

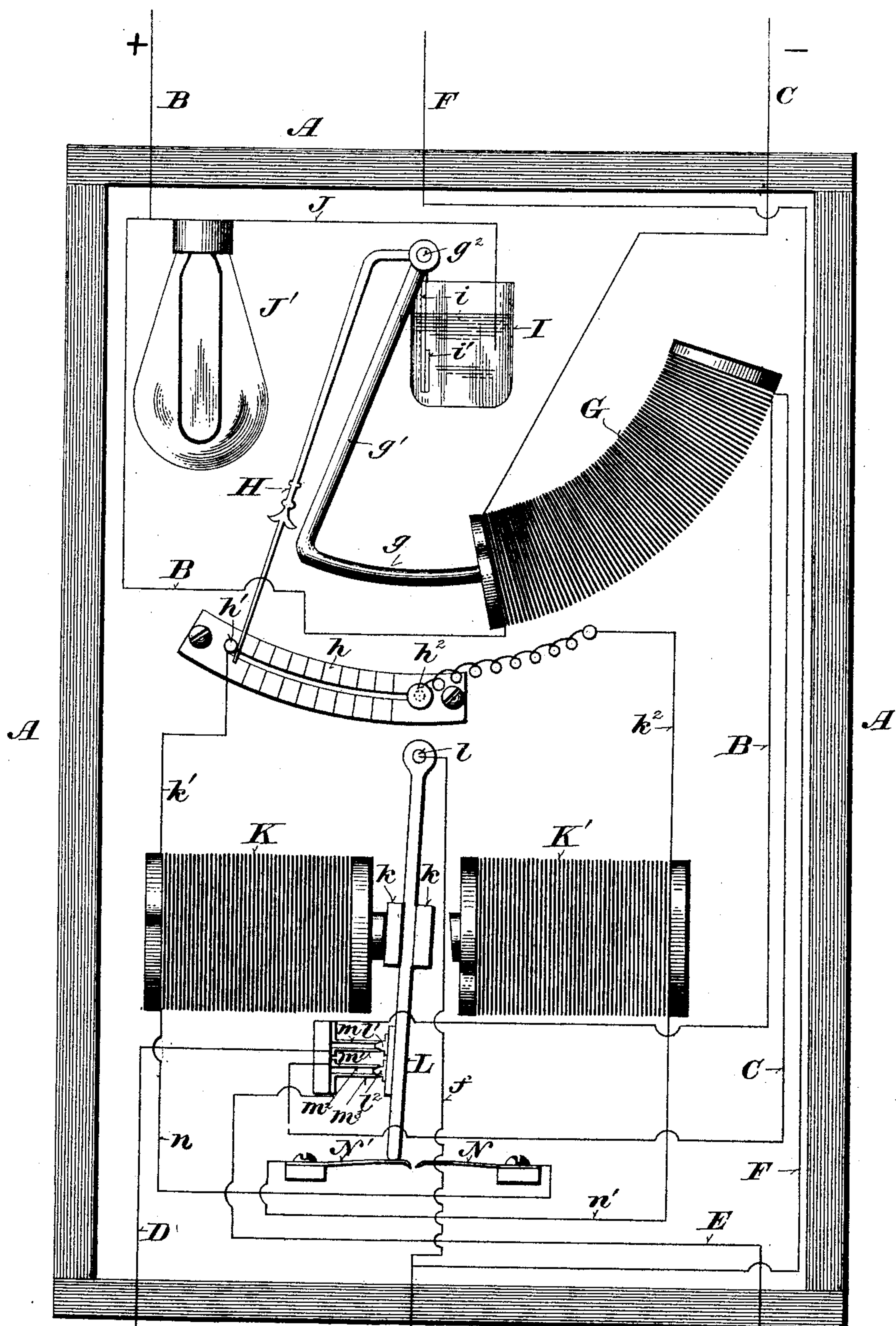
(No Model.)

C. CUNO.

AUTOMATIC CUT-OUT FOR ELECTRIC LIGHT CIRCUITS.

No. 497,491.

Patented May 16, 1893.



Witnesses:

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UNITED STATES PATENT OFFICE.

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AUTOMATIC CUT-OUT FOR ELECTRIC-LIGHT CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 497,491, dated May 16, 1893.

Application filed April 16, 1892. Serial No. 429,413. (No model.)

To all whom it may concern:

Be it known that I, CHARLES CUNO, of Wauwatosa, in the county of Milwaukee and State of Wisconsin, have invented certain new and
5 useful Improvements in Automatic Cut-Outs for Electric-Light Circuits; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it
10 pertains to make and use the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which forms a part of this specification.

My invention is designed particularly for
15 use in connection with electric light plants furnishing lights at a cost based upon the average or maximum number of lights used at any given time by any patron, and its main object is to automatically cut out of circuit
20 the loop or branch in which the lamps of a plant, building or apartment are located, whenever it is attempted to use a greater number of lamps than is permitted, and to automatically re-establish the circuit through such
25 loop or branch, when the lamp or lamps in excess of the number permitted are turned off. Dwelling houses and other buildings, tenements or apartments are usually equipped with or for more lamps than are needed for
30 actual use at any one time, it being desirable to light different apartments or portions of a building or apartment at different times while the lights in other apartments or portions of the building or apartment are discontinued,
35 the average number of lights used at any given time being approximately constant. It is perfectly feasible and convenient, particularly in connection with comparatively small plants, to fix the rate of charges for lights according to the average number used by any
40 patron, provided some absolutely certain check can be had against the use of a greater number of lights than that upon which the rate is fixed. To meet such requirement and
45 to provide such a check, is the design of my invention.

The accompanying drawing shows a front elevation of my improved cut out, the cover of the case being removed to disclose the interior mechanism.

For the purpose of illustration I have shown

and will describe my invention in connection with a three wire system, although it is equally applicable to the two wire system of incandescent lighting.

A represents a case of suitable shape and construction to inclose and protect from interference the necessary mechanism. It is designed to be placed at some convenient point in a plant, building or apartment supplied
60 with lamps, on a loop or branch of the main circuit.

B and C are the main wires leading in from the main circuit to the cut out, D and E are the corresponding wires leading out of the
65 cut out to the lamps O O in the loop or branch, and F is the neutral wire.

G is an arc-shaped solenoid, the windings of which are formed by or connected with the wires B and C. A similarly shaped core g , of
70 soft iron, suspended at one end by an arm g' from a horizontal axis g^2 , projects at the opposite end into said solenoid.

Attached to the axis g^2 and movable with the core g of the solenoid, is a metallic index
75 H, the free end of which moves over a graduated arc h , between two contact pieces h' h^2 , one contact piece h^2 being adjustable toward and from the other contact piece h' .

I is a mercury cup placed below and near
80 the axis g^2 . A depending arm i , attached to the axis g^2 and movable with the core g , dips into the mercury cup and is furnished therein with a wing i' . The arm i and the axis g^2 are made of metal or other suitable electrical con-
85 ductor.

J is a wire leading from the main wire B into the mercury cup I, and constituting a part of a branch, which like the lamps is in parallel or multiple arc with the lamp circuit.
90 In this branch is placed a lamp J', or other suitable resistance, which will prevent injury to the windings of the magnets hereinafter mentioned, also in said branch.

K K' are two opposing electro-magnets, the
95 armatures k k' of which are attached to a vibrating arm L, pivoted at l to the case or any other suitable and convenient support. One terminal of the winding of magnet K is connected by a wire k' with the contact piece h' ,
100 while the other terminal is connected by a wire n with a contact spring N, with which

the arm L is adapted to engage when attracted by the magnet K'. One terminal of the winding of magnet K' is connected by a wire k^2 with the adjustable contact piece h^2 , while the other terminal of said winding is connected by a wire n' with a contact spring N', with which said lever L is adapted to engage when attracted by the magnet K. The arm L is made of metal or other suitable electrical conductor, and is connected through its pivot l , by a wire f , with the neutral wire F. It will be observed that the index H and the windings of magnets K K' are thus connected with the wires B and F in parallel, and are in the same relation thereto, that a lamp in the working circuit is to the wire D or E and F. The arm L is provided with insulated metallic contact blocks l' and l'' , which when the armatures k k' are attracted to magnet K are adapted to engage with and electrically connect the contact springs or pieces m and m' , m^2 and m^3 . The wire B is connected with the contact piece m , the wire D with the contact piece m' , the wire C with the contact piece m^2 , and the wire E with the contact piece m^3 . It is obvious that the blocks l' and l'' and the contact springs or pieces m , m' , m^2 and m^3 , constitute switches by which the wires B and D and C and E are connected or disconnected respectively.

My improved apparatus as above described, operates as follows: The adjustable contact piece h^2 having been set at the proper point in the graduated arc h , to permit of the use of the number of lamps agreed upon, but no more, the case is closed and securely locked to prevent interference with the apparatus, which is now ready for operation, and requires no further attention or care. When one or more lamps within the permitted number is turned into circuit, the current, traversing the windings of the solenoid G, energizes the same and draws the core g into the same more or less, according to the number of lamps in circuit. The index H is thereby swung away from the contact piece h' toward the contact piece h^2 , but so long as the number of lights in circuit is not above the number permitted for which the instrument is set, the index will not engage the contact piece h^2 . If however, the number of lamps in circuit is increased above the number permitted, the increased energy of the solenoid will carry the index H into engagement with the contact piece h^2 , thereby closing the circuit through wire J, mercury cup I, arm i , index H, contact piece h^2 , wire k^2 , the winding of magnet K', wire n' , contact spring N', arm L, wire f , to the neutral wire F. Magnet K' being thus energized, attracts its armature and draws the arm L out of engagement with the contact spring N' into engagement with the contact spring N, thereby breaking the circuit through the winding of magnet K' and at the same time disconnecting the wires B and D and C and E, and cutting all the lamps in the associated loop or branch out of circuit. The solenoid G being thus de-energized, releases its core g ,

and the index H is permitted to gravitate slowly toward the contact piece h' with which it is arranged to engage when no current passes through the instrument. The backward movement of the index H is retarded by the passage of the wing i' , through the mercury in cup I, the purpose of this device being to prevent a rapid vibration of the index H between the contact pieces h' and h^2 and the consequent breaking and closing of the circuit through the lamps in rapid succession. The mercury cup I and arm i also serve to produce and maintain a more perfect electrical connection between the wire J and the index H than could be depended upon if the connection were made through the bearings of axis g^2 . As soon as the index H engages with the contact piece h' the circuit is closed through the branch, now including the contact piece h' , wire k' , winding of magnet K, wire n , contact spring N, arm L, wire f , from wire B to the neutral wire F. Magnet K being thus energized attracts its armature, shifting the arm L out of engagement with the spring N, into engagement with the spring N'. The circuit is thus broken through the branch and established by the switch through the wires D and E and the lamps. Should the number of lamps in circuit still be greater than that permitted and for which the instrument is set, the index H will be drawn into engagement with the contact piece h^2 and the lamps will be again cut out as before stated. The engaging parts of the index H and the contact pieces h' and h^2 should be platinum plated or pointed to prevent corrosion.

In place of the lamp J', any other suitable resistance may be placed in the branch, or the windings of the magnets K and K' may be made to afford sufficient resistance in themselves.

It is obvious that by moving the contact piece h^2 , the instrument may be set to permit of the use of any desired number of lamps, or both contact pieces may be made permanent and different instruments made for use with different numbers of lamps.

The details of the apparatus may be considerably modified within the intended scope of my invention.

Although I have for convenience shown and described my invention in connection with a three wire incandescent electric light system, it is applicable to other purposes.

I claim--

1. In an automatic cut out the combination of a switch connected with and arranged to open and close the working circuit, two magnets, arranged one to open and the other to close said switch, two contact pieces connected respectively with the windings of said magnets, a part movable in opposite directions into engagement with said contact pieces and connected with one side of an electric circuit the other side of which has connections with the windings of said magnets, and a magnet arranged to actuate said movable part and

having its winding in or connected with the working circuit, substantially as and for the purposes set forth.

2. In an automatic cut out for electric lamp circuits, the combination of a switch for opening and closing said circuit, magnets arranged to open and close said switch, two contact pieces connected respectively with the windings of said magnets, a movable part in parallel with the lamp circuit, normally engaging the contact piece in connection with the closing magnet, and a magnet having its winding connected with the lamp circuit and arranged to move said movable part toward the contact piece in connection with the opening magnet a distance corresponding with the strength of the current in the lamp circuit, substantially as and for the purposes set forth.

3. In an automatic cut out for electric lamp circuits, the combination of a switch arranged to open and close the lamp circuit, magnets arranged to open and close said switch, two contact pieces connected respectively with the windings of said magnets, a movable part in parallel with the lamp circuit, bearing normally against the contact piece in connection with the closing magnet when no current is passing through the instrument, a magnet having its winding in or connected with the lamp circuit, arranged to draw said movable part toward the contact piece in connection with the opening magnet, a distance corresponding with the strength of the current in the lamp circuit, and a retarding device in connection with said movable part, arranged to check its movement toward the contact piece connected with the closing magnet, substantially as and for the purposes set forth.

4. In an automatic cut out for electric lamp circuits, the combination of a switch arranged to open and close the lamp circuit, magnets arranged to open and close said switch, a relatively fixed contact piece connected with the winding of the closing magnet, an adjustable contact piece connected with the winding of the opening magnet and movable toward and from the relatively fixed contact piece, a movable part in parallel with the lamp circuit engaging normally with the fixed contact piece when no current is passing through the instrument, and a magnet having its winding in or connected with the lamp circuit, arranged to draw said movable part toward the adjustable contact piece a distance corresponding with the strength of the current in the lamp circuit, substantially as and for the purposes set forth.

5. In an automatic cut out for electric lamp circuits, the combination of a switch connected with and arranged to open and close the lamp circuit, magnets arranged to operate said switch and having their windings connected respectively with contact pieces, a circuit breaker operated by said magnets and connected with an electric circuit, two contact pieces connected respectively with the opposite terminals of said windings, a movable

part arranged between the two last mentioned contact pieces and connected with the other side of the electric circuit with which said circuit breaker is connected, and a magnet having its winding in or connected with the lamp circuit and arranged to actuate said movable part, substantially as and for the purposes set forth.

6. In an automatic cut out for electric lamp circuits, the combination of a switch for opening and closing the lamp circuits, magnets arranged to open and close said switch, contact pieces connected respectively with the windings of said magnets, a part in parallel with the lamp circuit, movable in opposite directions between said contact pieces into engagement therewith, and resting normally in engagement with the contact piece connected with the closing magnet when no current is passing through the instrument, a magnet in or connected with the lamp circuit, arranged to draw said movable part toward the other contact piece, according to the strength of the current in the lamp circuit, and a circuit breaker operated by the switch actuating magnets to break the circuit through the winding of the magnet which last operated the switch and close it through the winding of the other magnet, substantially as and for the purposes set forth.

7. In an automatic cut out for electric lamp circuits, the combination of a switch for opening and closing the lamp circuit, magnets arranged to open and close said switch, two contact pieces connected respectively with the windings of said magnets, a vibrating arm movable at its free end between said contact points into engagement therewith, a magnet in or connected with the lamp circuit, arranged to draw said arm toward the contact piece connected with the winding of the switch opening magnet, and a mercury cup, into which dip a conductor connected with said vibrating arm and a conductor leading off from one of the wires of the lamp circuit, substantially as and for the purposes set forth.

8. In an automatic cut out for electric lamp circuits, the combination of a switch for opening and closing the lamp circuit, magnets arranged to open and close said switch, contact points connected respectively with the windings of said magnets, a vibrating arm movable between said contact pieces into engagement therewith, a magnet having its winding in or connected with the lamp circuit and arranged to draw said arm toward the contact piece connected with the winding of the switch opening magnet, a wing attached to the axis of said vibrating arm, a mercury cup into which said wing dips, and a conductor leading off from one of the wires of the lamp circuit and dipping into the mercury cup, said wing serving to insure an electrical connection between the vibrating arm and said conductor and to retard the movement of said arm toward the contact piece connected with

the winding of the switch closing magnet, substantially as and for the purposes set forth.

9. In an automatic cut out for electric lamp circuits, the combination of a switch for opening and closing the lamp circuit, magnets arranged to open and close said switch, which consist of a vibrating arm to which the armature of each of said magnets is attached, contact pieces with which the terminals of the lamp circuit are connected, and insulated metallic blocks connected with said arm and arranged to electrically connect said contact pieces when moved into engagement therewith, two contact pieces connected respectively with the windings of said magnets, a vibrating conducting arm movable between

said contact pieces into engagement therewith, an arc-shaped solenoid in or connected with the lamp circuit and having a movable arc-shaped core projecting into it and connected with said vibrating arm, and an electrical connection between said arm and one of the wires of the lamp circuit, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

CHARLES CUNO.

Witnesses:

CHAS. L. GOSS,
JOHN H. HURLEY.