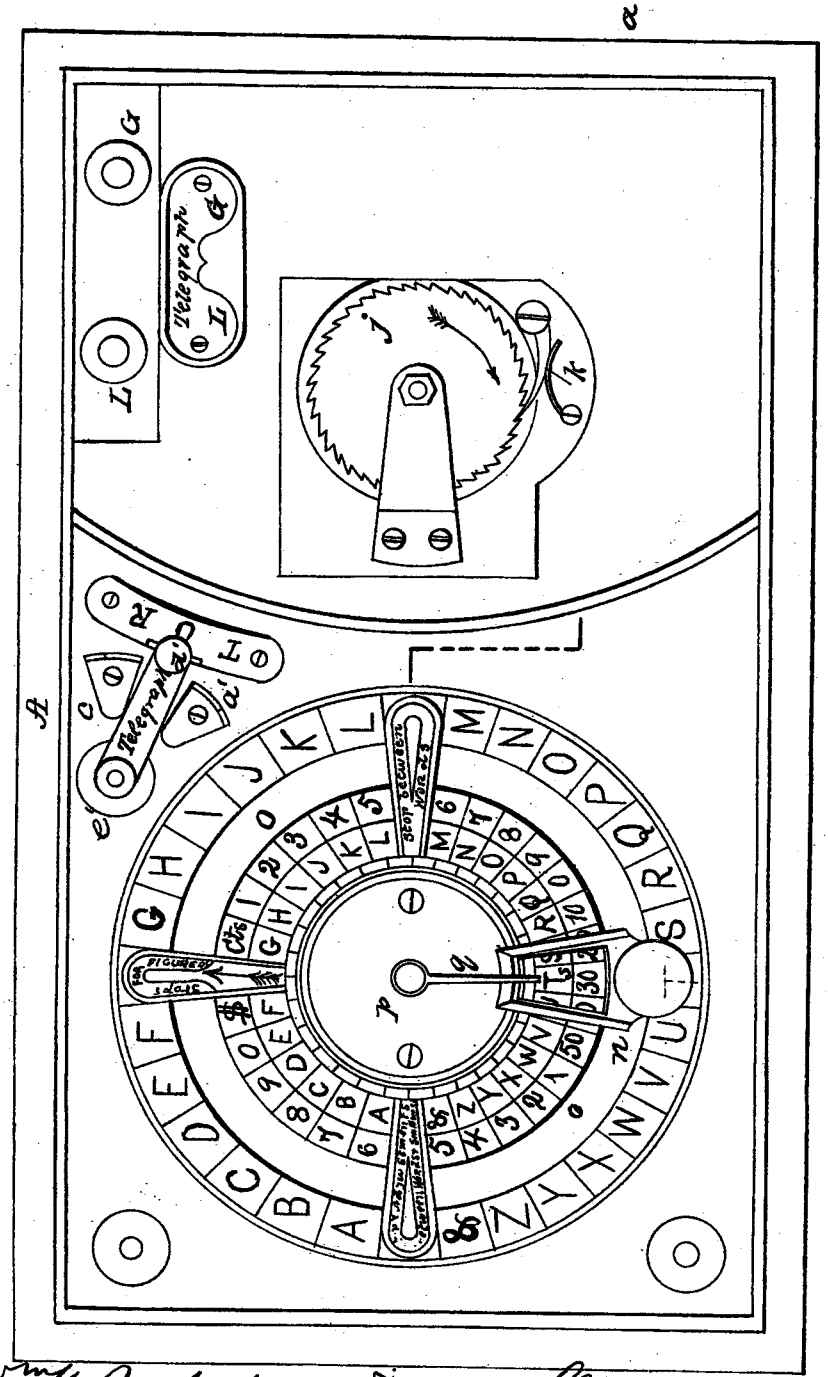
3 Sheets—Sheet 1.

G. W. BEARDSLEE.

Dial Telegraph.

No. 39,376. Patented Aug. 4, 1863.

Fig. 1



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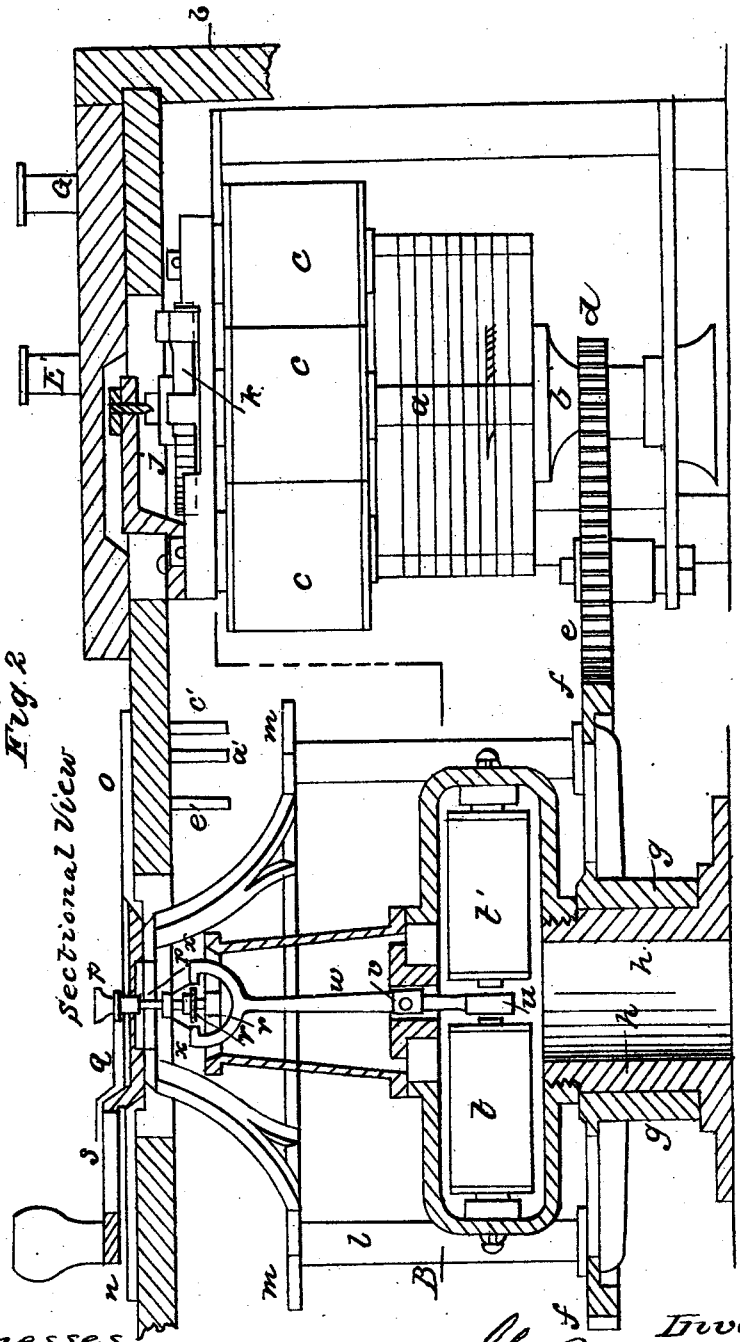

Fig. 2

Sectional View

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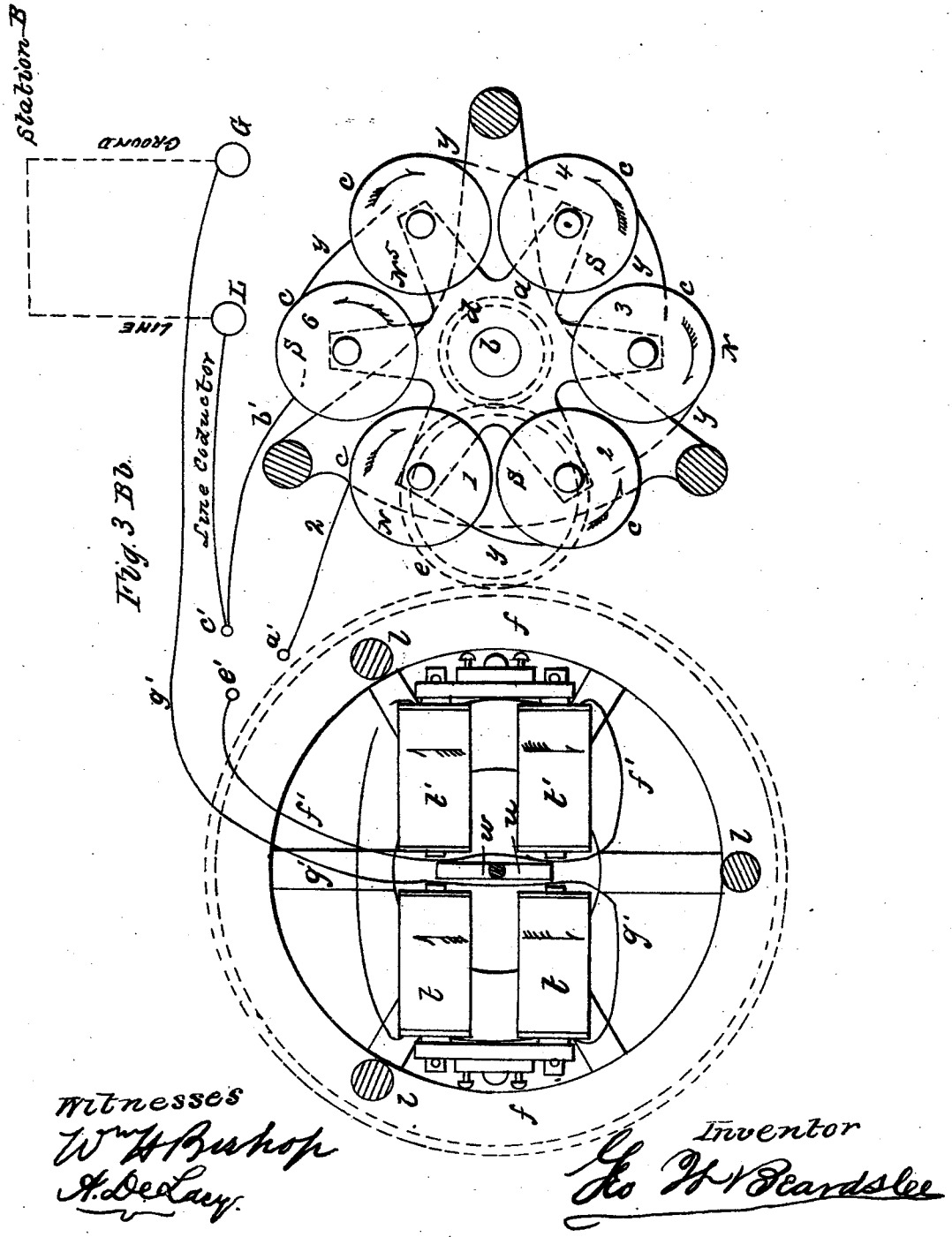

UNITED STATES PATENT OFFICE.

GEORGE W. BEARDSLEE, OF COLLEGE POINT, NEW YORK.

IMPROVEMENT IN MAGNETO-ELECTRIC TELEGRAPHS.

Specification forming part of Letters Patent No. **39,376**, dated August 4, 1863.

To all whom it may concern:

Be it known that I, GEORGE W. BEARDSLEE, of College Point, Queens county, and State of New York, have invented certain new and useful Improvements in Magneto-Electric Telegraphs; 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, in which—

Figure 1 is a top view of an apparatus on my improved plan; Fig. 2, a vertical section taken at the line A *a* of Fig. 1, but with the pointer or needle and the handle for operating the apparatus in a different position; and Fig. 3, a horizontal section taken at the line B *b* of Fig. 2.

The same letters indicate like parts in all the figures.

The leading object of my said invention in telegraphing by magneto-electricity is to enable the operator, by the operation or movement which he makes to designate or select the character or sign which he desires to transmit, to develop the electric current by which such character or sign is transmitted; and to this end my said invention consists in the employment of a magneto-electric engine by the rotation of which electric impulses are induced alternately in opposite directions, connected by suitable conductors with electro-magnets the polarity of which is alternately reversed by the alternately-reversed impulses induced by the engine and an interposed vibrating permanent magnet or armature, which is caused to vibrate by the alternately-reversed polarity of the electro-magnets, when these are combined with a mechanism which, as the operator indicates or designates the characters or signs which he desires to transmit, will operate the magneto-electric engine, and thereby develop (or generate) the electric impulses which transmit such character or sign; and the second part of my said invention consists in combining with the foregoing, or the equivalent thereof, an escapement to indicate or develop the character or sign transmitted.

In the accompanying drawings, *a* represents a wheel of radial magnets constructed on the plan described in Letters Patent granted to me, and bearing date the 27th day of December, 1859. Six radial magnets are represented and lettered, according to their polarity, alternately N and S. This wheel of magnets is composed of a series of plates of the form represented, and secured to a vertical shaft, *b*, mounted in suitable bearings, as represented. Above this wheel of radial magnets is arranged a series of spools, *c*, there being as many spools in each series as there are arms in the wheel of magnets.

On the lower end of the shaft there is a cogged pinion, *d*, which engages the cogs of a wheel, *e*, which, in turn, engages the cogs of a large wheel, *f*, the hub *g* of which is mounted to turn on a hollow stud, *h*, secured to a platform or bed-plate.

The shaft *b* is provided with a ratchet-wheel, *j*, and pawl *k*, to prevent the wheel from turning in the contrary direction of the arrow.

On the rim of the wheel *f* are mounted three (more or less) standards, *l*, to the upper ends of which is secured a ring, *m*, the arms of which are curved upward, and are united to a small rim, to which a handle, *n*, is secured, and by this handle the operator imparts motion to the wheel *f*, and thence, through the intermediate wheel, *e*, and the pinion *d*, to the wheel of magnets *a*.

Above and concentric with the rim *m* there is a circular dial, *o*, with three concentric circles of characters, divided each into thirty equal parts, marked with the required characters. In the center of the said dial there is a central shaft, *p*, which carries above the dial a hand or pointer, *q*, and below the dial a toothed wheel, *r*, with fifteen teeth—that is, half as many teeth as there are divisions in one circle of the dial. The handle *n* is also provided with an opening, *s*, to enable the operator to see the characters on the dial, that he may stop the said handle over any one of the divisions on the dial.

The proportions of the cog-wheels which communicate the rotary motion from the handle *n* to the wheel of magnets *a* are five to one, so that the wheel of magnets shall make five revolutions for each revolution of the handle and its pointer, and as there are six magnets in the circle, and each magnet, in passing a spool, will give an impulse, there will be thirty electric impulses given for every revolution of the handle, and therefore as many impulses as there are divisions in one circle of the dial.

Any variation may be made in these proportions, provided the number of magnets and the revolutions of the magnets bear such a relation to the dial that one impulse shall be given for each division of the dial.

Below the dial are placed two pairs of electro-magnets, *t t'*. The two pairs are placed with their poles at a given and suitable distance apart, and between these poles is placed a pendulous permanent magnet, *u*, on a rocking shaft, *v*, and from this shaft an arm, *w*, extends up, and its upper end is forked to extend each side of the toothed wheel *r*, and the prongs of this fork are formed into pallets *x x* at such distance apart that in the vibration, as one pallet on one side of the axis of the wheel acts on one cog to turn the wheel, the other pallet on the other side gradually liberates and permits the cog which it held to escape, so that each vibration turns the wheel the distance of half a cog, and as the wheel has but fifteen cogs, each vibration in one direction will move the pointer *q* the distance of one division of the dial.

The wires of the several spools are connected with each other by the conducting-wires *y* in the usual manner of magneto-electric engines, and as represented in Fig. 3; and the first of the series of spools is connected by a conducting-wire, *z*, with a metallic lug, *a'*, and the last of the series is connected by the conducting-wire *b'* with another metallic lug, *c'*. A metallic conducting-switch, *d'*, is pivoted to a third metallic lug, *e'*, so that the said switch can be shifted at will and put into conducting contact either with the lug *a'* or the lug *c'*. One of the terminal wires (marked *f'*) of the pairs of electro-magnets is attached to the lug *e'*, and the other terminal, *g'*, is connected with the ground or other return conductor at the hitcher G, and the lug *c'* is connected with the line conductor or hitcher L. The line and ground or other return conductors are to be in like manner connected with a similar apparatus at the other station.

For the purposes of this description I will denominate the two stations A and B.

When the switch *d'* at either station is in contact with the lug *a'* and the wheel of magnets is turned one-sixth of a revolution, so as to move any one of the radial magnets from one of the spools to the next in the series in the direction of the arrow, which is effected by moving the handle *n* the distance of one division on the dial *o*, an electric impulse is generated, and acts along the conducting-wire *b'* through the lug *c'* to and along the line-conductor to station B, thence through the instrument at that station and back by the ground or other return conductor to and along the conducting-wire *g'* to and through the coils of the electro-magnets *t* and *t'*, thence by the terminal conductor *f'* to the lug *e'*, through the switch *d'* to the lug *a'*, and from that by the conductor *z* to the series of coils of the engine. The impulse thus induced gives polarity to the electro-magnets *t t'*, by which the pendulous magnet *u* is vibrated in one direction by the joint attraction and repulsion of the opposing poles of the electro-magnets. This vibration of the magnet *u* operates the pallets *x x*, which turn the wheel *r* and its hand or pointer *q* the distance of one division on the dial *o*, so that by the electric impulse generated by moving the handle *n* the distance of one division the hand or pointer *q* is impelled or caused to move the same distance. The next motion of the handle *n* the distance of another division, on the dial will cause the wheel of magnets to turn to the extent of another division, which will generate another electric impulse in the contrary direction to the first, the effect of which will be to reverse the polarity of all the electro-magnets, and thereby vibrate the pendulous magnet *u* in the opposite direction, which will move the hand or pointer *q* the distance of another division on the dial. In this way, as the handle *n* is moved around the dial in passing each division, the magnet *u* is caused to vibrate, and alternately in opposite directions, and at each vibration it moves the hand or pointer *q* the distance of one division, following the handle all around the circle, and stopping wherever the handle is stopped, and again starting whenever the handle is moved. Now, as the electro-magnets at station B are in the same circuit with the electro-magnets at station A, it follows that the hand or pointer *q* at both stations will be moved alike by the same electric impulses, and that this will be the result whether the electric impulses be generated by the magneto-electric engine at station A or at station B.

The object of the switch *d'* is to enable the operator at either station to throw his magneto-electric engine out of the circuit, leaving his electro-magnets in the circuit with the other station. This is effected by simply shifting the switch from the lug *a'* to the lug *c'*, which will close the circuit outside of the engine—as, for instance, if the switch at station A be so shifted, the impulse from station B, coming along the ground conductor, will, after passing around the electro-magnets at station A, pass along the terminal *f'* to the lug *e'*, thence along the switch *d'* to the lug *c'*, and thence by the shortest way to the line-conductor, to return to the engine at station B without passing through the coils of the engine at station A; and so in like manner with the other station, if the switch be there shifted. So that when the operator at either station desires to transmit a message he simply shifts the switch to the lug *a'*, which connects his engine in the circuit with the electro-magnets at both stations. Without this every impulse given at one station would be required to pass through all the coils of the engine at the other station, which would tend to reduce the power of the impulses, while at the same time it might be injurious to the magnets.

From the foregoing it will be seen that whatever characters may be on the dials the operator at one station, by turning the handle *n* and stopping it over the character or sign on any one division of the dial, will cause the hand or pointer *q* at the other station to stop opposite the same character or sign on the dial at that station, the hand or pointer *q* at his own station coming to and stopping opposite the like character or sign, which simply verifies; but it will be obvious that the connection may be directly between the engine at one station and the electro-magnets at the other station, in which event the operator will simply lose the advantage of having before him the verification of the character or sign which he has transmitted.

It will be obvious that instead of two pairs of electro-magnets with a permanent vibrating magnet interposed, a single pair of electro-magnets with a spring-armature may be substituted, the electro-magnets moving the armature in one direction and the spring in the opposite direction; but by such substitution the impulse will have to overcome the tension of the spring, and therefore such substitution will be inferior to the mode herein described.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The magneto-electric engine connected with the electro-magnets operating a vibrating magnet or armature, substantially as herein described, in combination with a mechanism, substantially as described, which, as the operator indicates or designates a character or sign which he wishes to transmit, will operate the magneto-electric engine, and thereby develop the electric impulses which transmit such characters or signs, as set forth.

2. In combination with the combination first herein claimed, the employment of the escapement, or the equivalent thereof, operated by the vibrating magnet or armature, substantially as herein described, to indicate or develop the character or sign transmitted, as set forth.

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