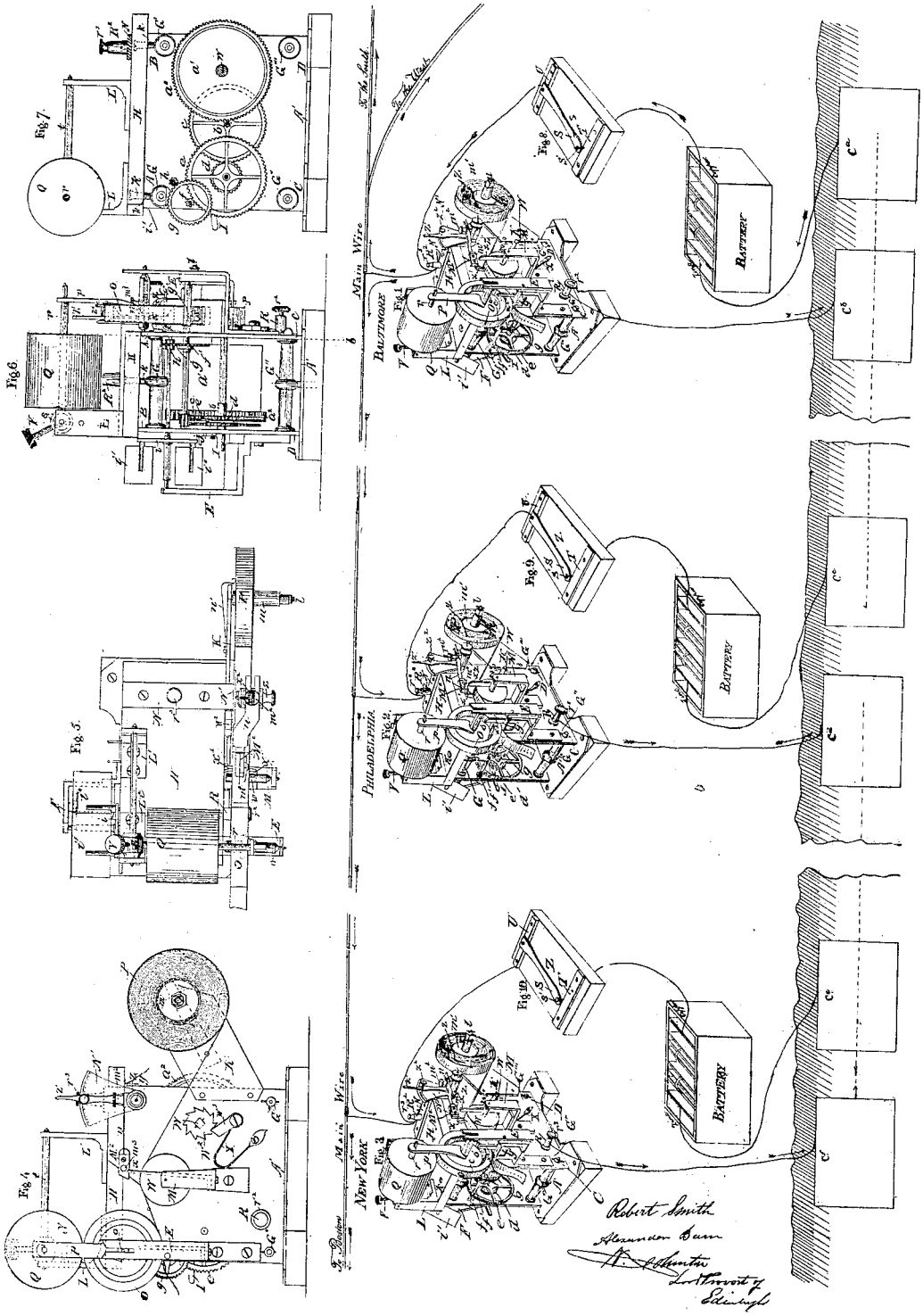
R. SMITH & A. BAIN.

ELECTROCHEMICAL TELEGRAPH.

No. 6,837. Patented Oct. 30, 1849.



UNITED STATES PATENT OFFICE.

ROBERT SMITH, OF BLACKFORD, COUNTY OF PERTH, SCOTLAND, AND ALEXANDER BAIN, OF BEEVOR LODGE, HAMMERSMITH, COUNTY OF MIDDLESEX, ENGLAND.

IMPROVEMENT IN ELECTRO-CHEMICAL TELEGRAPHS.

Specification forming part of Letters Patent No. **6,837**, dated October 30, 1849.

To all whom it may concern:

Be it known that we, ROBERT SMITH, Esquire, lecturer on chemistry, of Blackford, in the county of Perthshire, in Scotland, in the Kingdom of Great Britain, and ALEXANDER BAIN, Esquire, electro-telegraphic engineer, of Beevor Lodge, Hammersmith, in the county of Middlesex, in the Kingdom of England, have invented certain new and useful Improvements in Electro-Chemical Telegraphs.

These improvements consist, first, in the peculiar mode of arranging the several parts herein described of our marking-instruments of electro-chemical telegraphs; secondly, in a mode of constructing a style or point holder so as to afford a ready and convenient mode of regulating the pressure of the style or point on the surface of the chemically-prepared paper or other suitable fabric; thirdly, in a mode of applying a weight for regulating the pressure of an upper on a lower revolving wheel or roller in motion, so as to grasp the strip of chemically-prepared paper or other suitable fabric and insure its being drawn continually forward; fourthly, in a mode of arranging the marking-instruments, keys, wires, and batteries in a single circuit and in branch circuits connected therewith, so that a copy of a message sent from any station may be marked upon the chemically-prepared paper or other fabric at any desired number of stations in communication therewith, and also, if required, at the transmitting-station.

We do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, forming part of this specification.

Figures 1, 2, and 3 are perspective views of three marking-instruments and apparatus as they would be arranged and appear at three distinct and distant stations—as, for instance, at New York, Philadelphia, and Baltimore—which may be portions of an extensive system of telegraphic communication from and at any of which messages may be transmitted and received. These instruments may be at any convenient distances from each other, and although three only are here shown, any number of them may be used, according to the number of places between which it is desired to transmit intelligence. Fig. 4 is an external side elevation of a marking-instrument. Fig. 5 is a plan of the same; Fig. 6, an end elevation, and Fig. 7 a vertical longitudinal section through the line *a b* of Fig. 6.

The same letters and figures refer to similar parts in each of these figures.

Figs. 4, 5, 6, and 7 are drawn of the full size as employed by us. Figs. 1, 2, 3, 8, 9, and 10 are drawn to a scale of eight inches to a foot.

Within a metal frame, A B C D, open at the ends, is a movement consisting of a train of wheels or clock-work set in motion by a spring within the barrel *a'*, the posterior periphery of which is formed into teeth a^2, that work into and drive a pinion, *b'*, on the axle of the first wheel, *c*. The wheel *c* takes into a wheel, *d*, on the axle of the larger wheel *e*, which wheel *e* works into a pinion, *e*, on the axle *f'*, which carries a wheel, *g*. The axle *f'* passes through the front plate of the frame, and is supported by an external bracket, E, screwed or otherwise affixed to the frame. The wheel *g* drives a pinion, *h*, the axle of which projects through the back frame and is supported by a bracket, F, affixed thereto. On this axle, between the side frame and the bracket F, is placed an arm, *i*, carrying an adjustable fly or regulator with two vanes, *i' i''*, the resistance of the air against which as they revolve retards the motion of the train of wheels acted upon by the spring in the barrel *a'*. The two vanes *i' i''* turn spring-tight on pivots in the arm *i*, to admit of their being set at any required angle, and thereby increase or diminish the amount of resistance opposed to the motion of the train of wheels.

The two side frames of the instrument, A B C D, are held together by four pillars, G G' G'' G''', which are riveted to the back frame. The opposite ends of these pillars pass through the front frame, and are pinned on the outside thereof. The side frames, A B C D, and the foundation-plate A' are of metal; but the top H of the frame is of wood or other non-conductor of electricity, and is secured thereto by two sunk

screws, *k k*, which pass down into the pillars G G′.

A detent-lever, I, is centered upon a double-shouldered screw inserted in the back frame of the instrument, and terminates in a projecting arm, *j*, which, catching the arm *i* of the vanes, prevents their revolving, but being depressed permits them to revolve freely.

The range of the detent-lever I is limited by two pins fixed in the frame. Attached to the front frame externally there is a projecting plate, K, carrying a fixed axle, *l*, on which is mounted a brass collar, *m*, and wooden roller *m′*, upon which is coiled a strip of chemically-prepared paper or other fabric, P.

We would here state that the paper, linen, or other suitable fabric may be prepared by being equally and thoroughly moistened by the following chemical compound, viz: ten parts, by measure, of a saturated solution of prussiate of potash, which will be best made in distilled water, and we prefer to use the yellow prussiate for this purpose; two parts, by measure, of nitric acid of the strength of about 40° by Baumé's scale; two parts, by measure, of muriatic acid of the strength of about 20° by Baumé's scale. To keep the paper or other fabric in a sufficiently moist state favorable for the action of an electric current, we add about one part, by measure, of chloride of lime. This mixture is to be kept stirred about with a glass rod until the chloride of lime is in complete solution.

In connection with this compound, it is proper to observe that we have found that prussiate of potash combined with almost any acids will give marks under the decomposing action of an electric current; but no other mixtures act so quickly or give such permanent marks with feeble currents of electricity as that herein described. The principal use of the chloride of lime is that it absorbs moisture from the atmosphere, and thereby keeps the prepared fabric in a proper state to be acted upon by an electric current in all states of the weather.

At the back of the plate K is screwed a spring, *n′*, the end of which is bent round and presses against the roller *m′*, so as to prevent its turning, except when acted upon by some moving power.

Between the front plate of the instrument and the bracket E, and immediately over the roller *g′*, there is a larger roller, O, the periphery of which we prefer to be of wood. The axle *o* of the roller O turns in slots cut in the side frame of the instrument and the bracket E, the roller O being kept in close contact with the roller *g′* by a stem, *p*, which presses upon the axle *o*. The stem *p* is acted upon by a weight, Q, which slides backward and forward upon a spindle, *r*, so as to increase or diminish the pressure upon the roller O, according as the weight is brought nearer to or farther from the stem *p*. The back end of the spindle *r* is attached to a boss, *s*, held in its required position on the spindle *t* by a set-screw, V. Whenever it is required to take out the roller O the stem *p* and weight Q are lifted and turned back until the set-screw V comes in contact with a stop, *v*, affixed to the standard L, the spindle *t* being pivoted in the two upright standards L L′.

Near the middle, in front of the frame externally, there is affixed a bracket, M, supporting between itself and the frame a metal roller, *w*, which revolves between two upright forks, *x x′*, which are for the purpose of guiding the strip of chemically-prepared paper or other fabric as it passes over the roller *w*. The roller O, before described, revolves between two similar guiding-forks, x^2 x^3, for the same purpose.

On the wooden top of the frame H there is screwed a metal plate, N, terminating in a quadrant-shaped bracket, N′, which projects beyond and is quite clear of the metal frame, and therefore has no metallic communication with it. At the lower part of the quadrant-shaped bracket N′ there is a projecting spindle, *y*, which carries a socket-piece, *z*, and pointer *z′*, capable of being set at any required angle (within the limits of the quadrant N′) by means of a pointed screw, z^2, which takes into a series of indents near the edge of the quadrant.

The top of the socket-piece *z* is made flat to receive the forked spring-stem *n* of a style-holder, M^2, which is secured to the socket-piece *z* by a set-screw, m^2. The style-holder M^2 has a slit in it for the reception of a style or wire, which is held fast therein by a small tightening-screw, m^3. The wire, style, or point placed in the holder M^2 is made to press upon the periphery of the metal roller *w* by adjusting the position of the pointer *z′*, as before described. One end of the chemically-prepared paper or other fabric being led up over the roller *w* and beneath the style or wire inserted in the holder M^2, it is passed between the rollers O and *g′*.

W is the winding-spindle of the spring, with its ratchet-wheel w^2 and pawl w^3. X is a spring screwed to the frame for keeping the pawl and ratchet engaged.

At the lower part of the front of the frame externally there is a projecting pillar, R, having a transverse hole for the insertion of an electric wire, and furnished with a binding-screw, r^2, for holding the wire in contact.

Upon the plate N at the top of the frame there is a second pillar, R^2, furnished, like the former, with a transverse hole and binding-screw, r^3. The first-named pillar, R, is in metallic contact, by means of the frame, with the roller *w*, and therefore an electric current reaching the one would be instantly communicated to the other. The pillar R^2, on the contrary, is not in metallic contact with any part of the apparatus, being attached to the non-conducting top of the instrument. An electric current, therefore, from the pillar R^2 could only reach the pillar R by passing down the style or wire in the holder M^2 and through the chemi-

cally-prepared paper to the roller *w*, a mark being made upon the paper every time and all the time an electric current is passing.

In order to transmit intelligence, a key-board (shown at Figs. 8, 9, and 10) is employed. This apparatus consists of a flat mahogany board, Z, on which are two brass plates, T U. To the plate U a metal spring, S, is screwed in such a manner that its opposite end is directly over but not in contact with the plate T.

In the free end of the spring S a screw, *s'*, is inserted, the point of which, on pressing down the spring, strikes the plate T and makes a contact between the plates T and U. A wire from the copper end of a galvanic battery, being brought through the key-board Z, is permanently attached to the under side of the plate T. A wire is similarly attached to the plate U. On pressing down the spring S, therefore, a continuous metallic communication is established between the two wires, which becomes broken on releasing the spring.

At each telegraph-station there is a similar arrangement of apparatus, and also a suitable battery with two plates of copper sunk in the earth, as shown in the drawings at C^a C^b C^c C^d C^e C^f.

A single main wire is carried through all the stations between which telegraphic communication is to be held, whether they may be in a direct line or radiating therefrom. A wire proceeds from the zinc end of the battery to the copper plate C^a, Fig. 1, while a wire from the opposite end of the battery passes up to the key, Fig. 8, and is in direct communication with the plate T. A wire from the plate U is led up to the pillar R^2, from which there is also a wire communicating with the main wire of the telegraph. A wire from the pillar R is in communication with the copper plate C^b.

The instruments and apparatus at each of the communicating stations are arranged in a similar manner.

Having thus fully described the whole of the machinery and apparatus necessary at each station for transmitting and recording messages, we will now explain its operation.

We will suppose that a communication is to be transmitted from Baltimore to Philadelphia and New York, and to be also recorded at Baltimore. The system of correspondence made use of consists of dots and lines, the number, dimensions, and relative positions of which form an intelligible code of signals, as is well understood. The spring *a'* being wound up and the detent-lever I disengaged from the arm *j*, the train of wheels commence running down, and the chemically-prepared paper or other fabric is gradually drawn forward by the friction of the roller *g'* and the weighted roller O and passes between the style or point in the holder M^2 and the roller *w*. On pressing down the spring S on the key Z, Fig. 8, and striking a blow on the plate T an electric current from the copper end of the battery passes up through the key Z to the pillar R^2, one portion of which electric current goes to the holder M^2, down the style, and through the chemically-prepared paper or other fabric (on which it marks a dot) to the roller *w* and pillar R, from which it goes by the conducting-wire down to the copper plate C^b, through the intervening earth to the plate C^a, and so up to the zinc end of the battery, thus completing the circuit; but at the same instant another portion of the electric current has passed up to the main wire and through the marking-instruments at all the stations in communication with the transmitting-station. Thus, for instance, a portion of the electric current passing from the main wire enters the marking-instrument at Philadelphia by the pillar R^2, passes through the chemically-prepared fabric, (upon which it marks a dot,) and goes by a path similar to that hereinbefore described to the copper plate C^d, and thence through the intervening earth and copper plate C^a to the zinc end of the transmitting-battery. Precisely the same effect takes place at New York. A portion of the electric current, leaving the main wire, passes down through the marking-instrument, taking the same course as before explained, and leaving a dot upon the prepared fabric, passes down to the copper plate C^f, from which it returns through the intervening earth and the copper plate C^a to the zinc end of the battery. The same effect precisely will be produced upon the marking-instruments at every other station within the electric circuit. If the spring S of the key Z is held down, instead of merely striking a blow, a line is produced on the chemically-prepared paper or other fabric of a length proportioned to the time the communication is continued; and in this way, by marking dots and lines upon the prepared fabric, messages may be transmitted from one station to the other. The train of wheels is to be kept constantly in motion at every station where a message is expected; but any of the stations may be thrown out of communication by lifting the style and holder M^2 out of contact with the chemically-prepared fabric and roller *w*, when no current of electricity can pass through the instrument at that station.

We do not claim as our invention the train of wheels constituting the motive part of the marking-instruments. Neither do we claim or confine ourselves to any particular form of battery or other generator of electricity, which may be of any suitable form, several of which are well known and in common use.

We desire it to be understood that what we claim as new and of our invention is—

1. The mode of arranging the several parts of our marking-instrument for electro-chemical telegraphs, substantially as hereinbefore described.

2. The mode of adjusting a style or point holder, as hereinbefore described and shown, so as to afford a ready and convenient mode of regulating the pressure of the style or point upon the surface of the chemically-prepared fabric.

3. The mode of applying the weight Q for the purpose of regulating the pressure, as herein described and shown.

4. The mode of arranging the marking and transmitting instruments, wires, and batteries in a single circuit, and in branch circuits connected therewith, so that a copy of a message sent from any one station may be marked upon the chemically-prepared paper or other fabric at one or any desired number of stations in communication therewith, and also, if required, at the transmitting-station, without requiring the use of any secondary current.

In witness whereof we have hereunto subscribed our names, at Edinburgh, the 15th day of March, eighteen hundred and forty-nine, in presence of the Right Honorable William Johnston, of Kirkhill, Lord Provost and Chief Magistrate of the city of Edinburgh.

ROBERT SMITH.
ALEXANDER BAIN.

The foregoing specification was subscribed at Edinburgh, the 15th day of March, eighteen hundred and forty-nine, by the therein-described ROBERT SMITH and ALEXANDER BAIN.

In presence of—

JAMES ANDERSON,
Of Edinburgh, Clerk to Andrew Dun, writer to the signet.

JAMES STUART,
Of Edinburgh, also Clerk to the said Andrew Dun.