(No Model.)

J. H. ROGERS.

MEANS FOR EFFECTING SYNCHRONISM.

No. 539,369. Patented May 14, 1895.

Fig. 1.

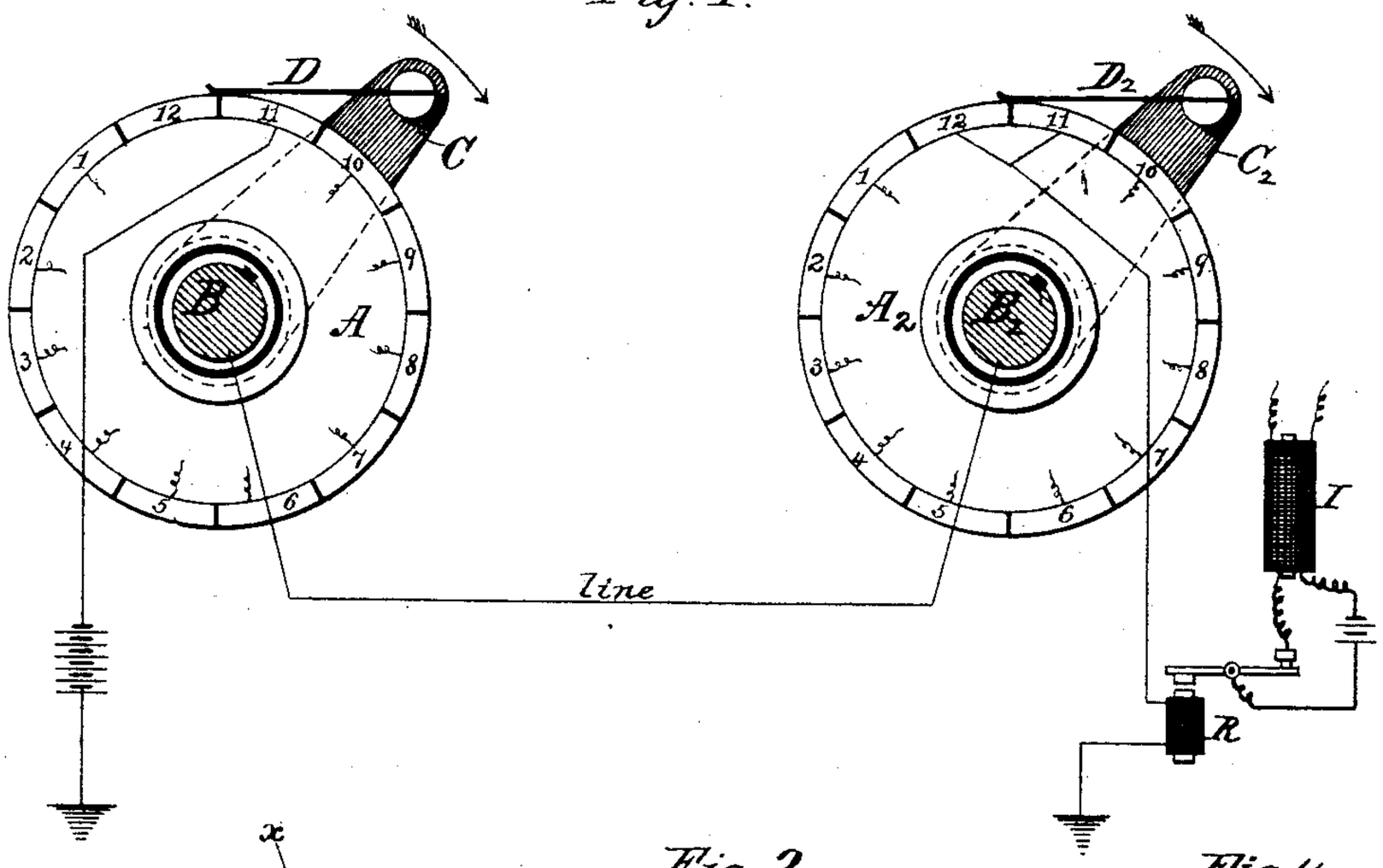


Fig. 3.

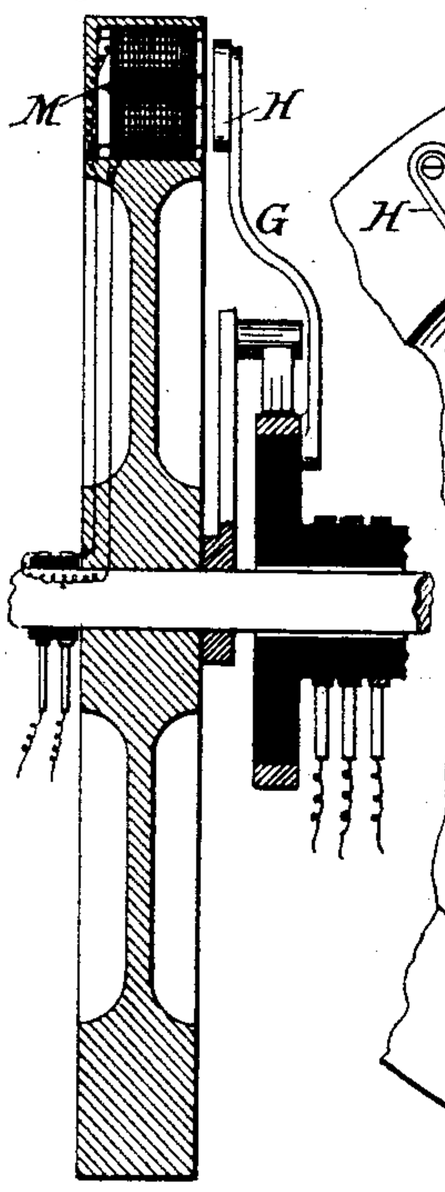


Fig. 2.

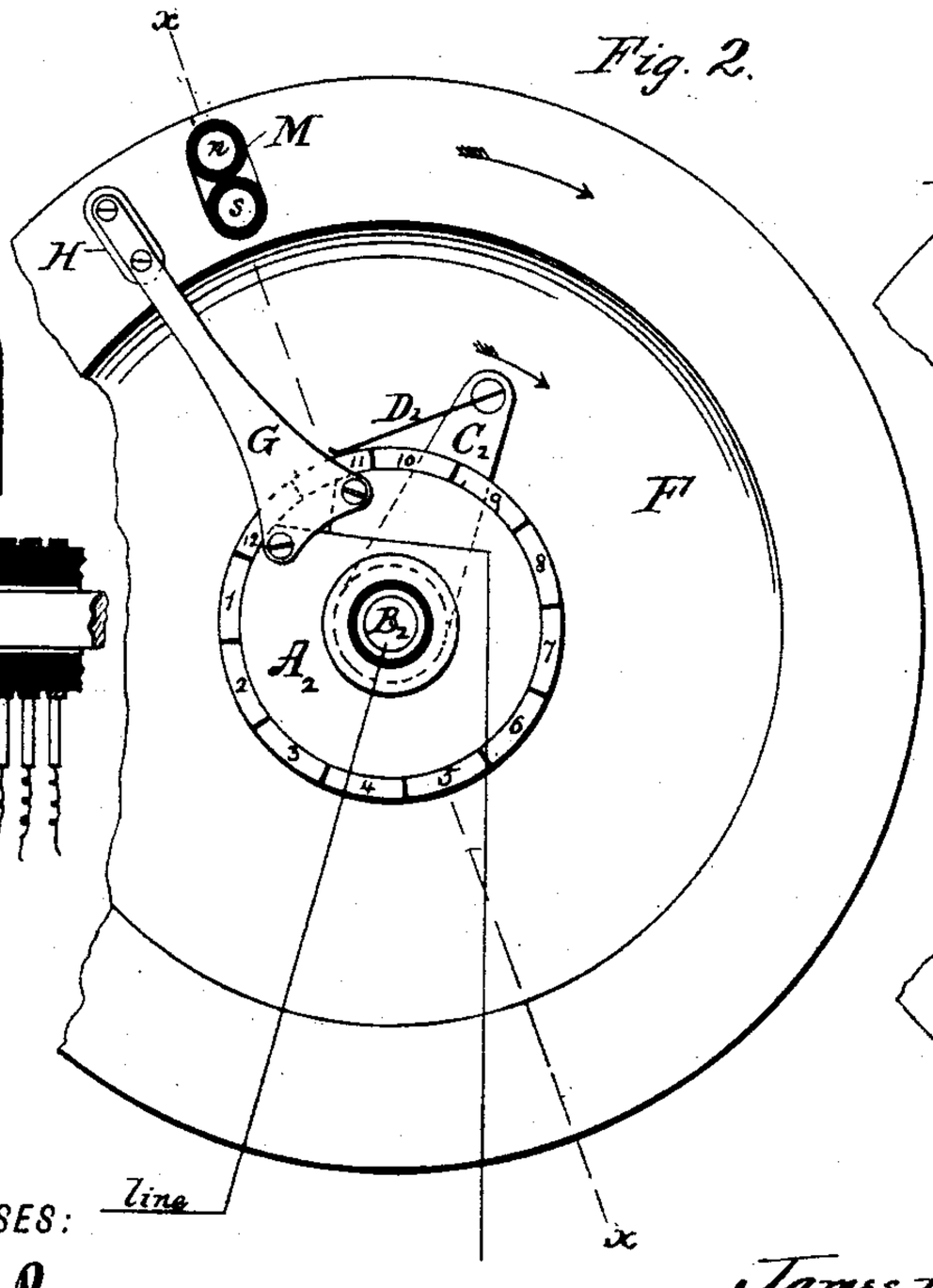
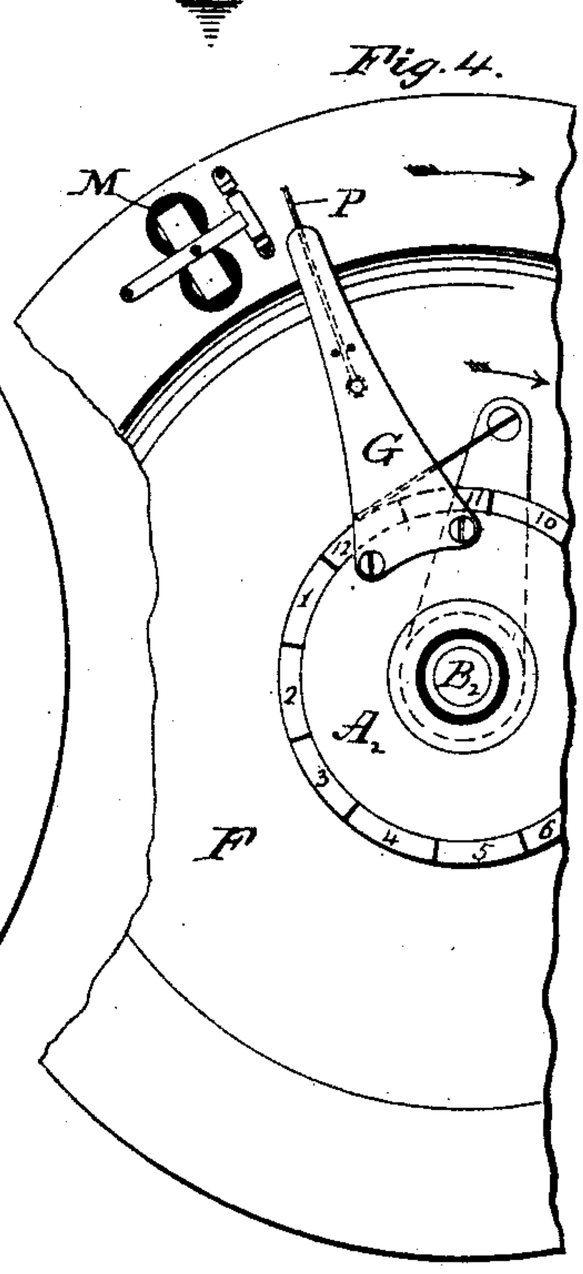


Fig. 4.



WITNESSES:

Edward W. Price.
Emile Henkel

INVENTOR
James Harris Rogers.
BY
McGiphert Worthington
ATTORNEYS

UNITED STATES PATENT OFFICE.

JAMES HARRIS ROGERS, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR TO THE VISUAL SYNCHRONISM COMPANY, OF WEST VIRGINIA.

MEANS FOR EFFECTING SYNCHRONISM.

SPECIFICATION forming part of Letters Patent No. 539,369, dated May 14, 1895.

Application filed December 29, 1888. Serial No. 294,979. (No model.)

To all whom it may concern:

Be it known that I, JAMES HARRIS ROGERS, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Means for Effecting Synchronism; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to certain improvements in effecting synchronism in the movements of rotating wheels or disks such as are frequently used in printing telegraph systems, electric time systems, and multiple telegraph systems, and in Letters Patent No. 358,753, issued to me March 1, 1887, I have shown and described means by which a visual indication is given when a rotary device is not in synchronism with another or primary rotary device and have described means for restoring the synchronism manually. In the said Letters Patent I have shown various modifications of the fundamental conception by which the visual indication may be so produced that the operator can instantly determine whether the rotary device used by him is in sychronism with the distant rotary device or motor which is at the time acting as transmitter.

My present invention has for its object more especially the provision of means whereby the want of synchronism in the secondary or receiving device or motor will be automatically detected and synchronism restored without any attention on the part of the operator.

The features of novelty will be more particularly hereinafter described and will be definitely indicated in the claim appended to this specification.

In the drawings which form part of this specification, Figure 1 is a diagram illustrating the primary and secondary sun-wheels of a system such as described in my said former patent, one of the wheels constituting the primary or transmitting wheel and the other constituting the secondary or receiving wheel. Fig. 2 is an elevation of the secondary or receiving wheel in connection with its fly-wheel and moving brush. Fig. 3 is a sectional view of the same, taken on the line $x\,x$ of Fig. 2. Fig. 4 is a modification showing another way of arriving at the result.

Referring now to Fig. 1, the general principle upon which my former invention was based may be briefly set forth as follows: A represents the sun-wheel of the primary or transmitting instrument which is made stationary and on its periphery is fitted with a number of segments 1, 2, 3, &c. The wheel A is stationary and I fit to a shaft B, which passes freely through the axis of the wheel, an arm C which carries a brush D adapted to bear upon the periphery of the disk A. Fixed also to shaft B, but not indicated in Fig. 1, is a heavy fly-wheel for the purpose of making the motion as uniform as possible, and the shaft B is driven by any suitable source of power, such, for instance, as a small electric motor, the intention being to drive the shaft at a high rate of speed for which purpose I prefer a speed of about seven hundred per minute. As the shaft rotates it carries with it arm C and causes the brush D to pass in rotation over each of the segments on the periphery of the wheel A. At the distant station I place a similar stationary, but adjustable, disk A^2, having the same number of segments on its periphery and arranged in like relation to a fly-wheel upon a shaft B^2 which carries with it an arm C^2 having a brush D^2 bearing upon the periphery of the wheel A^2. The shaft B^2 of the receiving apparatus is also driven in a positive manner by any suitable motor and at a speed approximately the same as shaft B of the transmitting instrument. Having thus secured an approximate uniformity the object is to effect absolute synchronism in the relation between the fly-wheels and their sun-wheels. On the sun-wheel A, I connect one of the segments, say No. 11, through a transmitting battery to earth, the circuit passing by way of brush D, arm C, shaft B to the line, which then passes directly to shaft B^2 of the receiving apparatus whence it passes by the arm C^2 and brush D^2 into one of the segments of the wheel A^2 and thence to earth through whatever circuit such segment may be connected to at the time.

According to my previous patent I have connected two of the segments of wheel A^2

together and from their junction have taken a circuit through the relay R to earth. The relay R operates the make and break contact of an induction coil I, whose secondary was used for the purpose of producing a spark, and this spark was utilized as a means of visually indicating the relation of the receiving apparatus with that of the transmitting apparatus and brush D^2 was shown to be in advance of or behind the position of brush D on the sun-wheel A at the transmitting station. Then the sun-wheel A^2 could be readily moved by hand either backwardly or forwardly a short distance in order to bring the two brushes into synchronal position. Under these conditions then I have been able to connect the remaining segments in turn to the line and with the certainty that at the instant the brush D was in contact with any given segment the brush D^2 would be in contact with the corresponding segment of the sun-wheel A^2, and thus the purpose of the invention could be fulfilled. The object of connecting two of the segments, for instance 11 and 12 on the sun-wheel A^2, was to give a margin for the transmission of the spark on either side of the exact position of synchronism and I have preserved that feature in the present instance.

To automatically bring about the adjustment which in the previous case must be effected by hand, I proceed as follows: The receiving wheel A^2 is constructed substantially the same as in the former instance and has fly-wheel F rotating on the same axis, the fly-wheel F being fixed to the shaft B^2, but the sun-wheel A^2 being held relatively stationary in suitable bearings in which, when necessary, it can move the required distance for effecting its adjustment. As before the arm C^2 is fixed to the rotating shaft and carries the brush D^2 which bears in rotation upon the segments 1, 2, 3, &c., of the sun-wheel A^2. The latter has fixed to it the arm G which extends out approximately as far as the rim of the wheel F and at its end carries an armature H fitted so as to be in close proximity to the exposed poles *n s* of an electro-magnet M which is sunk into the rim of the wheel F as shown in Fig. 3 more clearly. The transmitting circuit will be the same as shown in Fig. 1, but the local circuit instead of being applied to an induction coil as in Fig. 1 will be applied to the electromagnet M by suitable circuit connections, preferably in the form of brushes bearing on insulated rings on the hub of the wheel F as shown in Fig. 3.

In all the figures the rotary parts and the direction of rotation are indicated by arrows and for the sake of clearness I have all the various rotations in a common direction.

Assuming now that the transmitting wheel is in motion and the receiving wheel F in motion at approximately the same speed, it is easily seen that every time the brush D passes off segment 11 a break occurs in the main line and the relay R releases its armature and consequently closes the local circuit through the magnet M for an instant. Hence the magnet M will be made active once during every revolution of the wheel F so long as the brush D^2 passes over the segments 11 and 12 during any portion of the time when the brush D of the transmitting wheel is passing over segment 11. If now, through any change of speed in the wheel F, the relative positions between the brush D^2 and the sun-wheel A^2 should become somewhat different from the relative positions occupied by the corresponding parts of the transmitting wheel the magnet M will automatically serve to restore the relations to the proper position. For instance, suppose the wheel F has slightly increased its rate and at the instant when the relay R operates the magnet M has just passed the armature H of the stationary arm G it will become energized for an instant and exert an attractive power on the armature H as it passes away from it, and the effect is to produce a brief movement of the armature H toward the right and this, by means of the arm G, shifts the sun-wheel A^2 correspondingly, so that after one or more revolutions of the wheel F the sun-wheel A^2 has been brought to the exact position it should occupy with reference to the brush D^2 in order to effect perfect correspondence of relations between the receiving and transmitting wheels. On the other hand, if the wheel F should tend to run too slowly it would have a tendency to fall back some as to relative positions, and in that event, at the instant the magnet M becomes energized it will not yet have reached the point opposite the armature H and the tendency will be to slightly drag the armature H backward so as to bring the sun-wheel A^2 slightly back to correspond to the retardation in the speed of the wheel F. The relative positions are exaggerated in Fig. 2 in order to make clear the relation of the parts, but it is obvious that since the magnet M would receive current for an instant during every revolution of wheel F, the sun-wheel A^2, and with it the armature H, could not possibly become displaced to any such extent as shown on Fig. 2, since the magnet M would be constantly correcting any tendency to change of speed.

To provide for the contingency of a continued advance in speed of the wheel F, or a continued retardation, which would have the effect of carrying the sun-wheel A^2 step by step around through one or more complete revolutions, or the reverse effect taking place owing to a continued retardation of the wheel F, I propose to connect the various segments of the sun-wheel respectively each to its own contact ring, which I locate at a suitable point on an insulated sleeve extending from the wheel A^2 and coincident with the axis thereof. By placing brushes in contact with these rings the circuits are all preserved; and at the same time the wheel A^2 and its controlling arm G

are free to move forward or backward in rotation to any extent required by the conditions of speed of the wheel F.

The principle of automatic adjustment of the secondary wheel into synchronism with the primary may be carried out in other ways without departing from the essential idea of automatic operation, and I therefore do not confine the scope of this invention to any particular arrangement of devices for this purpose as such means are susceptible of a variety of modifications. One of such modifications is shown at Fig. 4 where the arm G is fixed to the sun-wheel A^2 as before, but instead of the armature H upon its extremity it is fitted with a long spring blade P shown in the figure partly in dotted lines as it is behind the arm G. The magnet M is arranged in the rim of the wheel F as before, and its armature is pivotally mounted on the wheel and has an extending projection which is arranged to impinge upon the outer extremity of the spring P at certain times and be drawn out of the way of the spring at other times, according to whether the magnet M is energized at the proper instant or not. The circuit of the magnet M is arranged the same as shown in Fig. 3. If now, the wheel F is tending to run too fast, the magnet M will not be energized until after it is past a point opposite the arm G. Therefore the armature on the wheel will not be attracted at the instant when its projection is about to strike the end of the spring P and the latter is caught for an instant and the arm G given a slight pull in the same direction, as the wheel F is moving, and is quickly released by the attraction of the armature to the magnet M, so that the wheel F moves on now without further alteration of the position of the arm G until want of synchronism requires further adjustment which is thereupon automatically accomplished. In this modification of my invention it is desirable to have the wheel F always traveling at a slightly greater rate of speed than the primary wheel, as the described arrangement of the adjusting parts will act only to advance the arm G and its sun-wheel A^2 but has no effect in driving it backwardly in a direction opposed to that of the wheel F. Other modifications will readily suggest themselves to one skilled in the art to which this invention relates.

The sun-wheel A^2 being held in bearings independent of the shaft B^2, there is of course no tendency for the movement of the wheel F to communicate movement to the sun-wheel A^2 further than the slight friction of the brush D^2 which is not sufficient to overcome the inertia of the sun-wheel, but in the positive movement given the sun-wheel by the automatic adjusting arrangements it is desirable to place sufficient friction upon the sun-wheel to control its inertia and prevent it from acquiring momentum by the attraction of the magnet M when the latter is energized.

It will be seen that I provide at each station a motor operating a revolving contact maker, the stationary member of one contact maker being circumferentially adjustable, and when synchronism fails a circuit is closed at one station and operates electromagnetically to shift the adjustable member of the contact maker at the other station until the instants of contact are simultaneous or synchronous.

I claim as my invention—

Means for producing synchronous contact at two stations comprising two mechanically disconnected motors, contact makers operated thereby, one member of each contact maker being stationary and the other revolved by its motor, an electric circuit periodically closed by one contact maker, and electro-magnetic means controlled by said circuit for circumferentially shifting the stationary member of the other contact maker when synchronism fails, for the purpose set forth.

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

JAMES HARRIS ROGERS.

Witnesses:
T. J. McTIGHE,
W. V. ROGERS.