March 28, 1933. M. E. BREED 1,902,946

SAFETY CABLELESS MULTIPLE ELEVATORS

Filed July 16, 1930 2 Sheets-Sheet 1

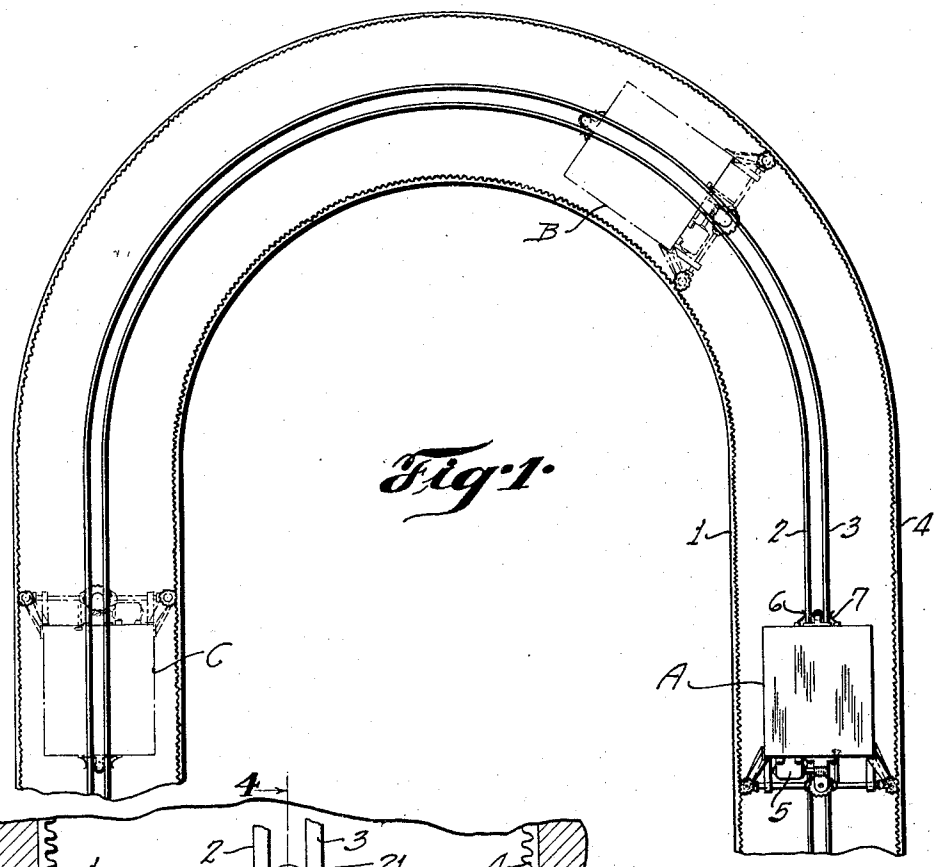


Fig. 1.

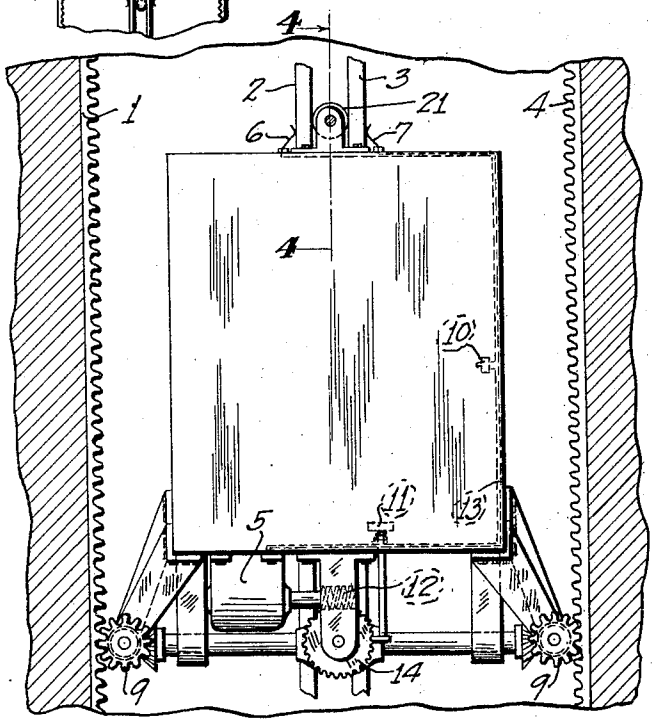


Fig. 2.

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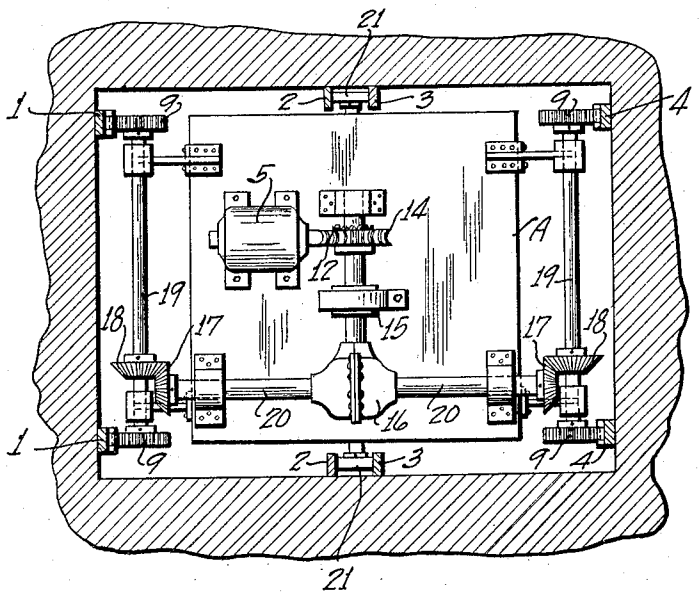


Fig. 3.

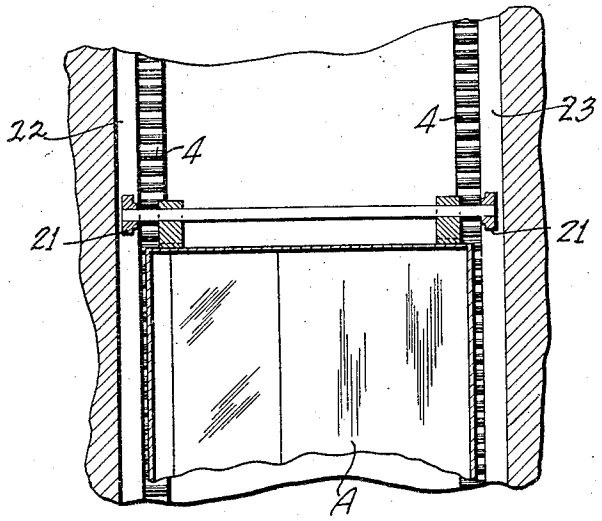


Fig. 4.

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UNITED STATES PATENT OFFICE

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SAFETY CABLELESS MULTIPLE ELEVATORS

Application filed July 16, 1930. Serial No. 468,363.

This invention relates to safety cableless multiple elevators; and an object of the invention is to provide an elevator system comprising a plurality of elevators mounted in an endless shaft consisting of a portion through which the elevators ascend and a portion through which the elevators descend with connections at the upper and lower ends of said ascending and descending portions through which the elevators pass from the ascending portion to the descending portion and from the descending portion to the ascending portion of said shaft, in combination with mechanism mounted on the elevators and cooperating with fixed elements in said shaft for propelling the elevators.

Another object of the invention is to provide an improved elevator operating mechanism comprising a series of racks secured in rigid relationship within an elevator shaft and having engagement with gearing supporting the elevator car whereby rotation of said gearing will essentially operate the elevator car through the shaft, and mechanism supported by the car for operating said gearing.

Another object of the invention is to provide an improved elevator mechanism comprising an endless elevator shaft having connected portions through which the elevator ascends and descends, respectively, and mechanism supported by the elevator for propelling the elevator through said shaft in an upright position in the ascending portion and in an inverted position through the descending portion.

Another object of the invention is to provide an elevator construction designed and adapted for use in buildings of the greatest height comprising an endless shaft through which a plurality of elevators operate in spaced relationship, so that a single endless shaft serves as a passage for any desired number of elevators as required by the height of the building, and improved mechanism for propelling the elevators along and through said shaft without the use of cables and similar hoisting devices.

Other objects and advantages of the invention will be apparent from the following description, reference being made to the accompanying drawings, in which—

Fig. 1 is a diagrammatic view illustrating the upper end of the endless elevator shaft and the manner in which a plurality of elevators operate in spaced relationship through said shaft.

Fig. 2 is an enlarged view showing the gearing and operating mechanism for propelling an elevator.

Fig. 3 is a sectional view of the elevator shaft showing an inverted plan view of an elevator therein.

Fig. 4 is a vertical sectional view approximately on the line 4—4 of Fig. 2.

In Fig. 1 of the drawings, the ascending and descending portions of the elevator shaft and the connecting passage between the upper ends thereof are shown. The lower ends of the ascending and descending portions of the elevator shaft are connected by a similar arcuate communication, so that the elevators ascend through one portion of said shaft and pass through the arcuate communication from the upper end thereof to the descending portion of said shaft in which the elevators descend inverted. This is sufficient to enable anyone skilled in the art to understand that the elevators pass through a similar arcuate connection from the lower end of the descending portion to the lower end of the ascending portion of the elevator shaft and thereby right themselves, so that the elevators pass upwardly in the ascending portion of the elevator shaft right side up as required for service in the transportation of passengers and/or freight. In Fig. 1 of the drawings, elevators A, B and C are shown in spaced relationship, the elevator A ascending through the ascending portion of the elevator shaft, the elevator B making the turn toward the descending portion of the elevator shaft, and the elevator C being inverted and descending inverted in the descending portion of the shaft.

A pair of spaced parallel endless racks 1 are attached to the inner wall of the endless elevator shaft, these racks extending continuously through the ascending and descending portions of said shaft and through the

curved connections at the upper and lower ends of the ascending and descending portions of the shaft.

A pair of spaced guide bars 2 and 3 are attached to each side wall of the shaft, and a pair of spaced parallel endless racks 4 are attached to the wall of the shaft opposite from the racks 1.

On each elevator A, B, C, etc. a motor 5 is secured. This motor 5 is energized and operated by electrical energy through a proper circuit designed and arranged for such purpose, including brushes 6 and 7 operating against the metallic bars 2 and 3, respectively. The electric circuit is not a specific part of the present invention and is not completely illustrated as the arrangement of such circuits in order to energize motors on movable vehicles is known. The shaft of each motor 5 is equipped with a worm 12 which is in constant mesh with a worm gear 14 attached to a rotary shaft 15 supported by the elevator. The shaft 15 is differentially geared to two axially alined shafts 20 by differential gearing of any known type enclosed within a housing 16, so that the shafts 20 may be rotated at uniform or different speeds in order to propel the elevator through the straight ascending and descending portions of the endless elevator shaft and through the arcuate connections at the upper and lower ends thereof. A gear 17 is attached to the outer end of each shaft 20. The gears 17 mesh with gears 18 attached to shafts 19 supported in connection with the elevator car. The shafts 19 have attached thereto gears 9 which are in constant mesh with the racks 1 and 4, respectively. Thus, the gears 9 that are attached to one of the shafts 19 mesh with the two racks 1 and the gears 9 that are attached to the other shaft 19 mesh with the racks 4.

A pair of rollers 21 are attached to the ends of a shaft 22 and operate between the pairs of guide bars 2 and 3, respectively. One of these shafts 22 is supported at the upper end of each elevator car while the driving gearing described is supported at the lower end of each car, as will be readily understood by reference to Fig. 2 of the drawings. Thus, the rollers 21 at the upper end of each elevator car guide and direct the upper end of the car, holding the car upright in the ascending portion of the elevator shaft and turning the car in the upper end of the shaft to inverted position in the descending portion of the shaft through which the car is guided and operated downwardly in inverted position. It will be understood that at the lower end of the shaft, the car passes from the descending to the ascending portion and is thereby righted for service.

A switch control device 10 is conventionally shown in Fig. 2 of the drawings and the same may be operated in order to open and close the circuit to the electric motor in order to start and stop and operate said motor.

It will be understood that the invention contemplates the use of devices to hold and keep the cars in properly spaced relationship, so that no car can approach too close to another, but such devices are not illustrated in the drawings of the present invention.

The operator or conductor of each of these elevator cars remains in the car during the rise and descent. During the rise of the car, the operator or conductor stands upon the floor of the car. When the car reaches the top and passes through the curved connection from the ascending portion to the descending portion of the elevator shaft, the operator steps onto and stands upon the inside of the lower side wall of the car; and when the car passes into the descending portion of the elevator shaft in inverted position, the operator steps onto the inside of the top of the car and stands thereon until the car reaches the curved connection from the descending portion to the ascending portion of the elevator shaft. The operator or conductor then steps onto the inside of the lower side wall of the car and stands thereon until the car enters the ascending portion of the elevator shaft, whereupon the operator steps onto the floor of the car for another round trip.

It is now clear that my invention obtains all of its purposes and objects sufficiently and satisfactorily. It dispenses with the use of cables and other hoisting apparatus of that nature and permits the use of a number of elevator cars in a single shaft. The demand for some satisfactory arrangement of this kind in buildings of great height has become pressing. The cost of construction of such buildings is enormous. The buildings have required the service of many elevators operating in separate shafts, thus using a great amount of space in the buildings. My invention dispenses with the use of a large amount of space for the elevators, so that such space can be divided into rooms and used to produce income. Accordingly, the advantage of and demand for such invention are apparent.

I am aware that the construction and arrangement disclosed herein may be widely varied within the scope of equivalent limits without departure from the nature and principle of the invention. Accordingly, I do not restrict myself in any unessential respects, but what I claim and desire to secure by Letters Patent is:

1. An elevator system comprising separate ascending and descending shaft portions having arcuate shaft connection at their upper and lower ends respectively, an elevator car in said shaft, parallel endless racks mounted rigidly in said shaft portions and shaft connections, mechanism supported at one end of

said car and engaging said racks for propelling said car upwardly through said ascending portion and downwardly in inverted position through said descending portion of said shaft, a guide device in said shaft, and means in connection with the opposite end of said car from said mechanism engaging said guide device, said elevator car being propelled through said arcuate shaft connections from said ascending shaft portion to said descending shaft portion and from the latter to the former and guided throughout by said guide device and guide means.

2. An elevator system comprising an endless shaft including ascending and descending portions, parallel endless racks mounted rigidly in said endless shaft, a guide device in said shaft, a number of elevators mounted in said shaft, mechanism supported at one end of each elevator and engaging said racks for propelling said elevators upwardly through said ascending portion of said shaft and downwardly through said descending portion of said shaft, either end of each elevator acting as a floor, and means supported at the opposite end of each elevator from said mechanism engaging said guide device and guiding said elevators throughout their movement through said endless shaft.

3. An elevator system comprising an endless oval shaft having ascending and descending portions continuously connected at their upper and lower ends, racks rigidly mounted within said shaft, an invertible elevator enclosed in said shaft, either end of said elevator acting as a floor, gearing supported at one end of said elevator and engaging said racks, mechanism supported at said one end of said elevator for rotating said gearing and thereby propelling said elevator upwardly in upright position and downwardly in inverted position through said shaft, a guide device rigid in said shaft, and means supported at the opposite end of said elevator from said gearing engaging said guide device and guiding said elevator throughout said shaft.

4. An elevator system comprising an endless oval elevator shaft having ascending and descending portions continuously connected at their upper and lower ends, endless racks mounted rigidly in said shaft on the inner and outer curved portions thereof, an invertible elevator enclosed in said shaft, either end of said elevator acting as a floor, differential gearing and operating mechanism therefor supported at one end of said elevator and cooperating with said racks to propel said elevator through said shaft, and means other than said gearing for guiding said elevator throughout said endless oval shaft.

5. An elevator system comprising an oval elevator shaft having vertical ascending and descending portions and curved upper and lower connecting portions, a series of oval racks mounted rigidly in said shaft on the inner and outer curved portions thereof, curved guide devices rigid in said curved upper and lower connecting portions of said shaft, an elevator enclosed in said shaft, either end of said elevator acting as a floor, guide means supported at one end of said elevator for engaging said guide devices and guiding said elevator through said curved connecting portions of said shaft, rotary shafts supported at one end of said elevator, gearing attached to said shafts and meshing with said racks, and mechanism for rotating said shafts uniformly and differentially as required to propel said elevator through said shaft.

6. An elevator system comprising an oval elevator shaft, oppositely disposed series of oval racks mounted rigidly in said shaft, oval guide devices mounted rigidly on the inner and outer curved portions of said shaft, an elevator in said shaft having each end adapted to be used as the floor, means supported near one end of said elevator engaging said guide devices and guiding and preventing disarrangement of said elevator in said shaft, and driving mechanism supported near the opposite end of said elevator and constantly engaging said racks for propelling said elevator through said racks.

7. An elevator system comprising oppositely disposed series of endless oval racks rigidly supported with respect to each other, an elevator between said series of racks, mechanism supported by one end of said elevator and constantly engaging said racks for propelling said elevator along said racks upwardly in upright position and downwardly in inverted position, either position being used to receive passengers or freight, and devices at the opposite end of said elevator from said mechanism properly guiding and preventing said elevator from becoming disarranged.

MAURICE E. BREED.