of stairs and landings are to be erected, a hand-rail and other guards for the side and ends of the structure being also shown. Fig. 2 represents a broken side elevation of the preferred form of framework employed to sustain the movable parts of the improved elevator when two flights of stairs, upwardly inclined, and an intervening landing are to be erected. Fig. 3 is a broken transverse section of the structure as shown in Fig. 1, taken on the line 3 3 in said figure. Fig. 3ª is a detail side view of one of the details of construction, the position of which is indicated by the arrow 3ª in Fig. 3. Fig. 4 is a cross-section of the lower landing or platform of the elevator represented in Fig. 1 on the line 4 4 in said figure, attached parts being shown broken away. Fig. 5 is an enlarged sectional side view of part of the elevator shown in Fig. 1, the portion shown consisting of the upper platform, part of a guard, and mechanism that is employed in the movement of the elevator. Fig. 6 is an enlarged sectional side view showing the lower end portion of the device illustrated in Fig. 1, attached parts being shown broken away. Fig. 6ª is an enlarged broken detail of the elevator shown in Fig. 1 at a point where the stairs rise from the lower platform. Fig. 7 is a transverse section of the elevator-stairs broken away, taken on the line 7 7 in Fig. 1, showing the lower support for the hand-rail. Fig. 8 is an enlarged cross-section of the hand-rail and adjacent parts, the latter-named being shown broken away below. Fig. 9 is a cross-section of the upper platform shown in Figs. 1 and 5, taken on the line 9 9 in Fig. 5. Fig. 9ª is a transverse section of the lower frame portion of the upper platform, taken on the line 9ª in Fig. 5. Fig. 10 is a broken sectional side elevation showing a preferred form for constructing the elevator when two oppositely-inclined flights of stairs are to be provided, a lower platform for each series of stairs and a top landing or platform common to both stairways being also shown. Fig. 10ª is a transverse section of the upper platform or landing of the double pitch or incline elevator shown in Fig. 10, taken on the line 10ª in said figure. Fig. 11 is an enlarged broken sectional side elevation of one lower platform and a part of one series of upwardly-inclined stairs with attached mechanism, showing a portion of the double-staircase elevator represented in Fig. 10. Fig. 12 is a broken cross-section of the stairs shown in Figs. 10 and 11, taken on the line 12 12 in the last-named figure. Fig. 13 is a broken cross-section of the platform represented in Fig. 11, taken on the line 13 13 in said figure. Fig. 14 is a cross-section of the lower portion of the framework shown in Fig. 11, taken on the line 14 14 in said figure. Fig. 15 is a side view of the framework, newel-post, and transverse guard for the lower platform of the elevator shown broken away, indicating a preferred means for communicating motion from the revoluble mechanism that actuates the hand-rail to the vertically-movable transverse guard, said view being taken in the direction of the arrow 15 in Fig. 16. Fig. 16 is a transverse section of the portion of the device shown in Figs. 1 and 15, taken on the line 16 16 in the last-named figure. Fig. 17 is a side view, enlarged and partly in section, of the chain-gear shown in Figs. 15 and 16, taken on the line 17 17 in Fig. 16; and Fig. 18 is an enlarged broken side view of the adjustable support for the hand-rail-carrying wheel on the newel-post at the foot of the stairway shown in dotted lines in Fig. 1.

To afford a clear comprehension of the salient features of the invention preliminary to the detailed description of the several features of construction, a synopsis will be given of the same, indicating the nature of the improvement.

Briefly considered, the invention embodies a series of steps or platforms connected together so as to form an endless belt. A proper supporting-framework is provided, and each step or platform is furnished with wheels that rest upon tracks that are a portion of the stationary framework, thus converting the steps into movable trucks. Proper actuating mechanism is so connected to the series of steps or trucks that they may be made to ascend an inclined plane having level stretches or landings above and below, or there may be two or more inclines in the same direction with a landing between them. Furthermore, two opposite inclines for the support of progressively-moving steps may be provided, there being a landing or level platform below for each stairway and a common landing at the head of the two sets of stairs.

The trucks, which afford steps when on the track inclines, are so arranged and the tracks so constructed that each truck will be sustained with its top face in a plane parallel to the top of the truck above or below it, the trucks being adapted to assume a common level plane on their tops when on the landings or level places of the framework. The tops of the trucks may have such dimensions as to form of riser and tread as will form a stair-step adapted for pedestrian travel, so that the elevator may be ascended or descended while in motion or at rest, or they may be of other dimensions, it being intended that any desired variation in proportion be afforded.

This invention also includes a revolving hand-rail which moves in the same direction as the steps on the inclines and preferably at the same speed. A safety device consisting of a vertically-moving guard-wall is located transversely at the extremities of the landings, which walls are revolved in an opposite direction to that of the travel of the steps or trucks. A means for locking the elevator against progressive movement downwardly is connected therewith to obviate accident if the driving mechanism breaks, and a proper starting and stopping device is also provided.

Referring to the drawings, A A′ indicate the frame-supports, (shown broken where they appear,) these consisting of upright and horizontal posts and beams, respectively, whereon the elevator-frame is imposed, any suitable number being provided to insure stability and meet the requirements of the service and location.

The main portion of the elevator-frame consists of the side stringers B, which are preferably given the form of metal channel-beams, their flat surfaces being exposed outwardly, as shown in the transverse sections of the device given in Figs. 4, 7, 9, 12, 13, and 16. Within the channels of the beams B track-rail supports are secured, which are of slightly-changed form as provided for single and double flight stairs for elevators. (Shown, respectively, in Figs. 1 and 10, as well as their enlargements in other figures.) These will be successively described in their order. The trucks C, preferably used for elevators having one or more stair-flights in the same direction, the supporting-frames of which are shown in Figs. 1 and 2, have a similar form, and each consists of a tread *a* and a riser *b*, joined at their ends to brackets *b′*, (see Figs. 5 and 9,) which are of substantially triangular form, any desired number of similar brackets being located intermediate of the ends to render the trucks substantial without excessive weight.

The risers *b* of the step-shaped trucks C are curved inwardly throughout their length and made smooth, in order that the toes or heels of passengers will slip off of an adjacent riser, which they may come into contact with.

Each of the trucks C is adapted for progressive movement by the provision of small wheels *c c′*, which are revolubly secured thereto at their ends. The wheels *c′* are mounted loosely on journal-studs that project from the end brackets *b′* near the lower edges of the risers *b* and have a running clearance close to the exterior faces of the end brackets. The upper wheels *c* are given by preference the same diameter as the lower wheels *c′* and are each flanged, as at c^2. For a purpose which will appear the upper truck-wheels *c* are located in a vertical plane parallel with that of the lower wheels *c′* and are farther away from the ends of the trucks than said lower wheels.

Preferably the wheels *c* for a truck are in pairs loosely supported on the journal ends of a shaft c^3, which extends through the brackets *b′* and has a hub-like enlargement on each end exterior of the truck against which the wheels have loose contact, the length of said hubs being such as will locate the upper wheels a proper distance outside of the lower wheels.

As before indicated, the trucks C, that compose the steps and landings of the elevator shown in Fig. 1, are connected in sequence by their loose attachment to two endless sprocket-chains D, which are of equal length. There is a pivotal connection afforded between the joints of the sprocket-chains D and the projecting ends of the shafts c^3 outside of the wheels *c*, as at c^5, so that these chains are loosely jointed to each truck or step oppositely in alignment with the axis of the upper wheels *c*. The length of the chain-sections between the pivotal connections just mentioned is so proportioned with regard to the height of the risers and breadth of treads on the trucks or steps C that these will bear the true relation to each other of steps on a stairway when located on the incline of the elevator-frame, as will be further explained.

To provide an adequate means for the progressive and safe movement of the entire series of loosely-connected trucks C, upon the level stretches 10 and inclines 11 of the supporting-framework two sprocket-wheels E are preferably employed, which are secured upon the transverse driving-shaft E′, that is journaled in the boxes E^2 and receives motion from any source of power preferred, said boxes being attached to the joined channel-bars B′, which are the horizontal supports of the upper fixed landing 12, which may be the floor of an elevated-railway station or an elevated floor of a building. (See Fig. 3.)

The wheels E are so located that their teeth *d* will engage the chains D in the usual manner and cause the series of trucks to move in the direction of the curved arrow in Fig. 1 when the shaft E′ is revolubly moved in the same direction.

As a means for arresting the improper downward movement of the trucks C on the inclines 11, a detent ratchet-wheel F is provided, which wheel is secured on the end of the shaft E′, as shown in Fig. 3, the detached Fig. 3^a showing the side of the wheel and an interlocking pawl F′, that is engaged with its teeth and is adapted to arrest the retrograde movement of the shaft and sprocket-wheels E.

As the design of the improvement is to furnish an endless series of steps or platform-landings without gaps between, the framework and tramway-tracks must afford a proper support not only for use, but also for the remaining portion of the connected series of trucks C, that afford these steps or level landings. To this end there is a supplementary frame B^2 hung below and secured to the upper portion or main frame, of which the channel-beams B are the sides, the lower frame-portion B^2 having an undulating conformation to avoid street obstruction and afford a graceful appearance, as well as to provide an easy bed for the movement of the trucks. There is a change in relative location of the double tracks on the upper frame portion as compared to that of the same tracks on the lower frame portion B^2, which will be further explained.

The tramway-tracks on the channel-beams B consist of a main track *g*, that is supported by brackets *g′*, located at intervals along said track, the wheels *c* of the trucks C resting and rolling upon its top edge, as shown in Fig. 9. The lower wheels *c′* are sustained upon a lower track g^2, which is held projected inwardly from the main or top track *g* sufficiently to afford such support, the relative distance between the upper edges of the tracks *g* g^2, vertically considered, being so gaged as to dispose the tops or treads *a* of the trucks C in one level plane, it being understood that this description of tracks applies only to the landings at the bottom and tops of the steps formed by the trucks C on the inclines of the frame.

The tracks *g* g^2, formed on the inclines 11, are arranged to have their top faces in the same plane. (See Fig. 7, and as shown in Fig. 6^a.) These tracks on the inclines join the mating tracks on the landing, forming two angles *i i′* of equal degree. The tracks *g*, whereon the wheels *c* travel, extend in advance of the tracks g^2, and for the proper operation of the device it is essential that the parts be proportioned, so that the wheels *c c′* on each side of a truck that is about to ascend the inclined portions of the tracks will engage said inclines of the tracks at the same instant, as shown in Fig. 6^a, and the same is true with regard to the angles at the top of the track inclines.

As the trucks C are raised successively when they engage the inclined tracks *g* g^2 and all are alike, it is evident that if the first truck to strike the incline preserves its tread *a* in a horizontal plane parallel with the landing it is leaving all successive trucks will be correspondingly disposed and result in the formation of a series of stair-steps on the inclines 11.

When the upper landing of the elevator is reached by the progressively-moved trucks or steps C, the tracks *g* g^2 change their relative position vertically and assume the same degree of separation as has been described with regard to the lower landing, and consequently the trucks have their treads all located in one plane.

There is a necessity for the provision of guards above the top truck-wheels *c* to insure their retention upon the tracks they engage while traveling on the level stretches 10 and inclines 11. To this end the tracks *g* g^2 are affixed upon the inside surfaces of the channel-beams B at such points as will bring the wheels *c* in close proximity to the top flange g^3 of the channel-beams B, as represented in Fig. 9, the guard-rails thus afforded extending throughout the length of the structure upon each side of the same.

The track-rails *g* g^2 are curved at each end of the elevator-frame to provide a tramway which will support the series of trucks C at these points, the degree of curvature being proportioned to the distance between the ends of the upper and lower frame portions, as well as the dimensions of the trucks, so that the lower ends of the curved tracks will be located near to the tracks on the lower frame B^2 and will align therewith laterally, which will allow the wheels *c c′* of the trucks C to engage the tracks of the lower framework and properly sustain said trucks in an inverted position. Curved guard-rails *h* are secured to the frame, so as to loosely engage the truck-wheels *c c′* of the trucks that are running over the curved track portions just described.

In the construction of the elevator it is essential that provision be made to take up looseness of the sprocket-chains D. To readily effect this after the parts are in position, the main tracks *g*, that are on the lower frame portion 10, have a bolted attachment provided between them and the channel-beams B which

support them, and, as shown in Figs. 11 and 15, longitudinal slots h' are cut in the beams to allow the securing-bolts h^2 to move therein. By this plan of attachment the tracks and their curved continuations at this end of the structure can be slid endwise sufficiently to take up looseness.

When but a single flight of steps are to be provided, the extension of the frame will be produced on the level portion of the same at the lower landing, and when the device is to be constructed to allow progressive movement in either direction, and to this end is furnished with two transverse shafts and sprocket-wheels E on the same, as is shown in Fig. 10, there should be a connection formed between the boxes that support said shafts and the longitudinally-movable parts of the frames in any proper manner, whereby the wheels that have the sprocket-chains engaging their peripheries will be adapted to move with the frame portions mentioned, and thus take up slackness of the chains.

It may be here stated that the compensation for looseness is only necessary as a provision to enable the easy erection of the structure, as it would be a difficult matter to calculate the exact length of the chains so as to get the correct tension for them. It is also contemplated to effect the adjustment of the chains by placing liners under the boxes E^2, between these and the frame-supports, which will effect the tightening of the chains. These expedients, being incidentals in the matter of frame erection, are not shown, as if the chains are of a correct length the movement of the boxes will not be required.

A further provision for maintaining a proper tension in the sprocket-chains D consists in the construction of the trucks C and their proportion as compared to the degree of elevation between the lower landing and the top of the inclines. In other words, the number of steps—*i. e.*, trucks—and their height at the risers should be such with regard to the elevation traversed that there will be an even number of steps and a half-step in height required to attain the height desired, as is shown in Fig. 1. This formation and arrangement of the trucks and their pivotal attachment to the sprocket-chains, as shown, will cause the chains to draw in a straight line across the angular junction of the riser with the tread of the top step and produce a bend in the chains at the lower step which will tend to stretch the chains along the entire line of top travel of the trucks or steps C.

At the left side of the view shown in Fig. 3 a means for shifting the gear-wheel m, and thus throwing the shaft E′ out of connection with the driving gear-wheel m', is shown which will arrest the elevator at any desired point of longitudinal movement, the vibration of the lever n effecting a geared connection of the wheels or their separation, as may be required.

The device for throwing the elevator into or out of gear with the source of power may be altered to substitute a friction-clutch or other equivalent mechanism, as it is not desired to limit the construction to the apparatus shown, any well-known clutch device being applicable for the purpose.

In Figs. 10 to 14, inclusive, the plan of constructing the frame and trucks for double and oppositely pitched stair flights for the improved elevation is shown, and consists of a structure having two horizontal bottom landings 14, from which are erected the oppositely-inclined stair-supports 15, that terminate above in a top landing 16. The trucks G are connected to sprocket-chains D, as will be further explained, and as represented in Fig. 10 the chains engage a sprocket-wheel E at each end of the structure, these wheels being each mounted upon and secured to a shaft E′, the same as is represented with regard to the single-flight elevator shown in Fig. 1, said shafts being adapted to receive motion and rotate in opposite directions, so that when either is used and the other released from its driver the elevator will move in the direction the active sprocket-wheels revolve.

It is to be understood that the frame structure for the double-pitched stairway shown in Fig. 10 is to be sustained upon proper supports, which may be metal or other uprights or masonry walls, and fixed platform approaches are to be provided, as at 17, and also an avenue above (not shown) that is in connection with the upper landing 16 to permit passengers to locate upon the elevator-landings and leave the same.

The trucks G are modified in form to adapt them to move in either direction, as may be required, and to this end have two risers provided for each truck, as shown at o, in the transverse sections of said similar devices.

Each truck G is furnished with two wheels o' at each end of the same dimensions, which wheels are loosely secured upon projecting journal-studs affixed in the end brackets of the truck near the lower corners and on the exterior surface. Upon each end of each truck G a larger wheel o^2 is loosely mounted upon a journal-stud o^3, which studs project sufficiently to support the wheels o^2 in planes farther removed from the ends of the trucks than are the lower wheels o', as shown in Figs. 12 and 13.

The frame for the double-pitch-stairway elevator is mainly composed of channel-beams that are similar to the beams B, and upon their inner surfaces are secured the main tracks p and supplementary tracks p', the tracks p being bolted or otherwise affixed to the sides of the opposite channel-beams at proper points, so that their upper edges will lie in planes parallel with the upper flanges p^2 of the channel-beams and in the same inclined plane when the pair of channel-beams are inclined in the same direction. The wheels o^2, which rest and roll upon the upper surfaces of the tracks p, are of such a

relative diameter that they will lie near to the overhanging top flanges p^2 of the channel-beams, which serve as guards to prevent their vertical displacement, said wheels having radial flanges on one edge of each, which retain the trucks from displacement endwise. The tracks p' are so projected from the main tracks p that they will furnish supports for the lower wheels o' of the trucks G, and, as shown in Fig. 11, the truck G, that is about to mount the inclines of the framework when moved in the direction of the arrow 11, will travel across the space between the points 18 19 by reason of the rolling engagement of its leading small wheels o' with the lower tracks and the larger wheels o^2 with the upper tracks, the rear lower wheels passing through the air between said points until they reach the angle 18 of the upper track on each side, where a third track p^3 is formed which is parallel with the main track p and has its top face in the same plane therewith. The third track p^3, formed on each side of the stairway inclines of the elevator shown in Figs. 11 to 14, lies in the same vertical plane with the lower track p', so that the rear wheel o' of an ascending truck G on each side will rest on the upper track p^3, the leading small truck-wheel o' on the lower track p', and the larger normal upper wheel o^2 on the uppert rack p, as shown in Figs. 11 and 12, the relative disposition of parts, as described, throwing the treads of the trucks G into parallel horizontal planes, substantially in the same manner as explained with regard to the trucks C.

There is a lower frame-section provided for the elevator having double-stair flights, which is composed, essentially, of the channel-beams H, and, as indicated in Fig. 10, said beams are located in a horizontal plane a proper distance below the lower fixed landings 17 and parallel thereto, curved track-pieces 18^a and guard-rails 20 being secured at the ends of the level frame portions 14 of proper curvature to afford a continuation of the tracks p, whereon the larger wheels o^2 will travel and sustain the inverted trucks G as they are together moved in sequence upon the elevator-tracks.

The connection of the sprocket-chains D with the trucks G is formed by the extension of the journal-studs o^3 outside of the larger truck-wheels o^2, and the jointed connection of the chains with said studs, which form pivots for the chain-links at the points of connection, whereby a free flexing connection is established between the trucks at each of their ends with the chains that move them.

The main-track rails p are longitudinally slotted, as shown at h' in Fig. 11, to afford means for adjustment, so as to take up looseness in the chains D, and, as shown in Fig. 10, the trucks G are so proportioned in height to the height of the upper landing above the lower landings that a half-step in height will be produced below at the junction of the track inclines with the level portions of the framework, full steps in height being afforded at the top on each side, the angles formed thereby in the sprocket-chains serving to take up slight looseness in the joints, thus avoiding any tendency to irregular movement or cramping at either end of the trucks. The half-steps may be above or below at the terminals of the inclines and effect the same result.

In each style of constructing the progressively-moving elevator it is of advantage to provide a hand-rail for the exposed side and one for each side of the stairway if the structure is not otherwise protected by a building-wall on one side. The preferred form for constructing the hand-rail M is shown in the drawings and consists of an endless flexible band that is suitably supported to move with the trucks C or G in the direction of their travel at any suitable speed, which may be the same as that of the trucks or deviate therefrom. Said rail, which will be specifically described, is mainly supported by two band-pulleys M', which are located on the upper and lower landings of the elevator near the inclined portions of its frame. These pulleys, forming the terminals of the rail-guards, are revolubly sustained at a proper height from the landings by boxes on uprights that are erected from the channel-beams B, which will be further mentioned. To sustain the hand-rail M between the band-pulleys M' in a manner which will permit it to be moved with the trucks or steps, a sufficient number of properly-spaced standards r are erected from the channel-beams that form the frame sides of the stair inclines. Said standards, being secured together at their bases in pairs by a foot-block r' for each, as shown in Fig. 7, are retained in place on the channel-beams by the blocks and receive the idler-pulleys r^2, that are separately journaled between the upper end portions of each pair of standards.

The hand-rails M, when used in pairs, are alike and each consists of an endless band s, preferably made hollow and cylindrical in cross-section, as shown in Fig. 8. The hand-rail body s is enveloped with a leather casing s', that forms the grip-surface for the band in use and which is secured upon the portion s by any preferred means, having flanges s^2 formed on it, which are seated upon a flexible base-piece s^3, that extends beneath the rail-body, and wedge-pieces s^4, that are introduced between the casing s' and flanges s^2, serving to support the rail-body laterally. Upon the series of idler-pulleys r^2 an endless belt t is mounted and properly stretched, the base-piece s^3 having a secure engagement with its exterior surface, effected by rivets or other means. The cylindrical hand-rail body s is supported and adapted to travel longitudinally by the engagement of the endless belt t with the pulleys r^2, as before stated, which are revolubly mounted upon the upright posts r, that are secured upon the channel-beams of the framework and are repre-

sented by dotted lines in Figs. 1 and 10, there being idler-pulleys t' provided to support the lower portion of the hand-rail as it moves longitudinally, said grooved pulleys having a position near to the inclines and upon the upper landing, which adapts them to sustain the hand-rail free to travel in planes that are tangential to each other, as is necessary to enable a proper movement of the rail upon the stairways and top landing of the elevator.

The hand-rails M are moved by the sprocket-chains N, (shown in Figs. 1 and 10,) which chains are engaged with sprocket-wheels on the shafts that support the pulleys M′ and similar wheels M^2 on the driving-shaft E′, the idler-wheels u being introduced at points that will give a proper direction to the chains and allow them to transmit motion from the driving-shaft to the hand-rail and move the latter in the same direction with the trucks C or G.

In order to provide means for the longitudinal movement of the pulley-supports of the hand-rail M, each lower pair of posts t^2 has an adjustable box t^4, mounted upon a transverse bar t^5, secured on the outer face of one post of each pair and adapted to such a movement as will stretch the hand-rail by moving the set-screw bolts t^6, (see Fig. 18,) the box t^4, after its adjustment, being clamped to the bar t^5 by the bolts t^7.

Each of the trucks G, preferably used in connection with double-flight stairways of the elevator, is provided with a projecting lug v at each end of the same. Said lugs, which are located near the tread of the truck, are designed to receive the rolling impinge of one or more pressure-rollers v', (see Figs. 10 and 10^a,) which serve to keep the ends of the trucks depressed and their wheels in contact with the tracks they travel upon.

The sides of the posts r are utilized to afford supports for wall-plates u', which incase the sides of the elevator-stairways, (one or more,) and upon the top of the posts a longitudinally-extending flexible flap u^2, of leather or gum cloth, is secured, these flaps being inwardly projected sufficiently to rest loosely upon the movable belt t, and thus protect the fingers of the persons on the stairs from injury that might result from a squeezing-contact between the posts r and moving belt t.

In Figs. 1, 3, 4, 6, and 15 a vertical guard for the protection of occupants of the trucks on the landings of the elevator is shown, which is preferably constructed as represented, and consists, essentially, of a lower transverse roller w, journaled in the side uprights w', and an upper roller w^2, that is also supported to rotate by a journaled engagement with boxes that are affixed to any substantial support above the lower roller, these vertically and transversely aligning rollers being adapted to receive and support a flexible sheet P, of any suitable material, which is endless and is mounted in a taut condition upon its revoluble supports.

The endless guard-wall P, just described, is moved by the lower roller w in a direction which will carry the portion facing the landing upwardly or away from the landing, and thus prevent injury to any person forced against it, as such a movement of the guard-wall will prevent the toes of the party from becoming wedged fast at the floor-line between the trucks and the guard-wall.

Motion is communicated to the upper guard-wall of the single-incline elevator by a chain gearing, as represented at the right side of Fig. 3, consisting of a sprocket-wheel w^3 on the driving-shaft E′ and a similar wheel on the end of the roller w, which wheels are connected by the chain w^4.

The guard-wall on the lower landings of the elevator receives motion through chain gearing rigged as represented in Fig. 15, and as therein shown the chain x is engaged with a sprocket-wheel on the end of the shaft that supports the pulley M′, whereon the hand-rail belt t is mounted, said chain being downwardly extended to engage the idler-wheels x', and thence along the exterior surface of the channel-beam of the framework toward the guard-roller w, there being two idler-wheels x^2 loosely supported on the beam mentioned, which engage the sprockt-chain and direct it upwardly to have contact with a sprocket-wheel on the end of the roller w, and thereby rotate the roller when motion is given to the hand-rail gearing. As a preferred means for stretching the chain x, the idler-wheels x' are supported upon a slotted bracket-plate x^4, which is secured on the channel-beam B diagonally by bolts that are inserted in holes in the boxes x^5, that slide in the slot of the bracket-plate, so that these boxes and the idler-wheels they support on projected journals x^6, if moved and secured properly in the slot, will stretch the chain or slacken it, as may be desired.

To remove dirt accumulations from the trucks C or G as they are rotated on the frame of the elevator, a brush O of any suitable material is affixed to a stable support near the end of the framework, so as to permit its free end to have contact with the treads successively when the trucks are moved.

It is intended that a suitable roof be erected above the elevator if it is in an exposed situation, the supporting-posts A being upwardly projected or others supplied for the reception of the roof. (Not shown.)

Any suitable material may be utilized in the construction of the elevator which may be considered most available, dimensions and limits as to cost being considered.

With regard to the operation of the elevator and its adjuncts it may be specified that, if desired, the elevator can at any time be suspended from travel and be used as a stationary stairway and the hand-rail device be given a progressive motion by proper means independently of the elevator-trucks C or G, or the hand-rail as a movable device may be dis-

pensed with and the same supplanted by a fixed hand-rail of any preferred construction.

In Figs. 10 and 11 will be seen a guard for the lower landings, in which the upright screen-wall is dispensed with and the lower guard-roller *w* utilized, it being covered partly by a transverse box S, that will allow a sufficient portion of the roller to project for a guard to prevent injury to the feet of those who approach it, the roller *w* receiving motion from the main shaft E′ by chain gearing shown in Fig. 11, which will cause it to revolve in a direction away from the moving trucks that form the landings.

It is claimed for this elevator that by its employment the transferring of large numbers of pedestrians will be rapidly effected in a safe manner and with less fatigue than the ordinary stairway that it is designed to supplant, as the moving hand-rails, if used, will be of positive service to aid parties who move from step to step on the elevator while it is traveling upwardly or if the elevator is at rest and the hand-rail moving.

Slight changes may be made in the construction and arrangement of parts within the spirit and scope of my invention. Hence I do not wish to limit the construction to the exact forms and combinations shown.

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

1. In an elevator, a movable stairs and landing comprising a connected series of trucks, in combination with a track or guideway having an incline and a horizontal or approximately horizontal portion, the trucks at the incline being in the form of steps and those lying on the horizontal portion of the guideway having their upper surfaces in alignment and forming a movable level landing of practically unbroken continuity and which is a continuation of the movable stairs, substantially as described.

2. In an elevator, a movable stairs and landing comprising an endless series of trucks, in combination with a track or guideway having an inclined and a horizontal or approximately horizontal portion, such horizontal portion extending in a straight direction, the trucks at the incline being in the form of steps and those at the horizontal portion of the track lying with their upper surfaces in alignment, the juxtaposed edges of the several trucks lying in the same horizontal plane and forming a level movable landing, substantially as described.

3. An elevator having a series of four-wheeled trucks that engage tracks on a supporting-frame and become steps on inclines of said frame, all the trucks connected by sprocket-chains and moved by sprocket-wheels, each truck having the journals of one pair of its wheels pivoted to links of the sprocket-chains, affording a flexing joint between the chains and the trucks, substantially as described.

4. An elevator having a frame provided with tracks on inclines of the frame and also on level places at the terminals of the inclines, movable trucks which form level landings when on the level portions of the tracks, and steps on the inclines thereof, and a transverse guard-roller on each landing actuated in a direction opposite to the movement of the trucks, substantially as described.

5. An elevator having a longitudinally-moving series of trucks which are adapted to become steps on portions of the frame and a transverse vertically-revolving guard-wall near a terminal of the elevator-frame above a landing formed by the trucks, substantially as described.

6. The combination, with an elevator, of a traveling hand-rail separate therefrom, substantially as described.

7. An elevator having an incline on its supporting-frame, furnished with steps that may be movable or stationary, and an endless hand-rail which is longitudinally movable and adapted to guard the side of the elevator, substantially as described.

8. An elevator having level portions and inclines produced on its frame, tracks thereon, an endless series of wheeled trucks on all the tracks, and mechanism adapted to move the trucks longitudinally on the frame and further provided with an endless longitudinally-movable hand-rail that is adapted to guard the side of the elevator, and a transverse movable guard-wall near each terminal of the elevator-frame, substantially as set forth.

9. An elevator having a frame provided with opposite inclines, level places below and above at ends of the inclines, tracks on the frame, trucks connected to endless chains and adapted to be moved thereby on the tracks, and pressure-rollers secured to the frame on the upper level portion thereof above the trucks and adapted to have contact with projections at the ends of the trucks, substantially as described.

10. The combination, with an elevator, of a traveling continuous hand-rail separate from the elevator, substantially as described.

11. The herein-described hand-rail, movable in a suitable guideway, in combination with guards overlapping the same, substantially as described.

12. The herein-described hand-rail, consisting of an endless traveling band, and a cylindrical rail proper secured to and traveling with said band, substantially as described.

13. The herein-described hand-rail, consisting of an endless belt, and a cylindric rail proper secured to and traveling with the said belt and provided with a separate covering, serving as a means of uniting the rail to the belt, substantially as described.

GEORGE A. WHEELER.

Witnesses:
WM. P. PATTON,
E. M. CLARK.