(No Model.)

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J. F. McLAUGHLIN

PRINTING TELEGRAPH.

No. 420,240. Patented Jan. 28, 1890.

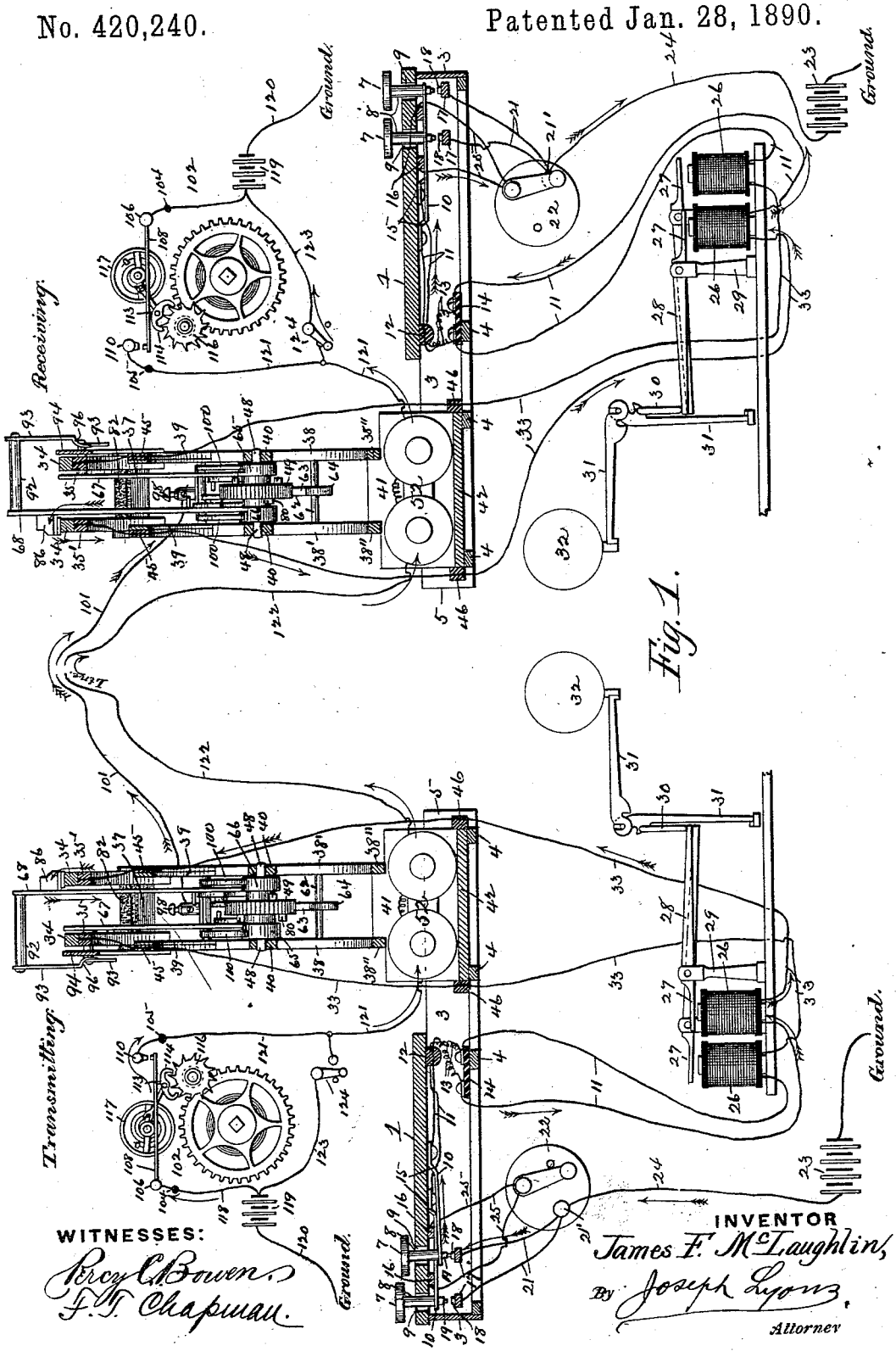

Fig. 1.

WITNESSES:

Percy C. Bowen.

F. T. Chapman.

INVENTOR

James F. McLaughlin,

By Joseph Lyons,

Attorney

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J. F. McLAUGHLIN.

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Fig. 2.

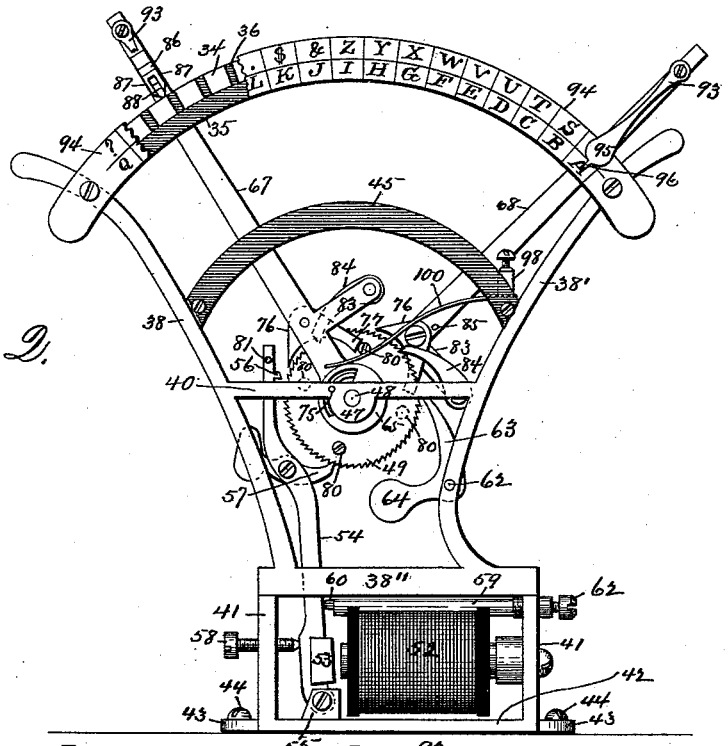


Fig. 5.

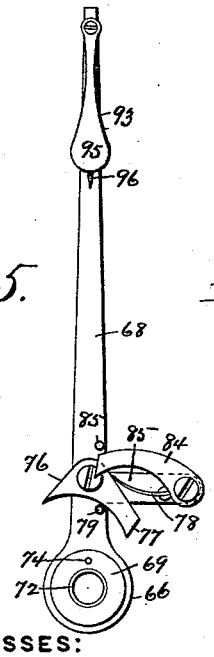


Fig. 6.

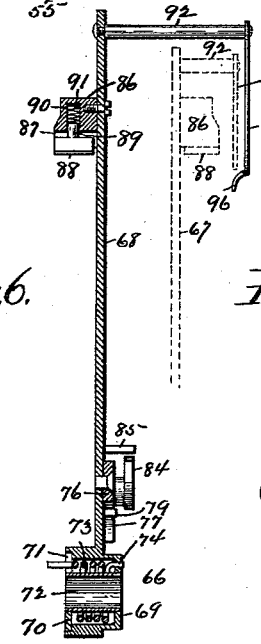
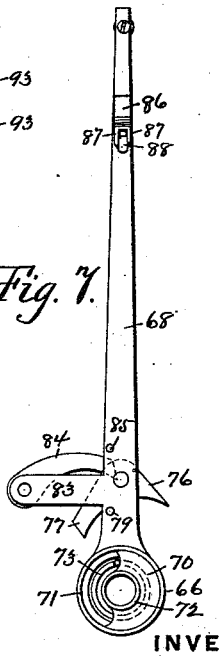


Fig. 7.



WITNESSES:

Percy C. Brown

F. T. Chapman

INVENTOR

James F. McLaughlin,

By Joseph Lyons,

Attorney

(No Model.) 5 Sheets—Sheet 3.

J. F. McLAUGHLIN.

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No. 420,240. Patented Jan. 28, 1890.

Fig. 3.

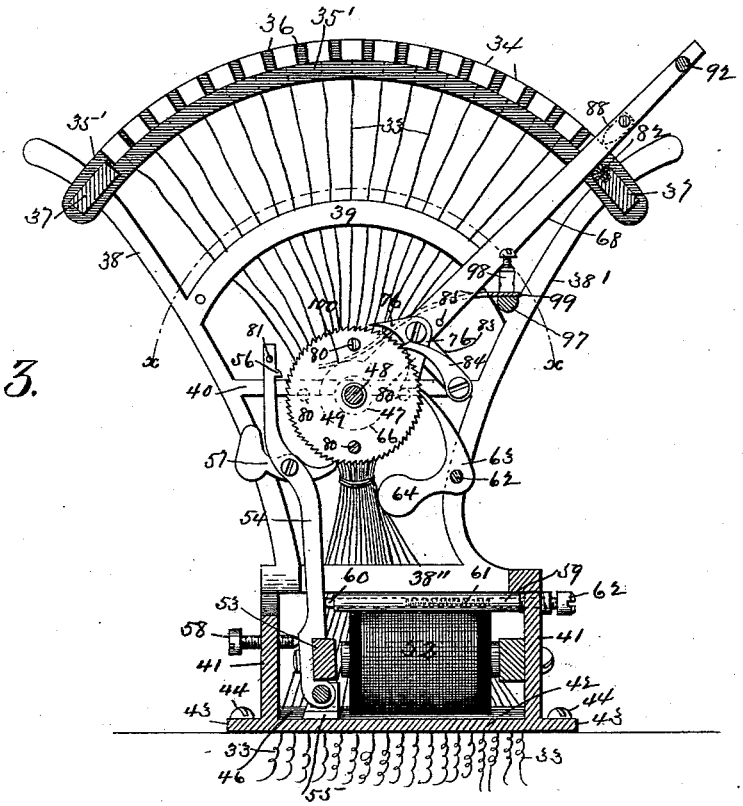
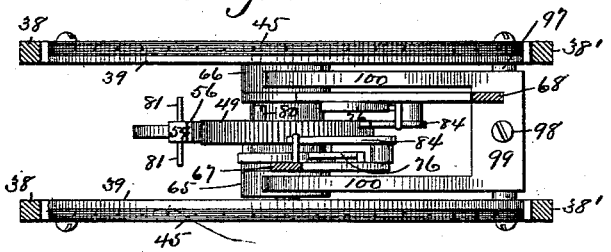


Fig. 4.



WITNESSES:

Percy C. Bowen.

F. F. Chapman.

INVENTOR

James F. McLaughlin,

By Joseph Lyons

Attorney

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J. F. McLAUGHLIN.

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Fig. 8.

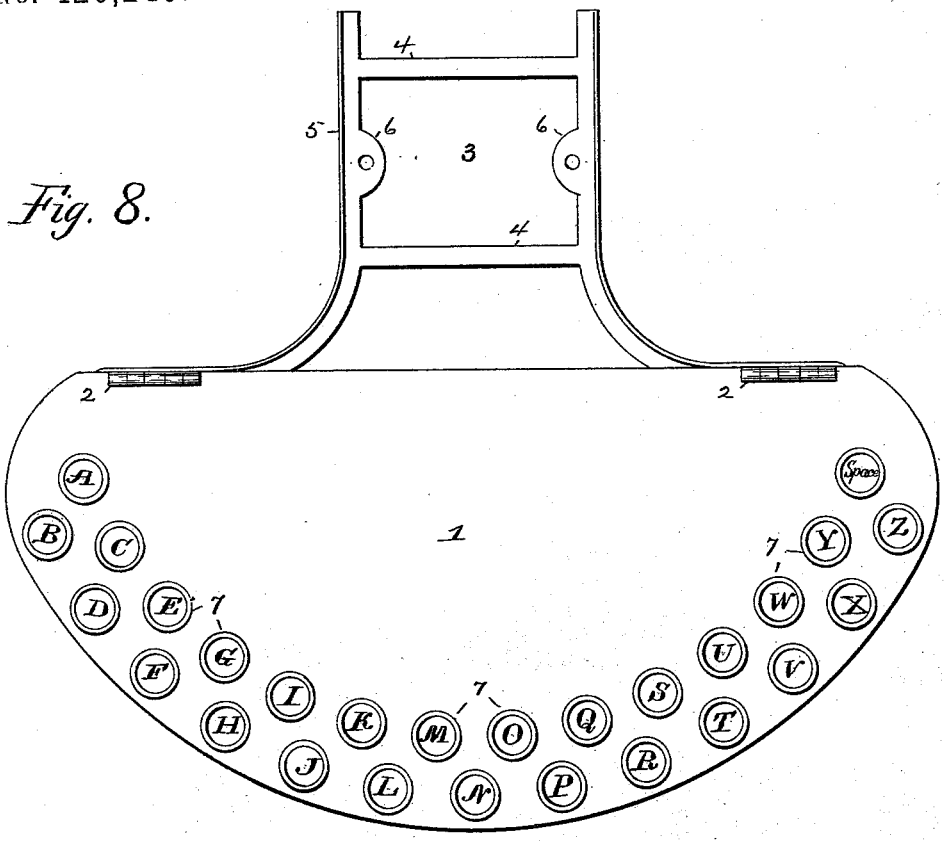
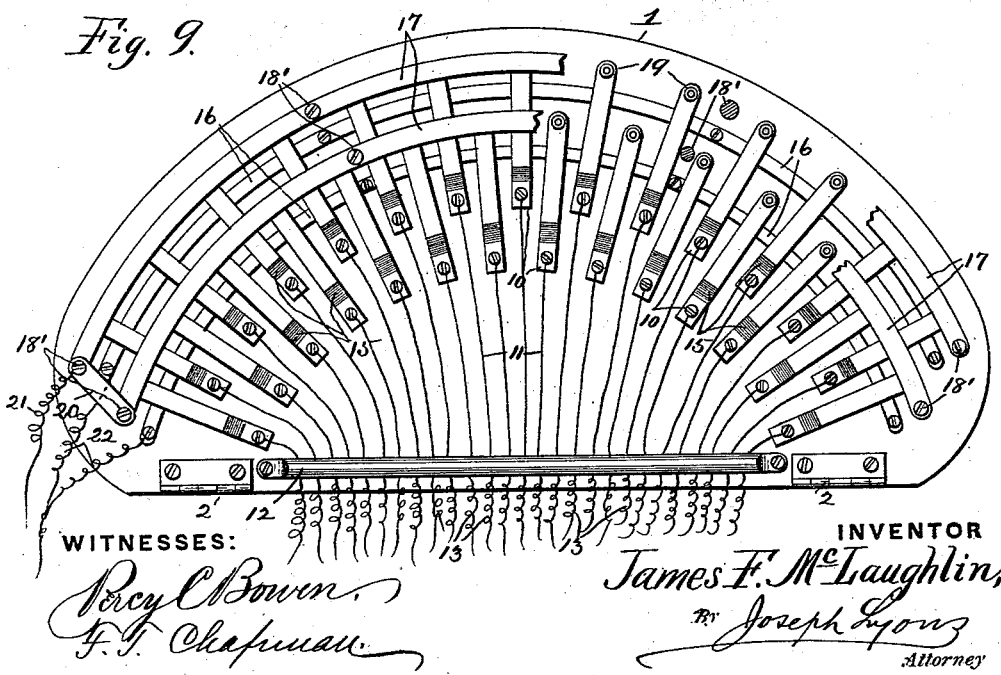


Fig. 9.



WITNESSES:

Percy C. Bowen.

F. T. Chapman.

INVENTOR

James F. McLaughlin,

By Joseph Lyon

Attorney

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J. F. McLAUGHLIN.

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Fig. 10.

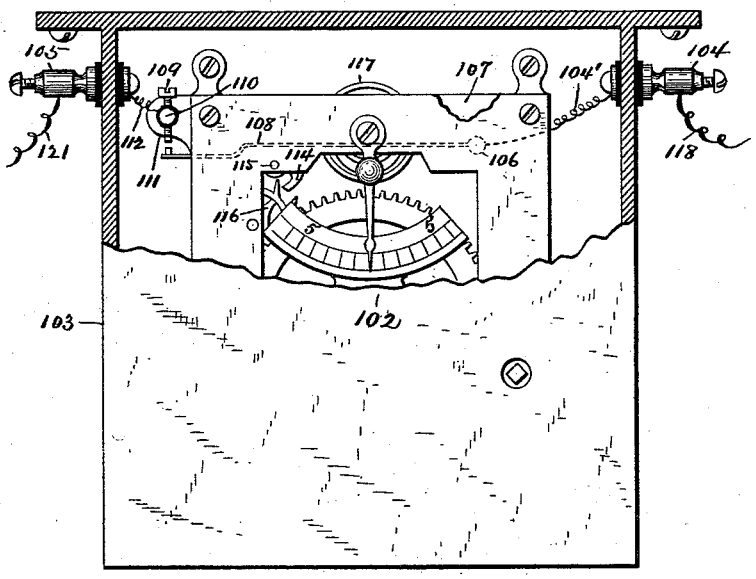
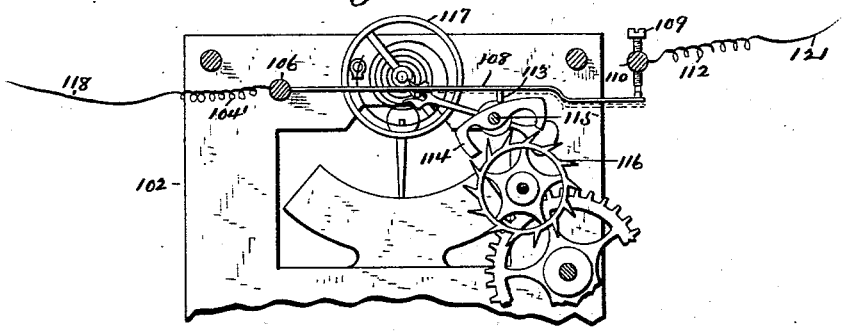


Fig. 11



WITNESSES:

Percy C. Bowen,

F. T. Chapman.

INVENTOR

James F. McLaughlin,

By Joseph Lyon,

Attorney

UNITED STATES PATENT OFFICE.

JAMES F. McLAUGHLIN, OF PHILADELPHIA, PENNSYLVANIA.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 420,240, dated January 28, 1890.

Application filed August 29, 1889. Serial No. 322,343. (No model.)

To all whom it may concern:

Be it known that I, JAMES F. McLAUGHLIN, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Printing-Telegraphs, of which the following is a specification.

My invention has reference to improvements in printing-telegraphs in which a key-board, in connection with an electrical type-writer, heretofore invented by me and fully shown and described in other pending applications, is used both for transmitting and receiving messages; and, broadly speaking, the invention consists in the combination, with such instruments at each station, of a mechanical rheotome at the transmitting-station and electrical synchronizing-rheotomes at each station, the latter being controlled by the former and constructed in the manner hereinafter more fully explained, to avoid the necessity of absolute synchronism.

The invention also consists in the various combinations and constructions hereinafter set forth, all of which will fully appear from the following detailed description with reference to the accompanying drawings, which illustrate one special embodiment of my invention, and more especially of the electrical synchronizing-rheotome. I desire it, however, to be understood that I do not mean to limit myself to the identical details herein shown and described, since the same may be variously changed without departing from the *modus operandi* herein disclosed. More especially are such changes admissible in the mechanical rheotome and in the electrical synchronizing-rheotome, as will be clear to those skilled in the art.

In the drawings, Figure 1 represents the equipment of two stations with sets of instruments constructed and arranged in accordance with my invention, showing the key-board and synchronizing electrical rheotomes in vertical section. Fig. 2 is a front elevation, partially in section, of the automatic synchronizing electrical rheotome. Fig. 3 is a longitudinal vertical section of the apparatus shown in Fig. 2. Fig. 4 is a section of the synchronizing electrical rheotome on a somewhat larger scale than that of Fig. 3, and taken on the line x x of Fig. 3. Figs. 5, 6, and 7 are respectively a rear view, a central section, and a front view of one of the index-arms of the electrical rheotome. Fig. 8 is a top plan view of the key-board and a portion of the frame supporting the same. Fig. 9 is a bottom plan view of the key-board removed from its supporting-frame. Figs. 10 and 11 are detail views of a mechanical rheotome for controlling the actuating mechanism of the electrical rheotome of both the local and distant printing-machines.

Like numerals of reference indicate like parts throughout all the drawings.

Referring to the drawings, there is shown in Figs. 1, 8, and 9 a key-board 1 of insulating material rounded at the front and attached by hinges 2 (shown in Figs. 8 and 9) to a supporting-frame 3. The main portion of this frame 3 conforms to the shape of the key-board, being shown as a skeleton frame provided with cross-bars 4, which serve to strengthen the frame and support parts hereinafter referred to; and at the rear beyond the key-board the said frame is reduced in width, as shown at 5, and is provided with inwardly-projecting ears 6 for securing thereto the electrical rheotome. (Shown in Figs. 2 and 3.) Concentric with and adjacent to the curved edge of the key-board are two series of alternating finger-keys 7, each key consisting of a circular head having a letter, word, or other symbol on its upper or exposed face, and a shank 8 extending through a hole 9 in the key-board. Each finger-key is carried by the free end of a spring-metal strip 10, so that there are two series of metal strips, and these are radially arranged beneath the key-board and secured thereto at their inner ends by screws or other means. The spring-strips yield when the keys are depressed and return them to their normal position when released. Leading from the fixed ends of the strips 10 are conducting-wires 11, (one for each strip,) passing through a bar 12 of insulating material, which bar is secured to the under side of the key-board at the rear thereof and extends across the path of said wires, as clearly shown in Fig. 9. Beyond the bars 12 the wires 11 are each formed into a short coil 13, and are then secured to a strip 14 of insulating material supported on one of the cross-

bars 4 of the frame 3, as shown in Fig. 1; and it will be understood that when the key-board is turned on its hinges the coils will yield to such movement and relieve the wires from strain.

Each spring-strip 10 is bent near the rear or fixed end, as shown at 15, so that the free end is parallel to but at a distance from the under side of the key-board. Between the strips and the under side of the key-board are two curved metallic bars 16, concentric with the edge of the latter and respectively adjacent to and in normal contact with the free ends of the two series of strips.

Below the free ends of the two series of strips 10 are two curved metallic bars 17, supported by posts 18′, (see Fig. 9,) depending from the key-board. Each of these bars 17 is provided on the upper surface with platinum contact-points 18 immediately below similar points 19 on and near the free ends of the strips 10. The bars 17 are connected near one end by a metallic bridge-piece 20, and are electrically connected by means of conductors 21 to the contact-point 21′ of a switch 22, which in turn is connected with a battery 23 by a conductor 24, the battery itself being grounded, as shown. The bars 16 are electrically connected with the lever of the switch by means of conductors 25. It will now be seen that the circuit between any one of the wires 11 and the battery 23 may be completed by depressing the key on the strip 10, to which the particular wire 11 is attached, until the point 19 is in contact with the point 18 on the bar 17 thereunder; or the circuit may be completed by moving the switch-lever onto the contact-plate 21′, in which case the said circuit is through the bars 16, and remains closed until the switch is again opened. In other words, the switch when closed establishes the circuit from the battery 23 to any one of the wires 11, and when the switch is opened the circuit can only be closed by depressing some one of the keys 7. Each wire 11 leads to one terminal of the coil of an electro-magnet 26, forming part of a printing mechanism, which in the drawings is conventionally illustrated only, being fully shown and described in an application filed by me on the 5th day of June, 1888, and serially numbered 276,151, and in other applications.

Adjacent to each magnet 26 is an armature 27, constituting the shorter arm of a lever 28, which latter is mounted on a post 29. Bearing on the outer end of the longer arm of the lever 28 there is a pin 30, with the other end adjacent to and in such relation to a type-lever 31 that when the magnet is energized, as hereinafter described, and attracts its armature, thus raising the outer end of the longer arm of the lever, the pin will be forced against the type-lever and move it into engagement with a platen 32, all of which is fully described in my aforesaid application. From the other terminal of the coil of each magnet 26 proceeds a conducting-wire 33, terminating in one of a number of contact plates or blocks 34. (Shown in Figs. 1, 2, and 3 as elements of construction of the electrical synchronizing-rheotome.) In said rheotome there are two series of plates 34, supported in curved bars 35 35′, respectively, constructed of insulating material, and these plates 34 are insulated one from the other by spacing-pieces 36. Each bar is reduced in thickness for a portion of its length, and the plates 34 and spacing-pieces 36, supported by said bar, have their upper faces exposed and flush one with the other and with the ends of the bar, as shown. The two curved bars are held parallel to each other and at a distance apart by end pieces 37, and are each supported on a frame composed of legs 38 38′, connected at the bottom by a foot 38″ and diverging upward therefrom. These legs are also connected by a curved strip 39 and a straight strip 40, integral with the said legs. The leg-frames are mounted on a support composed of end pieces 41, to which the said frames are secured in any suitable manner, and a base-piece 42, integral with the end pieces and provided with ears 43 at the ends. This support rests on the bars 4 4 of the reduced portions 5 of the frame 3, as shown in Fig. 1, with the ears 43 registering with the ears 6, and is secured thereto by screws or bolts 44, Fig. 3, extending through said ears. The wires 33 are secured to the leg-frame by curved insulating-strips 45, through which they are passed, and these insulating-strips are in turn secured to the curved strips 39. From the strips 45 the wires extend to and are held by insulating-strips 46, applied to the sides of the base-piece 42, as shown in Figs. 1 and 3.

Centrally in each strip 40 there is formed a bearing 47 for a transverse shaft 48, carrying at its middle a ratchet-wheel 49, which latter is rotated in one direction only by the following means: Secured to one of the end pieces 41 of the leg-frame support is an electro-magnet 52, included in a synchronizing-circuit, conveying intermittent impulses through the said magnet by automatic means, hereinafter described. An armature 53 is carried by an upright lever 54, pivoted at its lower end between two ears 55 on the base 42, and continued upward and bent, as shown, so that its upper end is opposite the edge of the ratchet-wheel 49. Near the upper end of the lever 54, and on the side facing the toothed edge of the ratchet-wheel, is a tooth 56, and about on a level with the lower edge of the said wheel the lever carries a gravity-pawl 57, the nose of which engages the ratchet-wheel. In one of the end pieces 41 there is a nut for a stop-screw 58, which is in the path of the armature-lever, to limit its movement from the magnet; and in the other end piece 41 there is a nut for the screw-threaded end of a sleeve 59, the other end of which is adjacent to the armature-lever to limit its movement

toward the magnet. Projecting from the free end of the sleeve 59 is a sliding pin 60, bearing against the lever 54, and retained in such position by a coiled spring inclosed in the sleeve and indicated by dotted lines at 61. The tension of the spring is regulated by a screw 62 entering the sleeve through the other end from that carrying the pin 60 and bearing on the end of the spring opposite that engaging the pin.

It will now be understood that when the magnet is energized the armature will be attracted and move the lever 54 against the action of the spring 61, thereby causing the pawl 57 to engage a tooth on the wheel 49 and rotate the latter a distance equal to the length of a tooth, by which time the lever has approached the wheel near enough for the tooth 56 to engage the wheel and prevent further rotation of the same.

When the circuit through the magnet is broken, the spring 61 reacts through the pin 60 upon the armature-lever and moves it away from the magnet until in contact with the stop-screw 58, which movement causes the pawl 57 to ride over a tooth of the wheel 49, engaging the next succeeding tooth, as will be readily understood. It will also be understood that if a series of impulses be sent through the magnet the ratchet-wheel will be moved step by step in a forward direction around its axis and ultimately complete the rotation. Pivoted on a bar or rod 62, extending between the legs 38′, there is an L-shaped gravity check-pawl 63, with its nose engaging the teeth of the ratchet-wheel 49, and having the other or free end enlarged, as shown at 64, to overbalance and hold the nose of the pawl at all times against the ratchet-teeth and prevent reverse rotation of the said wheel 49. Loosely mounted on the shaft 48, at the sides of the ratchet-wheel 49, are two similarly-constructed drums 65 and 66, having arms 67 68, respectively, projecting between and beyond the upper edges of the curved bars 35. Each drum has formed on it at one end an inwardly-projecting flange 69, and the other end closed by a plate 70, with a slotted or cut-away portion. (Shown at 71.) Extending centrally through each drum is a sleeve 72, supported by the flange 69 at one end and by the plate 70 at the other end, an eye being formed in the latter for the purpose, and through this sleeve 72 extends the shaft 48, forming a pivotal bearing for the drum, which, if otherwise unimpeded, may be freely rotated about said shaft, but is prevented from moving longitudinally thereon by end bearings formed by the ratchet-wheel 49 and strip 40, before described. Within each drum and surrounding the sleeve 72 is a coiled spring 73, one end of which is secured in a perforation in the flange 69, as shown at 74, and the other end is extended through the slot 71 in the plate 70 and secured in a perforation in the strip 40, as shown at 75, Fig. 2, the arrangement of the spring being such that when the drum is moved in one direction the tension of the spring will be increased, and when the drum is released the reaction of the spring will immediately return it to the first position, as will be readily understood.

On each arm 67 68 there is a tumbler 76, pivoted about midway of its length, one end 77 being prolonged, as shown. This tumbler is at a distance above the drum, and is shaped as shown, so that when the end 77 is depressed by a spring 78 until in contact with a stop-pin 79 on the arm it will be in the path of laterally-projecting pins 80 on the side face of the ratchet-wheel 49. As the wheel 49 is rotated in the manner hereinbefore explained—that is, by passing a series of electric impulses through the magnet 52—one of the pins 80 will be brought into contact with the end 77 of the tumbler 76, and as such rotation is continued the arm and drum will be carried around the shaft against the action of the spring 73, until the nose of the tumbler is in the path of a pin 81, projecting laterally from the armature-lever 54 near its upper end. When the armature is next attracted by the magnet, the pin 81 engages over the nose of the tumbler 76 and depresses the same, thus raising the end 77 out of engagement with the pin 80 on the ratchet-wheel 49 and releasing the arm and drum. The reaction of the spring 73 will immediately return the arm and drum to the first position and against a buffer 82, of leather, felt, or other material, mounted on one edge of one of the end pieces 37, and during this return movement the tumbler 76 assumes its normal position with the end 77 again in the path of one of the pins 80 on the ratchet-wheel, which pin will ultimately engage the heel 77 of the tumbler as the wheel continues to rotate, and the arm and drum will be again moved with the said wheel.

As shown in the drawings, there are four equidistant pins 80 on the wheel 49, two of them being diametrically opposite on one side or face, and the other two pins being similarly placed on the other side or face of the wheel, but in a line at right angles to those first mentioned, the arrangement being such that when the arm on one side of the ratchet-wheel has reached the limit of its return movement the tumbler 76 on the arm at the other side of the said ratchet-wheel will be engaged by one of the pins 80 and be immediately moved forward thereby, in the manner before described.

In Fig. 2 the arm 68 is shown in the position of rest or first position, while the arm 67 has nearly completed its forward stroke, so that a short additional movement of the ratchet-wheel will bring the nose of the tumbler 76 in the path of the pin 81, and the latter will effect the release and return of the arm 67, as hereinbefore explained, and one of the pins 80 (indicated by dotted lines) on the other side of the ratchet-wheel will be moved against the end 77 of the tumbler 76

on the arm 68, which latter will be immediately carried forward by the continued rotation of the ratchet-wheel effected by the succeeding electrical impulses through the magnet 52, while the other arm 67 remains at rest against the buffer 82.

Each arm 67 68 has a short side extension 83 about opposite the tumbler 76, and one end of the spring 78 is secured to said extension. At the outer end of this extension there is pivoted a gravity-pawl 84, with its nose resting on the toothed edge of the ratchet-wheel, over which edge this pawl rides freely during the return movement of the arm; but when the said arm strikes the buffer the pawl engages a tooth on the wheel and prevents any rebound of the arm. A stop-pin 85 on each arm above the free end of the pawl 84 limits its upward movement and prevents it from moving out of operative relation with the teeth of the ratchet-wheel.

On the front side of the arm 67 and on the rear side of the arm 68, at a point above the curved bars 35 35′, there is secured, by means of screws, as shown, or otherwise, a metallic bracket 86, having depending side wings 87, between which is mounted a sliding metallic block 88, with its lower edge resting on the upper curved surface formed by the contact-plates 34 and space-pieces 36, before described. Projecting from the upper edge of this block 88 there is a short stem 89, entering a recess 90 in the bracket 86 and bearing on a coiled spring 91, confined in the said recess, and tending at all times to force the block 88 into close contact with the plates 34.

The arms 67 68 are both extended above the brackets 86, and each carries at its upper end a laterally-extending rod 92, secured thereto by a screw or other means. This rod projects toward the front of the apparatus, and to its free end is secured a depending pointer 93, with its lower end adjacent to the face of a curved plate 94, mounted at its ends on the front legs 38 38′, in front of but out of contact with the plates 34 on the bar 35. On the face of this plate are two concentric rows of letters, symbols, or other signs corresponding to those on the keys 7 of the key-board.

As shown in the drawings, the pointer 93 on the arm 67 travels in front of the upper row of letters or symbols on the plate 94, and the pointer on the arm 68 travels in front of the lower row thereon. Thus the said upper row corresponds to the contact-plates on the bar 35 and the lower row with the plates on the bar 35′.

The arm 68 is of greater length than the arm 67, and the rod 92 on the former is also longer than that on the latter, so that the said arm 67 may move past the arm 68 without interference, as will be readily understood.

The pointer 93 of the arm 68 has an expanded lower end 95, of sufficient width to cover the letter or symbol of the upper row on the plate 94 when the needle-point extension or finger 96 of said pointer is opposite a letter or symbol on the lower row, so that only the lower sign is seen, and confusion of the upper and lower lines is thereby avoided. The needle-point or finger 96 is bent inwardly, as shown in Figs. 1 and 6, to bring its free end into proximity with the plate 94 to insure correct reading.

Extending between the two legs 38′ at the end of the curved strips 39 is a cross-bar 97, of insulating material, to which is secured, by means of a binding-post 98, a metallic plate 99, having two projecting spring legs or brushes 100, bearing with their free ends on the drums 65 66, respectively, as clearly shown in Figs. 1, 2, and 4. To the binding-post 98 is attached the main-line wire 101, hereinafter referred to in the description of the operation of the apparatus.

Referring now more particularly to Figs. 10 and 11, in connection with Fig. 1, there is shown a spring-motor 102 of common and well-known construction, being similar in many respects to ordinary clock-works, and consisting, essentially, of a spring-driven gear-train terminating in a pallet-wheel and anchor escapement, presently referred to.

In Fig. 10 there is shown a box or case 103, inclosing the motor 102, and provided with binding-posts 104 and 105, insulated in any suitable manner from the box and extending to the interior thereof, as shown. The binding-post 104 is connected by a wire 104′ to a pillar 106, mounted on the base-plate 107 of the motor, and having one end of a spring-metal strip 108 secured to it, the other end of the said strip being free and normally in close relation to a contact-screw 109, mounted in a stud 110. The stud 110 may be supported on an offset 111 of the base-plate 107, as shown, or on any other part of the apparatus; but it is insulated therefrom and is connected to the binding-post 105 by a short conductor 112. On the strip 108, near the free end, there is a pin 113 in the path of one arm of the anchor 114 of the spring-motor 102. The anchor is mounted upon a spindle 115, journaled in bearings in the base and top plates or frames supporting the motor gear-train, and is rocked by the combined action of the pallet-wheel 116 and balance-wheel 117 in a manner so well understood that a description thereof is not necessary. As the anchor is rocked in one direction it will strike the pin 113 and raise the free end of the spring-strip 108 until in contact with the screw 109, and when moved in the other direction the resiliency of the spring-strip will return it to its normal position, and thereby break contact with the said screw 109. The binding-post 104 receives a conductor 118, coming from a battery 119, which is grounded by a conductor 120. The binding-post 105 receives one end of a conductor 121, leading to the magnet 52, before described, which latter is in circuit with a line-wire 122, which I term the "synchronizing line-wire." The battery 119 is also

connected directly with the conductor 121 by means of a wire 123, which latter includes a switch 124.

The operation of an apparatus such as described and arranged, as shown in Fig. 1—that is, with an apparatus arranged for "transmitting" in circuit with a like apparatus arranged for "receiving"—will now be understood. Normally the mechanical rheotomes are locked by any of the well-known stop mechanism, and when it is desired to send a message the transmitting-operator starts the mechanical rheotome at his station and opens the switch 124. The condition, therefore, is as follows: The switch 124 at the transmitting-station is open and that at the receiving-station is closed, as shown, and the circuit is from the battery 119 of the transmitter through the mechanical rheotome 102 to the magnet 52, actuating the electrical rheotome, as hereinbefore described. From the magnet the circuit continues by the synchronizing line-wire 122 to the magnet 52 of the receiver, actuating the electrical rheotome of the same, and the conductors 121 and 123 to the battery 119 and to ground. This circuit is indicated by unfeathered arrows. It will now be seen that when the mechanical rheotome is started there will be a rapid make and break of the circuit, caused by the alternate engagement of the anchor-escapement with the spring-strip 108, and a series of impulses will therefore pass through the magnets 52 of the electrical rheotomes at both stations. The armature-levers 54 will thus be rocked on their pivots, in the manner hereinbefore stated, and will impart to the ratchet-wheels 49 a "step-by-step" forward movement or rotation. As each ratchet-wheel rotates it alternately carries the arms 67 68 forward with it, the said arms making successive contact with the plates 34 on the curved bars 35 at both stations.

By reference to Figs. 2 and 3 it will be seen that the contact-blocks 88, carried by the arms 67 and 68, have a bearing-edge much narrower than the length of the contact-surface of each plate 34; and the arrangement is such that when such contact-block is carried from one plate 34 to the next succeeding one it will at the end of its stroke bear upon the rearward end of the exposed contact-surface of such plate, as indicated in the drawings. The duration of the electrical contacts at the electrical rheotomes is thus prolonged, so that the main line is closed at both electrical rheotomes for a comparatively long period during each step movement of the arms 67 and 68. This is an important feature, for it renders the apparatus independent of absolute synchronism—that is to say, it is of no consequence whether or not the arms 67 and 68 move at precisely the same instant at the two connected stations; for even if they do not, owing to the prolonged period of contact, there will always be simultaneous contact at the electrical rheotomes of the two stations at some instant during the prolonged period of each contact. While the arms 67 68 are alternately in motion, as described, any one of the keys 7 of the transmitter may be depressed into contact with a point on the bar 17, when, as before explained, the circuit will be established from the battery 23 through the conductors 24 21 (the switch 22 being open when the instrument is used as a transmitter) to the bar 17, through the respective strip 10, conductor 11, and magnet 26, and by the wire 33 to the contact-plate 34, to which the said wire is connected. One of the arms 67 68 of the transmitter in moving over the plates 34, will ultimately make contact with the one in circuit with the depressed key, and then the circuit will be completed through the block 88 to the bracket 86 and arm 67 or 68, from whence it passes through the brushes 100 to the binding-post 98, and from thence by the main line 101 to the receiver. The current enters the receiver through the binding-post 98, and passes from the brushes 100 to the arm 67 or 68, moving approximately synchronously with the moving arm of the transmitter, and owing to the prolonged contacts at the electrical rheotomes, as before explained, it passes to a plate 34, with which the block 88 on the said arm is at this instant in contact, and from the block 34 the current passes by the respective conductor 33, magnet 26, wire 11, strip 10, and bar 16, with which the said strip is in normal contact, to the conductor 25 and switch 22, (which is closed when the instrument is used as a receiver,) from whence it passes by the conductor 24 to the battery 23 and to ground. This circuit, which is the main or primary circuit, is indicated by feathered arrows.

It will be seen from the foregoing that the current passes through corresponding magnets 26 at both the transmitting and receiving stations, and as both magnets are energized at some instant during the prolonged contacts, their armatures 27 will be attracted and cause the corresponding type-levers 31 to move against the platens and thereby simultaneously print the same letter.

For continuous printing one of the keys on the transmitter is depressed and held until the index-finger 93 on one or the other of the arms 67 or 68 reaches the same letter or symbol on the plate 94, in which case the corresponding type-levers on both the transmitter and receiver will be operated, and then the key may be released and another key depressed, and this operation may be repeated until the desired matter has been printed on both the transmitter and receiver.

It will, however, be understood that the mechanical rheotome will in practice be made to vibrate very rapidly, thus causing the arms 67 and 68 of the electrical rheotomes to have a rapid step-by-step vibratory movement, whereby the whole range of the alphabet and other symbols represented by the key-boards

and the electrical rheotomes will be passed through by the arms 67 and 68 within a very short time. It is therefore not necessary to observe the positions of the pointers 93 in operating the keys. Each key is simply depressed and the finger is allowed to rest upon the same a short time and is then withdrawn. Short as this time is it is longer than the time required for the arms 67 and 68 to pass through the set of symbols represented by the electrical rheotome and by the key-board.

It will be readily understood that any number of receiving-instruments may be operated by one transmitting-instrument, and that any one receiving-instrument may at any time be used as a transmitting-instrument by opening the switches 22 and 124, those on the instrument that is to operate as a receiver being normally closed.

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

1. In a printing-telegraph, the combination, with an electric printing mechanism and an electric rheotome at each station controlling the printing mechanism, comprising a series of type-lever-actuating magnets arranged in a single organized machine, of a mechanically-actuated rheotome at the transmitting-station controlling the electrical rheotome at each station, substantially as described.

2. In a printing-telegraph, an electric circuit connecting the various stations and including the actuating electro-magnets of an electrical rheotome at each station and a mechanical rheotome at the transmitting-station, in combination with an independent electric circuit, including a series of type-lever-actuating magnets, constituting an organized electric printing mechanism, and the electric rheotome at each station and a key-board at the transmitting-station, substantially as described.

3. In a printing-telegraph, the combination, at each station, of an electrically-actuated step-by-step rheotome comprising moving contacts and stationary contact-plates, spaced as described, to preserve circuit throughout the greater part of the paths of the moving contacts, and an electrical printing mechanism at each station in the circuit of these rheotomes, with a mechanically-actuated rheotome at the transmitting-station controlling the electrical rheotomes, and a key-board controlling the printing mechanisms, substantially as described.

4. In a printing-telegraph, the combination, at each station, of an electro-magnetic printing mechanism and a key-board for controlling the same, with a line and circuit connections between the key-board and the electro-magnets of the printing mechanism, a ground-connection common to all electro-magnets, and a single switch in said common ground-connection, whereby the printing apparatus is adapted for receiving when the switch is closed and is adapted for transmitting when the switch is open, substantially as described.

5. In a printing-telegraph, the combination, at each station, of a printing mechanism actuated by electro-magnets, a line connecting the stations, and a key-board at each station, composed of keys normally in circuit with the electro-magnets, with front and back contacts for the keys, permanent ground-connections for the front contacts, and a switch for grounding the back contacts, whereby the apparatus is adapted for transmitting when the switch is in one position and for receiving when the switch is in the other position, substantially as described.

6. In a printing-telegraph, the combination, at each station, with an electric printing mechanism and synchronizing-rheotome in circuit therewith, of a key-board with the keys in circuit with the said printing mechanism and provided with electric contacts for completing the circuit through the keys when depressed, and other contacts for completing the circuit through the keys when in their normal position, and a switch in circuit with the last-mentioned contacts for cutting them out of circuit when the apparatus is used for transmission, substantially as described.

7. In a printing-telegraph, the combination, at each station, of an electric printing mechanism with an electrically-actuated rheotome consisting of two series of contact-plates in circuit with the printing mechanism, and two alternately-vibrating arms in circuit with the main-line wire, and each constructed to make successive contact with the respective series of plates, substantially as described.

8. In a printing-telegraph, a synchronizing electrically-actuated rheotome at each station receiving intermittent electrical impulses, said rheotome consisting of alternately-vibrating contact-arms having step-by-step movement, and a series of spaced contact-plates for each arm, and spacing mechanism for arresting each arm at the limit of each step movement upon the rearward end of a contact-plate, whereby each contact is prolonged throughout the greater part of each step movement of each arm, substantially as described.

9. In a printing-telegraph, the combination, at each station, of an electric printing mechanism with an electrically-actuated step-by-step rheotome consisting of contact-plates in circuit with the said printing mechanism, and alternately-vibrating arms in circuit with the main-line wire and actuated step by step over the contact-plates, each step movement beginning and terminating near the rearward end of the respective contact-plate, whereby the circuit is maintained during the greater part of such movement, substantially as described.

10. In a printing-telegraph, the combination, with an electric printing mechanism, of an electrically-actuated rheotome consisting of contact-plates in circuit with the printing mechanism, vibrating arms in circuit with

the main-line wire and making successive contact with the said plates, and actuating and releasing mechanism, substantially as described, for engaging the arms alternately and carrying them forward against the action of retractile springs and permitting them to be returned by the latter to the first position, substantially as described.

11. In a printing-telegraph, an electrically-actuated rheotome consisting of an actuating electro-magnet receiving intermittent electrical impulses, an armature-lever controlled by said magnet, a ratchet-wheel engaged by a pawl on the said lever and provided with equidistant studs, pivoted spring-retained arms provided with pivoted tumblers or dogs constructed to be engaged by the studs on the ratchet-wheel to move the arms forward and to be released therefrom by contact with the armature-lever, and insulated contact-plates arranged in the paths of contact-blocks on the arms, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES F. McLAUGHLIN.

Witnesses:
WILSON R. KER,
H. F. REARDON.