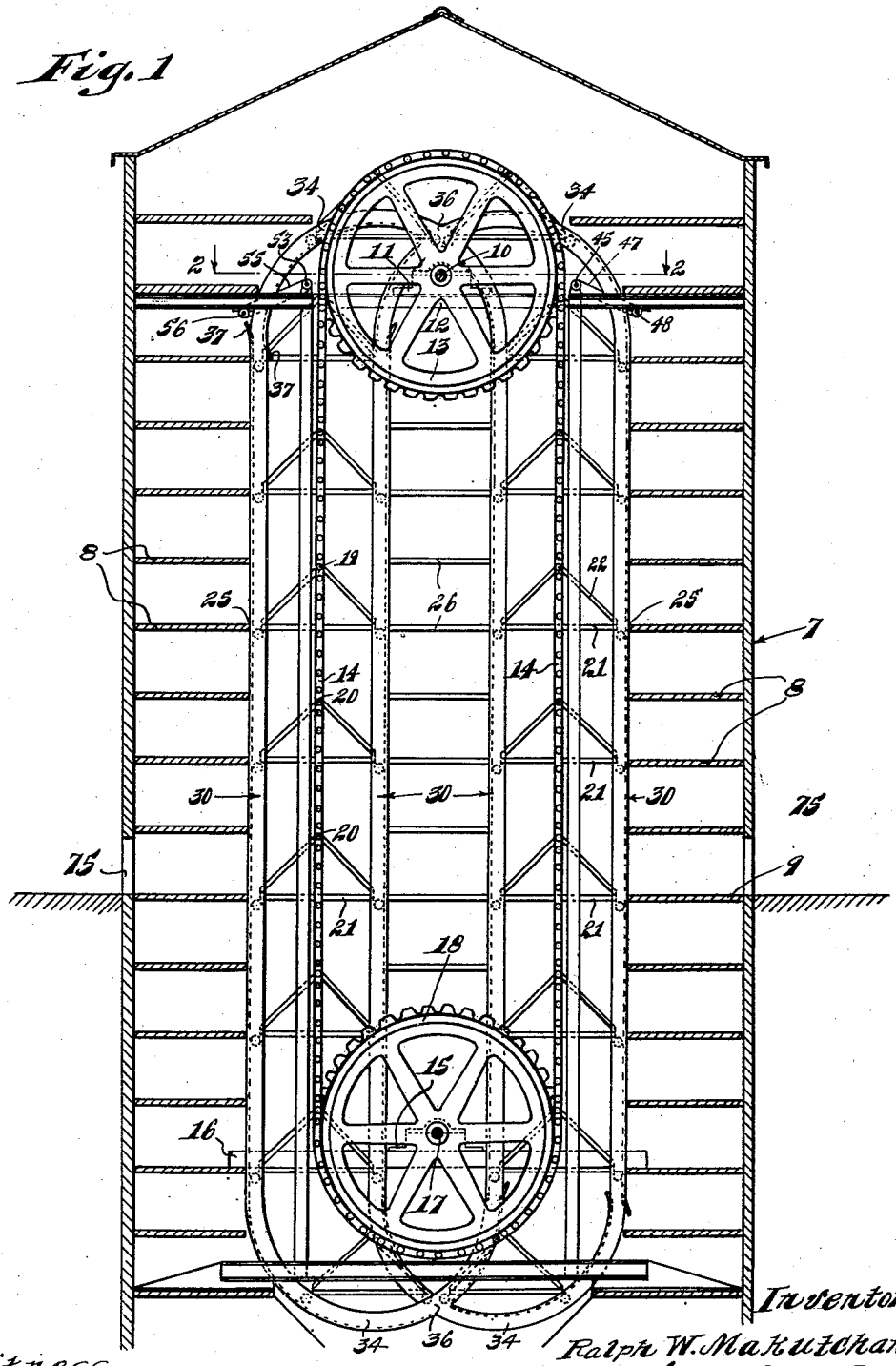
Oct. 6, 1931. R. W. MAKUTCHAN 1,826,357

ELEVATOR CONSTRUCTION

Filed May 24, 1926 6 Sheets-Sheet 1

Fig. 1



Witness
C. E. Wessels.

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ELEVATOR CONSTRUCTION

Filed May 24, 1926 6 Sheets-Sheet 2

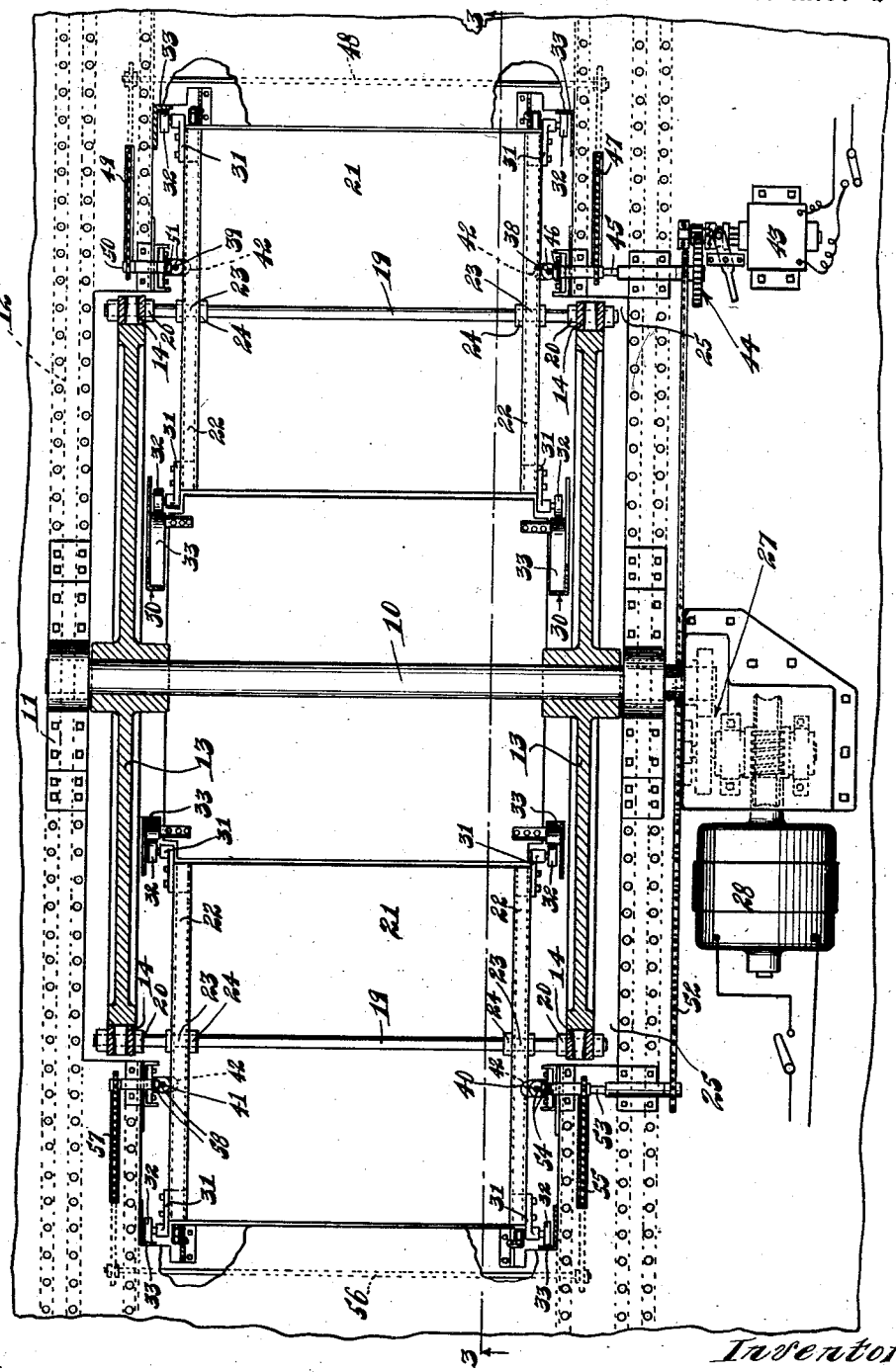


Fig. 2

Witness
E. E. Wessels.

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ELEVATOR CONSTRUCTION

Filed May 24, 1926 6 Sheets-Sheet 3

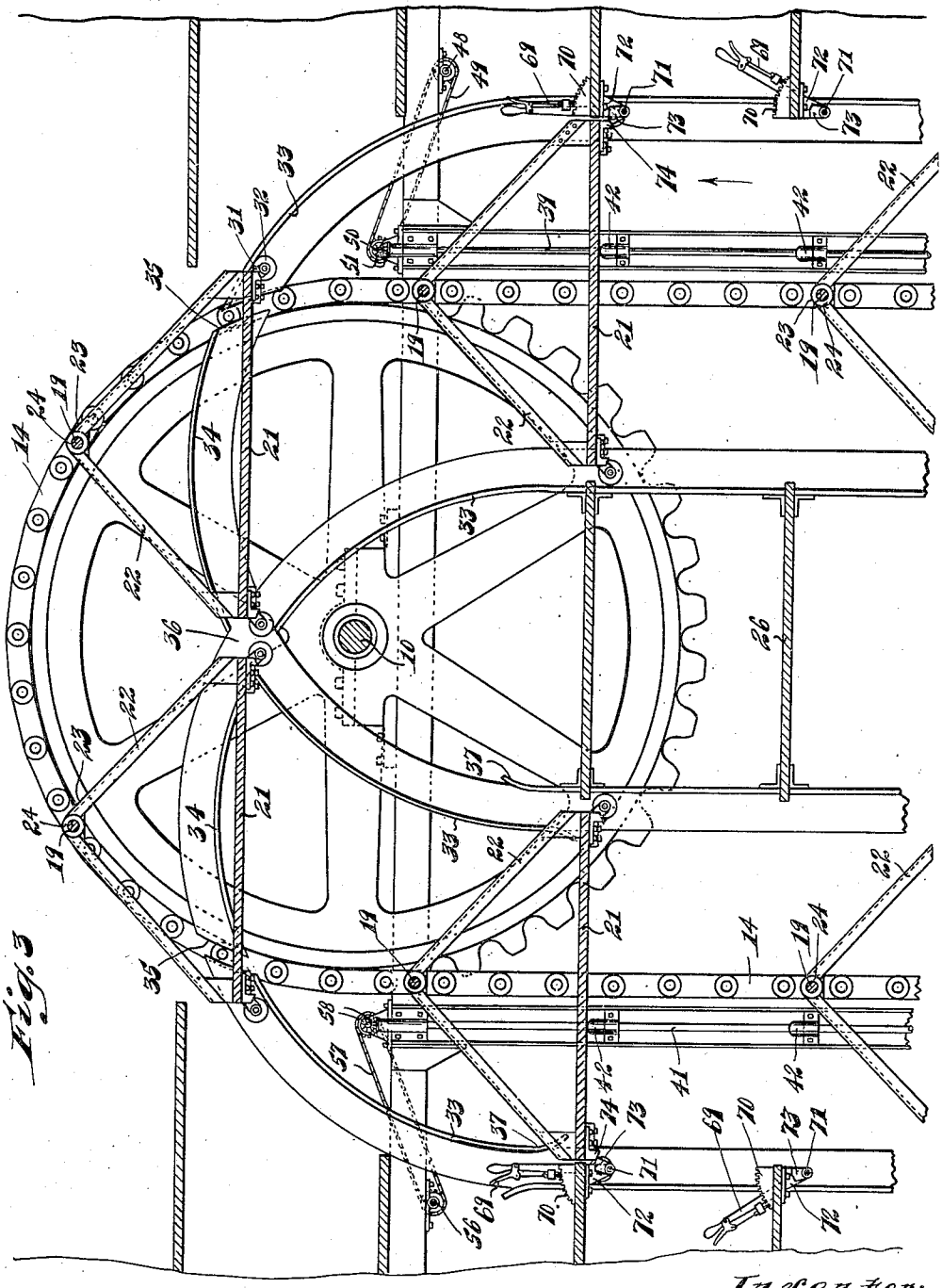


Fig. 3

Witness
C. E. Wessels

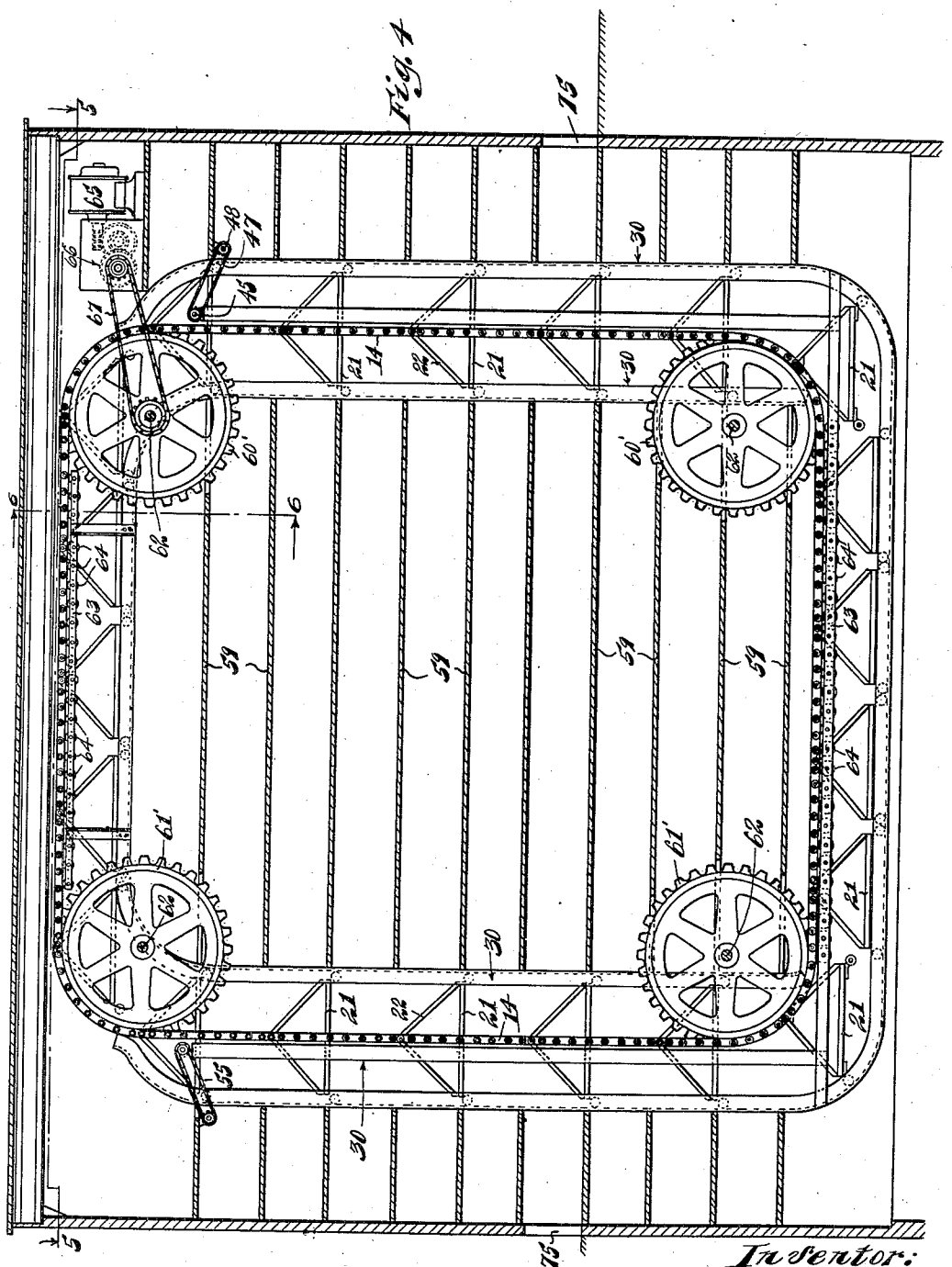
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ELEVATOR CONSTRUCTION

Filed May 24, 1926 6 Sheets-Sheet 4

Fig. 4



Witness
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ELEVATOR CONSTRUCTION

Filed May 24, 1926 6 Sheets-Sheet 5

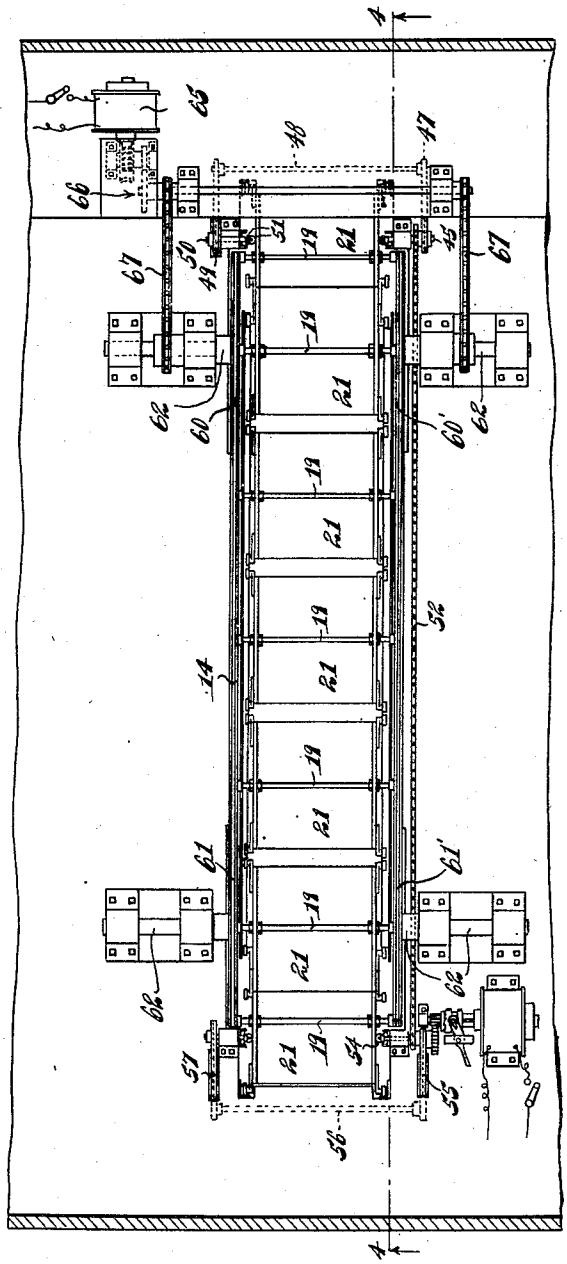


Fig. 5

Witness
C. E. Wessels

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ELEVATOR CONSTRUCTION

Filed May 24, 1926 6 Sheets-Sheet 6

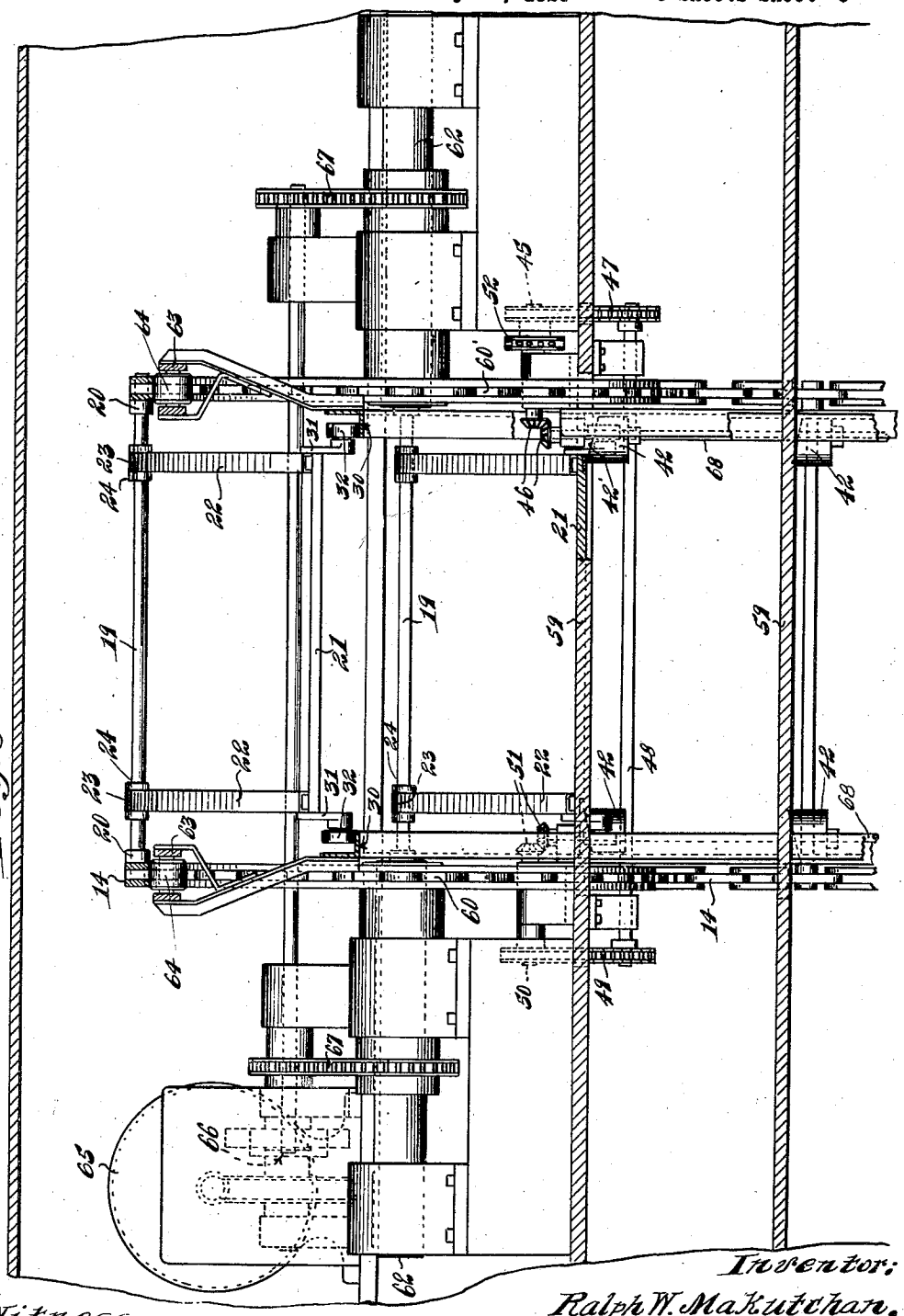


Fig. 6

Witness
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Patented Oct. 6, 1931

1,826,357

UNITED STATES PATENT OFFICE

RALPH WILLIAM MAKUTCHAN, OF CHICAGO, ILLINOIS

ELEVATOR CONSTRUCTION

Application filed May 24, 1926. Serial No. 111,112.

My invention relates to elevator constructions, and the general object thereof is to provide an improved construction of this class and one in which the design and arrangement are such that a very capacious structure may be built on a minimum of ground space.

One of the principal objects of my invention is to provide a construction of this class for storing and parking motor vehicles and involves means in the form of an endless conveyer equipped with a series of elevator cars for parking, raising and lowering a large number of motor vehicles at one time.

Another object of my invention is to provide an elevator construction of this character involving principles of design and arrangement which can be readily adapted to buildings of various transverse and elevational dimensions, and which may be erected wholly above ground, wholly below ground or partly above and partly below ground.

Another object of my invention is to provide a series arrangement of elevator cars whereby a large number of motor vehicles may be quickly raised or lowered to or from different floors or levels.

Still a further object of my invention is to provide a series arrangement of elevator cars which may itself be employed as either a temporary or permanent storage facility.

Other objects will appear hereinafter.

The invention consists in the combinations and arrangements of parts hereinafter described and claimed.

The invention will be best understood by reference to the accompanying drawings forming a part of this specification, and in which,

Fig. 1 represents a vertical sectional view of an elevator structure made in accordance with my present invention, the endless conveyer incorporated in the structure being shown in end elevation;

Fig. 2 represents a plan view on a larger scale, this view being taken approximately on the line 2—2 of Fig. 1;

Fig. 3 represents a sectional detail through the top portion of the endless conveyer and associated part, this view being taken approximately in the direction indicated by the arrows associated with line 3—3 of Fig. 2;

Fig. 4 represents a vertical sectional view through a modified arrangement of my elevator construction;

Fig. 5 represents a top plan view taken approximately on the line 5—5 of Fig. 4; and,

Fig. 6 represents a vertical cross sectional view taken approximately on the line 6—6 of Fig. 4.

While the preferred embodiments of the elevator constructions constituting the subject matter of my present invention have been especially designed to provide storage facilities for the accommodation of a large number of motor vehicles and to provide means whereby the motor vehicles may be readily moved to or from different floors, it is to be understood that these embodiments of my elevator constructions, which are illustrated by way of example, are adapted to be employed generally for storing and handling goods, wares and merchandise.

With more particular reference to Figs. 1, 2 and 3, wherein I have illustrated one of the preferred embodiments of my invention, 7 designates a storage building, shown in skeleton form and provided with a series of superposed storage floors or levels 8 both above and below the ground floor or level 9.

For moving or transferring the motor vehicles to or from the different floors or levels both above and below the ground floor or level 9, I provide power operated endless conveying means which is equipped with a series of elevator cars or platforms. For the operative support of the endless conveying means, I provide in the top portion of the storage building 7 an upper shaft 10 rotatably mounted in suitable bearings 11 which are fixed to girders or beams 12 forming part of the storage building. Fixed on the rotatable shaft 10 in spaced relation as best shown in Fig. 2 is a pair of large sprocket wheels 13 around each of which is passed the top portion of a sprocket chain 14. Within the lower portion of the storage building below the ground level 9 is similarly mounted by means of suitable bearings 15 and beams or

girders 16 a lower shaft 17 carrying a pair of large sprocket gears 18 around which the endless chains 14 are engaged. By this arrangement, each of the upper sprocket gears 13 is connected with its corresponding lower sprocket gear 18 by an endless chain 14, it being observed from Fig. 1 that the upper and lower shafts 10 and 17 are arranged in vertical alinement within the building so that the right and left-hand runs of the chains 14 will extend vertically of the storage building intersecting the floors or levels thereof.

The endless sprocket chains 14 are connected at spaced intervals by axis shafts 19, the mounting of these shafts in the chains being preferably accomplished by providing certain links of the chains with suitable bearings 20 in which the ends of said axis shafts are fixed. From each one of the axis shafts 19 is suspended an elevator car preferably comprising a platform 21, the means of suspension as herein shown consisting of hanger arms 22 having the form of inverted V-shaped devices whose apexes 23 are furnished with bearings 24 having loose fit upon the shafts 19. Preferably and as shown, two hanger arms 22 are employed for swingably suspending each platform 21 from its shaft 19, the platform being secured to and between the lower extremities of the hanger arms so as to be positioned between the endless chains 14 and to be carried thereby between the upper sprocket gears 13 and as well to depend from between the lower sprocket gears 18 during the travel of the endless chains thereabout. It is to be noted in this connection that under this arrangement the sprocket gears must be of sufficient diameters to keep the elevator cars on the right and left-hand runs of the endless chains in spaced relation; and further that these sprocket gears must be of such diameters that the elevator cars in traversing the upper arc will pass over the upper shaft 10. Obviously, the superposed floors 8 of the storage building are provided with suitable alined hatchway openings 25 for both the right and left-hand runs of the elevator cars and as well for the arcs at the top and the bottom for the movement of the elevator cars from the right-hand run to the left-hand run. In the present exemplification, I have employed upper and lower sprocket wheels of such diametrical dimensions that a series of superposed storage floors 26 are situated between the right and left-hand runs of the endless conveyer.

The endless conveyer, thus constructed with a series of elevator cars, may be operated in any suitable manner, as by applying power to one or both of the upper and lower shafts, to one or more of the sprocket wheels, or to the sprocket chain. In the present instance, by way of example, I show the power applied to the upper shaft 10 through a suitable system of reduction gearing 27, power being transmitted through such gearing from an electric motor 28.

In accordance with an important feature of my invention, I provide guiding means for steadying the elevator cars and holding them in horizontal position during the vertical travel of the conveyer and also during the travel of the conveyer across the arcs at the top and bottom of the structure. This guiding means includes an arrangement of four guide rails 30 for the right and left-hand runs of the endless conveyer, these guide rails extending vertically through the hatchway openings and occupying positions closely adjacent the path of the front and rear corners of the platforms 21 as clearly shown in Fig. 2. Each of the platforms is provided at its front and rear corners with a bracket 31 carrying a roller 32 adapted to turn on the flange 33 of the adjacent guide rail. Preferably and as shown the guide rails 30 are made of angle iron so that the flanges 33 are integral therewith. At the top and bottom of the structure, arc-shaped guide portions 34 connect the guide rails for the right-hand run with the guide rails for the left-hand run of the endless conveyer. These guide portions 34 have suitable transverse openings 35 to allow the passage of the axis shafts 19; and where they intersect as at 36, the flanges 33 are omitted in order that the rollers 32 may pass from one arc-shaped portion to the other; and also where the arc-shaped portions 34 merge into the vertically extending guides the flanges 33 are suitably outbent as at 37 to allow for the rollers during the transit of the car to or from the arc-shaped portions.

According to another feature involved in the present invention, I provide power operated means whereby to adjust all of the elevator cars on the right and left-hand runs to their floors or levels. This means includes the provision of two vertically extending shafts for each of the right and left-hand runs. Thus, in referring to Figs. 2 and 3, it will be seen that the shafts 38 and 39 extend across the opposite end edges of the platforms in the right-hand run while similar shafts 40 and 41 are arranged across the opposite edges of the platforms in the left-hand run. These shafts are all rotatably mounted and they carry cam devices 42 in such positions that the platforms may be engaged thereby and moved upwardly so as to come flush with their floors or levels. The cam devices 42 as best shown in Fig. 6, are made with inclined tops 42′ so that, when they are engaged with the undersides of the platforms, they will have a lifting action under the turning movements of their supporting shafts. These vertically extending shafts 38, 39, 40 and 41 are power operated, the power being taken from a suitable electric motor 43, transmission reduction gearing 44 and a main drive shaft 45. Referring to Fig. 2, it will be seen that the vertical

shaft 38 receives its power from the main drive shaft 45 through interengaged bevelled gears 46; that the vertical shaft 39 receives its power from drive shaft 45 through transmission comprising a chain drive 47, a transverse shaft 48, a chain 49, shaft 50 and bevelled gears 51. To the vertical shaft 40, power is transmitted from the drive shaft 45, through shaft 52, shaft 53 and bevelled gears 54; and to the remaining vertical shaft 41 power is transmitted from the shaft 53 through chain 55, transverse shaft 56, chain 57 and bevelled gears 58. By this arrangement, all of the platforms in the right and left-hand runs of the endless carrier may at one time be adjusted to position with respect to the floors or levels with which they are to be associated for receiving or discharging the motor vehicles. In this connection, also, it is to be observed that inasmuch as the vertical shafts are operated simultaneously, the up-lift of the cams on the platforms will serve as means for moving the endless carrier a trifle so as to properly adjust the platforms with their corresponding floors or levels.

In Figs. 4, 5 and 6, I illustrate a modified form of my elevator construction, which may be employed in connection with buildings having a large cross sectional area or with buildings in which it is desired to have large storage floors or areas as 59 located between the right and left-hand runs of the conveyer. In this modified construction, I employ four upper sprocket wheels 60, 60′, 61 and 61′, the sprocket wheels 60 and 60′ constituting one pair while the remaining sprocket wheels 61 and 61′ constitute a second pair spaced a distance from the first pair. Each of these sprocket wheels is mounted on a separate head shaft 62, so that there will be no shaft connections between the members of each pair, the space therebetween being clear for the movement of the elevator cars suspended from the endless conveyer. At the bottom of the structure, the endless carrier passes around four sprocket wheels arranged in two pairs and comprising precise duplicates of the sprocket wheels at the top of the structure. This form of construction also includes an endless conveyer provided with elevator cars or platforms precisely like those previously described, there being also suitable guide rails for the cars of the right and left-hand runs, all precisely as set forth in the previous instance, except that the arc-shaped guide portions are omitted and a suitable platform 63 equipped with rollers 64 are substituted for the support of the endless chains at the top and bottom of the structure, this arrangement in this regard being such that the endless chains are drawn across and supported by the series of platform supported rollers 64. As best shown in Fig. 5 the power for operating the endless conveyer in this construction, is taken from a suitable motor 65 and transmitted through suitable reduction gearing 66 and transmission 67 to the head shafts 62 carrying sprocket wheels 60 and 60′. With this form of construction cam devices 42 may as in the previous instance be mounted upon vertically extending power operated shafts 68 for adjusting the platforms to the floors or levels.

In connection with each form of elevator construction, as herein illustrated, there may also be employed suitable manually operated means for adjusting the elevator cars to the floors or levels. Thus, as best illustrated in Fig. 3, each floor or level at the edge of the hatchway opening may be provided with a manually operated lever 69 in cooperation with the quadrant-shaped rack 70, the lever 69 being attached to a stud shaft 71 arranged in a bracket 72 secured to the underside of the floor or level. Secured to the stud 71 is a cam 73 which is adapted to be engaged with a cam-like catch plate 74 with which each of the platforms is equipped for the purpose. By moving the lever 69 in one direction the cam 73 is withdrawn from the path of movement of the platforms; whereas, when said lever 69 is moved in the opposite direction, assuming the platform to be approximately in flush position with respect to its floor or level, the cam 73 will engage the catch plate 74 so as to force the platform upwardly into alinement with its floor or level.

In either one of the forms of construction herein illustrated, I may employ a motor having a reversible field, so that the endless conveyer may be driven at will in either direction. In each type of storage building, as illustrated in Figs. 1 and 4, a doorway 75 may be conveniently provided on the ground floor level 9 directly in front of both the right and left-hand runs of the endless conveyer, so that the motor vehicles may be driven directly to or from the elevator cars brought to the level with the ground floor; and it will be observed in this connection that the elevator cars are so arranged on the endless conveyer that when a car of each run is in alinement with the ground floor, all of the other elevator cars on both the right and left-hand runs will be in alinement with the storage floor to receive or discharge a vehicle. By this arrangement, a large number of vehicles may be moved to or from the elevator cars at one time. When a vehicle is to be stored or parked for a short time only, it need not be transferred to a storage floor, but may remain on the endless conveyer which will itself serve as a temporary parking or storage facility. In this connection, it is thought that it will be obvious that either of the endless conveyer structures, as illustrated in Figs. 1 and 4, may be built wholly above the ground or wholly below the ground, or they may be incorporated in an

open skeleton structure to serve as a facility for parking cars for their periods of time.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. In an elevator construction, the combination with a series of storage floors arranged at different levels; of a pair of wheel supported endless chains intersecting said floors; axis shafts supported by and connecting said chains at intervals; a platform swingably depending from each axis shaft between said chains; vertical shafts arranged for rotation in relation to the path of said platforms; and means on said vertical shafts for engaging said platforms and adjusting them to said floors, substantially as described.

2. In an elevator construction, the combination with a series of storage floors arranged at different levels; of a pair of wheel supported endless chains intersecting said floors; axis shafts supported by and connecting said chains at intervals; a platform swingably depending from each axis shaft between said chains; vertical shafts arranged for rotation in relation to the path of said platforms; means on said vertical shafts for engaging and adjusting said platforms to said floors; means for actuating said endless chains, and means for turning said vertical shafts, substantially as described.

3. In an elevator construction, the combination with a series of storage floors arranged at different levels; of a pair of wheel supported endless chains intersecting said floors; axis shafts supported by and connecting said chains at intervals; a platform swingably depending from each axis shaft between said chains; catch plates fixed to said platforms; and means on the floors adapted to be moved into engagement with said catch plates for adjusting said platforms to said floors substantially as described.

In testimony whereof I have signed my name to this specification.

RALPH WILLIAM MAKUTCHAN.