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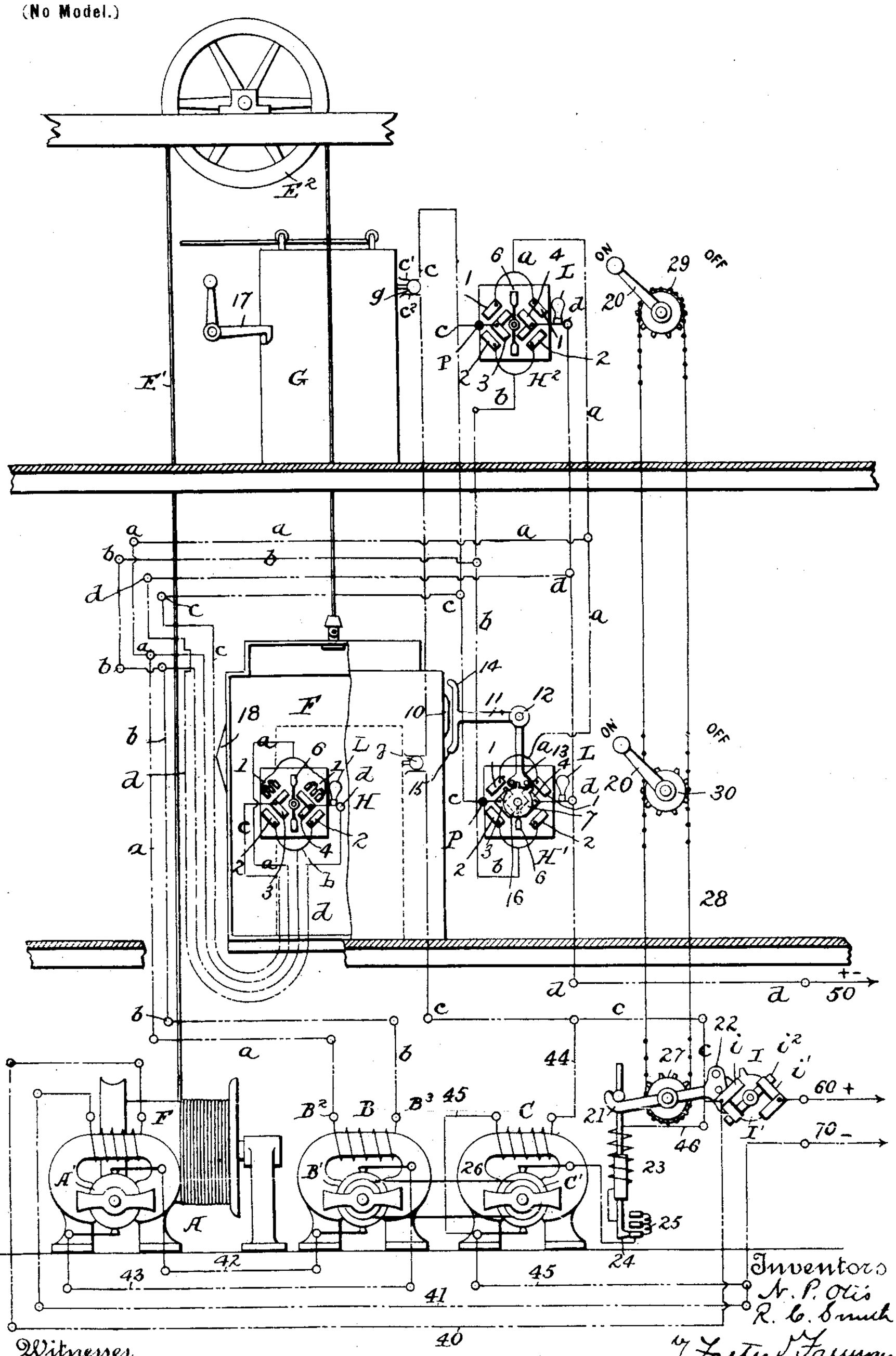
N. P. OTIS & R. C. SMITH.

CONTROLLING DEVICE FOR ELECTRIC ELEVATORS.

(Application filed Apr. 4, 1892.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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CONTROLLING DEVICE FOR ELECTRIC ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 610,197, dated September 6, 1898.

Application filed April 4, 1892. Serial No. 427,740. (No model.)

To all whom it may concern:

Be it known that we, NORTON P. OTIS and RUDOLPH C. SMITH, citizens of the United States, residing at Yonkers, Westchester county, State of New York, have invented certain new and useful Improvements in Controlling Devices for Electric Elevators, of which the following is a specification.

Our invention relates to automatic circuit-controlling devices for electric elevators, and has more particular relation to such controlling devices when used in connection with what is generally termed the "Leonard" system of transmission of power; and it has for its object to adapt said system for the operation of elevators, whereby they may be safely and economically operated and whereby the circuits may be controlled from the car or from the various floors or landings of the building containing the elevator, so that the whole system may be stopped, started, and controlled either from the car or from any of the landings.

To these ends our invention consists in the various features of construction, arrangement, and mode of operation, substantially such as is hereinafter more particularly pointed out.

The accompanying drawing is a diagrammatic representation of the preferred embodiment of our invention and is sufficient to explain the principles of construction and operation of our invention.

The so-called "Leonard" system of transmission of power, especially as exemplified in Patent No. 463,802, dated November 24, 1891, consists, generally stated, in the combination of an electric motor which is connected to apply the power to the car or other device to be operated and is known as the "working" motor, an intermediate motor, and an intermediate generator driven by said intermediate motor and connected with the working motor. It is not deemed necessary herein to explain in detail the operation of this system, as it is well understood by those skilled in the art and is fully explained in the patent referred to, and in our invention we make use of substantially this system of operation.

Referring to the drawing, A represents the working or elevator motor, the field-coils of which are connected to the main or working line, and in the case of a three-wire system, such as is shown in the drawing, the terminals of the field-magnet coils are connected by conductors 40 41 with the positive and negative feeding-wires 60 70 of the system, and the field of this working or elevator motor receives a constant current from the system of distribution.

B represents the intermediate generator, the armature B′ of which is connected by the conductors 42 43 to the armature A′ of the elevator-motor A. The field-magnet coils of the generator B are connected to one of the main feed-wires, as 60, and with the neutral wire 50 in a manner hereinafter set forth, and the strength of this field can be varied by suitable means.

The intermediate motor C is an ordinary motor, preferably having a constant field from any available source of electricity, and in the present instance it is shown as being supplied with current from the main leading-wires 60 70 by means of the conductors 44 45, while the armature-circuit is supplied from the same source by means of the conductor 46, extending from the leading-wire 60 to the armature, which armature-circuit is connected to the conductor 45 and consequently with the leading-wire 70.

Interposed between the motors and generators and the main wire is a switch I, and while of course in many cases it is preferable to break the circuits of all the leading-wires for the purposes of illustration we have shown a simple break or starting switch connected to the positive leading-wire 60, and this switch, which may be of any desired construction, is shown as having terminals i i', and they may be connected by the cross-bar or contact-piece i^2, preferably in the form of a double-break snap-switch. This switch is provided with means for operating it from a distance, and we have shown a pinion I′, which is arranged to engage with the rack 22 on the switch-operating lever 21. This lever has an extension engaging with the core of the solenoid 23, which is included in the circuit-wire 46 and carries a brush 24, passing over a series of resistances 25, which are normally included in the armature-circuit of

the motor C. This arm is so arranged that when the switch I is operated to break the circuit the core of the solenoid will be positively moved to such a position that the resistance 25 will be included in the armature-circuit, so that whenever the switch I is closed the current will have to pass through the resistance 25 until the motor C attains a proper speed, and the counter electromotive force will regulate the amount of current, when the solenoid 23 will operate to cut out the resistance in a proper and usual way. The armature of this motor C′ is mechanically connected to drive the armature B′ of the generator B by any suitable means, as a belt 26.

Connected to the switch-operating arm 21 are means for operating it, arranged on the various floors of the building, and in the present instance we have shown the switch-arm 21 as provided with a pinion 27, around which passes a chain 28, the said chain also passing over a pinion 29 at the top floor of the building, and arranged on each floor is a pinion 30, also engaging the chain 28, and each pinion is provided with a suitable operating mechanism, as a handle 20, so that the switch 21 can be moved from any floor of the building. Of course it will be understood that other means may be provided for operating the switch, that shown being a conventional one and satisfactory for the purpose.

The motor A is shown connected with the ordinary drum E, which by means of the usual cable E′ passing over the sheave E^2 operates the elevator-car F, and G represents the doors on each floor, opening into the elevator-well in the usual manner. In order to control the elevator-motor from the car or from either floor, we provide a switch device H H′ H^2, the first of which is mounted on the car, while the remaining ones are arranged on each floor adjacent or convenient to the elevator-well and the switch-operating device 20. These switches H may be of any proper or suitable construction, and while we have shown a form which we prefer and which is found satisfactory any other well-known form by means of which substantially the same results can be accomplished may be used. The switches shown are what are known in the trade as "knife-edge" switches and are provided with a switch-arm 6, the upper half of the knife being omitted in switch H′ for clearness, which is arranged to normally be out of circuit, but to be moved to the right or to the left to change the direction of the circuits through the switch, and arranged on each side of this arm are the contacts 1, which are connected together, and these contacts on the switches, on the car, and on each floor are connected by the conductors *a*, and all are connected to one of the binding-posts B^2 of the generator B. Each switch is also provided with contact-plates 2, connected together, and these contact-plates of all the switches are connected together by the conductor *b* and to the terminal B^3 of the field-magnet coils of the generator B. Each switch is also provided with contacts 3, which are connected together by the conductor *c*, and this conductor is connected to the contact-plate *i* of the switch I, interposed in the main feeding-wire 60. Each switch is further provided with a contact-plate 4, and these plates of all the switches are connected together by the conductor *d*, and this conductor is then connected to the neutral wire 50 of the feeding system. Interposed in the circuit *d* adjacent to each contact-plate 4 of the switch H is a resistance device L, shown in the present instance as an incandescent lamp. Arranged on each switch in the circuit *c* connected to the plates 3 is a push-button P, which is nominally open, but which can be closed in the usual way. The circuit-wire *c* is arranged adjacent to each door on each floor and is provided with terminals *c′* c^2, which are normally closed by a contact *g* on each door when said door is in its closed position, but as soon as the door is moved to open it the circuit *c* is broken by the contact *g* being removed from the terminals *c′* c^2 on that floor.

The switches on the floors are each provided with means whereby they may be automatically set by the car as it moves upward or downward, and in order to do this we have shown the car as being provided with a cam 10 adjacent to and moving with the body of the car. Mounted adjacent to each switch is a lever 11, having on one end, projecting within the line of movement of the cam 10, the double ends 14 15, while on the other side of its pivot-pin 12 it is provided with an arm for operating the switch, and we have shown this arm as provided with the teeth 13, arranged to engage with the pinion 16 on the shaft 7 of the switch. When the car is opposite any floor, the lever 11 is in the position shown in the figure and the switch H′ adjacent said car is open. As the car moves upward, for instance, the cam 10 comes in contact with the arm 14 of the lever 11 and moves the switch H′ to such a position that pressing on the button P of that switch will cause the car to be moved downward, and, on the contrary, as the car moves downward past any floor the cam 10 will come in contact with the arm 15 of the lever 11 and set the switch, so that pressing the button will close the circuit in a manner to cause the car to ascend, and as it reaches the floor either coming down or going up on which the button is being pressed the cam will automatically, through the lever, operate the switch to cut out the circuit and stop the car.

The opening of the door G of the well will break the circuit *c* and prevent the motor being operated until the door is again closed, and the doors are arranged so that they cannot be opened unless the car is directly opposite the opening at that floor. This is done by providing a latch, as 17, which normally

engages the door G, and this latch is operated by a cam, as 18, or other equivalent device on the car itself, and as soon as the car moves either up or down the latch falls into its normal position to secure the door.

It will be understood that the circuit-wires leading to the switch on the car are carried in an elastic tube arranged about midway of the well in the usual manner, and it is further understood that while we have shown but two floors provided with switches, there may be any number, and for convenience we have only shown one of these switches as provided with the automatic operating-lever controlled by the car; but sufficient has been shown to explain the principles of our invention, and the details of construction and arrangement of course will vary with the requirements of each particular use.

We will now explain the operation of an elevator provided with our improvements.

Suppose a person to be on the central floor of the drawing. In order to bring the elevator to that floor, if it is not already there, the handle 20 is turned to the point marked "On," and this by means of the chain 28 will operate the switch-arm 21 to close the switch I, connected to the main leading-wire 60. It will then be seen that the current passes through the motor C, passing to the field-magnet coils through the conductor 44 and out by the conductor 45, and to the armature-circuit through the solenoid 23, the brush 24, and the resistance 25, which allows the field-magnet coils to be fully excited and prevents an excess of current flowing through the armature-circuit, which might cause injury to the motor. As before stated, as soon as the motor attains a proper speed to produce the requisite counter electromotive force the resistance 25 is cut out of circuit in the usual way. At the same time it will be seen that the field-magnet coils of the elevator-motor A are energized through the conductors 40 41, which are connected, respectively, to the leading-in wires 60 and 70 by the switch I. It will be seen that up to this moment the elevator-motor will not operate as there is no current flowing through the armature, which is fed by the current from the armature of the generator B, and although this armature B′ of the generator B may be rotated by mechanical connection with the rotating armature C′ of the motor C the generator will produce no current to start the elevator-motor until its field is excited. In order to do this from the position before assumed, the push-button P on the switch H′ is operated, and then the field-magnet circuit of the generator B will be closed through the circuit *c*, leading from the switch H′ to the contact 3, the contact 2, (it being remembered that the switch-lever 11 has been left in the proper position by the car,) the circuit *b*, through the coils of the field-magnet B, the circuit *a*, the contact 1, the contact 4, the resistance L, and conductor *d* to the neutral wire 50. The field-magnet of the generator being thus energized a current is generated which flows from its armature to the armature of the elevator-motor A, and this is operated to move the car until it is brought opposite the landing on which the switch H′ is placed, when the cam 10 on the car automatically opens the switch H′ and stops the elevator. The door G can then be opened and the passengers admitted to the car, and while this is being done, as before stated, the car cannot be started from any other floor, because the circuit *c* is broken by the contact *g* on the door and the field-magnet coils of the generator are no longer excited. When, however, the door is closed, this circuit is completed and the field-magnet coils of the generator are again excited, and the operator on the car by moving the switch-arm 6 by any suitable and usual device can cause the car to move upward or downward. When it reaches the landing desired, the cam 18 lifts the latch 17 and allows the door G to be opened, and the circut *c* is again broken until the door is again closed. It will thus be seen that the car can be operated by means of the switch on the car or by any one of the switches on the different floors, and the car cannot be moved from any particular landing until the door of that landing is closed, nor can the door of any landing be opened until the car is opposite the landing.

In order to prevent a short-circuit of the feeding-mains, if perchance any one of the push-buttons were operated while the car was moving, a resistance device L, shown in the form of a lamp, is placed in the floor-circuit.

It will be seen that the main switch I energizes the field-magnet of the elevator-motor and the field-magnet and armature of the intermediate motor, but that the elevator-motor cannot operate until current is supplied to its armature from the generator, and this generator cannot produce a current although its armature may be rotated until its field-magnet circuit is closed through the medium of the switch on the car or one of the switches on one of the floors, thus rendering the operation of the motor in connection with the so-called "Leonard" system entirely safe.

What we claim is—

1. The combination with an elevator-car and its operating mechanism, of two circuit terminals or contacts one to control a circuit for operating the mechanism to elevate the car and the other to lower it, a push-button at the landing, an automatic switch actuated by the car and governing said contacts, and means for holding the switch in an intermediate position when the car is opposite a landing, substantially as described.

2. The combination with an elevator and its operating mechanism, of a controlling-circuit including circuit-breakers for the several elevator-well doors arranged in series, push-buttons at the several landings, branches from said controlling-circuit, and an automatic switch governed by the position of the

elevator and adapted to direct the circuit of the push-buttons through devices for causing the elevator to move up or down according as the elevator is above or below the push-button operated, substantially as described.

3. The combination with an elevator-car and starting mechanism, of a floor-switch governing the circuit for operating the mechanism to elevate and lower the car, and means for holding the floor-switch at an intermediate position with the circuits broken when the car is opposite a landing, substantially as described.

4. The combination with the automatic floor-switch operated by the car and forming at each landing a path for the push-button circuit whereby the car may be controlled from the landing, of means for holding the switch in circuit-breaking position while the car is opposite each landing, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

NORTON P. OTIS.
RUDOLPH C. SMITH.

Witnesses:
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HENRY L. BRANT.