No. 686,919. Patented Nov. 19, 1901.

A. H. BATES.

INDICATING MECHANISM FOR ELEVATORS.

(Application filed Jan. 17, 1898.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

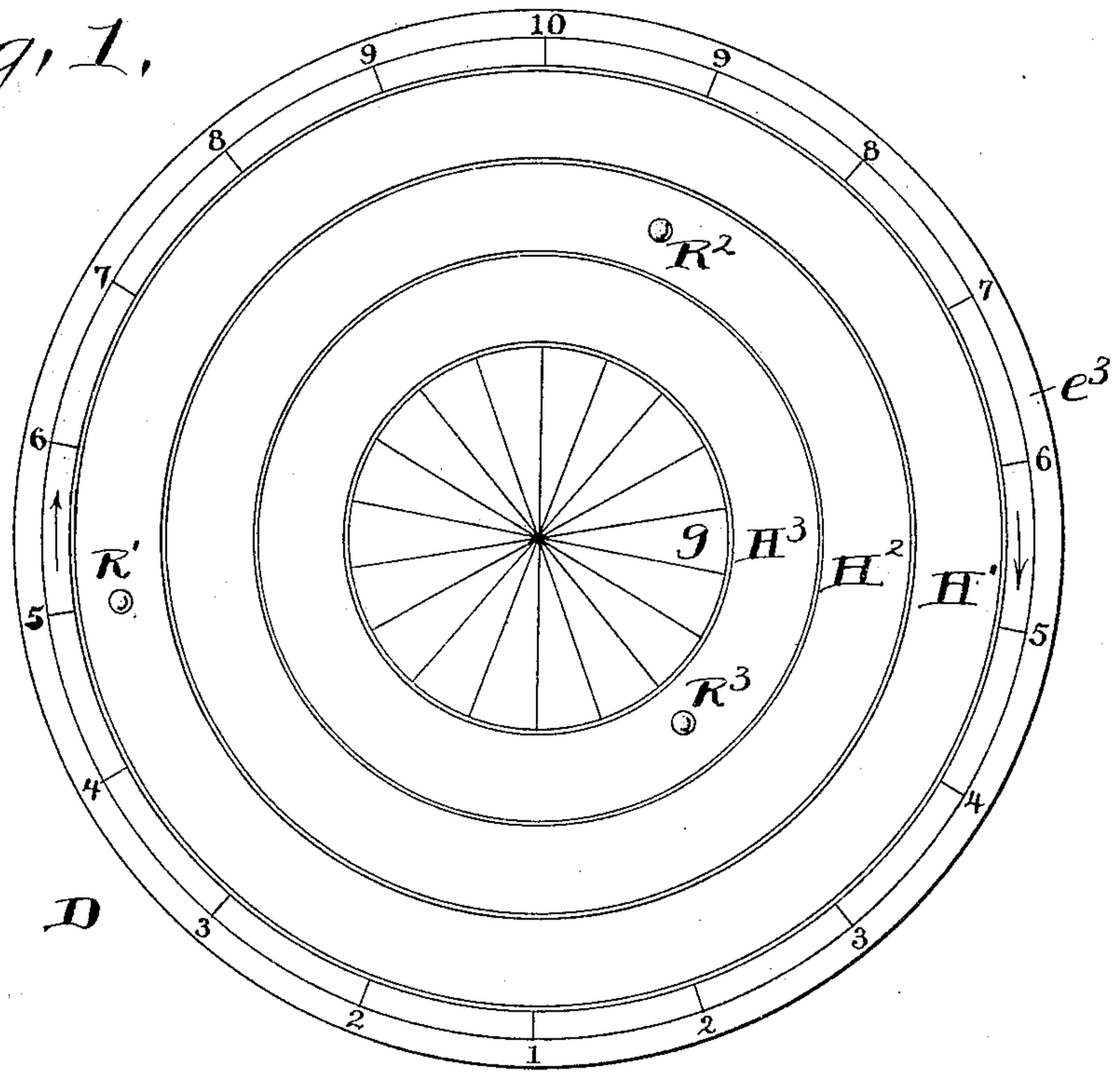
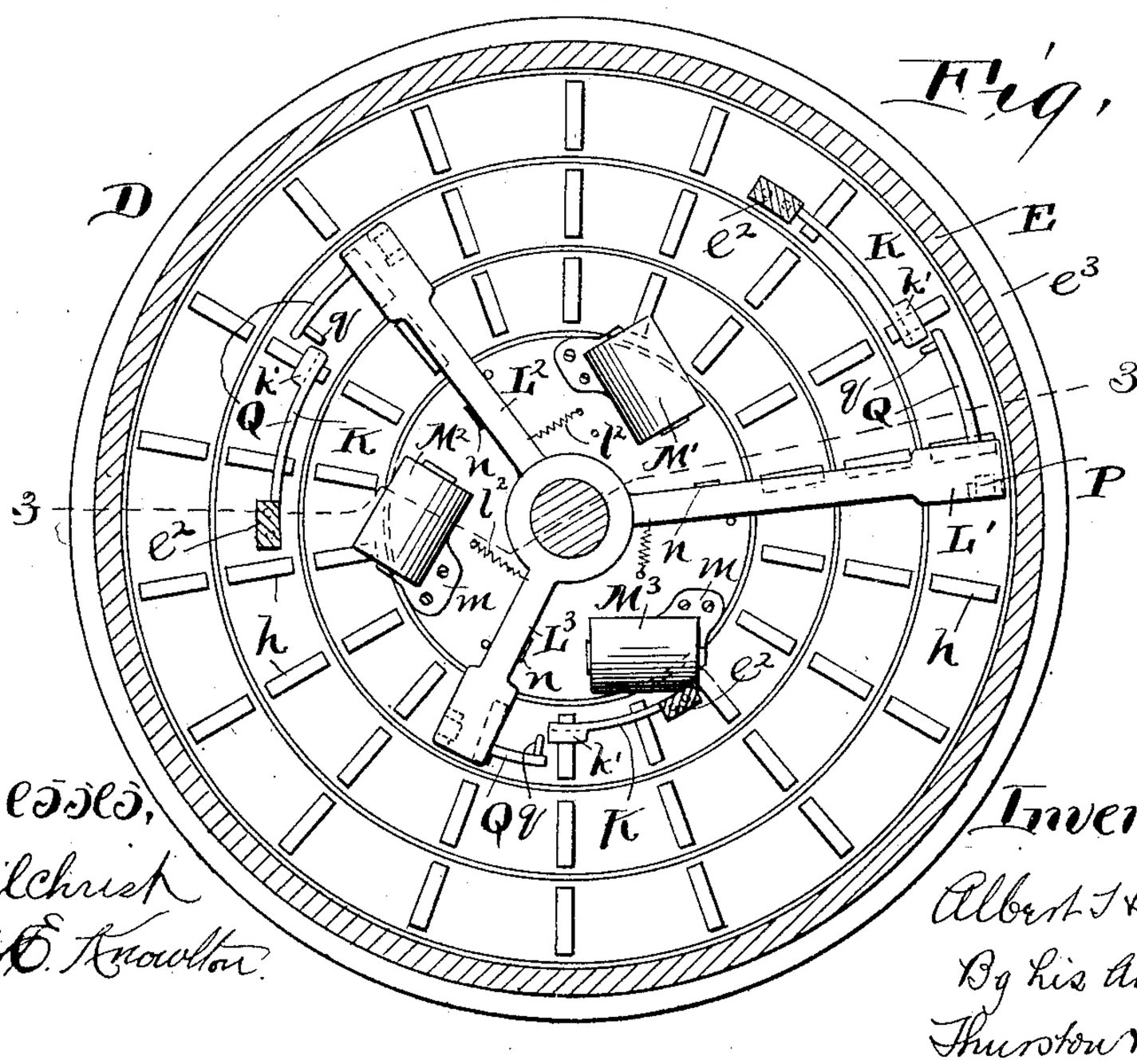


Fig. 2.



Witnesses,
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Philip E. Knowlton.

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No. 686,919. Patented Nov. 19, 1901.

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(No Model.) 4 Sheets—Sheet 2.

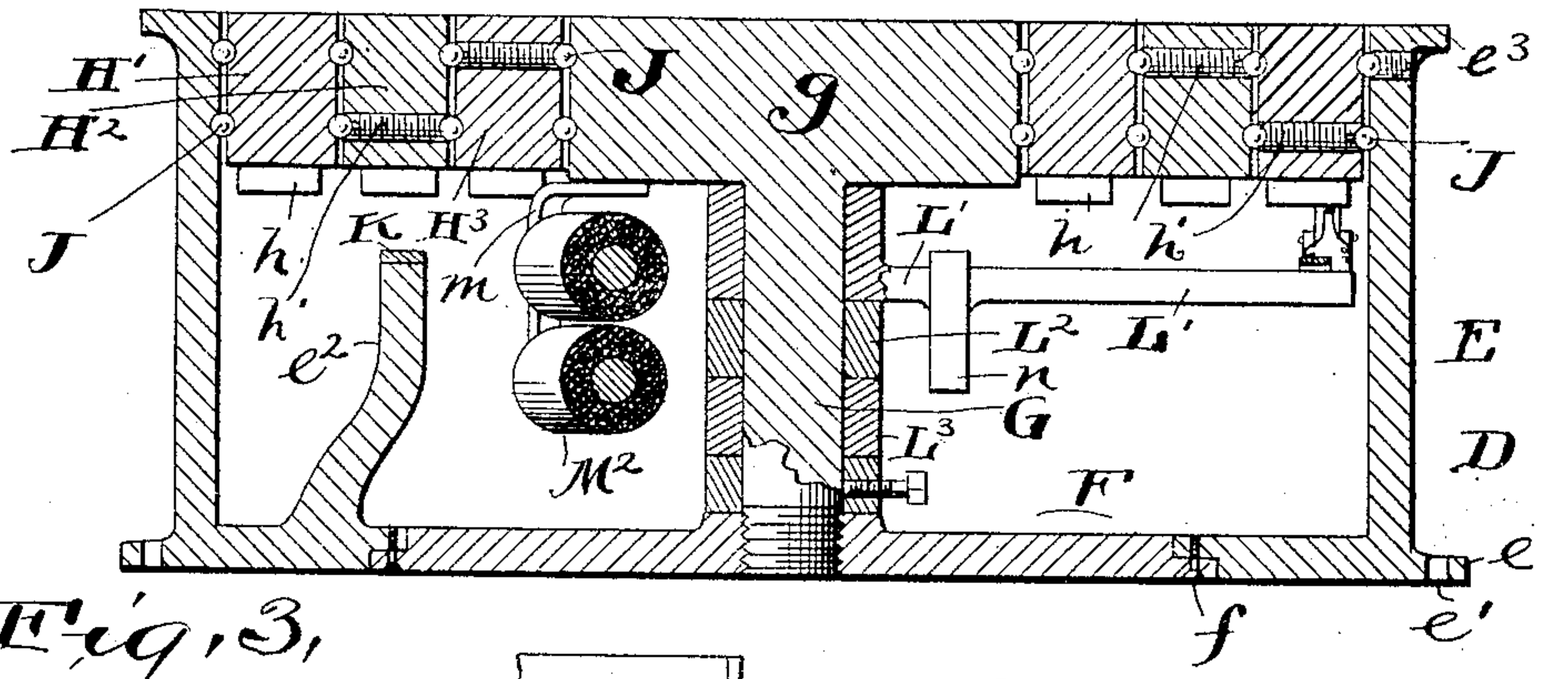

Fig. 3.

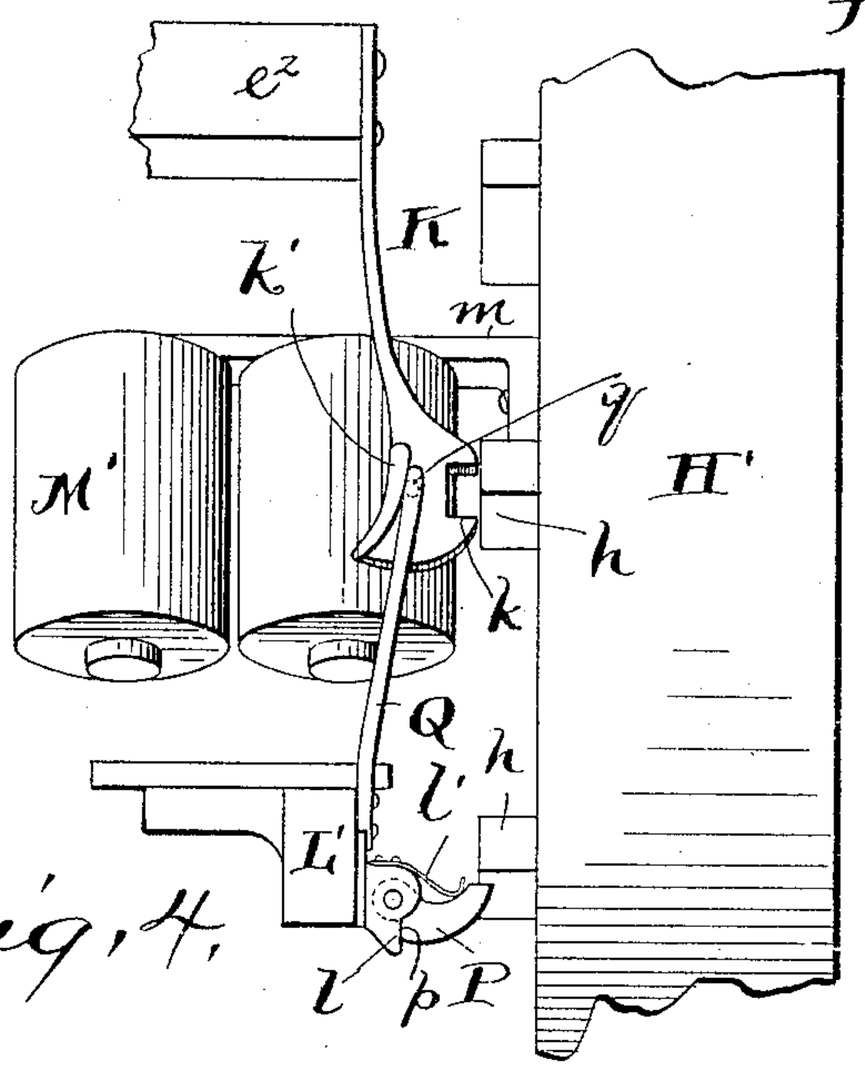

Fig. 4.

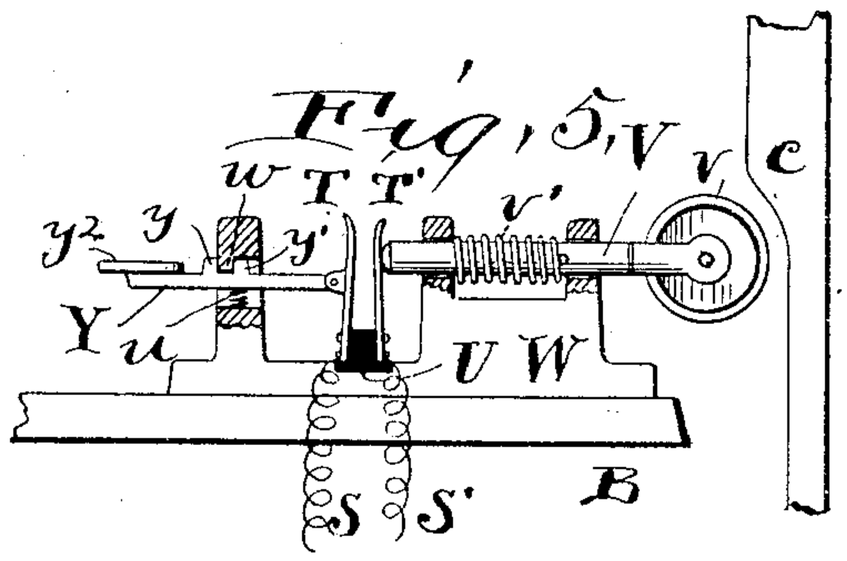

Fig. 5.

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(Application filed Jan. 17, 1898.)

(No Model.) 4 Sheets—Sheet 3.

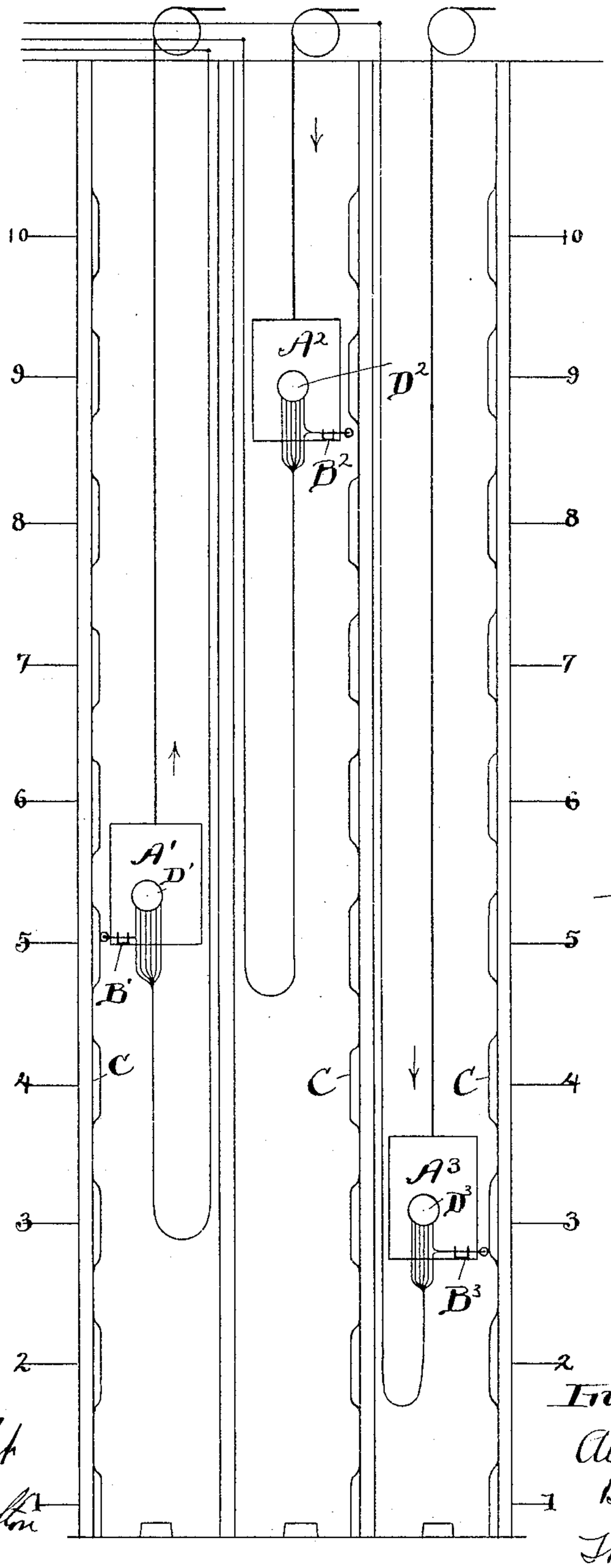

Fig. 6.

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(Application filed Jan. 17, 1898.)

(No Model.) 4 Sheets—Sheet 4.

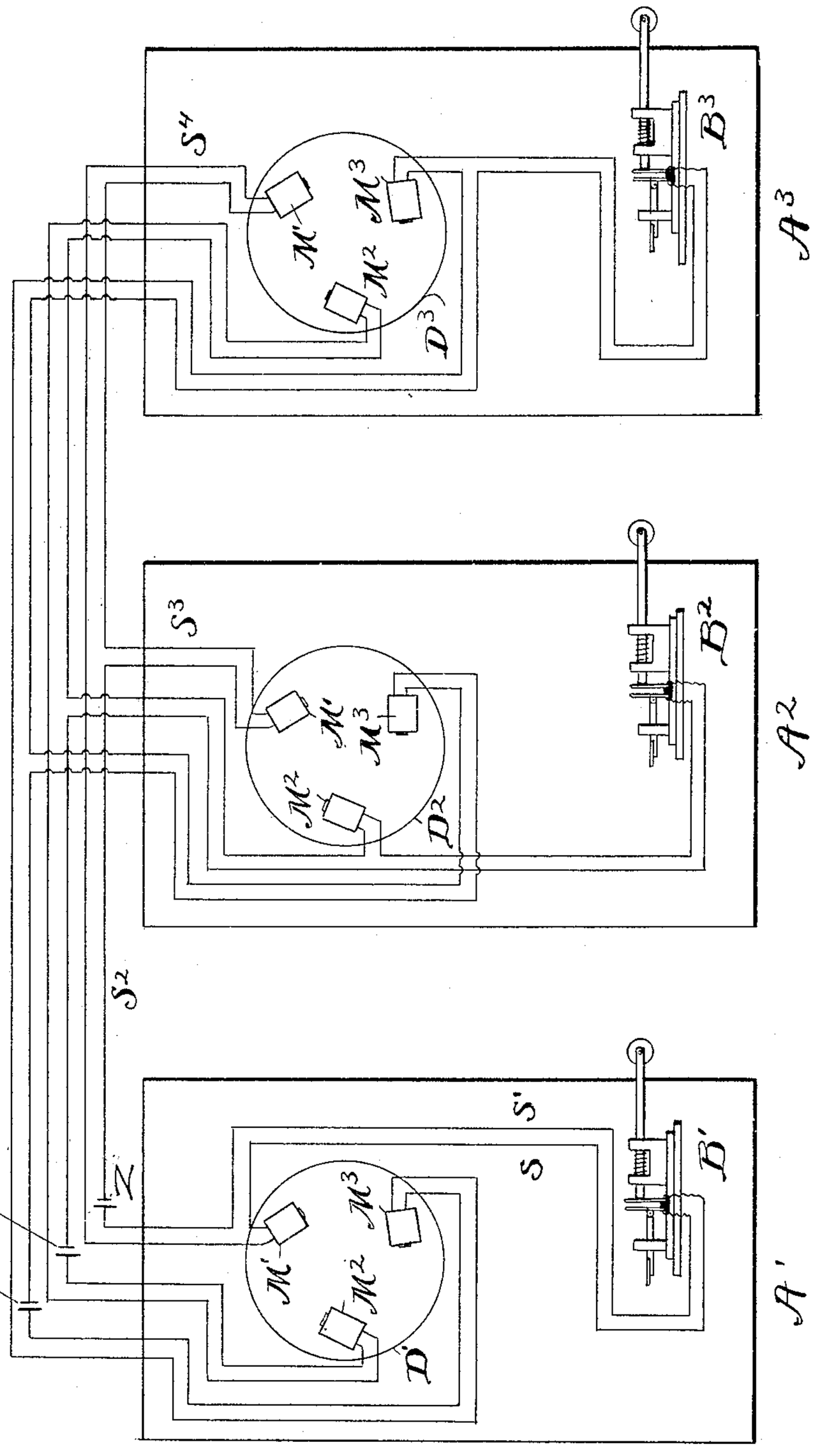

Fig. 1.

Witnesses:
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UNITED STATES PATENT OFFICE.

ALBERT H. BATES, OF CLEVELAND, OHIO.

INDICATING MECHANISM FOR ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 686,919, dated November 19, 1901.

Application filed January 17, 1898. Serial No. 666,977. (No model.)

To all whom it may concern:

Be it known that I, ALBERT H. BATES, 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 Indicating Mechanism for Elevators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

For the efficient operation of passenger-elevators it is essential that the cars in the bank be maintained substantially equidistant. With more than two elevators in the bank this has been found to be practically impossible without a separate attendant, a starter on the starting-floor, whose duty it is to see that the cars start at the proper time. Even with the starter a proper spacing is exceedingly difficult. As an illustration, suppose the cars get properly started and proceed equidistant. If now the attendant on the first car on reaching a floor finds a number of passengers awaiting, he stops his car for them and before they are all aboard the next car is even with him. While these two cars are thus running substantially together and stopping to receive passengers the elevator which is next following (coming past floors already cleared of passengers) runs faster and is very liable to catch up with the others. The result is that several of the cars get within a few floors of each other. The starter having no control over the cars until they reach the first floor cannot properly space them again until each has completed its trip at least. Even then it requires much skill and constant watching on the part of the starter to have the cars start at just the proper time.

The object of my invention is to provide means for indicating to the operator in each of the cars in the bank of elevators information as to where his car should be, so as to sustain proper relation to the other cars, and thus not only obviate the necessity of having a starter, but result in a more accurate spacing of the cars than the starter can produce. I accomplish this object by placing where each operator can take notice of it, preferably in each car, an indicator having such capacity and so connected as to be automatically affected by the position of all the cars which are running. I believe I am the first to do this.

My invention therefore consists, broadly, in the combination, with a bank of elevators, of an indicator automatically affected by the position of the cars running and indicating whether a particular car should run faster or slower to be in proper position with reference to the other cars.

The invention consists also in the combination, with elevators, of an indicator in each car indicating the position of other cars or all the cars.

The invention likewise consists of the indicator itself, which has this capacity; of an indicator in which the indicating-point moves in an endless path for the reciprocation of the elevator; of an indicator having a series of subindicators, each adapted to be operated independently of the others and the whole thus adapted to jointly indicate the relative position of several cars. The particular embodiment of the apparatus I have shown is my invention, and finally whatever combinations of parts are hereinafter described and enumerated in the claims are my invention.

The drawings show my invention in an approved form.

Figure 1 is a front elevation of the indicator. Fig. 2 is a sectional elevation of the same looking from the rear. Fig. 3 is an approximately horizontal section, being taken on the line 3 3 of Fig. 2. Fig. 4 is an enlarged view of the retaining and advancing mechanism as shown at the right-hand side of Fig. 2. Fig. 5 is a sectional elevation of the circuit-closing device carried by each elevator. Fig. 6 is a diagrammatical elevation of a bank of elevators having my indicators. Fig. 7 is a diagram showing the electric connections of the different indicators and circuit-closers.

Similar letters of reference designate similar parts in each figure.

I will now specifically describe, with the aid of reference-letters, the embodiment shown in the drawings, premising, however, that that embodiment, while invented by me, is to be taken as largely illustrative and may be greatly changed without departing from my invention.

In Fig. 6 three elevators (designated A' A^2 A^3) are shown, which number is chosen as being sufficient for purposes of illustration. These three elevators are supposed to be in a

ten-story building, the floors being No. 1 to 10, inclusive.

B′ B^2 B^3 represent corresponding circuit-closing devices carried by the elevators, and C represents a series of projections on the elevator-shafts, which are adapted to contact with and operate the circuit-closing devices as the cars pass these projections. Any other method of operating the circuit-closing devices may be employed and any suitable form of such devices may be used, and for the present I will postpone the description of the specific form which I have shown.

D′ D^2 D^3 represent the indicators, which are placed in the corresponding elevators. Each indicator has as many subindicators as there are cars, and each subindicator is adapted to be operated by the circuit-closing device on the car to which that subindicator refers, and thus indicate the position of that car. The position of the subindicators is such that the whole indicator shows the relative position of all the cars.

I will now describe the indicator in detail. It is shown in Figs. 1 to 4, inclusive, and is designated, when considered generally, D. The frame of the indicator is a cylindrical box E, having at its base a flange *e*. Screws passing through holes *e′* in the flange furnish means for securing the indicator to the wall of the elevator-car. Carried by the back of the box is a removable plate F, shown as secured to the box by the screws *f*. Projecting from this plate, being preferably screw-threaded into it, is the stud G, having the circular head *g*. The parts thus far described are stationary in operation. Surrounding the head *g* and within the cylindrical wall of the box are as many rings H′ H^2 H^3 as there are elevators. These rings constitute the subindicators, and each ring is adapted to indicate the position of the car to which it corresponds in a manner which will be hereinafter described. In order that the rings may turn easily, I provide them with ball-bearings J. The ball-races shown in the drawings consist of coöperating grooves in the rings, circular head *g*, and cylindrical wall E. These bearings may be installed in any desired manner and adjusted by whatever means seem preferable. In the construction shown in the drawings no means are provided for adjusting them, and the balls are placed in their corresponding races through radial holes in the rings, which holes are afterward plugged up by the screw-plugs *h′*.

From what has been described it will be seen that the rings H′ H^2 H^3 are adapted to easily revolve around one another and independently of each other. On the back of each ring are a series of teeth or lugs *h*. These lugs are radial and equidistant from each other, and the number of them on each ring is equal in the specific arrangement shown in the drawings to the number of times the circuit will be made and broken during a round trip of the elevator. During such round trip the elevator of course approaches and recedes from each of the intermediate floors twice and from the top and bottom floors but once, wherefore this number is equal to twice the number of floors less two.

Projecting from the back of the box E is a post e^2. This post is preferably made integral with the back of the box and has its forward end standing behind one of the rings. There are as many of these posts as there are rings, and on the forward end of each post is secured the spring-detent K. This detent has a notch *k* in its face, which is adapted to take over a tooth *h*, and thereby prevent the corresponding ring from rotating.

Journaled on the stud G are as many levers L′ L^2 L^3 as there are rings. Supported around the stud in suitable manner—as, for instance, by the bracket *m*, extending from the head *g*—are magnets M′ M^2 M^3, corresponding to the respective levers, the levers carrying armatures *n*, adapted to coöperate with the magnets. Each magnet is connected by conductors with a battery and with the circuit-closing device on the corresponding elevator. It therefore follows that when in the movement of any elevator a projection on the shaft causes the circuit to be closed the corresponding magnet is energized and the corresponding lever drawn toward the magnet. On each lever, near its extremity, is a pivoted dog P, adapted to engage with a tooth *h*. This dog has a shoulder *p*, adapted to engage with a corresponding shoulder *l*, carried by the lever, whereby backward movement of the dog is prevented, while a spring *l′* is provided which normally keeps the dog in its rear position, but allows it to be turned forward on its pivot against the action of the spring. Carried by the lever near its end and projecting in a circumferential direction on the side toward the magnet is the releasing-bar Q. This bar stands to one side of the spring-detent K, but has a projecting pin *q*, adapted to contact with the projecting lip *k′* on the detent. The construction of these parts just described is shown more particularly in Fig. 4, which represents their position after the lever L′ has begun to move toward its magnet. The result of this movement is as follows: First, the pin *q* engages with the lip *k′*, and thereby as the lever moves forward draws the face of the detent from engagement with the tooth *h*. Just as this disengagement is completed the dog P engages with the tooth *h* next behind the one the detent was engaging, and the continued movement of the lever through this dog and tooth moves the corresponding ring. Shortly after the ring has begun to move the pin *q* passes off of the lip *k′*, and the detent springs back into the path of the approaching tooth. As the lever reaches the end of its movement the tooth which the dog P is in engagement with comes into contact with the beveled face of the detent K and forces the same backward until the notch *k* springs over the tooth and holds it against

further movement. The parts stay in this position until the current is broken, when the lever returns (under the action of spring l^2) to its normal position, the pin q contacting with the back side of the lip k' and the bar Q being slightly bent inward thereby until the release of the pin allows the bar to spring back into its normal position, the bar being elastic enough for this purpose. At the same time the back side of the dog P engages with a tooth and springs inward under its influence against the action of the spring l' until it has cleared the tooth, when it springs back into its normal position.

From the foregoing it will be seen that each actuation of a magnet causes its lever to move the corresponding ring or subindicator forward one tooth. There being as many teeth on each subindicator as there are actuations of the magnet when the elevator makes a round trip, it follows that for each round trip of the elevator there is a complete rotation of the subindicator. Likewise for whatever proportion of a round trip the elevator travels for the same proportion of a rotation does the subindicator move.

The drawings show an actuation of the magnet for each floor approached and receded from in a round trip and a tooth for each of such floors—that is, eighteen teeth, which is twice the ten floors of the building, less two. I regard it sufficient if the indicator shows the position of the cars for whole floors, and hence actuations of the magnets oftener than once a floor (and thus showing positions for fractions of a floor) I deem unnecessary; but it is to be understood that, if desired, the magnet might be actuated oftener than once for each floor and that the teeth might be the same as the number of actuations or a multiple thereof, in the latter case a corresponding change being made in the advancing and retaining mechanism.

As the subindicator rotates proportionally to the round-trip travel of the elevator, it follows that if some suitable designating-point on the face of each subindicator be taken in the same relative position as that of the elevators these points will always indicate the relative position of the elevators as the latter move upward or downward, and hence will show when they are properly spaced. Such points are preferably indicated by pegs, as R' R^2 R^3, inserted in the face of the corresponding subindicator. All any operator has to do is to run his car at such speed that the peg on his subindicator is equidistant from that next ahead of him and from that next behind him, which simply a look at the indicator will tell him. If each operator does this, the pegs will all be equidistant from one another, and hence the cars will be properly spaced. The pegs are preferably removable, so that if any elevator is not running its peg may be removed from the corresponding subindicators and that subindicator disregarded by the operator.

The front end of the cylindrical wall of the box E (which is somewhat wider than the thickness of that wall by reason of the flange e^3) is divided off into spaces corresponding to the teeth on the back of the subindicators, which spaces are numbered with the floors of the building. In the exemplification shown in the drawings the left-hand side of the dial thus marked refers to ascending cars and the right-hand side to descending cars.

Suppose now, the cars being all at the first floor and the pins R' R^2 R^3 being in the radial line indicated by 1, that the car A′ ascends. This causes a movement of its subindicator one step for each floor that the car passes, and after this car has reached the sixth floor its peg R' will be at Fig. 6. When the first car has reached this point, the second car will start, and by the time it has reached the sixth floor and the first car has reached the eighth floor, coming down, the last car will start. There will be, therefore, the distance of six floors between each two of the cars.

Fig. 6 shows a position of the cars taken at random, but properly spaced, the car A′ having reached the fifth floor going up, the car A^2 having just passed the ninth floor coming down, and the car A^3 having just passed the third floor coming down, while Fig. 1 indicates these positions by means of the pegs R' R^2 R^3.

It will thus be seen that as the cars travel up and down the pegs which indicate their positions will travel continuously in an endless path and will indicate to the operator of each car the spacing of all the cars. If the operator of car designated A′ sees on the indicator that there is more angular space between the pegs R' and R^2 than there is between the pegs R' and R^3, he knows that his car is behind its proper position in the bank, and he therefore runs more rapidly. At the same time the operators of the cars A^2 and A^3, noticing the same thing, would each slow up a little with their elevators, the result being that all the cars would soon be properly spaced. The operation would of course be similar whatever the number of cars in the bank.

It is to be noticed that not only does my invention obviate the necessity of a starter, but permits the bank of elevators when any car gets out of position to become immediately adjusted or properly spaced without waiting for each car to reach the particular floor where the starter would be stationed.

I will now revert to the circuit-closer, which I employ for making and breaking the circuit through the different magnets. This is shown specifically in Fig. 5 and is designated as a whole when considered generally by B. Its base W is suitably secured to the car, preferably to the floor thereof, and in convenient location with reference to the operator's foot, (for a purpose to be hereinafter explained.) Carried by an insulating-block U, set into this base, are a pair of contact-strips T and

T′, which form the terminals for the conductors, as S and S′, from the corresponding circuits. These strips are of spring material and adapted normally to stand apart, as shown in the drawings, but may be forced together, and thereby complete the circuit through them. Slidably journaled in the base W is the rod V, impinging at one end against the strip T′ and carrying at the other end a roller *v*, adapted to contact with the projections C on the elevator-shafts and be by them forced inward. This inward movement forces the strip T′ into contact with the strip T and completes the circuit, while as soon as the wheel *v* is clear of the projection C the spring *v′*, surrounding the rod, returns it to its normal position.

In order that the operator may prevent the inward movement of the rod V under the action of a projection C from causing the strips to contact, (in case he runs back to a floor after having passed it,) or to allow him to cause additional contacts if for any reason the subindicator gets behind, I provide a bar Y, connected at the forward end to the strip T and normally locked in position by teeth *y* and *y′* on the bar engaging with the projection *w* on the frame, into contact with which said bar is normally pressed by a spring *u*. On the rear end of the bar Y is a plate y^2, adapted to receive a foot-pressure from the operator. If the operator wishes to make an additional contact irrespective of the projections C, he places his foot on the plate y^2 and presses the same downward and forward, thereby moving the strip T into contact with the strip T′. On the other hand, if he wishes to prevent contact by the movement of the bar V he pushes the plate y^2 downward and rearward, which draws the strip T backward far enough so that the strip T′ could not contact with it under any conditions. As the magnets operating the corresponding subindicators are all connected in series, these corresponding subindicators will always be in similar positions, and hence all that any operator has to do is to see that the subindicator on his car truly represents the position of that car.

Fig. 7 illustrates the electrical connections of the different indicators and circuit-closers. All the magnets operating corresponding subindicators and the circuit-closer on the car to which that subindicator refers are connected in series. Take, for example, magnet M′ on car A′. The circuit leads from this magnet via the conductor S to one contact-point of the circuit-closer B′. From the other contact-point of the circuit-closer the conductor S′ leads to the battery Z′, from which the conductor S^2 leads to the magnet M′ on car A^2, from whence the conductor S^3 leads to the magnet M′ on car A^3. From this magnet the conductor S^4 leads back to the other terminal of the magnet M′ on car A′. Similarly the three magnets M^2 are connected in series with each other through a battery Z^2 and through the circuit-closer B^2, and the magnets M^3 are connected through a battery Z^3 and the circuit-closer B^3. Thus when the circuit-closer B′ makes connection each of the magnets M′ is energized and similarly for the other magnets and circuit-closers. The conductors leading from the indicator and circuit-closer of any car will be grouped together into a cable, which will hang down in a bight in the ordinary manner, as indicated in Fig. 6. At the top of the shaft these conductors are connected substantially as shown in Fig. 7.

In place of having formal projections C in the elevator-shafts the wheel of the circuit-closer might normally run on a smooth surface and spring into depressions at proper places. Many changes in the circuit-closer or the method of operating it might be made; but I regard their discussion as superfluous, for though I prefer to use a make-and-break electrical connection for conveying the proportionate movement from the elevator to the subindicator such operation is not essential, and instead of an intermittently-moving indicator a continuous-movement indicator controlled by varying the strength of the current might be used. Other changes in the electrical arrangement might be made or the electrical connection might be abandoned altogether and a non-electrical method of transmission substituted therefor. It is only necessary as far as the transmission of motion is concerned that the movement of the indicator be substantially proportionate to the movement of the elevator.

It is obvious that some of the advantages of my invention might be obtained by placing the indicators on the different floors of the building or on the first floor only instead of in each car, as I prefer, and such change is within my invention. Similarly numerous changes might be made in the indicator itself. For example, the rings constituting the subindicators in place of being simple rings one bearing upon another might be flanges on disks placed beside each other. The mechanism for moving the subindicator instead of oscillating in a circular path might reciprocate in a right line. The retaining mechanism and the means for throwing it out might be greatly modified.

The above examples are given simply as illustrative and not as in any way exhaustive. All the constructions mentioned and many others are comprehended within my invention.

Having described my invention, I claim—

1. The combination with a system of elevator-cars, of an indicator, and means whereby said indicator shows automatically the relative progress of the cars of said system, and the direction they should move, if they be stationary, substantially as described.

2. The combination, with a system of elevator-cars, of an indicator carried by a car, means whereby said indicator shows automatically the relative positions of all the cars of said

bank, and the direction they should take if they be at a stop, substantially as described.

3. In combination with a bank of elevators, an indicator carried in each car of said system, and means carried thereby for showing the position of said car with respect to the car ahead of it, and the car following it, substantially as described.

4. The combination, with a system of elevator-cars, of an indicator carried by a car, members carried by said indicator, means for moving each of said members proportionately with a car of said bank, each of said members having separate outgoing and return paths, substantially as described.

5. The combination, with a bank of elevators, of an indicator carried by a car of said bank, indices carried by said indicator, said indices having two paths, means for causing each of said indices to move in one of said paths proportionately to the rising of a car and to move by the other of said paths proportionately to the descent of said car, whereby each of said indicators shows the position of and direction which will be taken by all of said cars, substantially as described.

6. The combination, with a system of elevator-cars, of an indicator, indices carried thereby and means for rotating said indices proportionally with the round trips of said cars, whereby said indices show the relative positions of the cars of said bank with respect to their round trips as well as the direction which stationary cars should take, substantially as described.

7. The combination, with an elevator system, of an indicator, concentrically-rotating indices carried thereby, and means for rotating said indices automatically and proportionally with the movement of the cars of said system, whereby the angular disposition of said indices shows the relative positions of the cars of said system, substantially as described.

8. In combination with an elevator system, an indicator, concentrically-rotating indices carried thereby, means for automatically moving one of said indices through one revolution with every round trip of one car of said system, whereby said indicator shows the relative positions of said cars and the direction which stationary cars should take, substantially as described.

9. In combination with a system of elevator-cars, a dial-indicator, rotatable indices mounted concentrically thereon, said dial being graduated and numbered progressively from the bottom to correspond with one round trip of a car, means for rotating each of said indices proportionally with a moving car and all in the same direction whereby said indicator shows the absolute and relative position of said cars and the direction which stationary cars will take, substantially as described.

10. In an indicator, in combination, the box E, a dial around the front edge thereof, a series of independently-rotatable concentric rings visible from the front of said box, and removable pegs adapted to be inserted in said rings, substantially as described.

11. In combination, a box E, a stud G suitably supported in the center of the box, a head *g* secured to said stud, a series of concentric independently-rotatable rings surrounding said head and within the walls of said box, levers journaled on said stud, suitable connections between the levers and rings whereby when the levers are operated the rings are rotated, and means for operating the levers, substantially as described.

12. The combination with a bank of elevators of an indicator having as many subindicators as there are elevators, a suitable connection between each indicator and its elevator whereby the subindicator makes a complete rotation in one direction for a complete trip from the bottom to the top of the building and back to the bottom by the elevator, substantially as described.

13. The combination with an elevator and its shaft having a series of projections along it, of a circuit-closer having a pair of terminals, a movable member adapted to be actuated by said projections and force one terminal into contact with another, and thereby complete the circuit, and means for withdrawing said other terminal out of the range of said first terminal, substantially as described.

14. The combination with an elevator-shaft having an uneven surface, of a circuit-closer adapted to travel along said surface and be operated by the unevenness thereof, said circuit-closer consisting of a pair of contact-strips T T′, means adapted to be actuated by the unevenness of the elevator-shaft for moving the strip T′ into contact with the strip T, the bar Y connected with the strip T and normally holding the same in stationary position but adapted to move it forward into contact with the strip T′ irrespective of the elevator-shaft, or to withdraw it to such a point that the strip T′ cannot contact with it under the movement caused by the unevenness of the elevator-shaft, substantially as described.

15. In combination, a series of elevators, a circuit-closer carried by each elevator and actuated by contact with the elevator-shaft, an indicator carried by each elevator and having a magnet adapted to be operated by each circuit-closer, each circuit-closer and all the corresponding magnets being connected in series through a source of electric power, and each magnet governing a corresponding portion of the indicator, substantially as described.

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

ALBERT H. BATES.

Witnesses:
E. L. THURSTON,
PHILIP E. KNOWLTON.