No. 616,688. Patented Dec. 27, 1898.

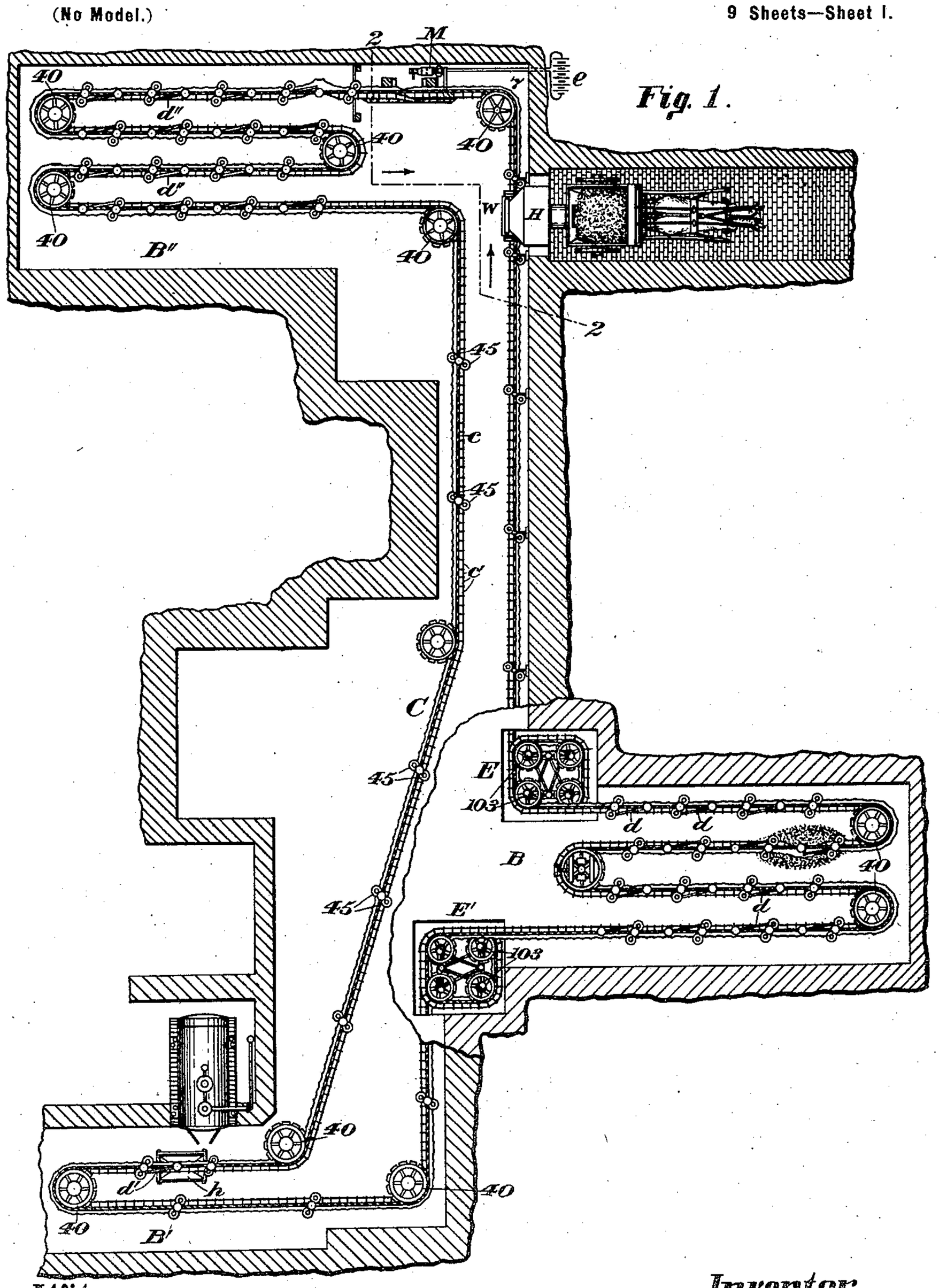
F. H. RICHARDS.

CONVEYER.

(Application filed Apr. 9, 1898.)

(No Model.) 9 Sheets—Sheet 1.

Fig. 1.



Witnesses.
Wilfred Atkinson.
J. L. Edwards Jr.

Inventor:
F. H. Richards

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(No Model.) 9 Sheets—Sheet 2.

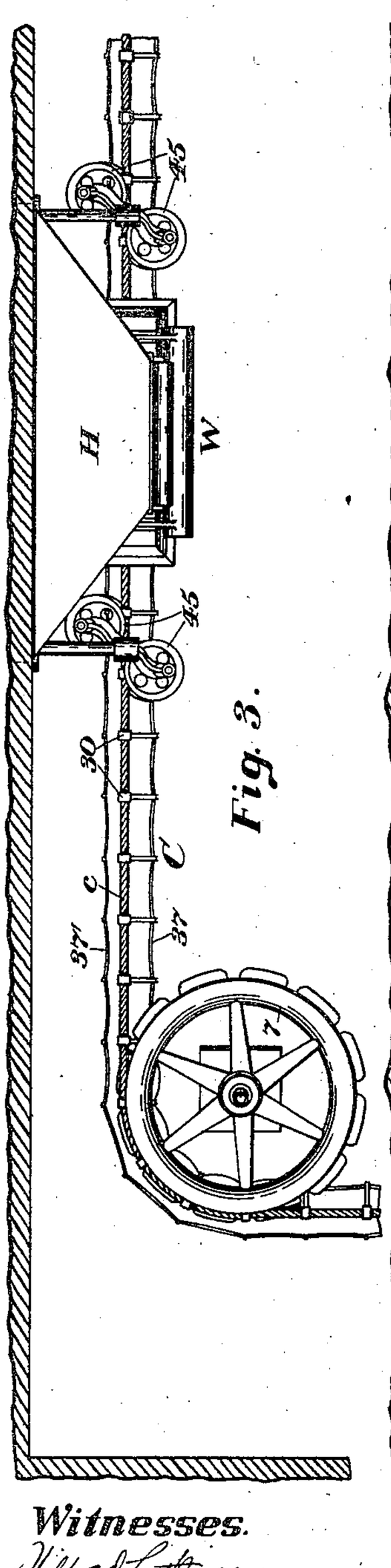

Fig. 3.

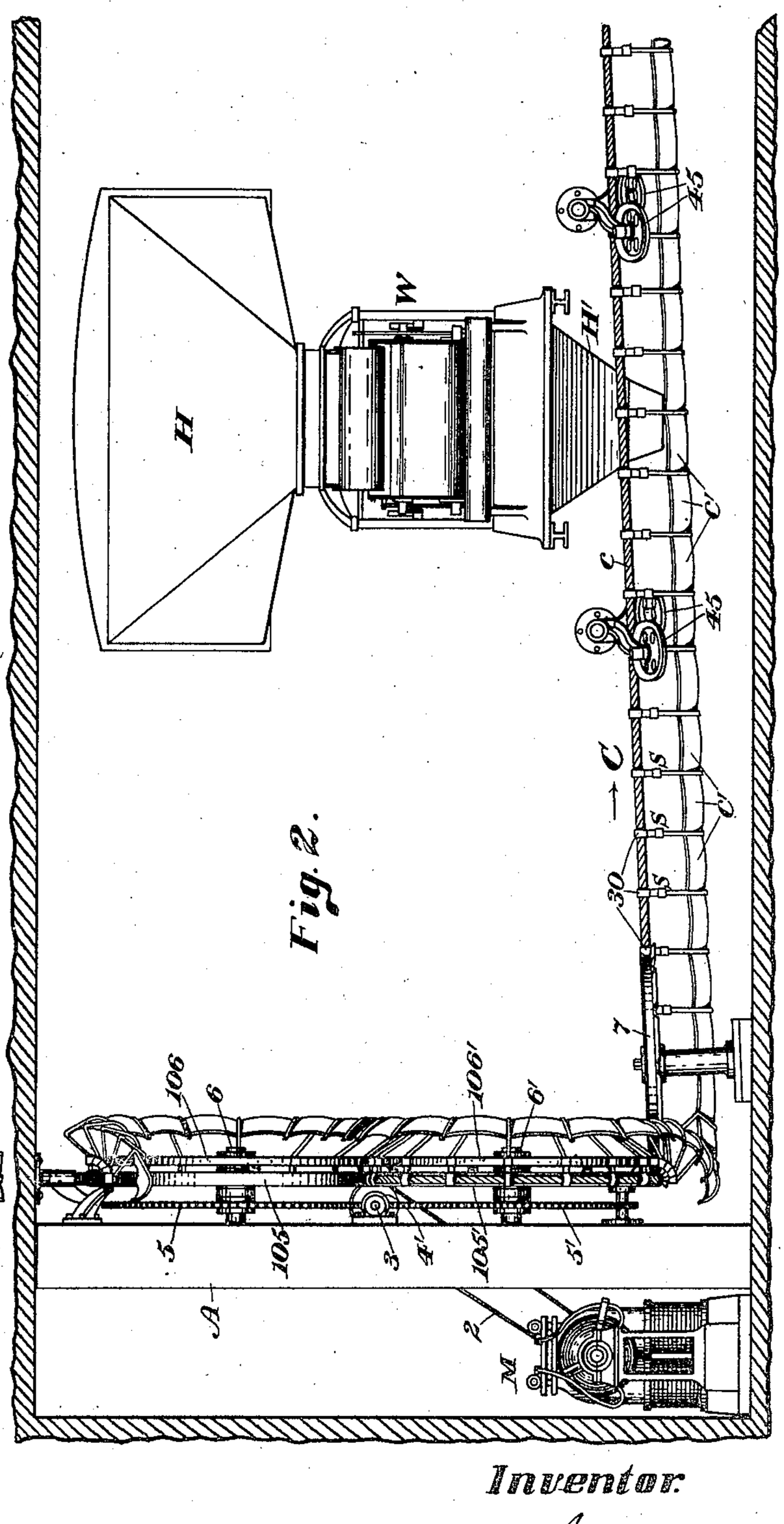

Fig. 2.

Witnesses.
Milford Atkinson.
L. L. Edwards Jr.

Inventor:
F. H. Richards.

No. 616,688. Patented Dec. 27, 1898.

F. H. RICHARDS.

CONVEYER.

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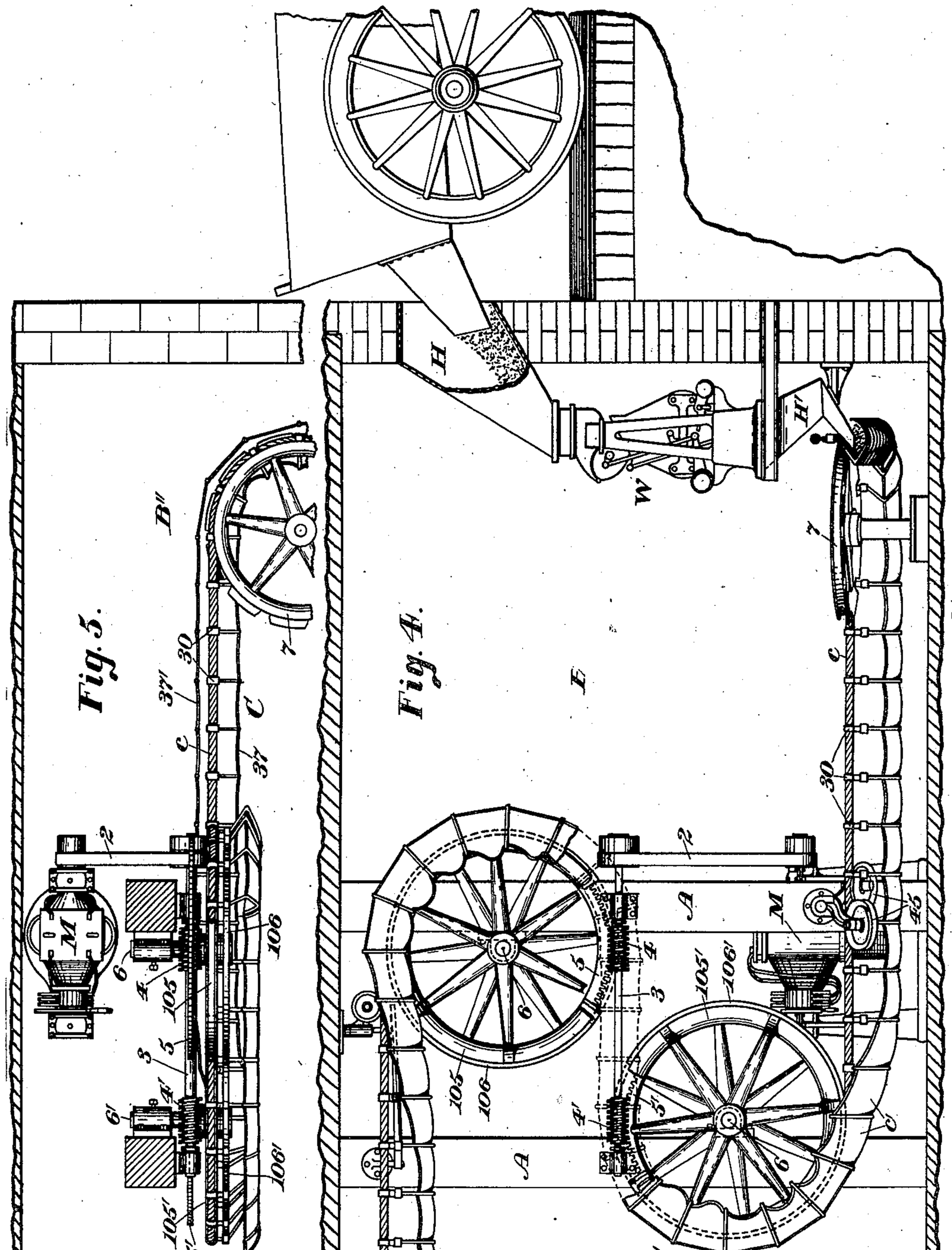
(No Model.) 9 Sheets—Sheet 3.



Witnesses.
Wilfred Litchmore.
F. L. Edwards Jr.

Inventor.
F. H. Richards.

No. 616,688. Patented Dec. 27, 1898.

F. H. RICHARDS.

CONVEYER.

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(No Model.) 9 Sheets—Sheet 4.

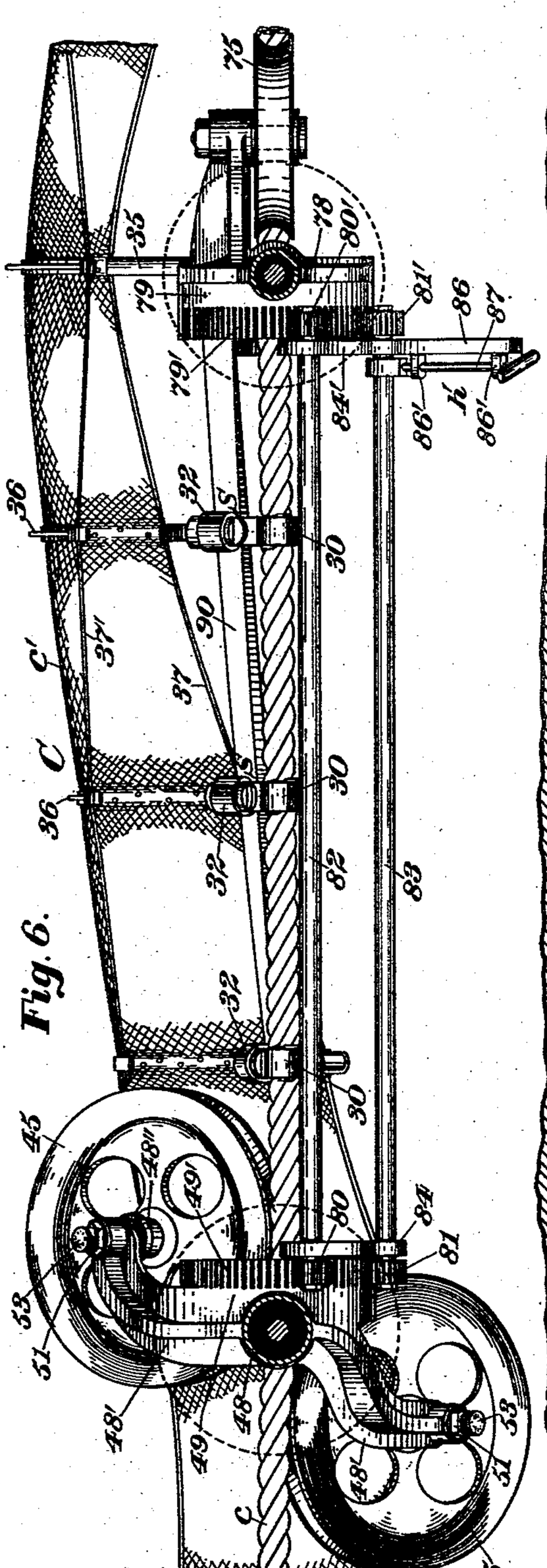

Fig. 6.

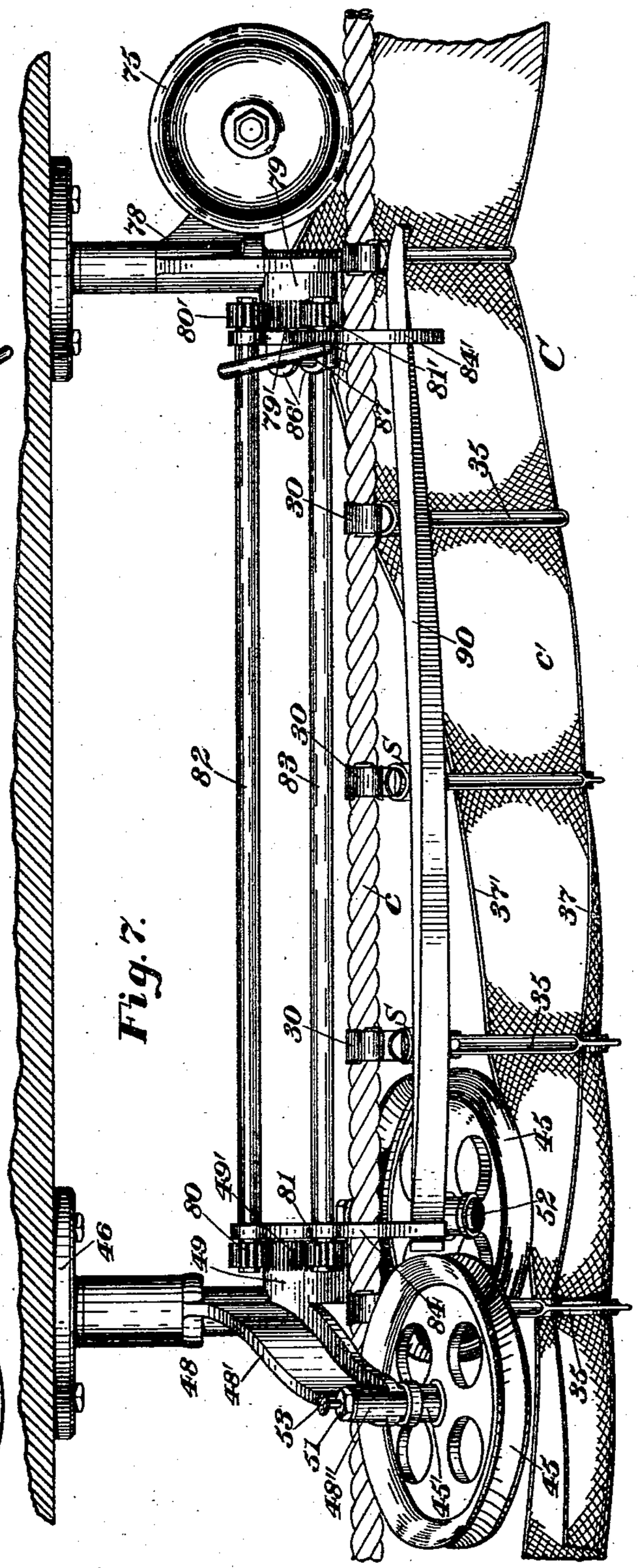

Fig. 7.

Witnesses.
Wilfred Clarkson.
R. L. Edwards Jr.

Inventor.
F. H. Richards.

No. 616,688. Patented Dec. 27, 1898.

F. H. RICHARDS.

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(No Model.) 9 Sheets—Sheet 5.

Fig. 8.

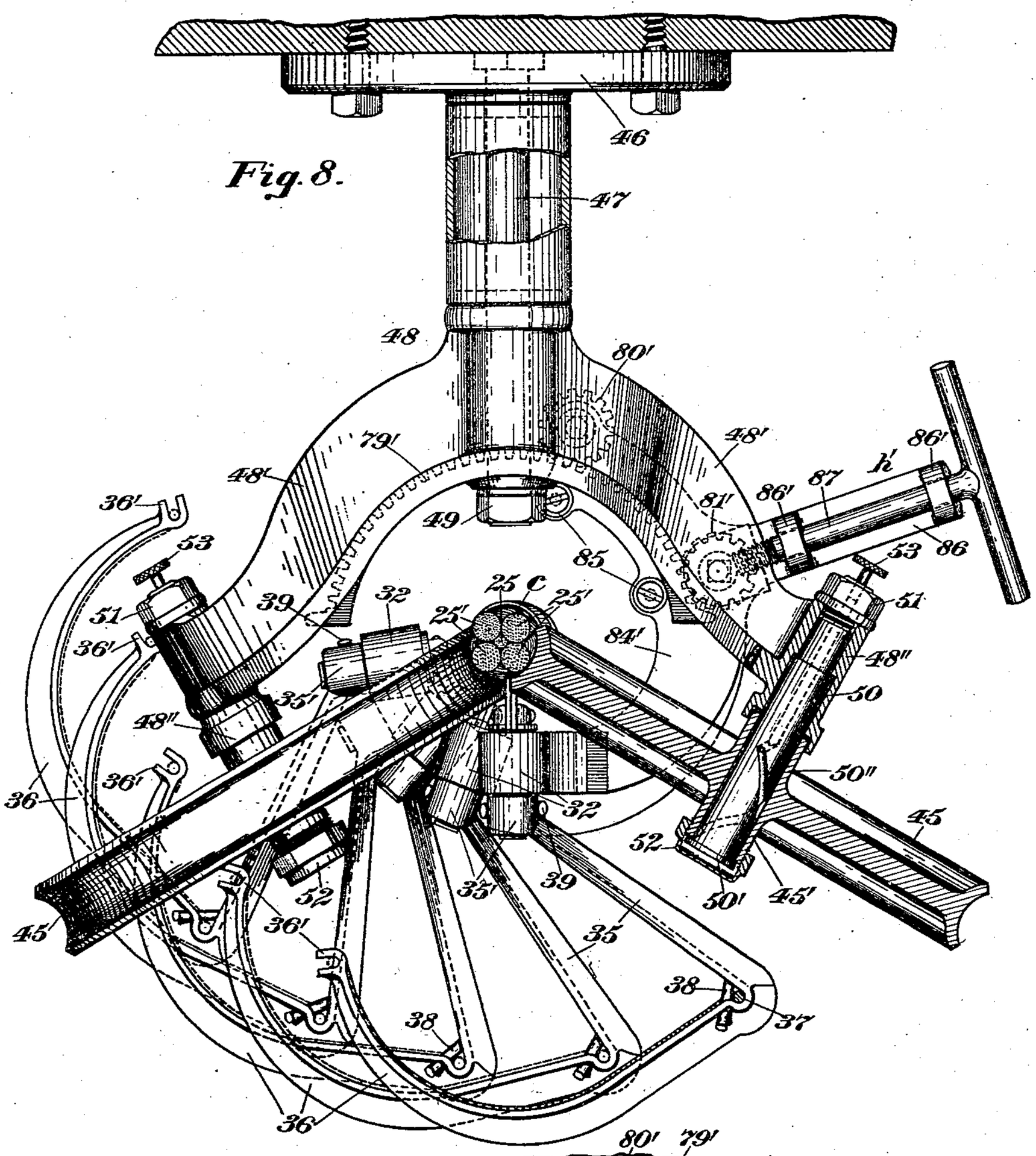
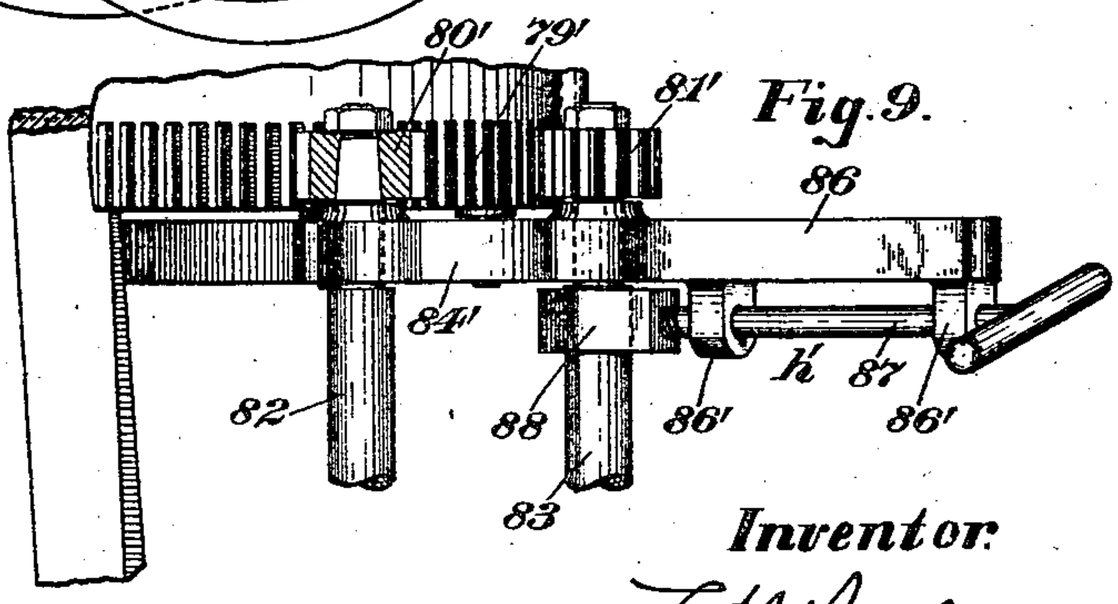


Fig. 9.



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F. L. Edwards Jr.

Inventor.
F. H. Richards.

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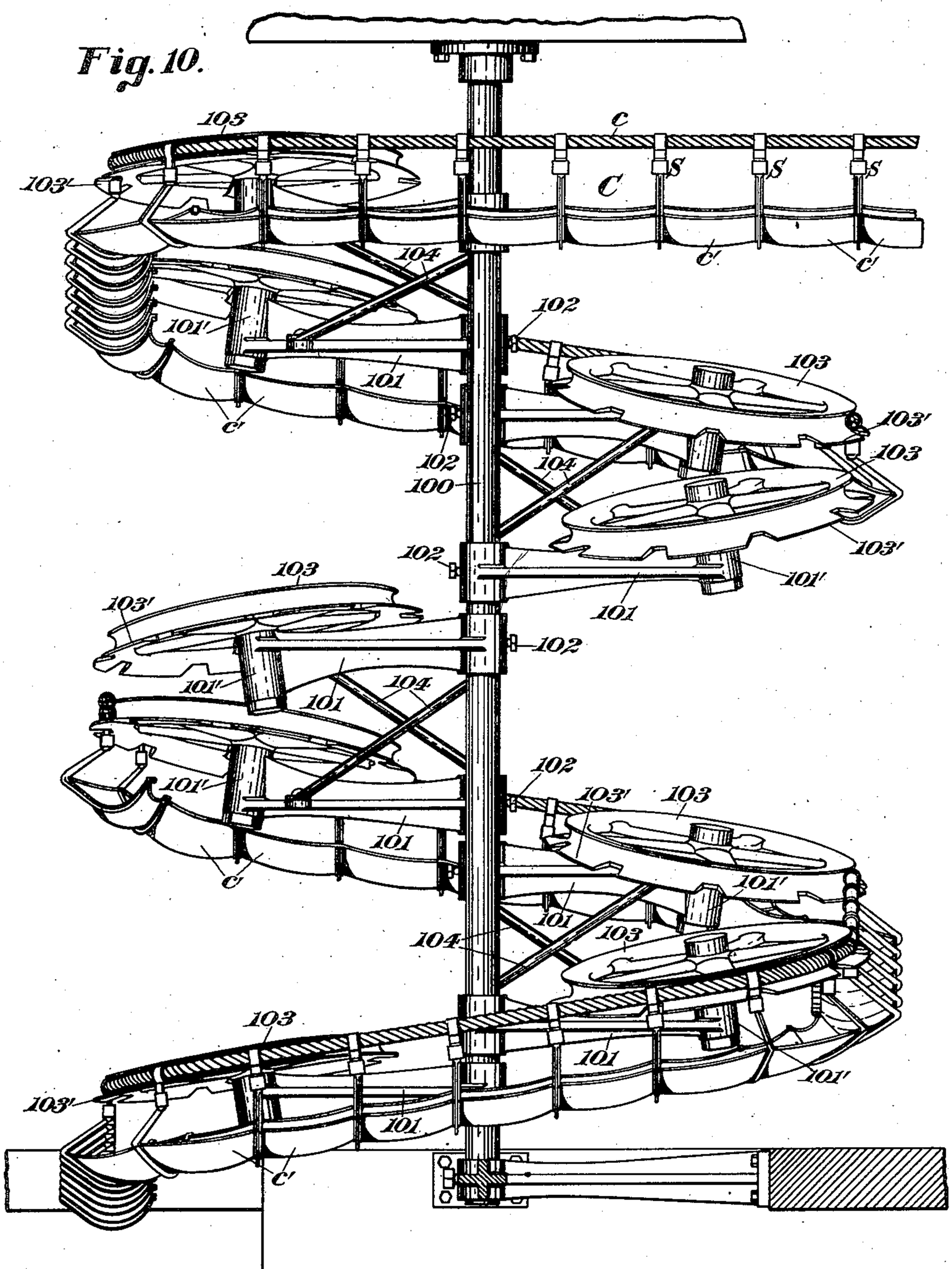
CONVEYER.

(Application filed Apr. 9, 1898.)

(No Model.) 9 Sheets—Sheet 6.

Fig. 10.



Witnesses.
Wilfred Atkinson.
F. L. Edwards Jr.

Inventor:
F. H. Richards.

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CONVEYER.

(Application filed Apr. 9, 1898.)

(No Model.) 9 Sheets—Sheet 7.

Fig. 11.

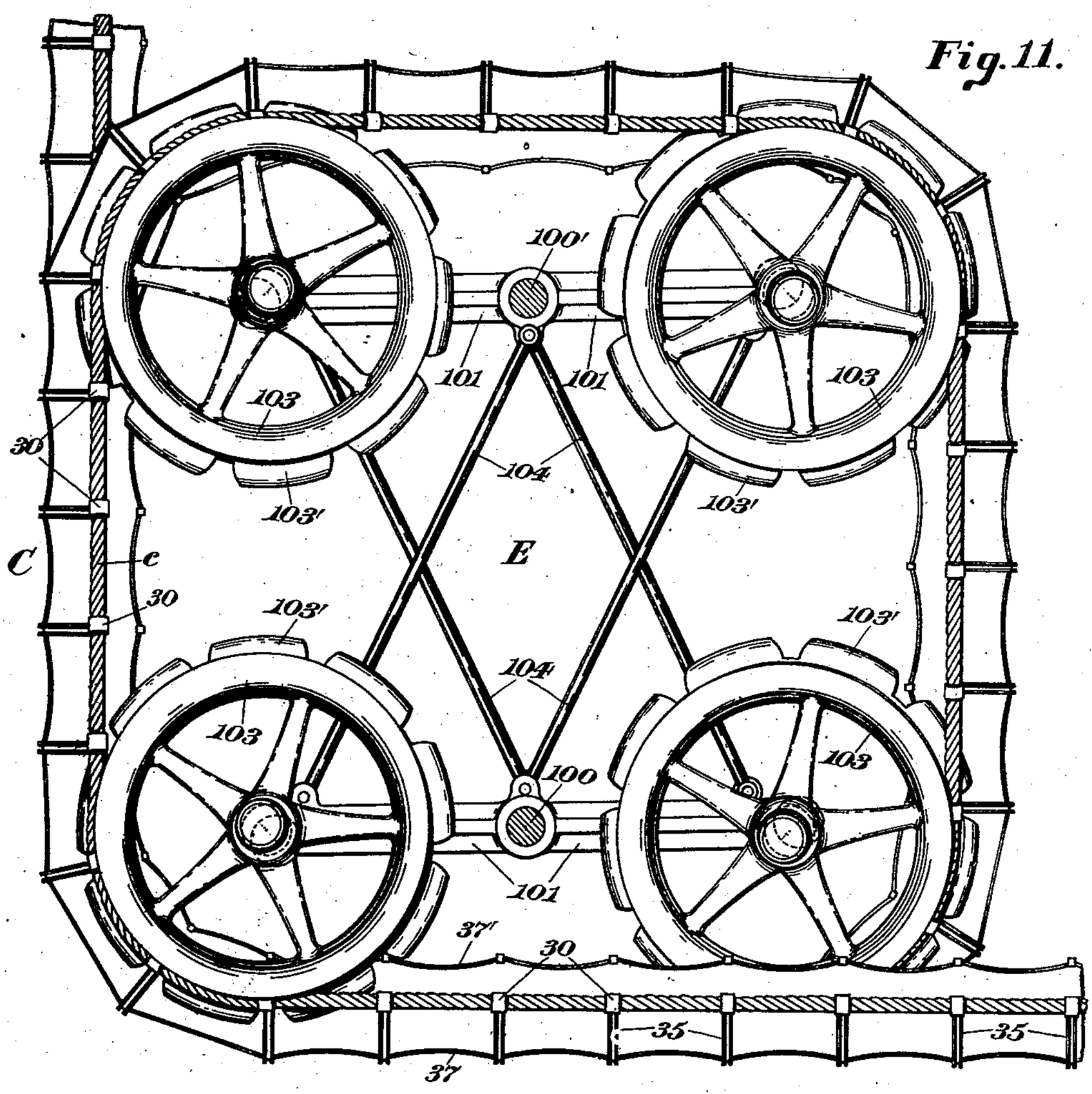
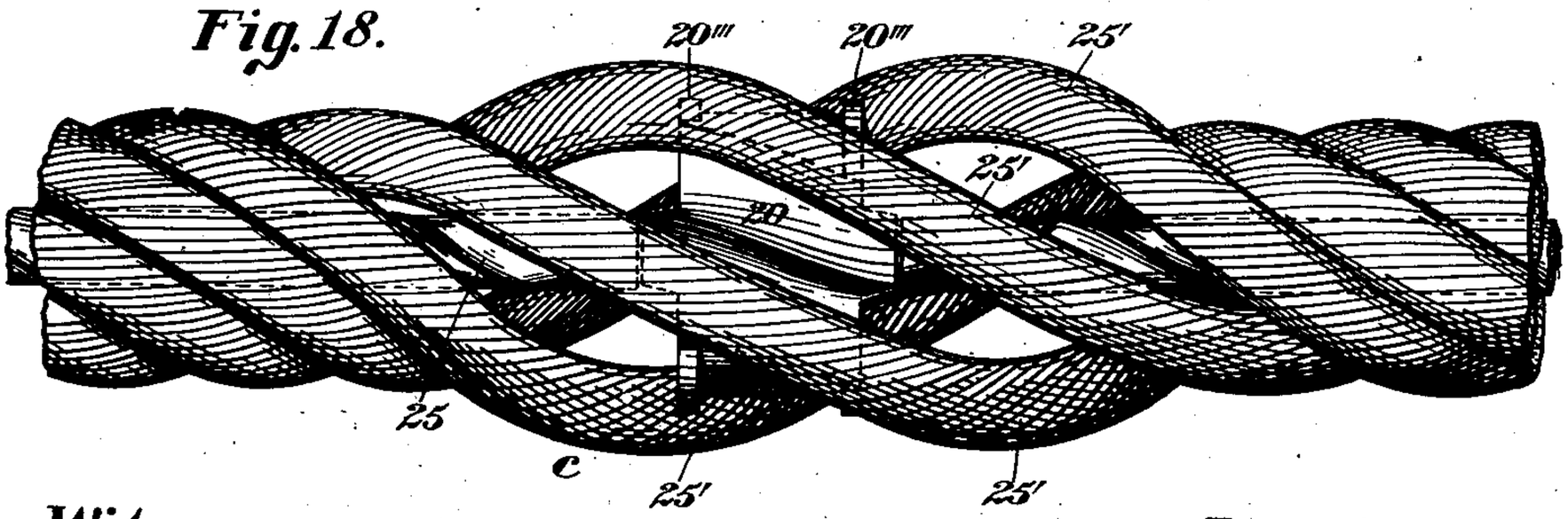


Fig. 18.



Witnesses.
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F. L. Edwards Jr.

Inventor.
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(No Model.) 9 Sheets—Sheet 8.

Fig. 12.

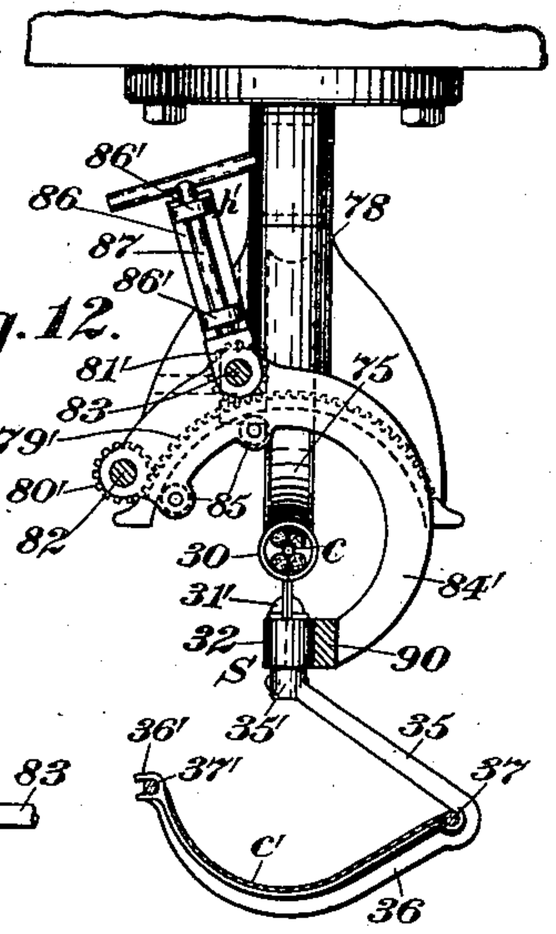


Fig. 13.

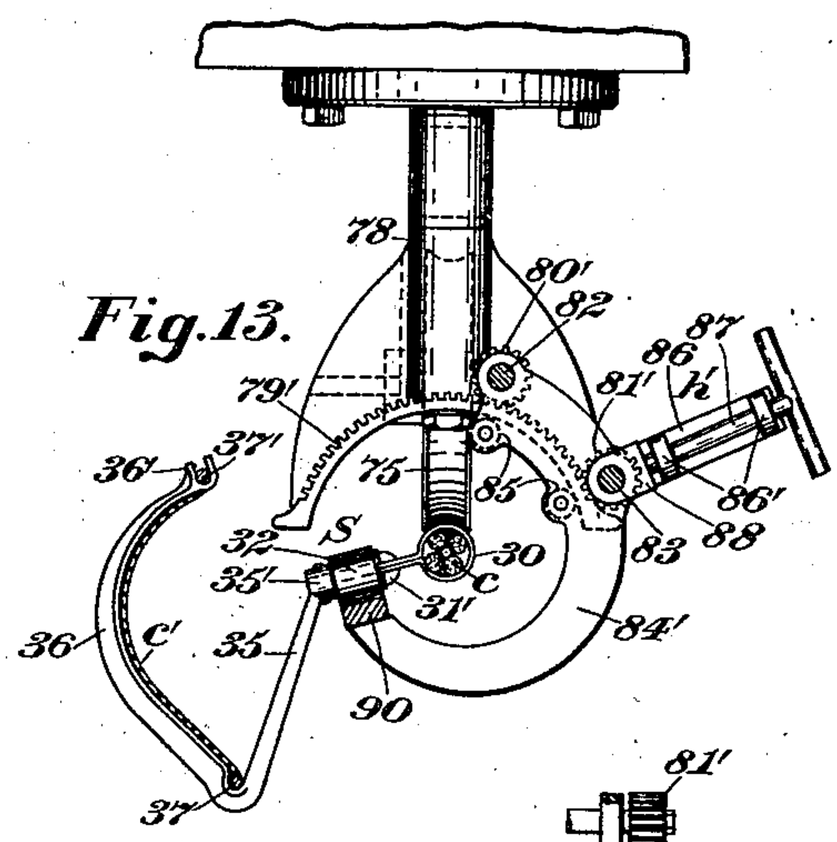


Fig. 16.

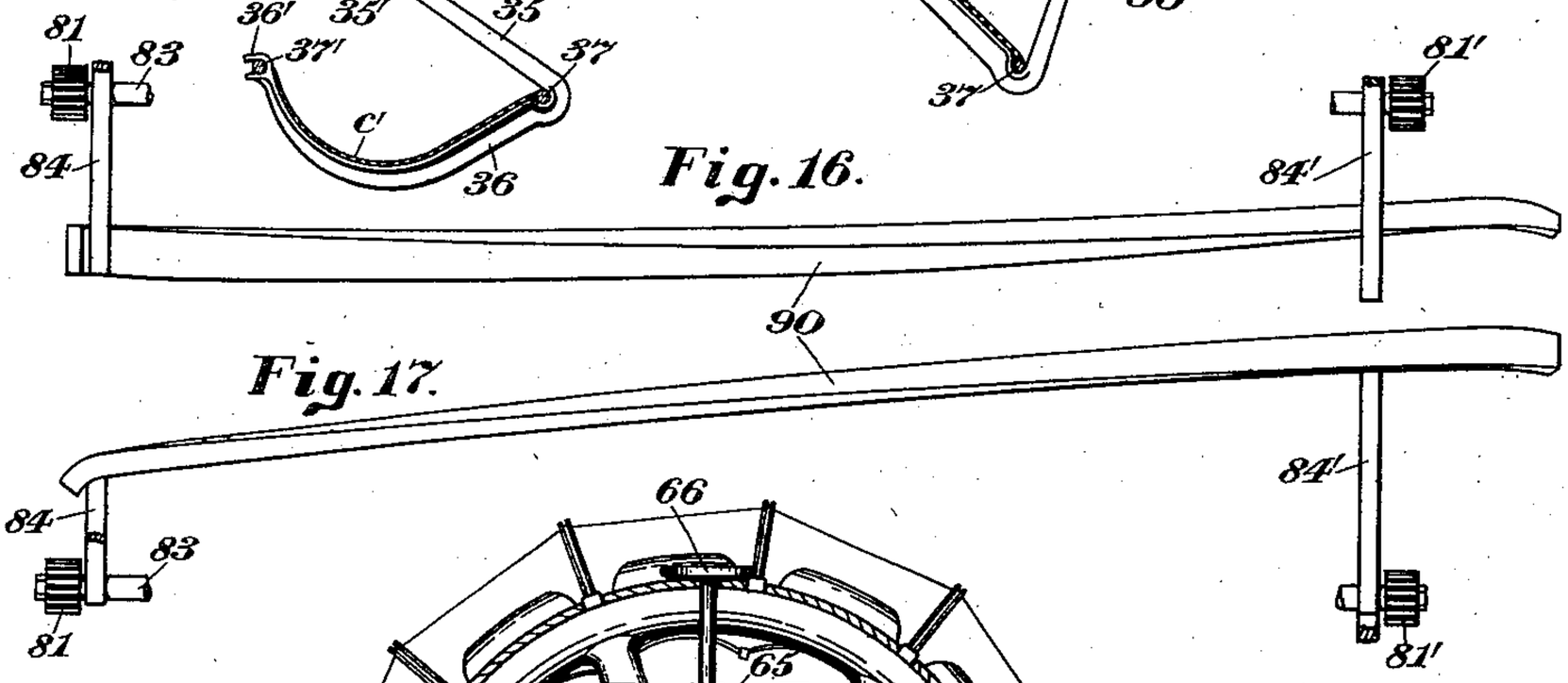


Fig. 17.

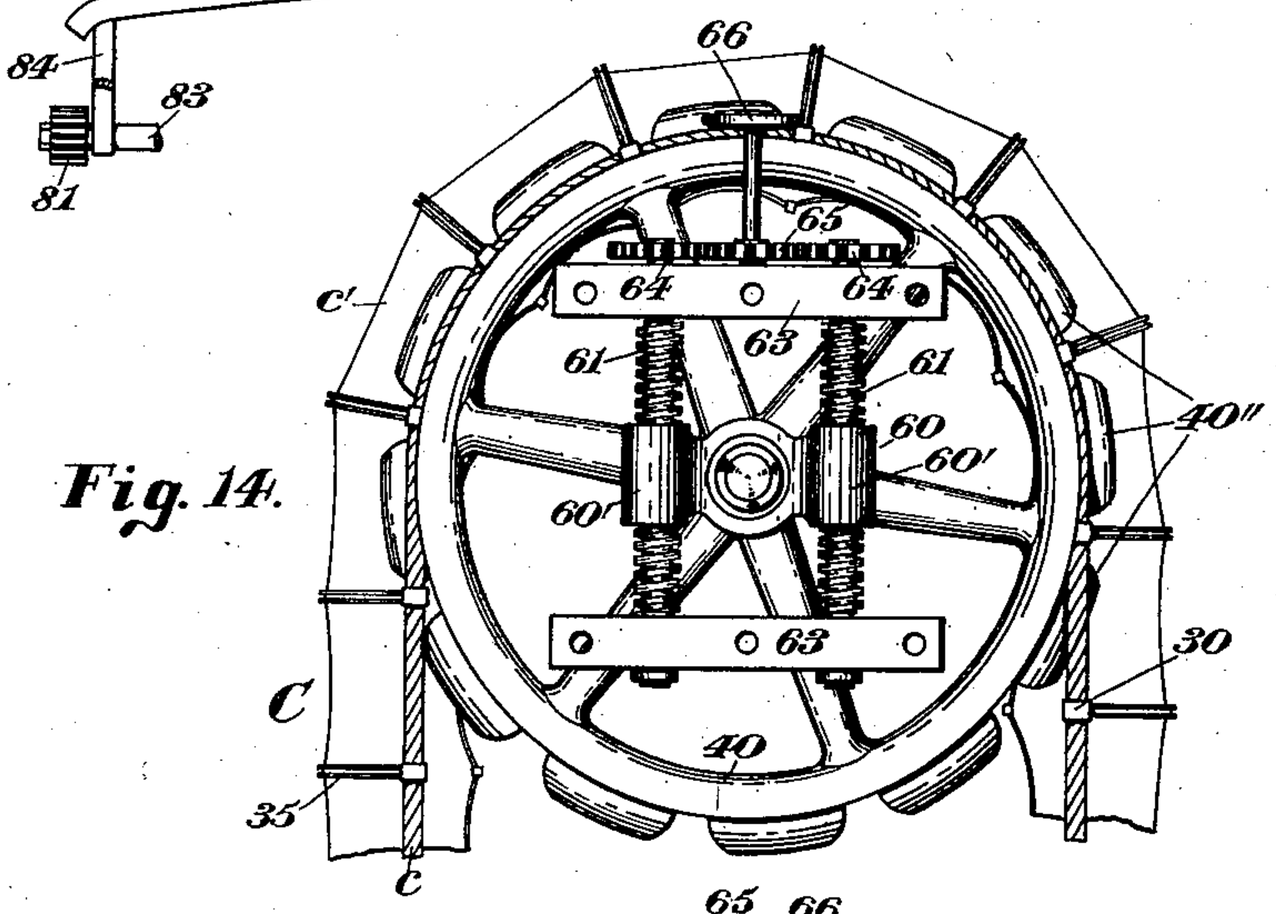
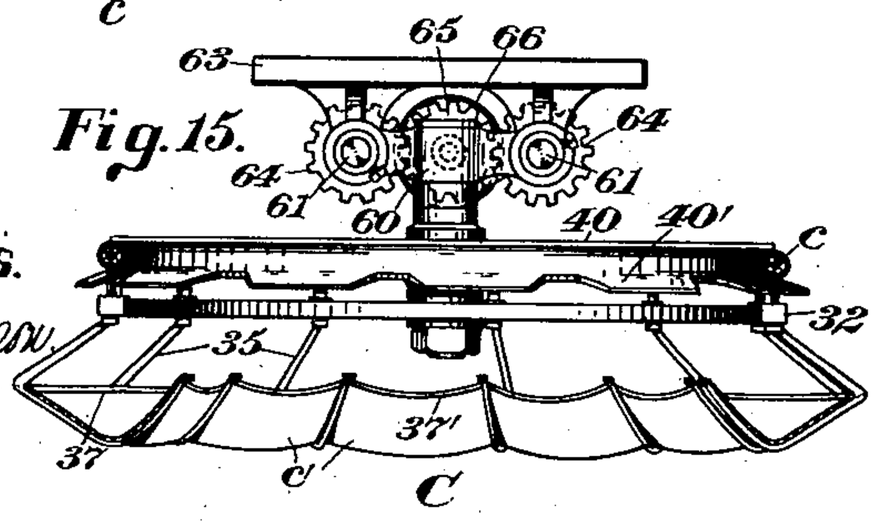


Fig. 14.

Fig. 15.



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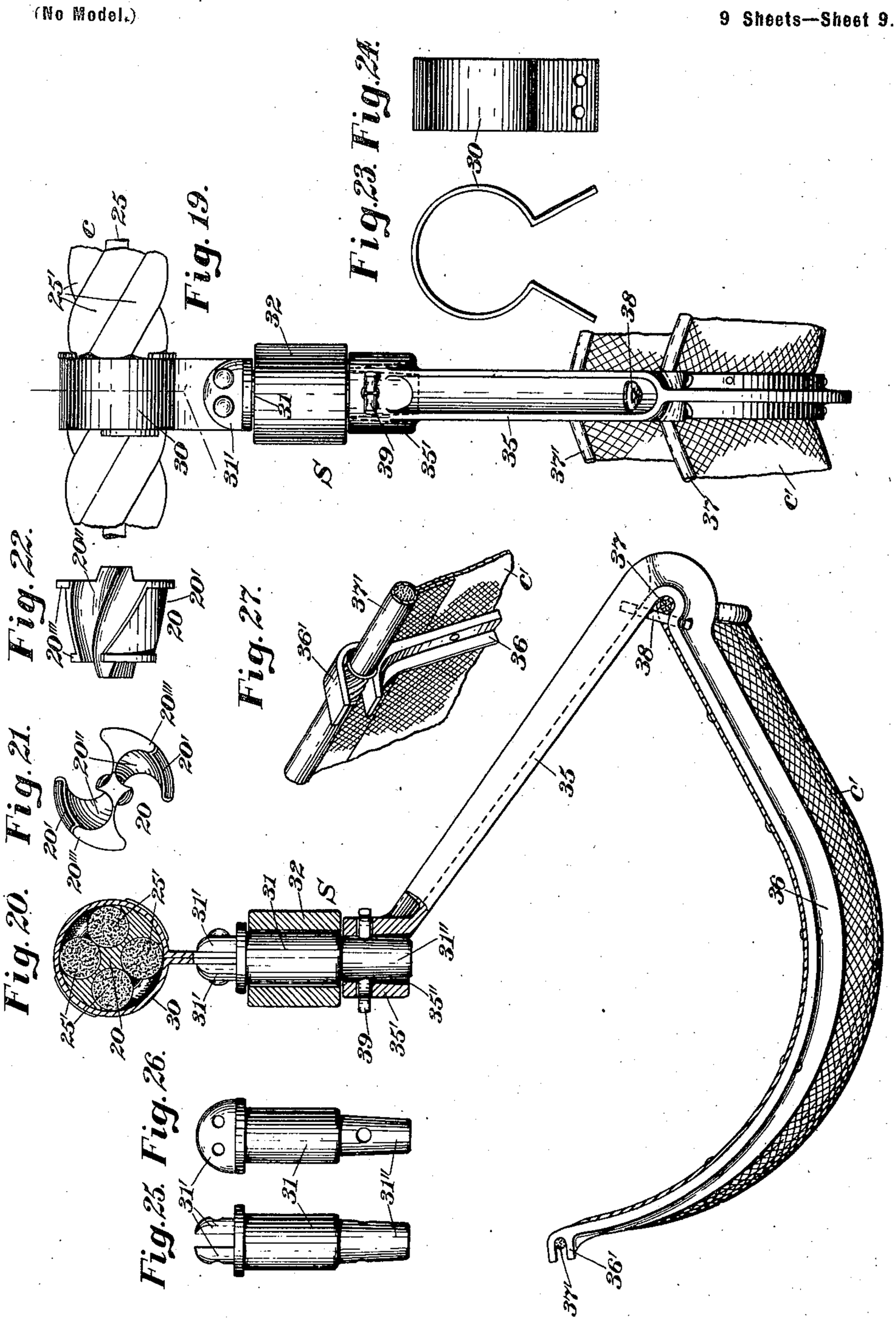

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

CONVEYER.

SPECIFICATION forming part of Letters Patent No. 616,688, dated December 27, 1898.

Application filed April 9, 1898. Serial No. 677,044. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Conveyers, of which the following is a specification.

This invention relates to conveyers; and it has for its main object the provision of an improved apparatus for transporting material from place to place in buildings or localities where there is but a small amount of space available for the installation and operation of the conveyer or where by the irregular nature of the path to be followed by the conveyer a conveyer system is required which has a greater flexibility of action and can be more readily adapted to the peculiar features of its surroundings than apparatus of this type as heretofore constructed.

The present system is peculiarly adapted for use in buildings where the conveyer is to travel from one story to another or under and around irregular projections from the walls or ceilings of rooms where there is but little space and short turns must be made at various angles in order to avoid obstructions or to ascend or descend to a different level. Such a system as this is especially useful in buildings where projecting walls, stairways, exposed piping, and other similar obstructions must be avoided and in which these projections and fixtures compel the employment of a conveyer which can change the direction of its movement readily in a small space without interfering with the operation thereof. Hence the main object of this invention is to provide a conveyer which can follow a tortuous or zigzag path in a building, mine, or other locality without disturbing the many projecting objects usually found in such places.

One of the main features of this invention is the employment of a conveyer in which a driving member or cable of any suitable type supports a series of directly-connected conveying elements in such a manner that the latter are free to move transversely to the path of travel of the cable without disturbing the position or movement of the cable itself, the preferred construction being one in which the conveying elements are journaled on and suspended from the cable in such a manner as to maintain a substantially vertical position at all points in the movement of the cable until it is desired to discharge the contained material. Ordinarily a continuous conveying member, preferably in the form of a flexible band or belt, will be suspended from the cable by hangers or similar members, journaled thereon and free to move transversely to the cable independently relatively to each other, thus permitting the conveying member to be shifted out of its normal path of movement in a plane transverse to such plane of travel at any desired point or points therein without disturbing the remainder of said conveying member or belt. Thus it will be seen that during the travel of this continuous conveying-belt it may be shifted transversely of the driving-cable and have a twisting or tipping movement imparted thereto to discharge or empty the contents of a certain portion or element of the whole conveying-belt without disturbing the contents of the remainder of the conveying member.

In connection with this improved conveying apparatus I make use of suitable deflecting means for shifting successive conveying elements or successive portions of the conveying member or belt transversely out of their normal path of travel at determined points in the movement of the driving-cable for the purpose of emptying successive portions of the total load-carrier by the conveyer and discharging such portions at a suitable point or points in the length of the conveyer. A conveyer of this type may be employed to advantage for transporting coal, grain, or similar material from a receiving-point to one or more storage-bins or other points of deposit, at which points or bins may be located suitable deflecting or discharging devices by means of which the several moving elements or sections of the conveyer may be tipped up and their contents discharged into the bin or bins or at such point of deposit. Ordinarily in filling or loading a storage-bin a series of deflecting or discharging devices will be employed, and these devices may be shifted successively into position to discharge material from the conveyer at different points in the movement of the latter, these discharging devices being preferably so operated as to fill

a storage-bin from the rear toward the front thereof when the discharging devices are set by hand, thus rendering it unnecessary for the attendant to climb over a mass of material. The discharging devices may be set for operation and thrown out of action successively as the material accumulates in the bin, and when the latter is completely filled all of them will usually be thrown out of the path of the conveyer.

For the purpose of transferring material from one level to another, as from the basement to an upper floor of a building, or vice versa, I make use of elevating mechanism by means of which the conveyer may be carried up or down a suitable incline with the belt-supporting hangers pendent from the cable substantially in a vertical position, and hence without interfering with the normal transporting action of the apparatus. This elevating mechanism will comprise, usually, a series of cable-supporting pulleys or sheaves so arranged that the several elements or sections of the conveying member will remain suspended in substantially the manner just described and will retain their loads while not interfering with the driving action of the cable or the rotary movements of the driving-sheaves. The manner in which my improved conveying devices coact with this elevating mechanism is radically different from the operation which would result if the ordinary conveyer-buckets moving in the plane of the driving-sheaves were employed, as in that case the material carried by the buckets would be discharged, while in this case the conveyer proper moves in a plane transverse to the plane of rotation of the sheaves.

Other features of this invention relating to the construction of the deflecting devices, the elevating mechanism, and various parts of the apparatus will be described more fully hereinafter in detail.

In the drawings accompanying and forming part of this specification, Figure 1 is a plan of a building, illustrating my improved conveyer system in use in a basement and on the ground-floor of the building. Fig. 2 is an enlarged elevation of a portion of the conveyer system at the right of the line 2 2, Fig. 1, looking toward the right in said figure, as indicated by one of the arrows. Fig. 3 is a plan of a portion of the system shown in Fig. 2. Fig. 4 is an enlarged elevation of the portion of the conveyer system at the right of the line 2 2, Fig. 1, looking in the direction of the other arrow in said view. Fig. 5 is a plan of the driving mechanism and a portion of the conveyer shown in Fig. 4. Fig. 6 is an enlarged plan of one of the deflecting or discharging devices in operative relation with the conveyer. Fig. 7 is a side elevation of the same. Fig. 8 is an enlarged sectional end elevation of the discharging device shown in Fig. 7 and illustrates different positions of successive hangers between the normal and the discharging position of the conveyer. Fig. 9 is an enlarged sectional detail of a portion of this discharging device. Fig. 10 is an enlarged side elevation of the elevating mechanism between the basement and the ground-floor of the building. Fig. 11 is a plan of the same. Figs. 12 and 13 are details showing different positions of one of the deflecting or load-discharging devices. Figs. 14 and 15 are respectively a plan and a side elevation of a take-up mechanism for one of the sheaves around which the conveyer passes. Figs. 16 and 17 are details of the deflecting-bar and coacting devices, the views being taken at right angles to each other. Fig. 18 is an enlarged detail of a portion of the cable, showing the manner in which the bearing members for the hangers are inserted among the strands of the cable. Figs. 19 and 20 are respectively a side elevation and a sectional end elevation of a portion of the conveyer, illustrating the cable, the hanger, and the conveyer-belt. Figs. 21 and 22 are details of the bearing member on which a hanger is to be supported. Figs. 23 and 24 are details of a collar or strap coacting with the bearing members just described. Figs. 25 and 26 are details of the roll-carrying stud between the hanger and the collar; and Fig. 27 is a perspective detail illustrating the connection between the outer end of the hanger and the outer edge of the conveyer-belt.

Similar characters designate like parts in all the figures of the drawings.

My improved conveyer apparatus may be operated from any suitable source of power and loaded at any desired point. In the construction illustrated in the drawings of this application I have shown an electromotor, such as M, receiving current from any suitable source of energy, such as *e*, the movement of the armature-shaft being transmitted by a belt, such as 2, Figs. 4 and 5, and a worm-shaft 3, carrying a pair of worms 4 and 4′, meshing, respectively, with large worm-gears 5 and 5′, secured, respectively, to driving-shafts 6 and 6′, located one above the other and journaled in suitable bearings on the framework A. At a point slightly in advance of the driving mechanism just described the conveyer passes around a substantially horizontal sheave or pulley 7 to the loading-point. (Shown clearly in Figs. 1, 2, and 4.)

Obviously the material to be transported may be delivered in any suitable manner to the conveyer at the loading-point; but as it is desirable to ascertain the exact amount of coal or other material transported and stored by the conveying apparatus I prefer to employ in connection therewith an automatic registering weighing-machine substantially of the type shown and described in prior patents granted to me—such, for example, as Patent No. 548,840, granted October 29, 1895—one of which weighing-machines is indicated in a general way by W and is located at the

loading-point of the conveyer to receive material from a suitable chute or hopper II. As the loads are weighed, registered, and delivered from the weighing mechanism W they are discharged into a suitable chute, such as II', from which the material passes into the conveyer-belt. From the weighing-machine at the loading-point the conveyer travels up a slight incline, which in the construction shown herein is about three degrees, but might be considerably more, of course. At the proper point the conveyer passes around the sheaves or pulleys of a suitable elevating mechanism, (designated in a general way by E,) which mechanism carries the conveyer up to the first floor above the basement and into a storage bin or room, (indicated in a general way by B,) where the conveyer may be caused to discharge its load, so as to fill said bin. It will be noticed that at this point I have provided a series of deflecting or discharging devices (indicated in a general way by *d*) controlling collectively the entire area of this compartment. From this point the conveyer may pass to a lowering mechanism E', similar to the mechanism shown at E, which will carry the conveyer down to the basement again and around suitable pulleys or sheaves to a boiler-room B', where a certain portion of the material may be discharged into a hopper *h* and onto the floor of the boiler-room, another deflecting or discharging device (indicated by *d'*) being employed for this purpose. From the boiler-room the conveyer may pass around suitable sheaves or pulleys through the basement to a point remote from the boiler-room and into another storage room or bin, such as B'', substantially similar to that shown at B, where another series of deflecting or discharging devices *d''* may control the filling of the storage room or bin substantially in the manner before set forth.

All of the deflecting or discharging devices herein described may, if desired, be shiftable from an operative to an inoperative position; but at least one of them—and preferably the last one of the series indicated by *d''*—should either be fixed permanently in an operative position for tipping the conveyer-belt and discharging the load, or else it should be left permanently in an operative adjusted position, so that the conveyer will always return to the starting-point unloaded.

It will be obvious, of course, that while I have described my improved conveying apparatus for storing coal at different points and on different levels of a building and for furnishing a supply to the boiler-room it may be employed for many other purposes than for transporting coal and on various kinds of properties, so long as the essential features thereof, hereinafter to be described in detail, are retained; but in all cases the system is peculiarly adapted for conveying material in localities and under conditions where existing types of conveying apparatus could not be used successfully.

My improved conveyer is designated in a general way by C, and in the preferred form thereof will be an endless carrier of substantially the same construction throughout. It may comprise a plurality of elements all connected with one another and forming successive portions of the whole conveyer, and the different parts of these elements or sections may be so formed that corresponding members of the conveyer will be interchangeable with one another.

The conveyer comprises two essential features, one of which is the driving member, which may be in the form of a continuous member or cable, preferably flexible and of any suitable type, while the other is the conveying member proper and is supported by the cable. The cable may be of the type indicated herein by *c*, while the conveying member proper may be made up of a series of sections movable transversely to each other relatively to the direction of travel of the conveyer, some of the sections being movable in this manner, while other sections of the conveyer maintain their normal path of travel.

The provision of a conveyer in which one or more and preferably all of the sections thereof, and especially the sections of a continuous belt conveyer, are movable independently transversely of the direction in which the conveyer travels normally is one of the principal features of my present improvements. For the purpose of providing for this independent transverse movement of each section of element of the conveyer these sections are preferably pivotally supported by the cable *c* in such a manner as to turn freely with respect thereto while traveling with the cable longitudinally of the latter.

In the construction illustrated herein the conveyer elements, and hence the continuous conveying member, are suspended from the cable by hangers having journal connections with such cable or rope. Usually a series of substantially equidistant hangers pendent from the cable will support the conveying member proper, which may advantageously be a flexible belt or band of canvas, (indicated herein by *c'*.) This canvas belt is secured to its supporting members or hangers in such a manner as to be quite slack and leave considerable space to permit straightening out of the canvas of the several sections in going around pulleys, turning sharp angles, &c.

The bearing members by which the conveying member or belt proper is supported will usually be of the type shown in detail in Figs. 18 to 22, inclusive, and the manner in which these bearing members are combined with the cable will be apparent. Each bearing member is designated in a general way by 20, and is substantially a metallic pulley having portions of the sides thereof cut away to form discontinuous circumferential journal-surfaces 20' with intermediate seats 20'', extending substantially lengthwise of the ca-

ble and preferably spirally to receive the separate strands of the rope, which strands of course will serve to hold the bearing member in place. In this case the cable employed is a multistrand cable or rope and has a central strand or core 25 and four spirally-wound outer strands 25′, which seat themselves in the four spiral grooves 20″ on each bearing member. At the sides of the journal-surfaces 20′ flanges, such as 20‴, may employed for the purpose of retaining in proper positions the belt-supporting member to be journaled thereon. Of course the core-strand 25 has removed therefrom at intervals sections of sufficient length to permit insertion of one of the bearing members 20 between the ends of the strands, it being obvious that the ends of the divided core-strand will serve to retain the bearing member in its proper position longitudinally, while the outer spiral strands will hold the bearing member in place circumferentially. Of course I may make use of any bearing member having a journal-surface suitable for permitting transverse movement or oscillation of the pendent support to which the conveyer-belt is to be secured; but I prefer to employ the type of inserted bearing member which I have just described, as I deem this a desirable form of bearing for the purpose.

The several conveyer elements or sections which are supported by the cable are intended, as before stated, to be capable of movement independently of one another transversely to the cable, although of course the conveyer or belt proper may be continuous provided it has sufficient flexibility to admit of being tipped or twisted at different points in the length thereof for discharging material therefrom without disturbing the normal travel of other portions of the conveyer. Indeed, so long as these relative transverse movements of different portions of the conveying member or belt are obtainable the pivoting or journaling of the conveyer-supports on the cable is of minor importance; but in order to permit the utmost freedom of movement of the different parts I deem it desirable to journal the different conveyer supports or hangers on the bearing members hereinbefore described. These supports or hangers may be of any suitable construction; but in this case each support, which is designated in a general way by S, comprises a plurality of parts, one of which will usually be a collar or strap encircling the journal-surfaces of the bearing member 20 and held in place by the flanges 20‴. This collar is designated in a general way by 30 and is illustrated in detail in Figs. 23 and 24. It is preferably of the "divided" type, and the pivoted ends thereof are brought together and riveted in place in this case between the forked ends 31′ of a stud 31, to which the hanger proper is secured. This stud also has a journal-surface on which an antifriction-roll 32 may turn freely.

The hanger proper may be of any suitable construction, but in this case will preferably be secured to the stud 31 and will have a lateral hanger-arm extending away from the cable and the stud 31, and will also have an oppositely-extending bowed supporting-arm for carrying the canvas conveyer-belt. This hanger is therefore substantially in the form of a hook, the hanger-arm of which is oblique to the stud 31 and is indicated by 35, while the supporting-arm, which is bowed, as just stated, to receive the conveyer-belt, is represented by 36. Between its side edges the belt *c*′ may be secured to the hangers at intervals by rivets, as clearly shown in Fig. 20, while the edges of the belt may be reinforced by hemming over small ropes 37 and 37′, suitable split pins, such as 38, being passed through proper openings in the two arms of the hanger at the junction of such arms to retain one edge of the belt in place, while the other is located by inserting the rope 37′ in the forked end 36′ of the bowed arm 36.

Although the bearing connection between the hanger and the cable will be sufficient to permit proper transverse movement of the several conveyer elements, yet I deem it desirable to make provision for considerable freedom of movement at the point where the hanger proper is connected to the stud 31. Hence I have shown in Fig 20 a stud having a tapering lower end 31″, while the bearing portion 35′ of the arm 35 is flared out, as indicated at 35″, to permit the hangers to maintain a substantially vertical position when the conveyer is traveling up or down a considerable incline. The hanger may be connected to the stud in any suitable manner, as by a split pin 39.

The parts hereinbefore described constitute all of the elements which make up the conveyer proper, and it will be noted that not only are corresponding parts interchangeable, but that any part or any section depending from the cable may be removed readily and replaced without taking the whole conveyer apart. Of course new bearing members may also be inserted in place readily when the old ones become worn.

For the purpose of supporting the conveyer I make use of a plurality of pulleys and sheaves of different sizes, large sheaves, such as 40, being employed at each point where the conveyer goes around a curve or turn. Smaller pulleys in sets of two each and indicated by 45 are disposed at intervals in the length of the conveyer, one on each side of the cable *c*, as clearly shown, for example, in Fig. 4. These pulleys 45 may be supported in any suitable manner—as, for example, by wall plates and brackets substantially of the type shown in Figs. 6, 7, and 8. Here the wall-plate, such as 46, may be secured to a suitable support or projection and may carry a stud or bolt 47, supporting a two-armed pulley-carrier 48 for rotation on said bolt, this carrier being maintained in place by a

nut 49. The two arms 48′ of this carrier are substantially similar in construction, and each may have at its outer end means for supporting a pulley. In this case each has a journal-bearing 48″, in which is mounted a spindle 50, (see Fig. 8,) held in place by a check-nut 51, screwed onto the upper threaded end of the spindle, the lower end of said spindle having a collar 50′ for retaining the pulley 45 in place. A cap, such as 52, may be screwed onto the lower threaded side of the hub 45′ on the pulley 45, and the upper side of this hub may be received in the bearing 48″, as will be obvious from Fig. 8.

For the purpose of supplying oil to the journals the spindle 50 may have an oil-channel 50″ extending for a portion of its distance through the body of the spindle and terminating at the upper side of the latter in an opening communicating with a corresponding opening in the check-nut 51, which opening will be closed by an oil-cap 53, while for the other portion of its length the oil-conduit may wind around the periphery of the spindle.

It will be noticed that owing to the manner in which the pulleys 45 of each pair are disposed in the construction illustrated in the drawings the cable *c* is supported at substantially all points in its circumference except at the under side thereof, there being only sufficient space between the flanges of the pulleys for permitting the upper portions of the hangers to pass between them.

As to the large sheaves or pulleys 40, which support the cable at the bends or turns, all of these may be substantially similar in construction, each being in the nature of a flanged pulley of the usual construction, except that the lower flange 40′ (see Figs. 14 and 15) is very much wider than the upper one and is notched or recessed at regular intervals to form a sprocket-wheel having a circuit of projecting members or teeth with intermediate or interdental spaces. The teeth 40″ are of such length that the hangers of the conveyer will work between the teeth and be suspended in the interdental spaces of the pulley as the cable and the conveyer elements travel around the pulley.

In connection with the particularly large sheave 40 that is shown in Figs. 14 and 15 and which is also illustrated adjacent to the elevating mechanism E, Fig. 1, I prefer to make use of a take-up device for maintaining the proper tension on the cable *c* at all times. This take-up device may be of any approved type; but in the construction shown the sheave 40 is journaled in a shaft-hanger, such as 60, having a pair of parallel internally-threaded members 60′, through which pass corresponding feed-screws 61, secured to suitable wall-plates, such as 63. At their ends the feed-screws have plain cylindrical portions, which are journaled in bearings in the wall-plates or hangers 63, and at their outer ends gear-wheels 64 may be secured to these feed-screws and operated by an intermediate gear-wheel, such as 65, manipulated by a hand-wheel, such as 66. When this hand-wheel is turned in the one direction or the other, of course the adjustable hanger 60 will travel along the feed-screws to loosen or tighten the cable, as may be desired.

The deflecting or discharging devices by means of which the conveyer elements or sections are shifted sidewise or tipped to discharge the contents thereof are illustrated clearly in detail in Figs. 6 to 9, 12 and 13, and 16 and 17, and in all of these views said devices are shown in connection with the cable-supporting pulleys 45 and their wall-brackets or hangers.

In the construction illustrated each deflecting or discharging device for elevating the conveyer-sections consists, essentially, of a deflecting member and supporting means therefor, movable in a curvilinear path, this latter being preferably a swinging frame supported for oscillation between one of the brackets or hangers 48 and a somewhat similar hanger or bracket 78, carrying a single pulley 75, disposed above the cable *c*, so as to keep the latter in place when the conveyer is elevated at that point to discharge a portion of its contents. The manner in which this pulley operates will be obvious by referring to Figs. 6 and 7.

In the construction illustrated the brackets 48 and 78 have projecting therefrom integral members, such as 49 and 79, toothed, as at 49′ and 79′, to form segmental resistance gears or racks, adapted to mesh with pinions, such as 80 and 80′ and 81 and 81′, secured to the ends of long spindles 82 and 83, journaled at their opposite ends in swinging slides, such as 84 and 84′, supported by and oscillatory on the guides or racks just described.

The guide-rack and coacting parts supported by the hanger 48 are indicated in Fig. 8, while those which are supported by the hanger 78 are shown in detail in Figs. 9, 12, and 13.

For the purpose of maintaining the swinging members or slides 84 and 84′ in place I may make use also of antifriction-rolls, such as 85, which travel on the smooth under sides of the racks 49′ and 79′ and are journaled on the slides just below the respective pinions with which they coöperate. By employing these guide-rolls the slides are held firmly in place on the racks and are free to oscillate in arcs concentric with the axis of the cable *c*.

For the purpose of securing the deflecting device in its operative or inoperative position I may make use of any suitable holding or clamping means—such, for example, as that illustrated by *h*′, Figs. 6, 7, 8, 9, 12, and 13. Here the slide 84′ has projecting therefrom an arm 86 with bosses 86′, through which passes a threaded clamping-rod 87, substantially T-shaped and threaded at its inner end, which may be screwed into a correspondingly-threaded opening in a shoe 88, carried by the spindle 83. This shoe is mounted loosely on the spindle, and when the clamping-rod 87 is

tightened it will be obvious that the spindle 83 will be held, and hence the pinion 81', secured thereto, will be locked in engagement with the teeth of the rack 79'.

The deflecting member proper, which forms the principal element of the deflecting device and coöperates directly with the conveyer to shift or tilt the latter transversely at determined points in its movements, may be advantageously a cam-shaped bar substantially of the construction clearly shown in detail in Figs. 16 and 17 and designated by 90. This deflecting-bar is secured adjacent to its opposite ends to corresponding ends of the curved slides 84 and 84' and is so shaped and placed as to give the conveyer-belt substantially a quarter-twist when the bar is in its operative position. (See Figs. 6, 7, and 8.)

The elevating mechanism (illustrated at E and E', Fig. 1) by means of which material is raised or lowered from one floor to another is illustrated in detail in Figs. 10 and 11, and consists, essentially, of a series of sheaves or pulleys disposed in a spiral having a gradual rise from one end to the other thereof. Preferably these sheaves will be carried by trussed beams or arms supported in some suitable manner—as, for instance, by means of columns 100 and 100' between the floors. All of the respective sheaves, beams, and truss-rods or stay-rods are substantially similar in construction, and a description of one of each will suffice for all. The beams or arms are indicated by 101, and each is in the nature of a bracket-arm having a sliding connection with its respective supporting-post, a clamp-screw, such as 102, being employed for securing it in place. At its outer end each of these arms has a journal-bearing for the reception of the stud of a sheave 103, which sheave is supported for rotation at the proper inclination, the bracket being of such construction and having its journal-bearing 101' at such an angle as to locate the sheave in the proper plane. These sheaves are substantially similar in every way to those shown at 40 at the several points where the direction of movement of the conveyer is changed, and each has a wide toothed lower flange 103', forming substantially a sprocket-wheel, and also serving to support the cable and the conveying member suspended therefrom. In addition to being supported on and clamped to one of the posts or pillars 100 and 100' each bracket-arm 101 is also trussed to the opposite post, in this case by means of a truss-rod, such as 104, extending from a point near the outer end of the bracket-arm over to the opposite post or column and preferably in a direction at an inclination to the horizontal, all of which will be obvious from an inspection of Figs. 10 and 11.

It should be understood, of course, that while this elevating mechanism is a simple and desirable one to employ in connection with my improved conveyer yet the details thereof might be modified in various ways without departing from the spirit of the invention.

It will be noticed that at all points in the travel thereof until the last deflecting device d'' is passed the several parts of the conveyer maintain either their normal carrying positions or else are not tilted more than about ninety degrees; but just before returning to the loading-point the normal movement of the conveyer may be reversed as it passes around the driving-wheel on the shaft 6. This pulley may be substantially of the ordinary type, as indicated by 105, as may also the driving pulley or wheel 105'; but each of these pulleys should carry on its shaft some means for enabling the conveyer to pass around the pulleys properly without interfering with the movements of adjacent parts. Hence I have illustrated herein a pair of supporting members, such as 106 and 106', in position to coact with the antifriction-rolls 32 in substantially the same manner that the deflecting-bars 90 do, except that the disks or flanged wheels 106 and 106' serve principally to support the several conveyer-sections as they travel around the pulleys 105 and 105' instead of operating to deflect or discharge the sections of the conveyer.

Having described my invention, I claim—

1. In a conveyer, the combination, with a carrying-cable, of a plurality of directly-connected conveying elements journaled thereon at fixed points in the length thereof for oscillation independently of each other transversely to the direction of movement of the cable.

2. In a conveyer, the combination, with a carrying-cable, of a plurality of hangers journaled thereon for oscillation transversely to the direction of movement of the cable, and a continuous conveying member carried by said hangers.

3. In a conveyer, the combination, with a carrying-cable, of a plurality of hangers journaled thereon for oscillation transversely to the direction of movement of the cable, and a flexible conveying member carried by said hangers.

4. In a conveyer, the combination, with a carrying-cable, of a plurality of hangers journaled thereon for oscillation transversely to the direction of movement of the cable, and a conveyer-belt carried by said hangers.

5. In a conveyer, the combination, with a carrying-cable, of a plurality of hangers journaled thereon for oscillation transversely to the direction of movement of the cable and having bowed supporting-arms, and a conveyer-belt carried by said supporting-arms.

6. In a conveyer, the combination, with a carrying-cable, of a plurality of hangers journaled thereon for oscillation transversely to the direction of movement of the cable and each having a hanger-arm extending laterally away from the cable and each having also

an oppositely-extending supporting-arm, and a conveyer-belt carried by said supporting-arms.

7. A conveyer comprising a continuous cable and a continuous conveying member supported by the cable and shiftable at different points therein transversely to the normal path of the conveying member.

8. A conveyer comprising a continuous cable and a continuous conveying member normally pendent from the cable and shiftable at different points therein transversely to the normal path of the conveying member.

9. A conveyer comprising a continuous cable and a flexible conveying-belt normally pendent from the cable and shiftable at different points therein transversely to the normal path of said belt.

10. The combination, with a carrying-cable and with a conveying element journaled thereon at a fixed point in the length thereof for movement in a determined path, of deflecting means for shifting said conveying element in a plane transverse to its plane of travel at a determined point in its movement.

11. The combination, with a carrying-cable and with a pivoted conveying element journaled thereon at a fixed point in the length thereof for movement in a determined path, of deflecting means for swinging said conveying element in a plane transverse to its plane of travel at a determined point in its movement.

12. The combination, with a carrying-cable and with a continuous conveying member supported thereby for travel in a determined path, of deflecting means for shifting a portion of said conveying member in a plane transverse to its plane of travel at a determined point in its movement.

13. The combination, with a carrying-cable and with a continuous flexible conveyer-belt suspended therefrom for travel in a determined path, of deflecting means for twisting a portion of said belt transversely out of its normal path at a determined point in the travel of the latter.

14. The combination, with a carrying-cable and with a suspended conveying element journaled thereon at a fixed point in the length thereof for movement in a determined path, of elevating discharging means for raising and emptying said conveying element in a plane transverse to its plane of travel at a determined point in its movement.

15. The combination, with a carrying-cable and with a continuous conveying member suspended therefrom in a normal conveying position, of elevating discharging means for raising and emptying a portion of said conveying member at a determined point in the travel of the latter.

16. The combination, with a carrying-cable and with a continuous conveying member suspended therefrom in a normal conveying position for oscillation thereabout, of elevating discharging means for oscillating a portion of said carrying member to a discharging position at a determined point in the travel of the latter.

17. The combination, with a carrying-cable and with a continuous conveying member supported thereby for travel in a determined path, of deflecting means shiftable into and out of an operative position and normally operative for shifting a portion of said conveying member transversely at a determined point in the travel of the latter.

18. The combination, with a carrying-cable and with a continuous conveying member supported thereby for travel in a determined path, of settable deflecting means shiftable into and out of an operative position and normally operative for shifting a portion of said conveying member transversely at a determined point in the travel of the latter, and holding means for securing said deflecting means in its set position.

19. The combination, with a carrying-cable and with a continuous conveying member supported thereby for travel in a determined path, of separately-settable deflecting devices located at different points in the travel of the conveying member and operative for shifting different portions of the latter transversely out of its normal path of travel.

20. The combination, with a carrying-cable and with a conveying element journaled thereon at a fixed point in the length thereof for movement in a determined path, of a deflecting-bar for shifting said conveying element in a plane transverse to its plane of travel at a determined point in its movement.

21. The combination, with a carrying-cable and with a conveying element journaled thereon at a fixed point in the length thereof for movement in a determined path, of a deflecting-bar having a cam-face for shifting said conveying element in a plane transverse to its plane of travel at a determined point in its movement.

22. The combination, with a carrying-cable and with a conveying element journaled thereon at a fixed point in the length thereof for movement in a determined path, of a deflecting device adjustable about said cable and operative for shifting said conveying element in a plane transverse to its plane of travel at a determined point in its movement.

23. The combination, with a carrying-cable and with a conveying element supported thereby for movement in a determined path, of a deflecting device adjustable in an arc concentric with the axis of said cable and operative for oscillating said conveying element in a plane transverse to its plane of travel at a determined point in its movement.

24. The combination, with a carrying-cable and with a conveying element supported thereby for movement in a determined path, of supporting means movable in a curvilinear path, and a deflecting member carried by said

supporting means and operative for shifting said conveying element transversely at a determined point in the movement of the latter.

25. The combination, with a carrying-cable and with a conveying element supported thereby for movement in a determined path, of curved guides concentric with the axis of said cable; slides carried by said guides; and deflecting means carried by said slides and operative for shifting said conveying element transversely at a determined point in the movement of the latter.

26. The combination, with a carrying-cable and with a conveying element supported thereby for movement in a determined path, of curved racks concentric with the axis of said cable; slides carried by said racks; pinions on said slides; and deflecting means carried by said slides and operative for shifting said conveying element transversely at a determined point in the movement of the latter.

27. The combination, with a carrying-cable and with a conveying element supported thereby for movement in a determined path, of curved racks concentric with the axis of said cable; slides carried by said racks; pinions on said slides; locking means for holding the pinions in engagement with the racks; and deflecting means carried by said slides and operative for shifting said conveying element transversely at a determined point in the movement of the latter.

28. The combination, with a carrying-cable and with a conveying element supported thereby for movement in a determined path, of curved racks concentric with the axis of said cable, and a swinging frame supported by said racks and having pinions in engagement therewith and also having a deflecting-bar operative for shifting said conveying element transversely at a determined point in the movement of the latter.

29. In a conveyer, the combination, with a multistrand carrying-cable, of a series of separate bearing members inserted among the strands of the cable at different points in the length of the latter and grooved substantially lengthwise of the cable, and each having a smooth circumferential journal-surface, and each having also stop-flanges at opposite sides of such journal-surface.

30. In a conveyer, the combination, with a multistrand carrying-cable, of a series of separate bearing members inserted among the strands of the cable at different points in the length of the latter and grooved substantially lengthwise of the cable and each having a circumferential journal-surface with stop-faces at opposite ends thereof, and conveying elements journaled on said bearing members between said stop-faces.

31. In a conveyer, the combination, with a multistrand carrying-cable, of a series of separate bearing members inserted among the strands of the cable at different points in the length of the latter and grooved substantially lengthwise of the cable and each having a circumferential journal-surface with stop-faces at opposite ends thereof; collars encircling the journal-surfaces of said bearing members and located between said stop-faces; and conveying elements supported by said collars.

32. In a conveyer, the combination, with a multistrand carrying-cable, of a series of separate bearing members inserted among the strands of the cable at different points in the length of the latter and grooved substantially lengthwise of the cable and each having a circumferential journal-surface with stop-faces at opposite ends thereof; divided collars encircling the journal-surfaces of said bearing members and located between said stop-faces; and conveying elements supported by said collars.

33. In a conveyer, the combination, with a multistrand carrying-cable, of a series of separate bearing members inserted among the strands of the cable at different points in the length of the latter and each having a circumferential journal-surface; collars encircling the journal-surfaces of said bearing members; hangers secured to said collars; and a continuous conveying member carried by said hangers.

34. The combination, with a carrying-cable, of a continuous conveying member shiftable at different points in the length thereof transversely to the direction of travel of the cable without disturbing the relative positions of the cable and the remainder of the conveying member, to thereby discharge portions of the load carried at different points in the length of the conveying member, while the remainder of the load at the other points in the length of said conveying member is not discharged at such time.

35. The combination, with a continuous carrying-cable, and with material-containing conveying elements pendent therefrom, of means for imparting a traveling movement to, and elevating, the cable, said means embodying movable cable supporting and elevating means disposed in a spiral path.

36. The combination, with a continuous carrying-cable, and with material-containing conveying elements pendent therefrom, of means for imparting a traveling movement to, and elevating, the cable, said means embodying a series of rotary cable supporting and elevating sheaves disposed in a spiral path.

FRANCIS H. RICHARDS.

Witnesses:
F. N. CHASE,
JOHN O. SEIFERT.