3 Sheets--Sheet 1.

H. MIDDLETON.

Telegraph Transmitters.

No. 166,712. Patented Aug. 17, 1875.

Fig. 1

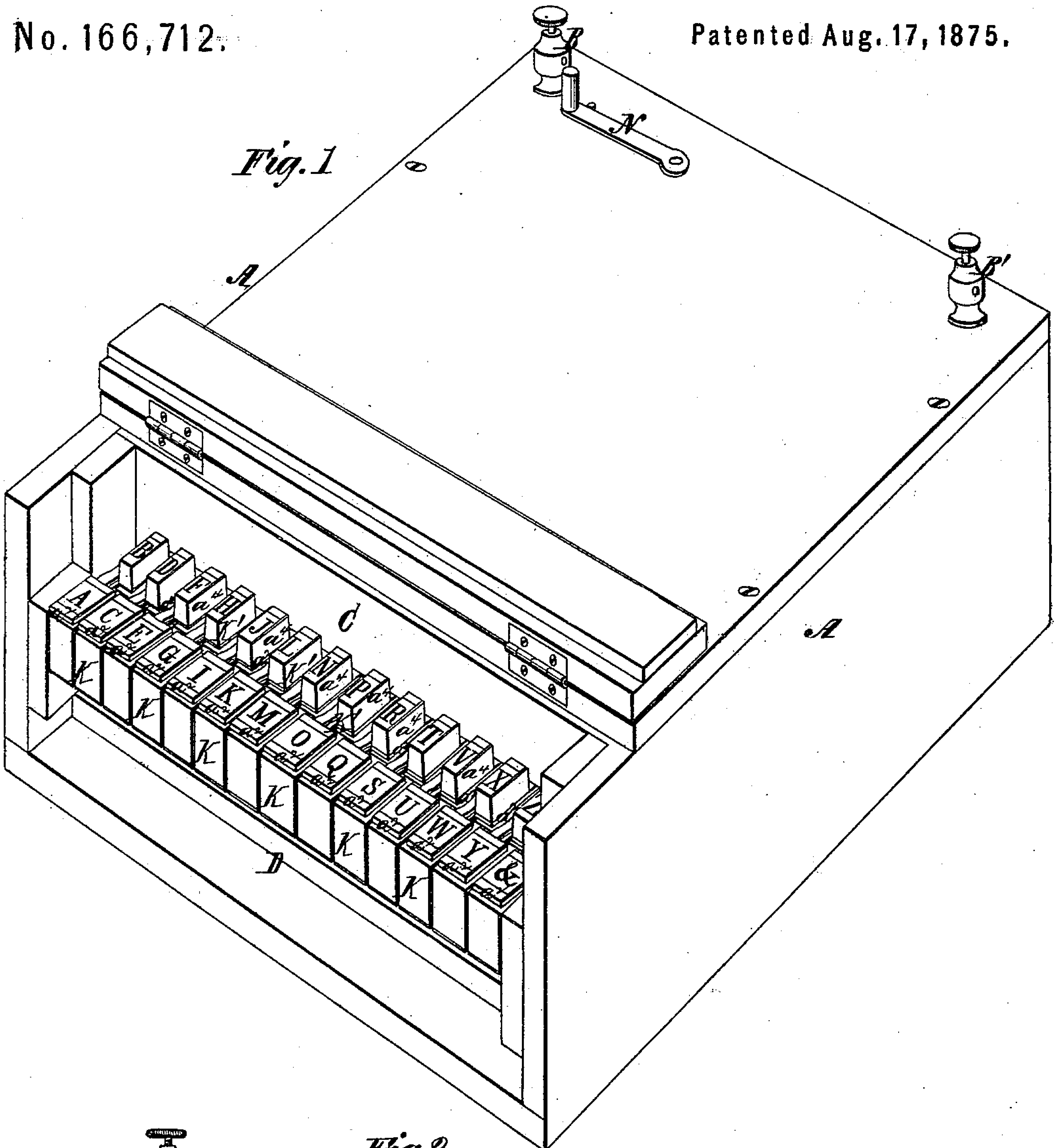
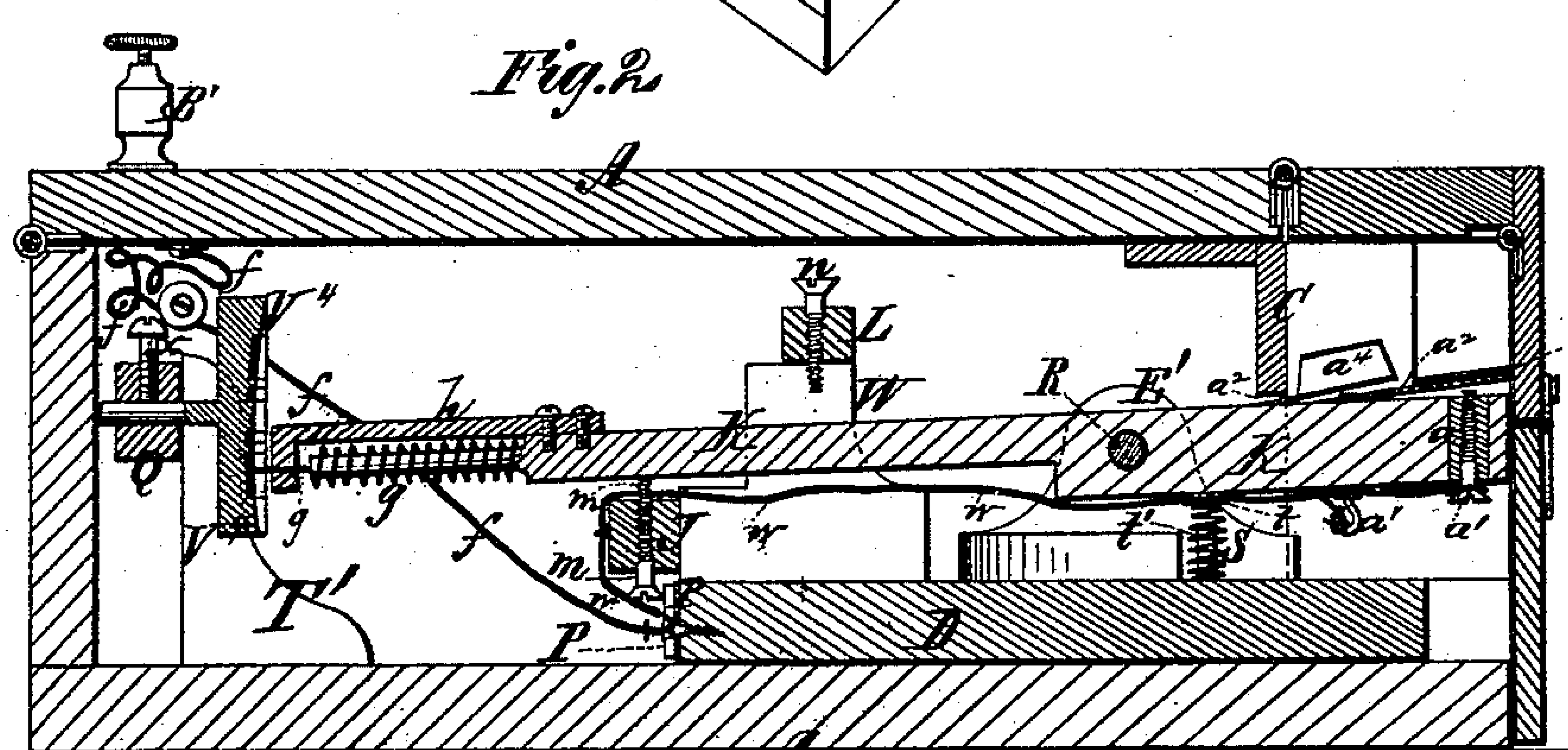


Fig. 2



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by
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N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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Telegraph Transmitters.

Fig. 3

No. 166,712. Patented Aug. 17, 1875.

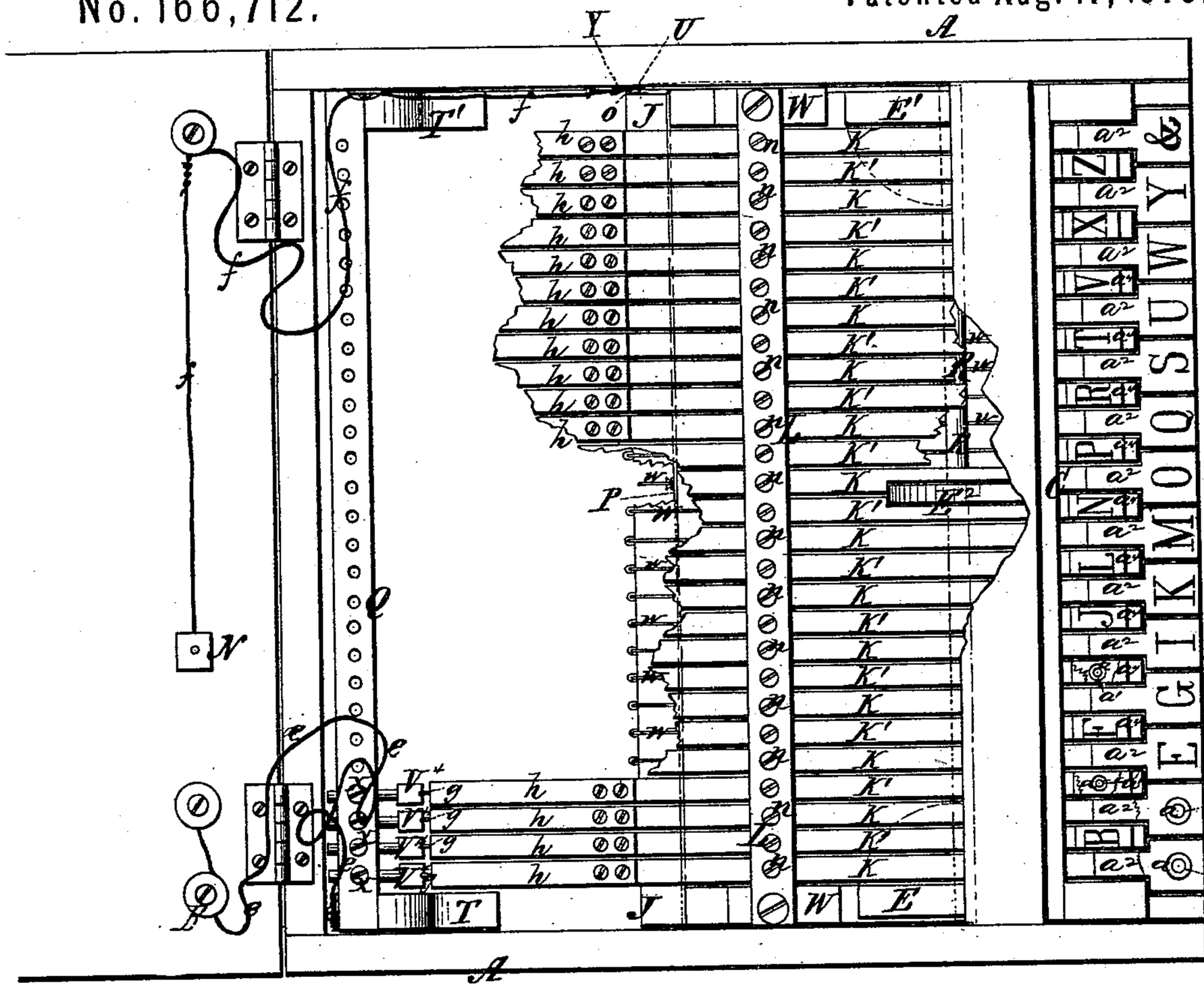

Fig. 4

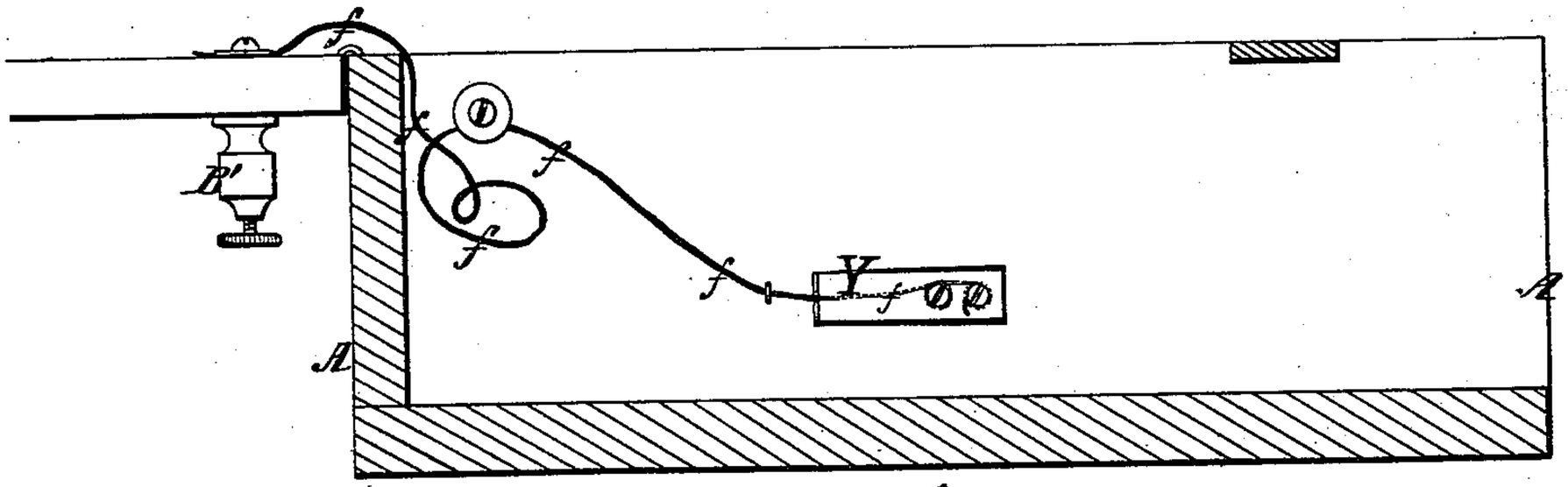

Fig. 5

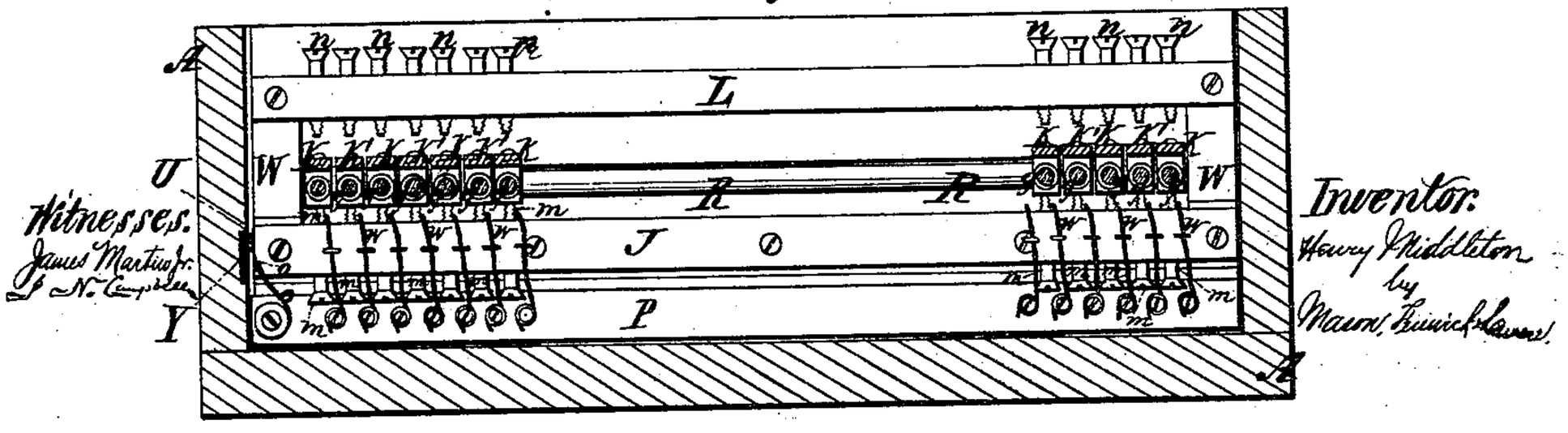

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Fig. 6

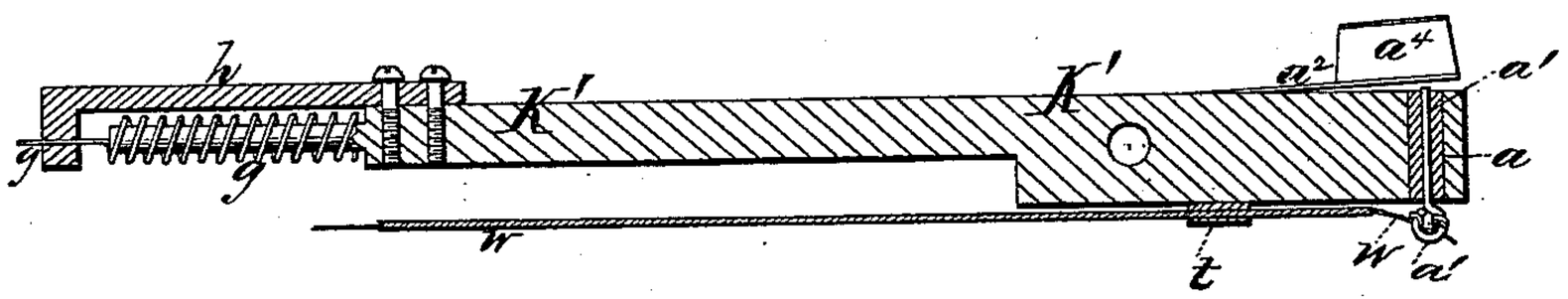


Fig. 7

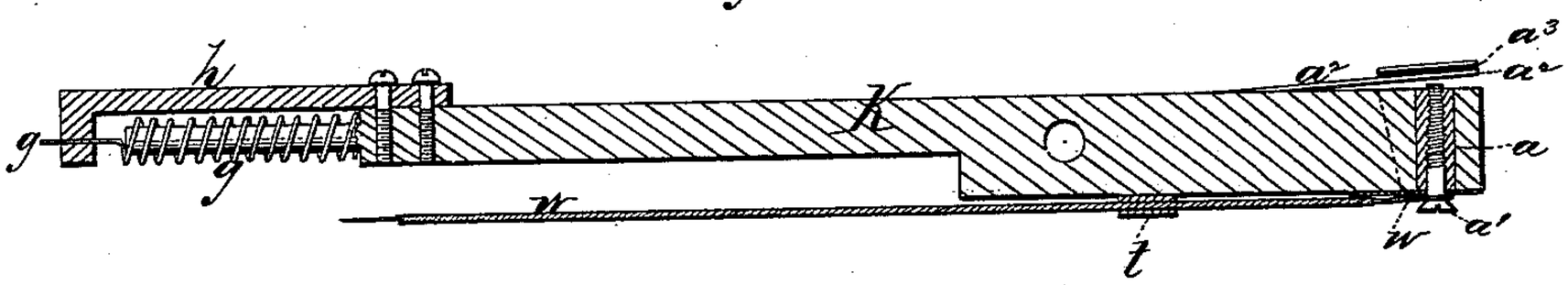


Fig. 8

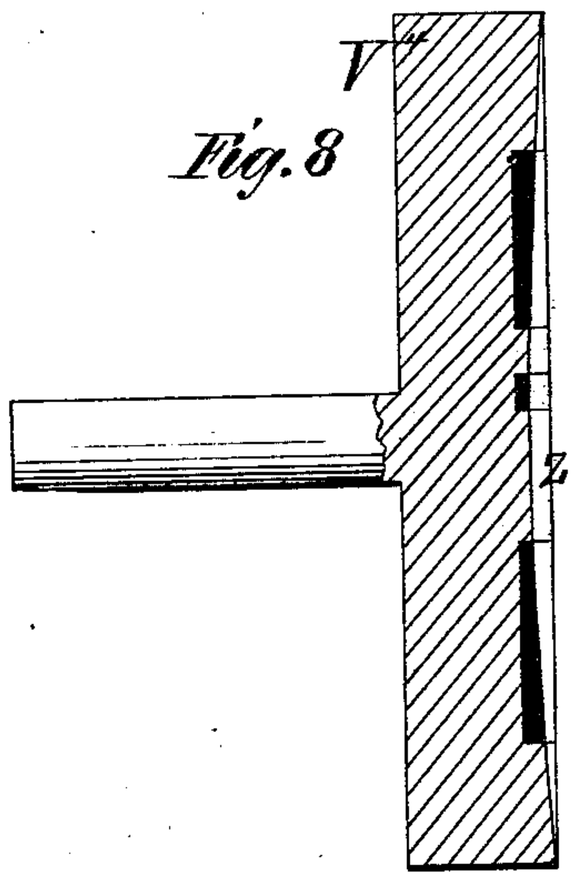


Fig. 9

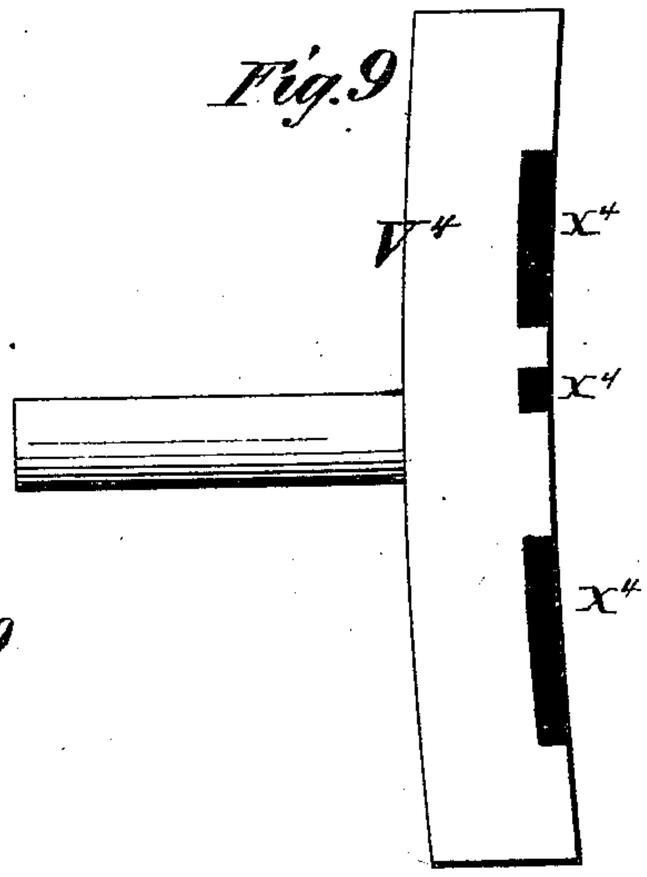
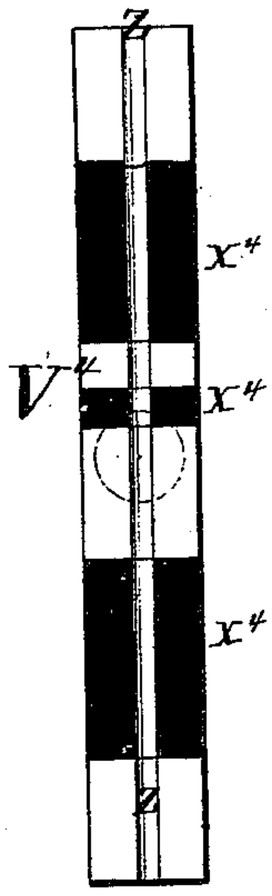


Fig. 10



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by
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UNITED STATES PATENT OFFICE.

HENRY MIDDLETON, OF CHARLESTON, SOUTH CAROLINA.

IMPROVEMENT IN TELEGRAPH-TRANSMITTERS.

Specification forming part of Letters Patent No. **166,712**, dated August 17, 1875; application filed June 10, 1875.

To all whom it may concern:

Be it known that I, HENRY MIDDLETON, of Charleston, county of Charleston and State of South Carolina, have invented new and useful Improvements in Telegraph-Keys; 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 perspective view of my telegraph-key, with the cover raised and front of box removed, so as only to expose to view the front ends of the finger-keys, upon which the letters of the English alphabet are placed. Fig. 2 is a vertical central section through the key, looking toward the right-hand side of the key-box. Fig. 3 is a top view, with the cover of the key-box thrown fully over. Fig. 4 is a vertical section through the key-box, looking at the right-hand side of the same. Fig. 5 is a vertical transverse section, looking toward the front of the key-box. Fig. 6 is a vertical central section of one of the short finger-keys and the connections thereof. Fig. 7 is a like view of one of the long finger-keys. Figs. 8, 9, and 10 are inverted views, somewhat enlarged, of the metallic letter V^4, and so formed as to make the dot and the dash of the Morse alphabet when my key is in operation, and said letters right side up.

A A is the box or case, which has attached to its top the binding-posts B and B′. The cover being raised shows the key-board C. The finger-keys are twenty-seven in number, and of two different lengths—long ones, as at K, and short ones, as at K′, alternating with one another. Twenty-six (26) of these finger-keys are marked with the letters of the English alphabet at their front ends, and when my key is properly connected with voltaic batteries and registering-instruments, the act of depressing any one finger-key communicates to such registering-instruments a system of such makes and breaks in the voltaic circuit as the Morse alphabet adopts to represent the corresponding letter written on the depressed key. The twenty-seventh finger-key has marked on it the symbol "&," and on depressing the finger-key in question the proper system of telegraph-characters used to represent that symbol will be communicated to the registering-instruments. Moreover, I reserve to myself the right of adding as many more finger-keys to my instrument, to express either numerals, abbreviations of words, or any other signs, as I may deem proper.

My key is composed of three principal parts—viz., "the key-board," "the letters," and "the battery-connections," which I will now describe in the above-mentioned order.

The key-board (see Figs. 1, 2, and 3) consists of a flat supporting-piece of wood, D, to which the brass pieces E and E^1 are fastened at suitable points. A brass rod, R, passes through holes drilled in the upper ends of E and E^1. A third piece of brass, E^2, is placed about the middle of the rod, to strengthen and give further support and stability to the same. The finger-keys K and K′ have holes bored in them, through which holes the above-mentioned rod R passes, for the purpose of supporting the finger-keys and permitting them to turn upon the rod as an axis. The finger-keys K and K′ are made of brass or other good conductor, of the form and shape shown in the drawings.

Long and short finger-keys are placed alternately for the purpose of getting the greatest number of such keys into a given space. In the front end of each of these keys is a hole containing an insulating-tube of wood, *a*, or other good non-conductor, and in the tube is fixed a conducting-core, a^1, of brass or copper, which extends from the bottom of the key upward, so as to project a small distance above the surface of the finger-key, as shown. Insulated copper wires *w* are fastened in such manner to the lower part of each core a^1 as to secure electrical communication between the core and its respective wire. These wires are twenty-seven in number, and extend backward under the finger-keys and parallel to their length, and are all put in electrical communication with the metal strip P. Spring-pieces of brass, as at a^2, are soldered to the finger-keys at a short distance behind the metal cores a^1, and project forward over them, but are so arranged and adjusted that they do not come in contact with these cores until the finger is pressed down upon them. These brass springs a^2 are of two different shapes. Those on the long keys have a thin non-conductor laid upon them, as at a^3, and upon this is fastened a letter of the alphabet. Those springs

which are attached to the short keys have wooden or ebony tops a^4, like the black notes of a piano, and upon these the proper letters are fastened.

The farther ends of all the finger-keys are made cylindrical, as shown in the drawings, so that spiral springs *g*, of silver wire, may work easily on them. The front end of each spring *g* is fastened to its respective key in such a manner as to secure good electrical communication between the two. The back ends of the spiral springs are straightened out, so that they may pass easily through small holes made in the L-shaped pieces *h*, which are attached to their respective keys, as shown. After passing through the holes in the L-shaped pieces *h* the ends of the silver springs project a little way and then terminate, their ends pressing against the surface of the metallic letter V^4, placed opposite each finger-key, and rubbing over the surface of the letter as the key is raised. Under each key a spiral spring, S, is placed, in order to restore the key to its proper position after it has been depressed. These springs have their upper ends resting against wooden strips *t*, which are glued to the under surface of the keys, and serve the double purpose of protecting the insulating-covering of the copper wire from being injured by the spring, and also of preventing the upper portion of the spring from slipping. The lower portion of each spring is fixed by a small wooden peg, t', which projects from the supporting-piece D, and passes into the hollow of the spiral. A wooden bar, J, runs under the finger-keys, across the end of the key-stand D, and behind the wooden pieces W, to which it is fastened. Into the bar J twenty-seven vertical holes are bored, so as to receive twenty-seven adjusting-screws, *m*. The keys rest upon these screws when the instrument is not working. A second wooden bar, L, is placed above the keys, and carries twenty-seven adjusting-screws, *n*, which limit the upward movement of the keys.

To facilitate further the adjustment of the various parts of my key I have so constructed it that the key-board proper may be removed from the instrument-box by taking out two screws which pass upward through the bottom of the instrument-box into the key-stand D, when the key-board may be drawn out.

The letters.—The letters are formed of pieces of brass, as at V^4, the stems of the pieces being rounded off, so as to slide horizontally into holes made for them in the brass bar Q. Clamping-screws *x* are placed in the upper part of this bar, in such manner that they can be made to adjust the position of the metallic letters V^4. The bar Q is supported by the brass pieces T and T′, which brass pieces are fastened to the bottom of the key-box. Morse characters are made by cutting out channels in the flat fronts of the pieces V^4, so that ridges of varying width and number correspond to the dot or dash of the letter they are intended to represent. Thus, to represent the letter A the brass piece V^4 is cut as in Figs. 8, 9, and 10, the channels being filled up, as at x^4, with some good non-conductor, as a piece of vulcanite or ivory. Moreover, two more pieces of vulcanite are inserted in channels at the end of the terminal ridges of the given letter, for the purpose of breaking the electrical circuit when the key is at rest, both before it begins and when it ends its motion. A groove or channel, *z*, is made in the center of the said metallic letter V^4, as in Figs. 8 and 10, in order to keep the point of the springs *g* in position when sliding over or scoring over the letter. Furthermore, this groove or channel is deeper in the middle than toward the ends, being cut into an arc whose radius is the perpendicular distance between the axis of the rod R and the farther end of any one of the silver springs *g*, as the case may be. If, however, the groove be dispensed with, as indicated in Fig. 9, the whole front surface of the letters is curved into arcs whose radiuses are the same as above mentioned.

The battery-connections.—A binding-post, B, on the top of the instrument-box, has attached to its lower part a wire, *e*, through which electrical communication can be established between said binding-post and the bar Q, and through the bar to the metallic letters V^4, which it supports. To the lower part of the binding-post B′ the wire *f* is attached, to connect this binding-post with the metal spring Y, which spring is placed against the inside of the instrument-box, and presses against a metal projection, U, Figs. 3 and 5. This projection has attached to it one end of a wire, *o*, Figs. 3 and 5, the other end of the wire being connected with the metal strip P. These connections are so made that electrical communications can be established between the binding-post B′, the wire *f*, the spring Y, the projection U, the wire *o*, the strip P, the several wires *w*, and the metal cores a^1 of the finger-keys K and K′.

Furthermore, the spring Y, whose connections have just been described, permits the key-board proper to be removed from the instrument-box without unfastening any of the battery-connections, such as wires, screws, &c., while the act of restoring the key-board to its place automatically restores the wire-connections between the binding-post B and the several keys of the key-board. A circuit-closer, N, Fig. 1, on top of the instrument-box enables the key to be cut out when desired. The contact of this circuit-closer is broken when the key is to be used for sending messages.

The method of working my key is as follows: The key is supposed to be connected with batteries, instruments, line-wire, earth, &c., in the same manner as the Morse key, and can be worked upon either the closed or open circuit principle. Let, now, any finger-key—as, for example, the one having the letter A on its forward end, as in Fig. 1—be depressed by the finger; then, the spring-piece a^2 being pressed against the core a^1 under it, (see Fig. 2,) the circuit is completed from the binding-

post B′ to the metal body of the finger-key K, and consequently to the end of the silver spring *g*, with which that key is in electrical communication. As the farther end of key K rises, the spring *g* passes from the lowest piece of vulcanite set in the metallic letter V^4, against which it is resting, and comes into contact with the first brass surface of said letter, which corresponds to the dot of the Morse character for A, and completes the circuit of the battery. As the spring moves on the vulcanite piece with which it next comes in contact it breaks the circuit, which is again restored as the spring reaches the next exposed brass portion of the metallic letter V^4, used to represent the dash of A. After passing this last brass surface the terminal vulcanite piece breaks the circuit, and shortly after the motion of the key is stopped by the adjusting-screw *n*. As soon as the operator feels the finger-key stop he moves his finger from the spring a^2, and the spring rises. The connection is thus broken between a^2 and the core a^1, when the spring *s*, under the finger-key, restores it to its first position. The finger-key, however, does not operate on its downward movement over the face of the metallic letter V^4, owing to the fact that the circuit is broken, as above described. In the same manner any other finger-key, on being depressed, completes the battery-connections, in such manner as to represent the Morse characters which correspond to the English letters, which are represented on the front ends of the finger-keys.

My key can be used to work either Morse instruments or chemical-telegraph apparatus, and by means of it messages can be transmitted between two points faster than by any known method.

Any one of the keys of my instrument, on being depressed once, communicates to registering-instruments the letters written on it. Now, in the Morse key it has to be depressed many times in succession to make a single letter; hence, it will easily be seen that any instrument that makes one letter by a single touch can write faster messages than one that takes many touches to make one letter, all other things being equal.

In the chemical telegraph a key-board and set of keys are so arranged that by striking or depressing any one of them once the key so depressed will punch in a strip of paper a series of holes to represent the letter written on the depressed key. After the strip of paper has been prepared by the punching-machine it has to be reeled on complicated machinery, which, on being set in action, transmits to the distant station what may have been written on the punched paper.

If my key is directly connected to the wires of a chemical telegraph, on depressing the keys the signals are instantly communicated to the distant station; the advantage in speed over the ordinary method being that no time is consumed in placing the paper in the punching-machines by the rehandling of the paper to place it on the reeling-machines, and no time is lost in the reeling off, &c., the paper by the cumbrous machinery at present in vogue. It being assumed that the keys on my instrument can be depressed with the same rapidity that the keys of the puncher of the chemical or automatic telegraph are worked, the time to transmit a message by my machine is the same as the time to punch a message for transmission by the automatic system.

Second. My key is applicable to duplex, quadruplex, or multiplex systems of telegraph, it being merely substituted for the ordinary Morse key, the battery-connections being exactly the same both for the Morse key and my key.

Third. My key enables the chemical telegraph to be used for all telegraph business whatever, since from its extreme simplicity, the absence of complicated machinery, and the fact that it requires but a single unskilled operator to work it, the chemical telegraphs can be used with economy and profit at way-stations, small towns, villages, &c., while up to the present time the great expense attending the working of the automatic system has precluded its use except in large cities and towns, where its chief business was the transmission of press-matter, &c.

Fourth. By the employment of my key in connection with duplex or multiplex electro-magnetic telegraphs the registering-instruments will be enabled to record as much as a given wire can transmit; and it is exceedingly probable that by the use of my key in connection with the duplex system it will be found that the electro-magnets of the registers will be enabled to record just as much as the line-wire will transmit, owing to the effect of retardation diminishing the capacity for transmission of all line-wires—in other words, that my key, in connection with the duplex, will accomplish far more and with far greater simplicity the transmission of a given amount of message-matter over a given wire than the quadruplex can ever hope to attain.

Having thus described the construction, operation, and application of my improved telegraph-key, what I claim is—

1. The finger-springs a^2, in combination with the finger-keys K and K′ and insulated cores a^1, substantially as and for the purpose described.

2. The finger-keys K and K′, having springs *g* applied thereto, as shown, in combination with the metallic letters V^4, substantially as and for the purpose described.

3. The bar Q, with its supports T and T′ and adjusting-screws *x*, in combination with the metallic letters V^4, substantially as and for the purpose described.

HENRY MIDDLETON.

Witnesses:

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