C. G. PALMER.

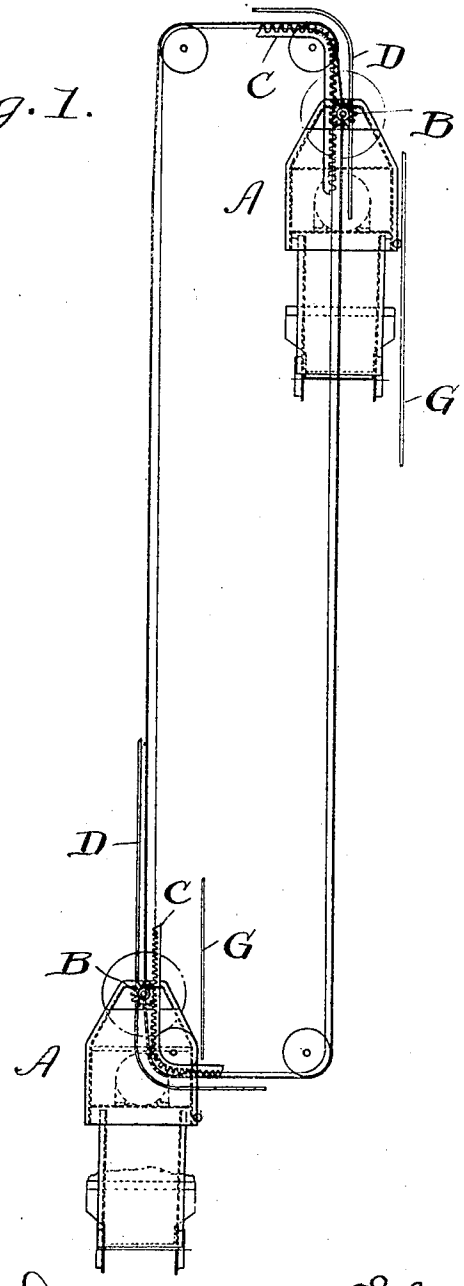
HOISTING MECHANISM.

APPLICATION FILED DEC. 5, 1907.

904,717. **Patented Nov. 24, 1908.**

4 SHEETS—SHEET 1.

Fig. 1.



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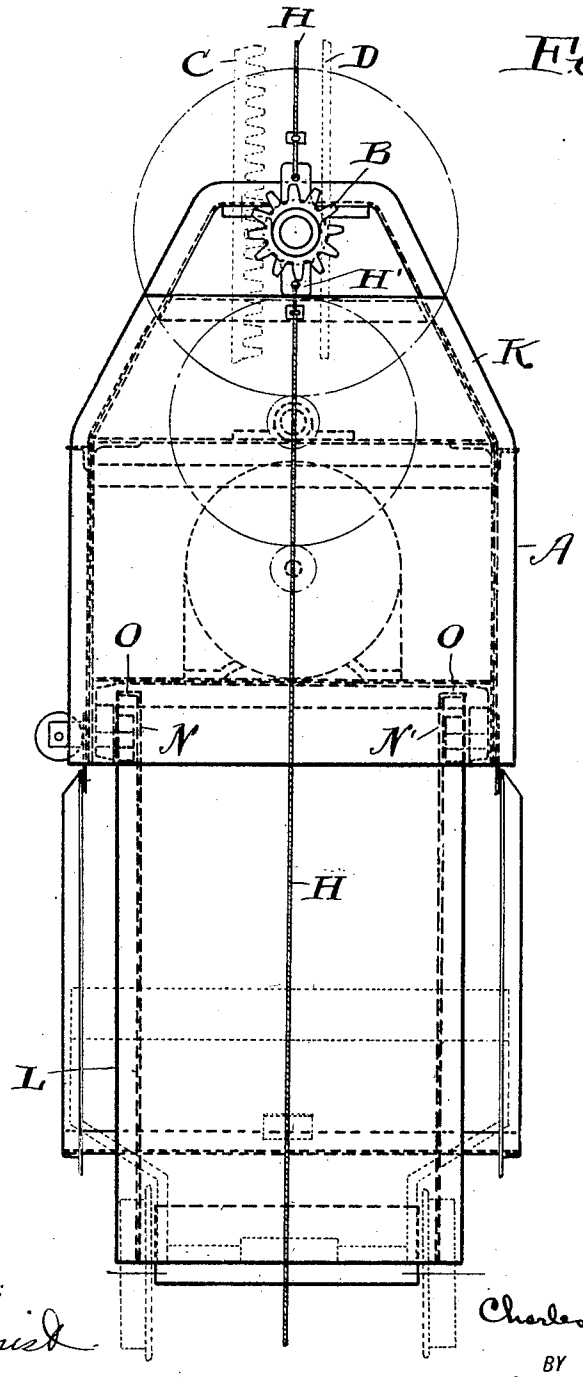
4 SHEETS—SHEET 2.

Fig. 2.



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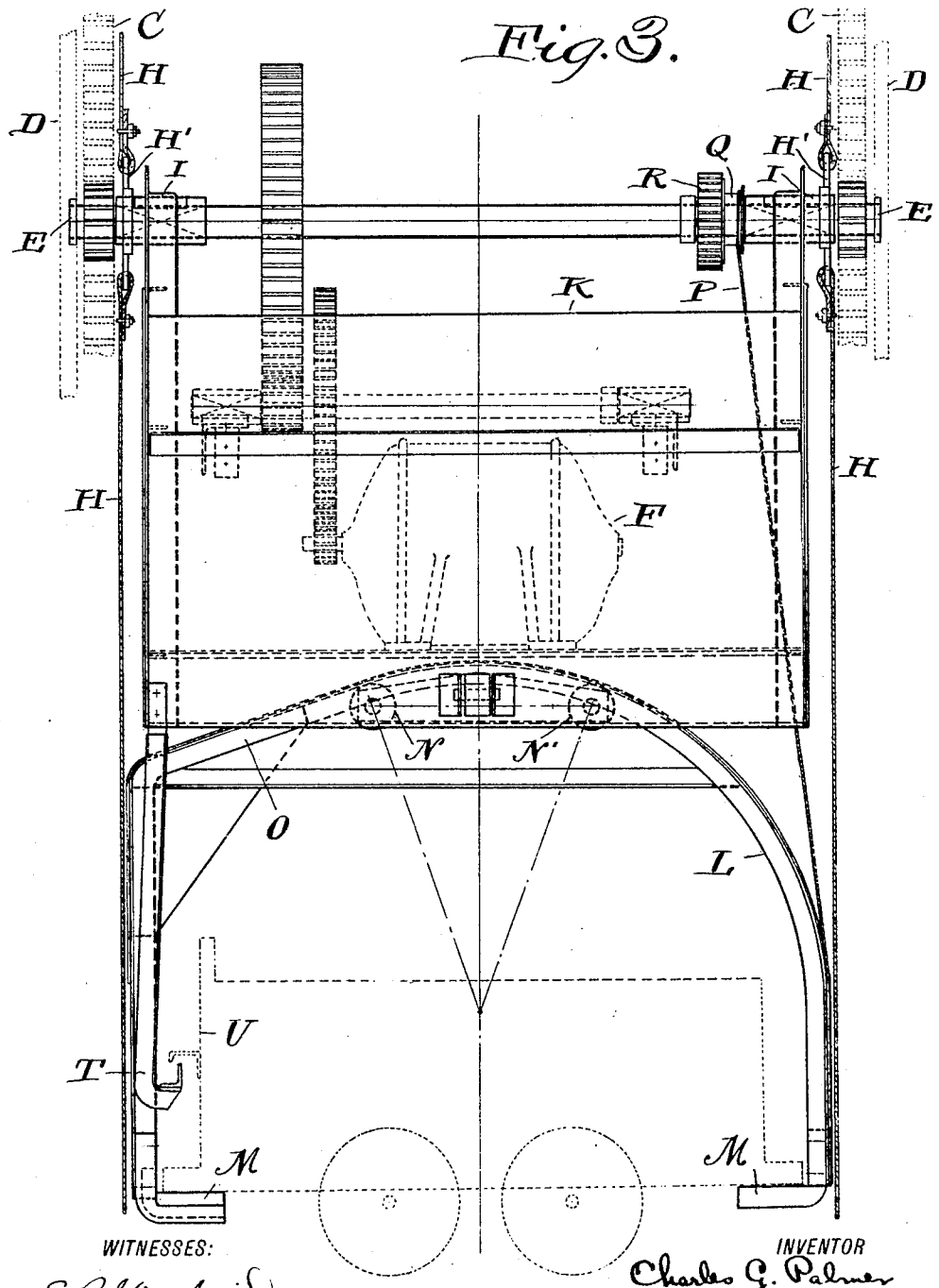
4 SHEETS—SHEET 3.

Fig. 3.



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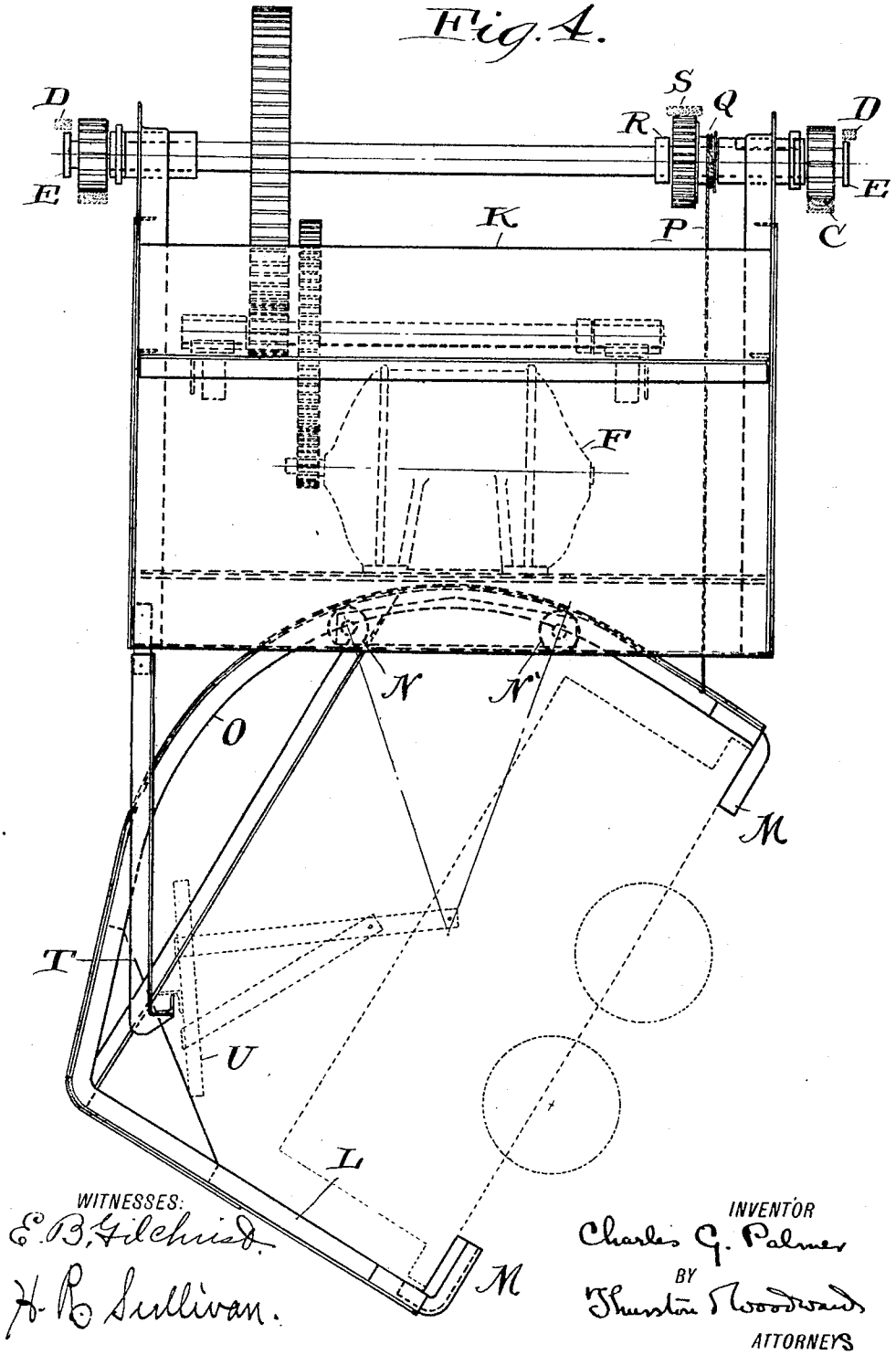
4 SHEETS—SHEET 4.

Fig. 4.



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UNITED STATES PATENT OFFICE.

CHARLES G. PALMER, OF CLEVELAND, OHIO.

HOISTING MECHANISM.

No. 904,717. Specification of Letters Patent. Patented Nov. 24, 1908.

Application filed December 5, 1907. Serial No. 405,194.

To all whom it may concern:

Be it known that I, CHARLES G. PALMER, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Hoisting Mechanism, of which the following is a full, clear, and exact description.

The object of the present invention is to provide an improved hoisting apparatus of comparatively inexpensive construction and of great capacity, flexibility of increase or decrease in capacity, simplicity and certainty of action.

As is well known to those familiar with vertical hoists such as are commonly used in mines, for which the present hoist is especially adapted, there are many disadvantages connected with the use of vertical reciprocating hoists, which have been borne with simply because of the lack of knowledge as to how to obviate them.

With the ordinary reciprocating vertical hoist, the movement of the carrying mechanism in a single path up and down obviously limits the capacity of the device so that it may not be increased, save by increase of speed of movement. Further the expense of installation and operation of all reciprocating mechanisms is comparatively great since the apparatus must be originally installed for its full final capacity regardless of the depth to which the mine may reach, since no additional cages may be added. Further, the motor as ordinarily used must be made sufficiently heavy to allow for the maximum speed of the cage, which maximum must be high to bring the average speed to the desired amount, inasmuch as the minimum speed is zero. Moreover, in the majority of the reciprocating hoists known, it is necessary to maintain a larger crew for shifting the loaded cars to the cage and removing the empty ones than it is necessary to employ with my improved construction, a feature which is not by any means of minor importance.

It is still further an object of my invention to so arrange the apparatus that the units of power required may be smaller than those heretofore used, a feature which is rendered possible by reason of the load being practically constant and the speed being low and of very small variation.

I further desire the arrangement to be such that each motor shall be at all times assisting in handling the load and shall not operate either idly or uselessly, and I have designed my apparatus with this object in view.

The above and other advantages will appear upon referring to the structure forming an embodiment of my invention described in the following specification, reference being had to the accompanying drawings, in which,

Figure 1 is an elevation illustrating the general arrangement of my apparatus, part of the rack and retaining guide being omitted as being unnecessary for illustration. Fig. 2 is an enlarged end elevation of the carrying cage, and Fig. 3 is an enlarged side elevation of the same, the structure of the interior parts being indicated in dotted lines. Fig. 4 is an enlarged side elevation of the cage in dumping position at the top of the hoist.

My invention broadly stated comprises the principle illustrated in Fig. 1 of having the load carriers A moved up the shaft in one line and pass to the side and move down in another line alongside of the upward line of movement, the travel being accomplished in main by a pinion B on the carrier which engages a rack C disposed in the path of travel. In Fig. 1 this rack is only illustrated in part, but it will be understood, of course, that it is substantially co-extensive and coincident with the path of movement of the operating pinion on the carrier. The rack is not necessarily disposed in the precise fashion indicated in Fig. 1, since this is not essential to my invention, obviously. Alongside of the rack and properly disposed to retain pinions of the carrier in engagement with this rack, I provide a guide D, against which a bearing E on the pinion shaft may travel, said guide being located on the side of the pinion opposite to that side on which the rack is located.

I preferably provide each individual carrier with its own motor F deriving its power from a suitable conducting wire G located along the path of movement, and where a

plurality of carriers are used I connect the carriers together by means of an, in effect, endless cable H, a loose collar H′ being inserted in the cable to fit over a suitable bearing projection I on each carrier frame. By means of this cable, which is practically taut in each of its sections, the power exerted by each motor in excess of its load will be transmitted to the next succeeding carrier. This is quite an advantageous arrangement, since I purpose having my carriers maintain a constant movement in the circuit within which they are confined without substantial variation in speed, and purpose locating the carriers so that each carrier shall have a companion carrier located at all times at a distance of half the circuit from it.

By my arrangement, from the moment a loaded carrier begins to travel upward; the carrier from which the ore has been dumped will begin to travel downward so that, so far as the mere apparatus is concerned, no considerable load will be thrown upon the motors and the energy of the two motors will be devoted to the lifting of merely the ore upon the loaded carriers, the power and weight of the empty carrier being transmitted to the loaded carrier through the cable above described. It is by this arrangement and by reason of the arrangement which permits me to keep the carriers in constant motion without the necessity of at times accelerating the speed from zero upward that enables me to install comparatively small motors of light weight upon the carriers, thus avoiding great initial installation expense.

It will further be seen that the system as outlined is exceedingly flexible. As the shaft grows deeper it will only be necessary so long as the same number of carriers is used, to lengthen out the rack and cable sections. When the work or the distance of travel demands the use of more carriers there may be inserted at opposite points in the circuit a pair of carriers each half way between the two carriers already in use. Thus the capacity can be doubled at once and obviously it may also be tripled or quadrupled without losing any of the advantages of the balanced arrangement, by properly locating the added carriers. Thus, not only will the capacity of the initial installation be greater than that of any other vertical hoist, due to the constant movement of the carriers and to the fact, since they do not reciprocate in one path, that no time is lost in waiting for one to finish its path of travel and be loaded, but also the flexibility of increase of capacity is without practical limit. The simplicity of the arrangement will, of course, appeal to every person familiar with such hoisting apparatus, since it will be seen that no part is employed that is inconsistent with ordinary shaft construction and no arrangement is had which necessitates special conditions.

If it is desired that the carrier shall move somewhat slowly at the point where the load is picked up and where it is dumped, as at the points in the diagram where the carrier is moving substantially on the level at the top and bottom of the circuit, suitable inserts may be made in the current conductor whereby the speed of the motor is cut down at the time when the carriers are in such location, causing them to move somewhat more slowly.

The detail structure of the carrier, which I have devised for use in this system, comprises a suitable frame K hung from the traveling shaft on which the operating pinions are mounted, this frame affording a platform for the support of an electric motor and its gearing by which power is transmitted to the aforesaid shaft. The lower part of the carrier is provided with a grab yoke L having at the lower extremity of the opposite ends inwardly projecting ledges M adapted to pass under the ends of the ore car and support the latter when the carrier is hoisted. By this construction it will be seen that as an empty carrier at the bottom of the shaft moves on the level sidewise toward a loaded car which is on the track a proper distance below the parts supporting the carrier the aforesaid ledges of the grab yoke will pass beneath the ends of the ore car resting on the track and as the carrier is then guided directly upward in its movement the loaded ore car will be lifted from its track and carried up the shaft. Again, as the carrier descends with an empty car in the grab yoke it will reach a point at which it will deposit the car upon a track located to receive the empties. The relation of the last mentioned track to the guide for the carrier frame should be such as to permit the carrier and its grab yoke to drop a couple of inches, or some suitable distance, so as to permit the ledges of the grab yoke to clear the ends of the car, at which point the guides for the carrier frame should give it a sidewise horizontal movement so as to enable it to clear the empty car and trackway. This arrangement permits the car to be handled with less shock than with any known system of hoisting apparatus and with little shock to the carrier itself. It likewise obviously affords a practical method of permitting a continuous movement of the hoisting apparatus, it being unnecessary to stop the same for the reception of the load at the bottom, the dumping at the top being also carried out without necessitating any stoppage, as will appear from the description below.

It is further obvious that my carrier does

not necessitate the use of a crew of men to operate it since the lifting and depositing of the ore cars is entirely automatic, it being merely necessary that the cars be run by gravity, or in any other manner, to the proper position on the track for being lifted, and be promptly hauled away for refilling when once deposited.

For the purpose of dumping the car, I have mounted the grab yoke on the carrier frame so that it may be tilted, this being accomplished by slinging the yoke on a pair of roller bearings N on the lower part of the carrier, a curved track-way O on the yoke running over these roller bearings. For the purpose of causing the grab yoke to move over said bearings and to tilt end downward, I attach to one end thereof a cable P, attached at its opposite end to a short sleeve Q mounted on the carrier frame and having keyed thereto a pinion R adapted to engage and be rotated by a rack S placed in the path of the said pinion at that point where it is desired to dump the ore car. As this last named pinion R engages its rack the cable attached to the pinion sleeve will be wound up thereon, lifting one end of the grab yoke and causing the latter to roll over on the roller bearings N upon which it is swung, thus lowering one end of the ore car and inclining it downward. As the ore car tilts downward a stop T fixed to the carrier frame will arrest the car door U, which is a swinging door at the end of the ore car of usual and well known construction. The car door being thus held in fixed position while the end of the car moves downward, the door will be swung open and the contents of the car allowed to fall out. As soon as the tilting pinion R has passed out of engagement with the rack S which operates it, the tilting cable will be released and the grab yoke with its empty car allowed to roll back to its former position. It will thus be seen that it is not necessary to stop the carriers for the purpose of emptying the cars at the top of the shaft, though, as above stated, I may, where I find it desirable, make inserts into the electric conductor such as to slacken the speed of the moving carriers at the points where the loading and unloading takes place.

From the above it will be clear that I have by my invention accomplished the objects stated, in that I have obtained greater capacity than can be obtained with any other vertical hoist and that my apparatus is capable of great flexibility as to increase or decrease of capacity.

It will further be seen that I am enabled to use very small units of power for the apparatus, due to the load remaining practically constant and to the fact that the speed is low, practically constant and of very small variation. Thus the initial cost is very small and the cost of increase is less than with any other known system, and the expense of operation will be low, as the system requires but a small crew for operating the same.

Having described my invention, I claim:

1. A hoisting system comprising a plurality of carriers, a rack or equivalent along the line of travel, motors on said carriers operating pinions or equivalents to engage said rack, the rack being disposed to permit the carriers to travel in a continuous circuit, said carriers being connected together.

2. A hoisting system comprising a plurality of carriers, a rack or equivalent along the line of travel, motors on said carriers operating pinions or equivalents to engage said rack, the rack being disposed to permit the carriers to travel in a continuous circuit, said carriers being connected together and located at a distance from each other, such that as a carrier is being lifted another carrier is being lowered.

3. A hoisting system comprising a plurality of carriers movable in a circuit, individual motors on said carriers, and a flexible connection between the separate carriers.

4. A hoisting system comprising a plurality of carriers movable in a circuit, individual motors on said carriers, a flexible connection between the separate carriers, a guide for said carriers arranged to guide the carriers transversely at the lower portion of the circuit.

5. A hoisting system comprising a carrier movable in a circuit, an individual motor on said carrier, guiding means for said carrier arranged to direct the movement of the carrier in a transverse direction at the lower portion of the circuit.

6. A hoisting system comprising a carrier, means for hoisting and lowering the carrier, means on said carrier adapted to pass under and engage a part of the frame of a car, guiding means for directing the movement of the carrier laterally at the loading point.

7. A hoisting system comprising a carrier adapted to hold a car, having a continuous path of forward movement means located in the path of movement of the carrier adapted to be engaged by a part on the carrier and thereby tilt the car and permit the continuous forward movement of the carrier.

8. A hoisting system comprising a carrier adapted to hold a car, having a continuous forward path of movement that portion of the carrier holding the car being movable to tilt the latter, means in the path of the carrier adapted to coöperate with means in

the carrier to tilt the portion holding the car and permit the continuous forward movement of the carrier.

9. A hoisting system comprising a plurality of carriers arranged to move in a vertical circuit, individual motors in said carrier, and means for transmitting the excess of the power of each motor over its load to a second carrier in the circuit.

10. A hoisting system comprising a plurality of carriers movable in a vertical circuit, individual motors on said carriers, and means for transmitting the energy of downwardly moving carriers to upwardly moving carriers.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

CHARLES G. PALMER.

Witnesses:
H. R. SULLIVAN,
E. B. GILCHRIST.