(No Model.) 2 Sheets—Sheet 1.

F. E. MORGAN & F A. LANE.

ELECTRIC CIRCUIT CLOSER FOR RAILWAY SIGNALS.

No. 427,783. Patented May 13, 1890.

Fig. 1

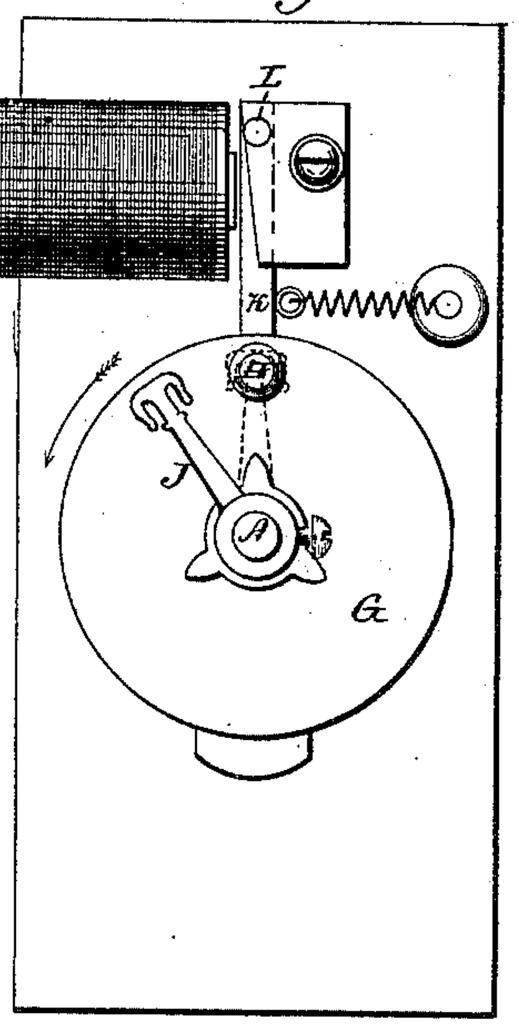

Fig. 2

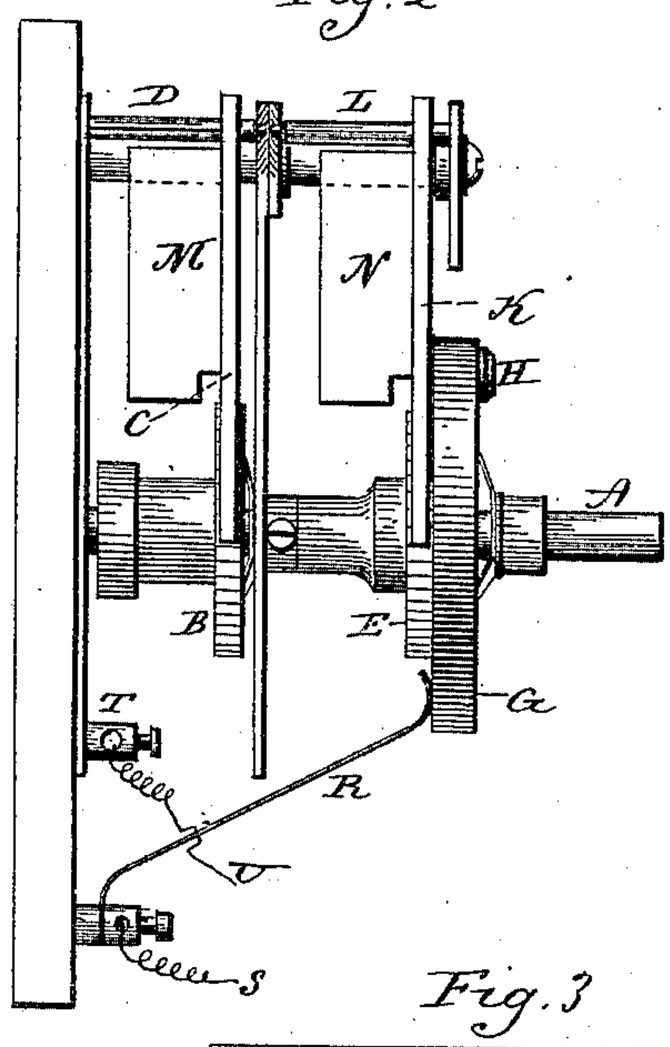

Fig. 6

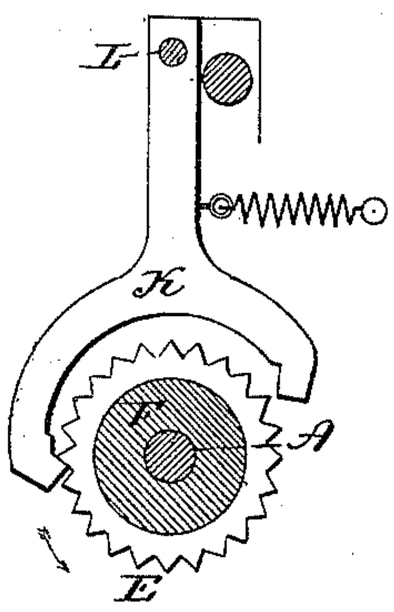

Fig. 7

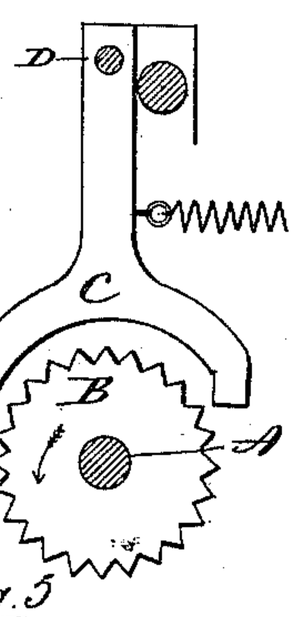

Fig. 3

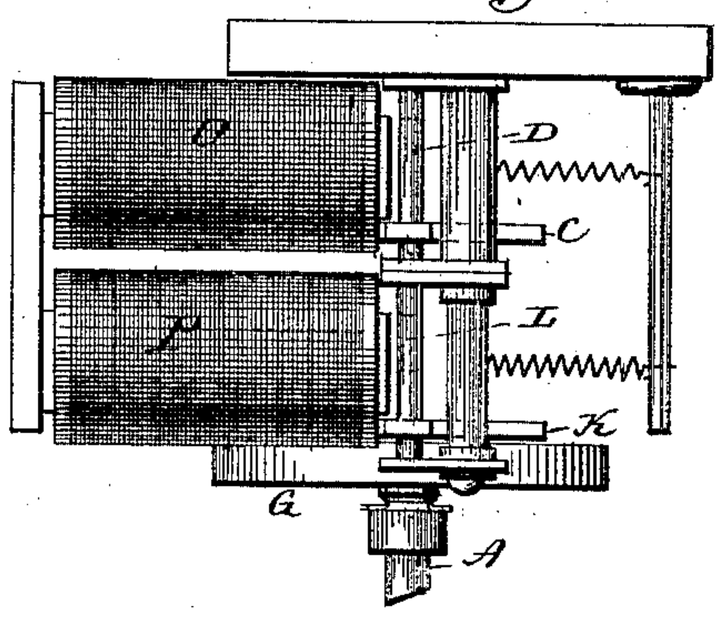

Fig. 5

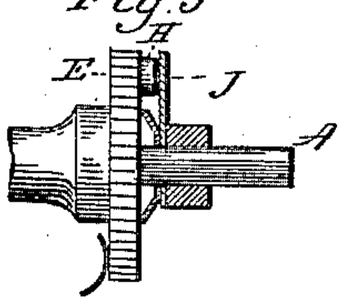

Fig. 4

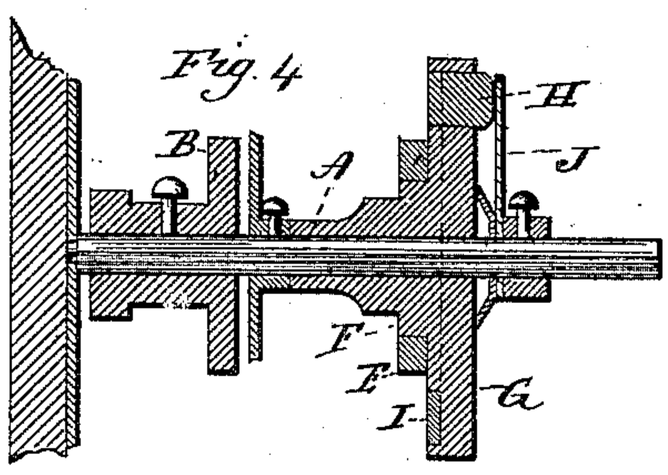

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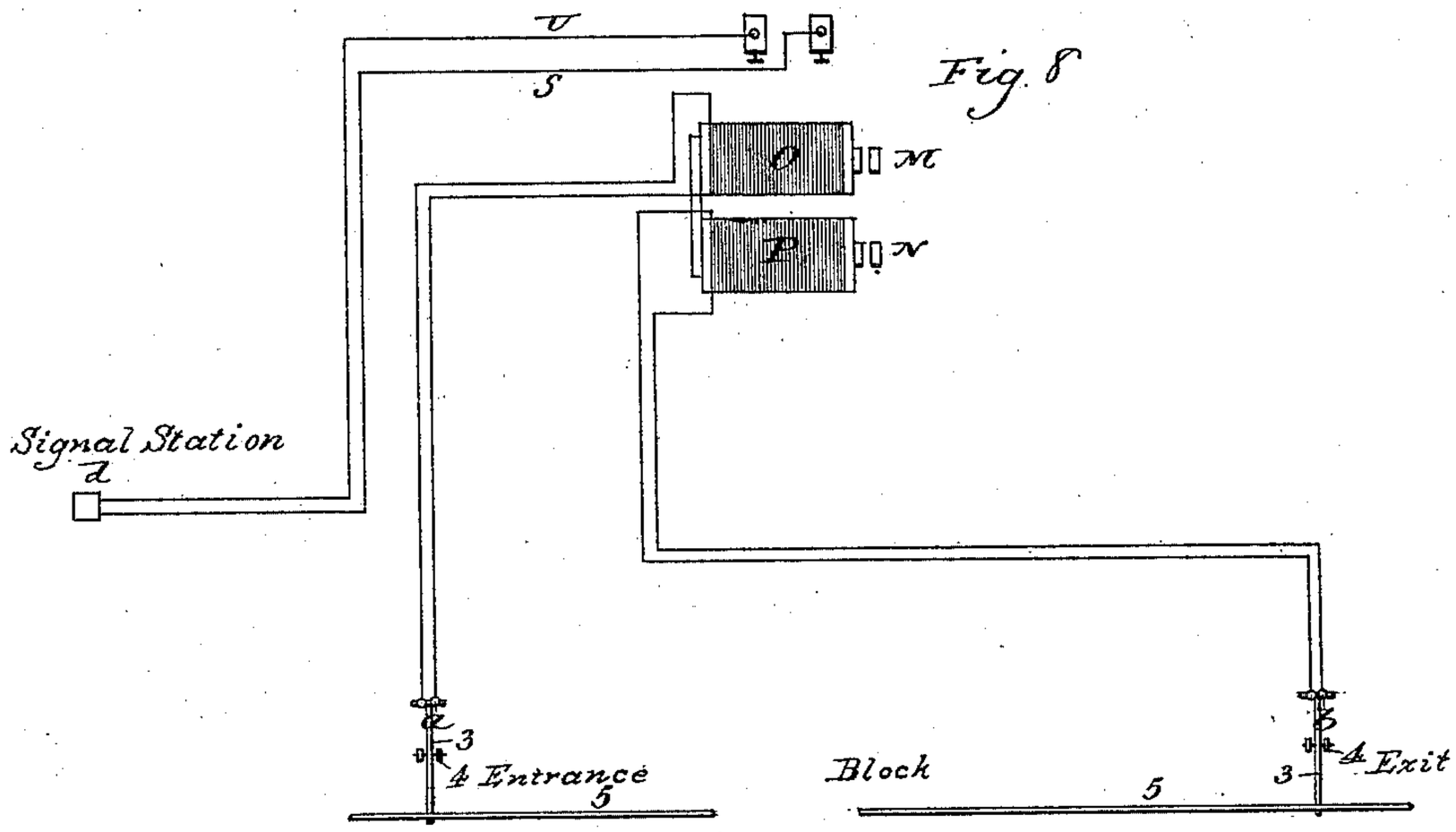
Fig. 8



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UNITED STATES PATENT OFFICE.

FRANK E. MORGAN AND FREDERIC A. LANE, OF NEW HAVEN, CONNECTICUT.

ELECTRIC-CIRCUIT CLOSER FOR RAILWAY-SIGNALS.

SPECIFICATION forming part of Letters Patent No. 427,783, dated May 13, 1890.

Application filed June 17, 1889. Serial No. 314,632. (No model.)

To all whom it may concern:

Be it known that we, FRANK E. MORGAN and FREDERIC A. LANE, of New Haven, in the county of New Haven and State of Connecticut, have invented a new Improvement in Electric-Circuit Closers for Railway-Signals; and we do hereby declare the following, when taken in connection with accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a front view of the apparatus complete; Fig. 2, a side view of the same, looking from the left, the magnets removed; Fig. 3, a top view of the apparatus complete; Fig. 4, a vertical central section through the shaft, showing the two verge-wheels and the two contacts as engaged; Fig. 5, a modification in the arrangement of the contact H; Fig. 6, a face view of the wheel E and its verge; Fig. 7, a face view of the wheel B and its verge, and in Fig. 8 a diagram illustrating the operation of the apparatus.

This invention relates to a mechanism for closing and opening electric circuits, specially adapted for railroad block systems, but applicable to other purposes where similar conditions exist. In the usual arrangement of the block system on railroads when one train enters the block it produces a signal of danger at the point of entering, in order that the next advancing train may be aware that a train precedes it on that block, and that signal remains until the first entering train passes from the block, such exit from the block changing the signal at the entrance from "danger" to "safety" to indicate to advancing trains that the block is clear. It is often desirable that after one train has passed onto the block, leaving the signal "danger" exposed, a succeeding train may pass slowly onto the block, being aware of the danger from a train in advance. In a like manner a third train may pass onto the block, the danger-signal being still exposed, thus bringing three trains upon the one block. Now, if the first train to enter passes from the block it removes the danger-signal and indicates that the block is free, whereas there are yet two trains on that block, the danger-signal being removed or changed by the exit of the first train to have entered, notwithstanding the fact that there are still trains on the block and consequent danger to an unadvised advancing train. These signals are usually operated through electric wires running from the entrance to the exit, so that the breaking of the circuit at the entrance will expose the danger-signal and the closing of the circuit at the exit will remove the danger-signal. It is, therefore, not safe for one train to run onto a block while there is yet a train upon that block.

The object of our invention is the construction of a mechanism for making and breaking an electric circuit which will require the exit of every train which may be on the block before the danger-signal will be removed, and this irrespective of the number, whether it be one, two, three, or more trains.

To this end our invention consists in the combination of mechanism, as hereinafter described, and more particularly recited in the claims.

In the best construction of the mechanism for the step-by-step opening and closing of the circuit we arrange a shaft A in suitable bearings, to which is fixed a toothed or verge wheel B, and in the plane of this wheel a verge C is hung, so as to swing as from an axis D, (see Figs. 2 and 7,) and so that as the verge vibrates, the ends of the verge being constructed with relation to the teeth so that as the ends come into engagement with the teeth they will impart a rotative movement to the wheel in the direction indicated by the arrow, each vibration of the verge giving one-step movement to the wheel.

On the shaft A is a second wheel E, like the first wheel, except that it is loose on the shaft A and insulated therefrom—say as by a hard-rubber center F. This second wheel E carries a disk G, in which a contact H is arranged, forming a slight projection on the face of the wheel. In the back of this disk is a metal ring I, which forms a concentric metallic connection with the contact H, the disk G being hard rubber or other non-metallic material. The shaft A carries a contact J, which is in the form of a pointer. It is arranged outside the disk and so that it may rotate with the shaft, and is adapted to bear

upon the contact H when the two are brought into a corresponding radial position. The wheel E is combined with a verge K, hung upon an axis L, and which, like the verge C, works into the wheel E to impart a one-step movement to each vibration of the verge. Succeeding vibrations of one verge C impart a corresponding successive step-by-step rotative movement to the contact J, while the vibrations of the verge K impart corresponding step-by-step rotation to the contact H, both rotative movements being in the same direction. The verge C is in connection with or made as a part of an armature M, and the verge K is in like manner constructed with or made a part of an armature N. (See Fig. 2.)

O represents a magnet for the armature M, and P a corresponding magnet for the armature N. (See Fig. 3.)

Suppose the contact J to be in engagement with the contact H, as represented in broken lines, Fig. 1, and as also seen in Fig. 5, which closes the circuit in which the said contacts H and J are arranged. If with this circuit through the contacts H and J so closed the circuit be closed through the magnet O to draw the armature M to its poles, a single-step rotative movement will be imparted to the wheel B, its shaft A, and thence to the contact J, which will take that contact J from the contact H and break that circuit. Then, the circuit through the magnet O being broken, after this result has been attained and that circuit through the magnet O be again closed, another step in the rotation will be imparted to the contact J, taking it one step farther from its contact H, and the third closing of the circuit through the magnet O will take that contact J a third step from the contact H, and so on. Now, if after the separation of the contacts H and J, as before described, the circuit be closed through the magnet P it will draw the armature N to its poles and impart a corresponding vibration to the verge K, which in its turn will impart rotation to the wheel E and the disk G in the same direction of rotation which was imparted to the contact J, and so as to bring the contact H one step toward the contact J, and if the same number of closing of the circuits through the magnet P be made as were made for the movement of the contact J the same number of steps will be imparted to the disk G, and the contact H will be brought into engagement with the contact J, so as to close the circuit of the said contacts H and J. The said contacts after having been once separated by the said step-by-step movement of one of the contacts from the other can only be brought together by a corresponding step-by-step movement of the said other contact in the same direction in which the first contact moved. Connection is made with the contact H by a brush R, which is in connection with one wire S, this brush working in contact with the ring I in the back of the disk G. The other wire of this circuit is in connection with the frame which supports the mechanism—say as by a post T, from which the other line U of this circuit runs.

To illustrate the operation of this mechanism, suppose *a*, Fig. 8, represents the contacts at the entrance to a block. From these contacts wires of an electric circuit run to the magnet O to bring that magnet into the same circuit. *b* represents the contacts at the exit from the block, from which wires forming an electric circuit run to the magnet P, bringing that magnet P into the exit-circuit as the magnet O is in the entrance-circuit.

For convenience of illustration we represent engagement between the contacts *a* and *b* as produced by means of a lever 3, arranged to vibrate in a vertical plane upon a fulcrum 4, one arm extending toward the wires and so that it may be brought into engagement with both to produce electrical contact. The other arm of the lever extends beneath the rail 5, which rail has a sufficient amount of vertical play, so that when depressed it will bring the lever 3 into engagement with both wires and so as to produce electrical contact. The length of the rail which operates the lever must be such that the wheels of one car do not leave it before the wheels of another car come upon it, so as to prevent the breaking of the circuit until the entire train shall have passed. There are numerous mechanisms for making contacts of this character, too well known to require illustration; but such mechanisms constitute no part of my present invention, it only being necessary that there shall be contacts at the entrance and exit of the block. The two wires U S of a third circuit run to the signal-station *d*. Under the construction which we have represented the circuit to the signal *d* will be normally a closed circuit, the contacts H and J in the position indicated in broken lines, Fig. 1, and as also seen in Fig. 4, while the circuits at the entrance *a* and the exit *b* will both be open circuits. A train entering the block closes the circuit at *a*, which brings the magnet O into operation and imparts through the verge C a step rotation to the contact J, taking it from the contact H and breaking the circuit to the signal-station D, which will expose that signal, whether it be a sounding-signal or a visible signal, and which signal will remain exposed so long as the circuit R S remains open. If no other train enters the block and this train passes from the block, as it reaches or passes from the exit *b* of that block it closes the circuit through the magnet P, which operates the verge K and imparts a step rotation to the wheel E and the disk G in the same direction as was before imparted to the contact J, and this brings the contact H again into engagement with the contact J and closes the signal-circuit, which will remove the danger-signal before exposed. If, however, before the first train so coming onto the block shall have passed off the block a second train passes onto the

block, it will in its turn close the circuit at the entrance *a*, and in like manner will impart a step in rotation to the contact J, taking it two steps from the contact H, and if a third train in like manner comes onto the block it will in its turn close the circuit at the entrance and cause a third step in rotation to the contact J, taking it three steps from the contact H. Then as the first train passes off from the block it will close the circuit at the exit through the other magnet P and impart a corresponding step in rotation to the contact H, and so continuing until the last train shall have passed off the block, when the contacts H and J will have been brought together, so as to close the signal-circuit and remove the danger-signal to indicate "safety;" but the danger-signal will not be so removed or the safety-signal exposed until there shall be no train on the block. Irrespective of the number of trains which may go onto or off from the block, so long as there is a train on the block the danger-signal will be exposed.

We have represented the contact H as in an india-rubber or non-metallic disk independent of its driving-wheel E, the disk being provided with a metallic ring I in connection with said contact H, and against which ring I the brush R works; but the contact H may project directly from the wheel E, as represented in Fig. 5, the brush R working in contact with the wheel. In this case there will be the same concentric rotative movement imparted to the contact H as in the first illustration.

We have not illustrated the mechanism by which the train will automatically close the circuit as it comes upon the block or the mechanism by which it will close the circuit upon its exit from the block. Neither have we illustrated the mechanism for operating the danger and safety signals, for the reason that these mechanisms are common and well known and of great variety, any of which may be employed with our improved signaling mechanism.

The illustration which we have made of our invention as applicable to railway block systems will be sufficient to enable others skilled in the art to adapt the invention for other purposes to which it may be applicable.

We have represented the mechanism as arranged for open circuits at the entrance and exits and closed circuit at the signal; but it will be understood that, if preferred, closed circuits may be used in place of open circuits and open circuits in the place of the closed circuit, such change from open to closed circuit being apparent, and does not require particular description. We therefore, while describing the entrance and exit circuits as open circuits and the signal-circuit as a closed circuit, do not wish to be understood as limited thereto.

We claim—

1. The combination of a shaft, two toothed wheels arranged on said shaft, one fixed thereto and the other loose thereon and insulated therefrom, an independent vibrating verge for each of said wheels, an armature in connection with each verge, and so that the vibration of the respective armatures will impart corresponding vibration to the corresponding verge and step-by-step rotation to said wheels in the same direction, an independent magnet for each armature, a contact in connection with said loose wheel, and so as to be rotated thereby, and a second contact extending from said shaft and adapted to engage said rotative wheel-contact, the said two contacts adapted to be engaged with the respective wires of an electric circuit, substantially as described, and whereby under a step-by-step rotation of said contacts they are caused to separate or approach accordingly as one or the other is advanced.

2. The combination of the shaft A, a toothed wheel B, fixed to said shaft, a second toothed wheel E, loose upon the said shaft and insulated therefrom, an insulated disk G, carrying a contact H, in connection with a metallic ring I in said disk, a second contact J, fixed to said shaft, so as to revolve therewith, and adapted to engage the contact H, each of said contacts in connection with their respective wires of their circuit, an independent vibrating verge for each of said wheels B and E, each verge being in connection with an independent armature, and an independent magnet for each of said armatures, substantially as described.

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