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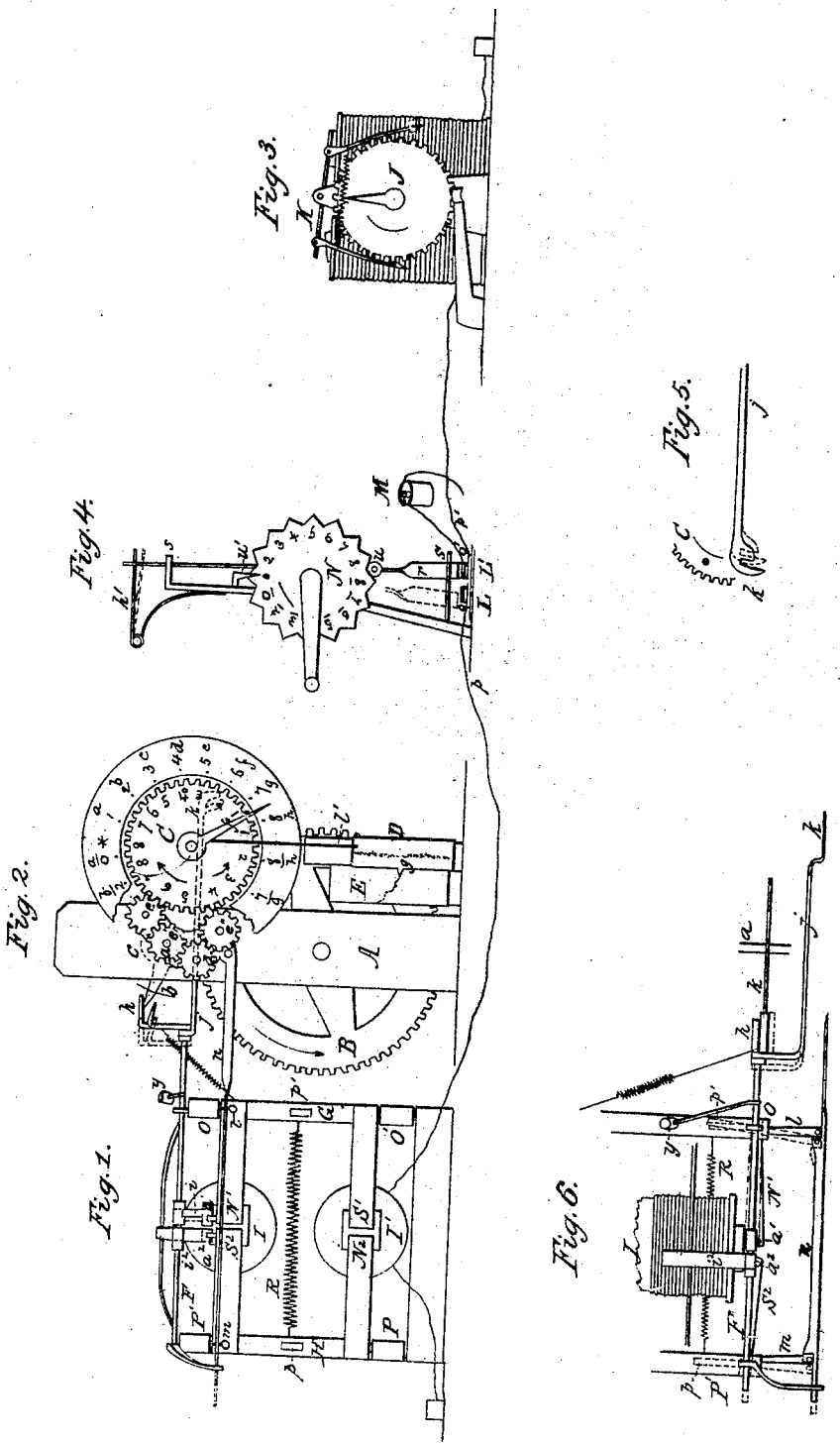
C. KIRCHHOF.

MAGNETIC TELEGRAPH.



UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN MAGNETIC TELEGRAPHS.

Specification forming part of Letters Patent No. **51,261**, dated November 28, 1865.

To all whom it may concern:

Be it known that I, CHARLES KIRCHHOF, of N Essex county, New Jersey, have invented certain new and useful Improvements in Indicating or Recording Telegraphic Instruments; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, and to the letters of reference marked thereon.

The nature of my invention consists, first, in the construction of an instrument by which communications may be transmitted to indicate the changes or variations that take place in any body or thing, and, second, in arranging the receiving instrument to be set or properly adjusted by the action of the transmitting instrument.

The principle of my invention consists in applying the electric current or currents to the helix or helices of the receiving-instrument in two directions, and in such a manner that, as the variations to be indicated advance or retrograde from a fixed or given point, state or condition the operation of the mechanism shall be made to undergo a corresponding automatic change for the purpose of correctly indicating or recording said variations.

To enable others skilled in the arts to construct and operate my invention, I will proceed to describe it.

Figures 1 and 2 represent a receiving-instrument constructed on the plan of my invention, and Fig. 3 is a modification of the same. Fig. 4 represents a transmitting-instrument to be used in connection therewith, and forming a part of my invention.

In Fig. 7 I have represented the Stoehrer relay-magnet, used for receiving messages by a double-recording instrument, and which consists of two permanent horseshoe-magnets, arranged parallel with each other, as shown by O and P′ of Fig. 6, and having their poles reversed, O′ indicating the positive pole of the one on the right, and P′ the positive pole of the one on the left, as shown in Fig. 6, O and P indicating their negative poles. Midway between and parallel with these two permanent magnets is placed a temporary magnet of the ordinary construction, the helix of which is connected with the battery, so that any current sent therefrom must affect it. Between the two arms of the permanent magnet on the right a bar, G, is pivoted at top and bottom. Rigidly attached to this bar G are two arms, N′ and S′, which project laterally far enough to bring their ends directly opposite the face of the poles of the temporary magnet, as clearly shown in Fig. 1, the permanent magnet on the left being similarly provided with a pivoted bar, H, having the arms S^2 and N^2 attached thereto in the manner already described. An arm or pin, *p*, projects from the pivoted bar G on the inside, at right angle to the arms N′ and S′, a similar arm, *p*, being attached to bar H on the left, and to the inner ends of these arms *p* and *p′* a spiral spring, R, is attached, which, by drawing the two arms inward toward each other, serves to keep the arms S′ and N′ on the right, and S^2 and N^2 on the left, thrown out away from the poles of the temporary magnet, except when attracted thereto by the current of electricity. These parts constitute the Stoehrer instrument, which I propose to use in connection with certain other improvements and devices hereinafter explained.

Fig. 2 represents my improved indicating-instrument, of which A is the frame and B the driving-wheel, operated by a weight or spring in the usual manner. Above the wheel B is located a shaft, *a*, provided with a small wheel (not shown) into which wheel B gears. An escape-wheel is secured upon the same shaft having but a small number of arms or points, one of which is represented by *b*. The end of shaft *a* protrudes through the frame A, and upon this shaft in front of the frame is pivoted the oscillating plate *c*, to which are secured the reversing gear-wheels *e*, *d*, and *e″*, to which motion is imparted by the wheel *e′* secured rigidly upon the outer end of shaft *a*, as shown. The wheels *e* and *e″* are so located that they are alternately thrown in and out of gear with the wheel or disk C, according as the plate *c* is moved or made to oscillate in one or the other direction, as hereinafter described.

Any other reversing mechanism may be used instead of that here described, and made to produce the same result.

By these means the disk C may be made to revolve in either direction at pleasure, and the pointer *f*, which is rigidly connected thereto, will be moved with it and made to pass by and point to a series of numbers, characters,

or signs arranged in a circle around the disk C; or, if preferred, a stationary index may be used, and the numbers arranged on the disk C, both methods being shown in the drawings; or, if preferred, a sliding style, D, may be used, it being so arranged as to move up or down, according as the disk shall revolve in one or the other direction, which may be done by attaching a cord, l', to the style D, and having the opposite end of the cord attached to and winding around the journal or pivot of the index f, as shown in Fig. 2, or by any similar device. If the style D be used, it should be provided with a series of numbers, characters, or signs, which will thus pass or re-pass a stationary index, or it may be provided with an index or pointer, g, or pencil-point, which shall rub against the surface of the cylinder E, which may be operated by any suitable clock-work. By this last means the pencil-point will be made to trace upon the surface of the cylinder E a line which shall exactly represent or record the undulations or movements of the index or pencil g.

A rock-shaft, F, is mounted in bearings above the relay-magnet (already referred to) in such a manner that it shall have a slight to-and-fro movement when desired, and to the end of this shaft F is secured a pallet, h, so located as to engage with the arms or points b of the escape-wheel, and thus regulate the movements of the latter, as shown in Fig. 2.

To the center of rock-shaft F is rigidly secured an arm or lever, i, provided at its lower end with a cross-head of proper length to be hit by the pins a' and a^2, which project from the arms S^2 and N' when shaft F is shoved to the left.

To rock-shaft F is secured a rod, j, which extends behind the frame A to near the right-hand side and in rear of disk C, at which point said rod terminates in a curved flat piece, k, shown in dotted lines on disk C. In this piece k a notch is made, as shown in Fig. 5, into which a pin projecting from the rear face of disk C enters when the disk is rotated in the direction of the black arrow, and as the pin enters the notch it moves the rod j, and with it the shaft F, a short distance to the right, whereby the arm i with its cross-head is moved so far to the right that it can only be hit by the pin a^2 on arm N', the rotation of the disk C and index f being arrested at the same instant by the pin on the back of the disk entering the notch in k, as already described.

From the front of the upright rock-shafts G and H project, in a horizontal position, two rigid arms, l and m, one from each, which arms serve to move the rod n to the right or left, as one or the other of them may be operated; and this rod n, being pivoted at one end to the oscillating plate c, serves to throw the reversing gear-wheels e and e'', in or out of gear with disk C, and thus cause the latter to rotate in one or the other direction, according as rod n is moved to the right or left, and thus the disk C is caused to automatically change the reversing-gear, by which the disk is made to rotate to the right or to the left.

When the current is sent in one direction, the magnet I I′ will operate the shaft G by means of the arms N' and S', in which case the rod n will be shoved to the left by arm l, and the disk C made to rotate in the direction indicated by the red arrow. When the current is sent in the opposite direction the arms S^2 and N^2 will be operated by the magnet I I′, in which case rod n will be shoved to the right, thereby causing the disk C to rotate in the reverse direction, as indicated by the black arrow, it being understood that said disk C can make but a single revolution in either direction, when it is stopped by the pin on the back thereof coming in contact with the piece k attached to rod j.

Upon shaft F is loosely pivoted another lever, i^2, which, when shaft F is moved to the right, is brought into position to be operated by the pin a^2 attached to arm s^2. By means of this lever i^2 communications of the ordinary character may be transmitted at pleasure without in any manner interfering with the indicating-instrument shown in Fig. 2, the latter remaining ready for instant use whenever desired.

Fig. 3 represents a modification of the indicating-instrument already described. J repa wheel or disk provided with ratchet-teeth on its periphery. An oscillating armature, K, is operated by two magnets or helices, and to this armature K is pivoted two pawls, so arranged that when the current is sent to one of the magnets the pawls on that side shall be made to operate the disk J and cause it to rotate in one direction, and when sent into the opposite magnet the corresponding pawl shall be operated, thereby causing the disk to rotate in an opposite direction. It is obvious that many modifications of these devices may be adopted without at all affecting the result, or changing the principle of its operation.

Fig. 4 represents a transmitting-instrument also made on Stoehrer's plan, with an improvement of my invention added, to adapt it to the purposes of this invention. L L′ are the contact-plates, forming the poles of the battery M, and o o' are the two keys, connected one to each end of the line p p', and resting upon a plate, q', upon which they are held down by a spring underneath their front ends. This implement I have improved by the addition of an automatic mechanism consisting of the vertical bar r, easily movable up and down in suitable bearings s s', the lower one of which is provided with a slot of sufficient length to permit the bar r to move laterally therein from one to the other of the keys o o', and thereby cause a contact of either of said keys with the plate q'. The bar r is held up by a spring, k', and is forced down upon either of the keys o or o' by the teeth on wheel N, ac-

cording as the latter is turned in one or the other direction, the teeth pressing against a roller, *u*, secured to the bar *r*. The wheel or disk N is provided with a series of numbers, characters, or signs corresponding with those on the indicating-instrument shown in Fig. 2, which are brought successively under the index or pointer *u'* secured to bar *r*, as shown in Fig. 4; or, if preferred, the numbers may be placed upon a circle or dial surrounding the wheel N, and an index attached to the latter and moving with it may thus be made point to any of said numbers according as the wheel is rotated.

It will be observed that, as already described, the index of the receiving-instrument, Fig. 2, can perform but a single revolution at a time, when it is brought to a fixed position, which always occurs at the same point, and without regard to the direction in which it is moved. Now, suppose the instrument shown in Fig. 4 to be located at New York city, and telegraphically connected with a number of the indicating-instruments shown in Figs. 1 and 2 located in various cities or towns in different parts of the country. Suppose, then, that I desire to transmit to these various points information in relation to the changing prices of stocks, goods, grain, or other commodities, or the changes of temperature. It is first necessary, in beginning operations for the day, that I know positively that the receiving-instruments at each point shall all agree—that is, that their indexes shall all point to the same number—and also that I shall have the power of setting them so that they will thus agree in case they are not already thus set. By simply turning the wheel N long enough to transmit a sufficient number of impulses to bring the indexes of the receiving-instruments to the fixed position already described, I accomplish the desired object of setting them all uniformly, and this is done with them all at one operation. I am then ready for the day's operations, and can transmit uniformly and simultaneously the same information as to the changes or variations occurring at the central point to all of the receiving-instruments, wherever they may be located.

A hammer, *y*, attached to and operated by rock-shaft F, is arranged to strike a bell or other object, when the receiving-instrument is operating, for the purpose of indicating by sound the number of impulses sent, so that the attendant can ascertain the number of the changes or variations, even though he be in a position where he cannot see the dial or indicator. It also serves the additional purpose of attracting the attention of the attendant whenever the indicator commences to operate. It is obvious that this part of the apparatus may be arranged in a great variety of ways and made to produce the same result, and hence I do not wish to be understood as confining myself to this special arrangement of parts for that purpose.

Having now described a mechanism that embodies my invention and which serves fully to illustrate the same, I do not wish to be understood as confining myself exclusively to the arrangement or use of the various devices here shown, as there are many others which may be readily substituted for these and made to produce the same results.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The indicating and recording instrument actuated by electricity, arranged to automatically shift the actuating mechanism and thereby move the dial or index in one or the other direction in accordance with the transmitter, or as may be desired by the attendant, substantially as described.

2. Securing a harmonious action between the transmitter and a series of receiving-instruments by so arranging or constructing the latter that their dials or indexes shall all cease to move or operate at a certain fixed place or character common to them all.

3. Transferring the motion of the receiving-instrument at pleasure to an instrument to be operated independent of the indicator, by the same helix or helices.

4. The combination of the recording-cylinder, or its equivalent, with the indicating-instrument, arranged and operating substantially as set forth.

5. Transmitting the communications automatically by a mechanism defining the number of electric impulses, their direction and intervals, by a simple manipulation of the attendant, substantially as described.

6. The reversing-gear when arranged to be operated by electricity for the purpose of automatically changing the motion of telegraphic mechanism.

CHARLES KIRCHHOF.

Witnesses:
ERNST A. ADAM,
HENRY DEGEL.