No. 897,454. PATENTED SEPT. 1, 1908.

G. A. CARDWELL.

TELEGRAPHIC TRANSMITTER.

APPLICATION FILED AUG. 19, 1905. RENEWED JAN. 20, 1908.

3 SHEETS—SHEET 1.

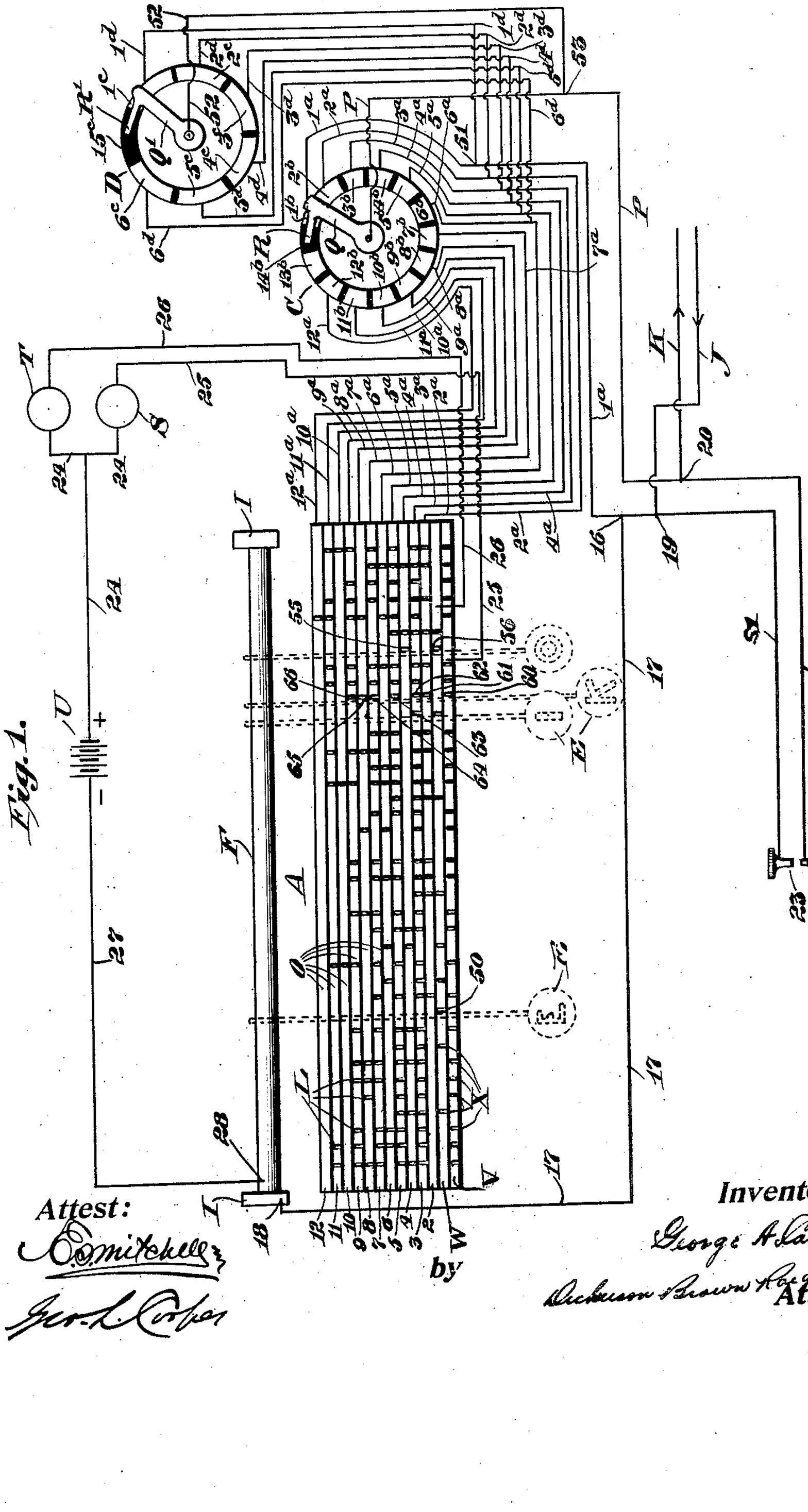

Fig. 1.

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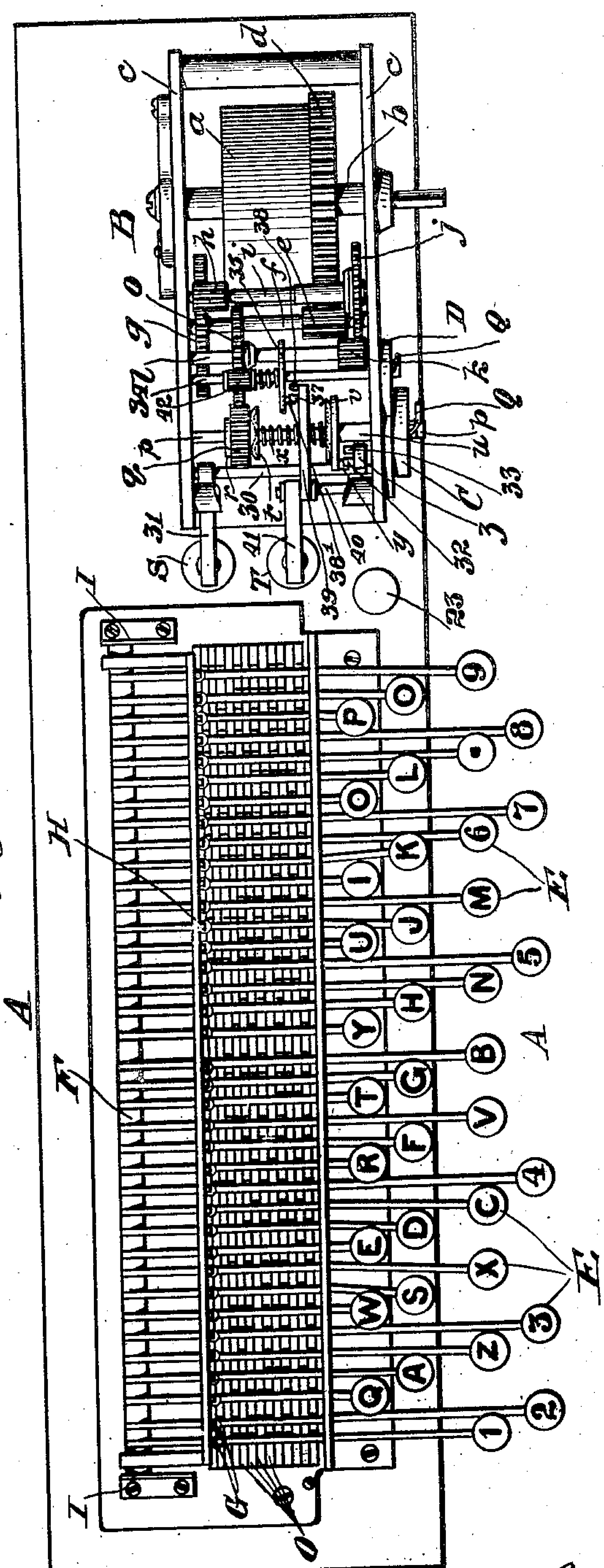
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 8.

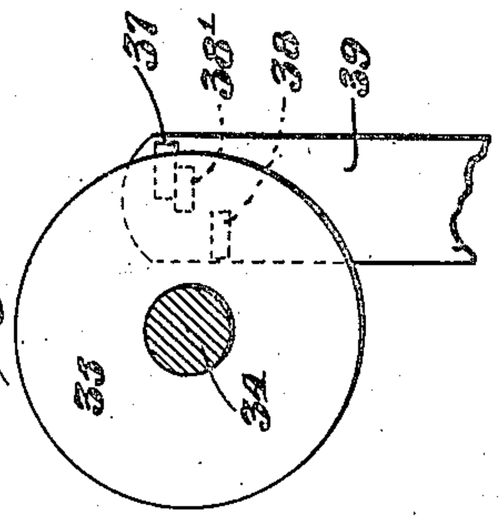


Fig. 7.

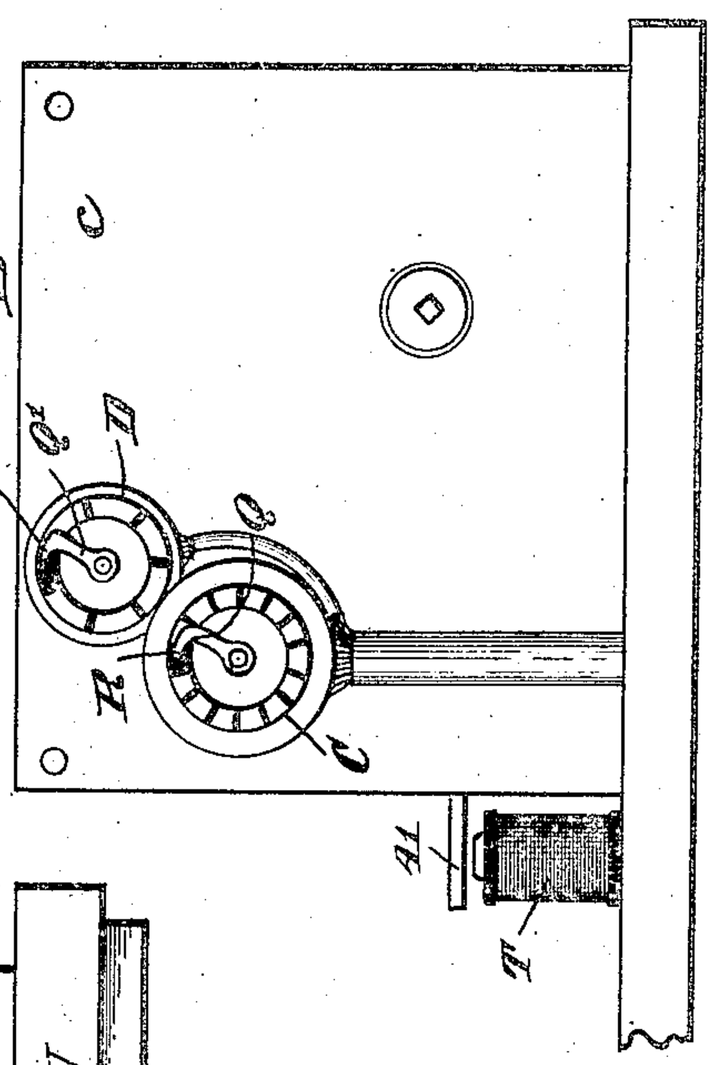


Fig. 6.

Fig. 3.

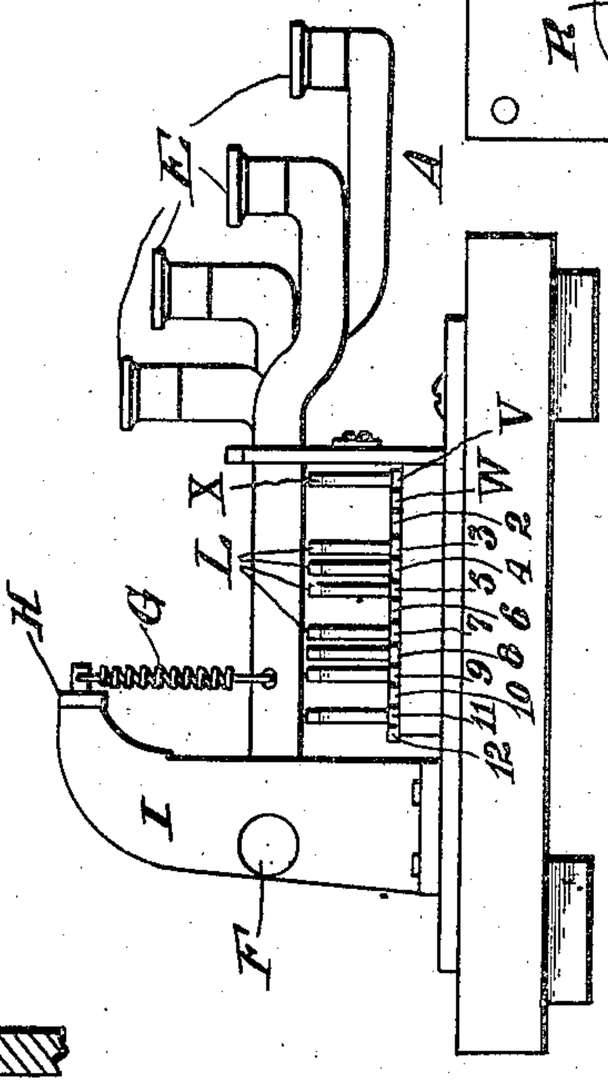


Fig. 4.

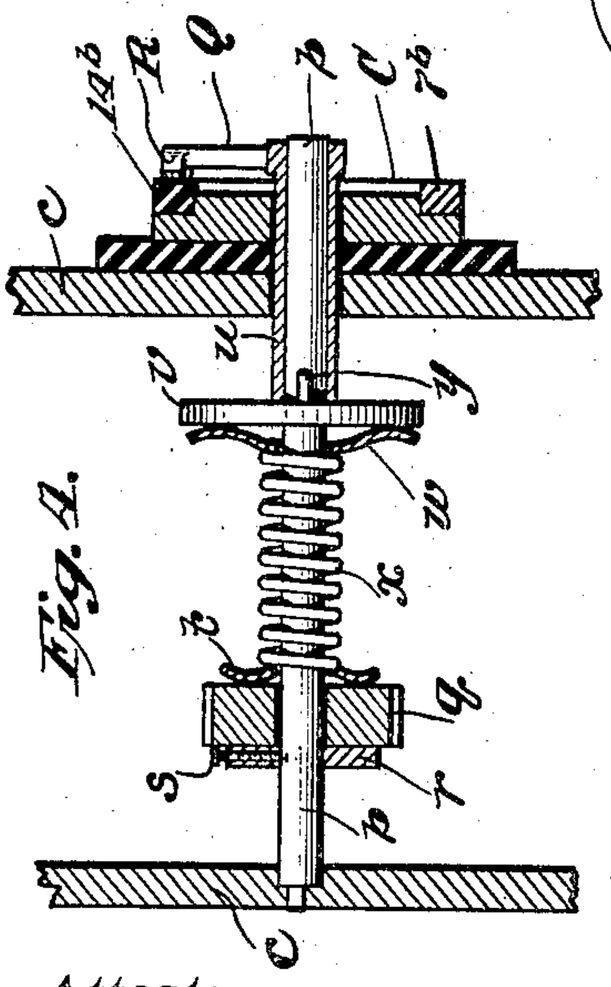
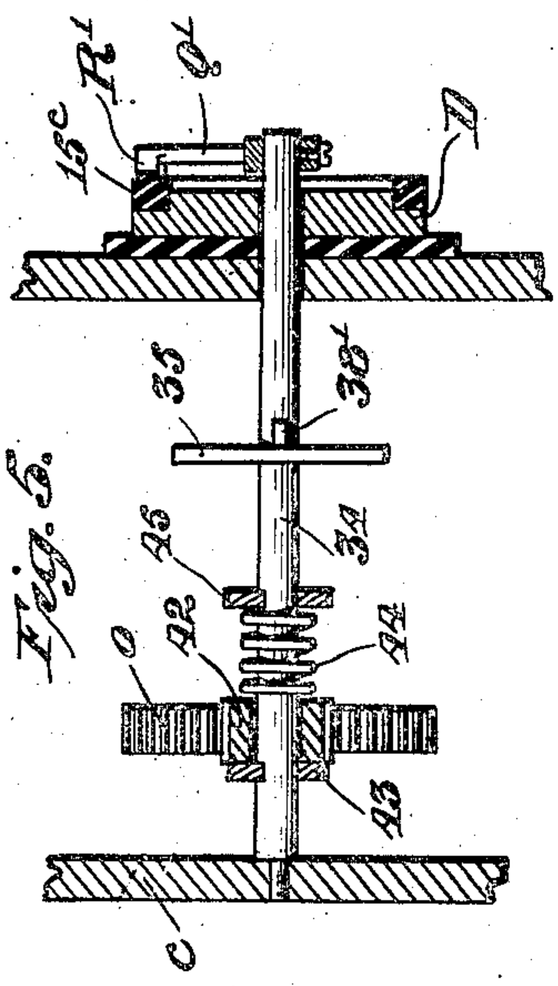


Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE A. CARDWELL, OF NEW YORK, N. Y., ASSIGNOR TO TELEGRAPH TRANSMITTING INSTRUMENT COMPANY, A CORPORATION OF NEW YORK.

TELEGRAPHIC TRANSMITTER.

No. 897,454. Specification of Letters Patent. Patented Sept. 1, 1908.

Application filed August 19, 1905, Serial No. 276,884. Renewed January 20, 1908. Serial No. 411,729.

To all whom it may concern:

Be it known that I, GEORGE A. CARDWELL, a citizen of the United States, and resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Telegraphic Transmitters, of which the following is a specification accompanied by drawings.

This invention relates to telegraphic transmitters, more particularly to a mechanical transmitter for attachment to a typewriter whereby the signals in any desired code, as for instance the Morse alphabet, may be automatically transmitted by the ordinary operations of manipulating the typewriter keys.

The objects of the invention are to improve upon the construction of such machines or attachments and increase their speed and efficiency, with simplicity of parts, which operate at all times with certainty.

Further objects of the invention will hereinafter appear and to these ends the invention consists of apparatus for carrying out the above objects embodying the features of construction, combinations of elements and arrangement of parts having the general mode of operation substantially as hereinafter fully described and claimed in this specification, and shown in the accompanying drawings, in which,—

Figure 1 is a diagrammatic representation of circuits and apparatus for carrying out the invention; Fig. 2 is a top plan view of the apparatus; Fig. 3 is an end elevation of the typewriter keyboard; Fig. 4 is a transverse sectional elevation on an enlarged scale through the operative mechanism for one of the commutators; Fig. 5 is a transverse sectional view on an enlarged scale through the operative mechanism for the other commutator; Fig. 6 is an enlarged detail top plan view of one of the brushes for the commutators; Fig. 7 is a front elevation of the motor; Fig. 8 is an enlarged detail view of the stop mechanism for one of the commutators.

According to this invention circuits and operative connections are provided whereby the manipulation of a key corresponding to any letter or figure or designation automatically sets in operation transmitting apparatus which transmits over the line a signal corresponding to the key lever operated, and after the desired signal has been automatically transmitted the apparatus resumes its normal position in readiness for the next signal.

The apparatus is so devised that it may be attached to the universal type of keyboard of the typewriter without interfering with the remaining parts of the typewriter.

Any suitable form of motor either mechanical or electrical may be used to control the operative parts of the apparatus for automatically transmitting the signals, and either mechanical or electrical devices may be used for controlling the motor.

Referring to the drawings, A represents the universal keyboard of a typewriter, the remaining parts of the typewriter being omitted as not essential to the invention and for the sake of clearness. A suitable motor B is shown, which in this instance is illustrated as a spring motor controlling commutators C and D, provided with series of segments and electrically connected to the line J—K, and also connected to contacts controlled by the key levers E. I have found that commutators such as shown at C and D operate satisfactory and well in carrying out my invention, but I am not to be understood as limiting myself to commutators, because other forms of electrical and mechanical apparatus may readily be devised for accomplishing the same ends, and the apparatus is furthermore subject to modifiations which fall in with the spirit of the invention.

I have illustrated the invention in connection with devices for transmitting signals in accordance with the Morse alphabet, although the apparatus may be modified to follow any other desired code. The key levers E, as shown, represent the alphabet and numerals having their designations on the finger pieces as illustrated in Fig. 2. These key levers are suitably hinged to a hinge bar F and suitable retracting springs G are connected to the levers and to a bar H supported in the brackets I, upon which the hinge bar F is also supported.

Extending longitudinally beneath the key levers E are a series of insulated conducting strips designated by the numerals 2 to 12 inclusive. These strips are insulated from the frame of the machine in any suitable manner, and from each other as for instance by layers of mica or any other suitable insulating compound. Each strip is provided

with contacts in the form of spring contact fingers L which project upwardly and are normally out of contact with the key levers, but make contact therewith when any given key lever is depressed. The strips 2 to 12 inclusive, which will be designated by O are each connected by wires 2^a to 12^a inclusive, with the individual segments 2^b to 12^b respectively on commutator C. A wire 1^a connects segment 1^b with the line J, while the line K is connected by the wire P with the brush Q on commutator C, said brush having a contact R adapted to sweep over the segments on the commutator. The segment 13^b on said commutator is not used in this instance and the segment 14^b is made of insulation so that when the contact R rests thereon the circuit is broken.

The commutator D is also provided with a brush Q′ and is provided with contacts 1^c to 6^c inclusive which are connected respectively by the wires 1^d to 6^d with the wires 1^a to 6^a leading to the commutator C. The segment 15^c on the commutator D is made of insulation and the brush Q′ is provided with a contact R′ adapted to sweep over the segments.

The line J and wire 1^a are connected from the point 16 by wire 17 with the frame of the machine at the point 18. The lines J—K are also connected between the points 19 and 20, by wires 21 and 22 with the switch 23 whereby telegraphic signals may be sent by hand in the usual manner over the line when it is not desired to use the typewriter attachment.

S and T represent electro magnets connected in the local circuit of a battery U and designed to control the operation of the commutators C and D respectively, that is, electro-magnet S controls commutator C, and electro-magnet T controls commutator D. The battery U is connected by wire 24 with magnets S and T, and wires 25 and 26 connect these magnets respectively with insulated conducting strips V and W extending longitudinally of the machine and arranged beneath the key levers E. These extra strips V and W are suitably insulated from each other and from the frame of the machine and are provided with contacts in the form of contact fingers X adapted to make contact with the key levers when they are depressed. The battery U is also connected by wire 27 with the frame of the machine at the point 28.

The commutators C and D are suitably connected to be operated by the motor B, which motor in this instance is operated by the spring *a* and runs continuously. The commutators C and D are controlled by suitable mechanisms by which they may be connected to the motor B as desired, and the apparatus is so arranged that upon the depression of a key lever E, one or the other of the magnets S and T will be energized, and one or the other of the commutators C and D will be thrown into connection with the spring *a* and will be automatically rotated through one revolution. The commutator C is designed to send signals over the line corresponding to the letters or designations which require a greater number of dots and dashes and take longer to send, while the commutator D is designed to transmit those signals which may be sent instantaneously or very quickly, and travels at a higher speed than does the commutator C. In this way the speed of the machine is very greatly increased over those heretofore in use.

Any suitable operative connections may be provided between the commutators, the magnets S and T and the spring *a*, and the motor may be of any suitable construction. In this instance the main shaft *b* is journaled in the frame *c* of the machine and is provided with a large gear wheel *d* operated by the spring *a*. Gear *d* meshes with pinion *e* on shaft *f* which also carries gear *g* meshing with pinion *h* on the shaft *i*, which also carries gear *j* meshing with pinion *k* on shaft *l*, which also carries the large gear wheel *o*, which is continuously operating.

The commutator C is suitably mounted on the frame *c* and the segments are insulated from each other and from the frame. Concentric with the commutator C is the shaft *p*, the commutator being fixed. Loose on the shaft *p* is a pinion *q* meshing with the driving gear *o*. The pinion *q* bears against a collar *r* fast upon the shaft *p*, which collar is adjustable by means of the set screw *s*. A friction clutch member *t* bears against a loose pinion *q*. Loose on the shaft *p* is also arranged a sleeve *u* which carries the brush Q and the stop disk *v* against which bears clutch member *w*. Between the clutch members *t* and *w* is arranged the spring *x* which presses said clutch members against the pinion *q* and stop disk *v* respectively. The stop disk *v* is provided with a stop *y*, with which coöperates the stop arm *z* connected to the shaft 30, suitably journaled in the frame *c*. On said shaft 30 is an arm 31 which forms the armature of the magnet S and is adapted to be attracted and pulled down by said magnet when the magnet is energized, thereby rocking the shaft 30 and moving the stop arm *z* into such position as to release the stop disk *v*, thereby permitting the sleeve *u* and brush Q to rotate through one revolution. It will be seen that the stop arm *z* is provided with two stops, 32 and 33, and when the shaft 30 and arm *z* are rocked, the stop 32 is moved out of contact with the stop *y*, thereby permitting the disk *v* to rotate through almost one revolution until the stop *y* comes into contact with the stop 33. The revolution of the disk *v* and brush Q is completed when the circuit of the magnet S is broken, in which case the arm *z* assumes its normal po-

sition, and the stop *y* comes into contact with the stop 32. The loose pinion *q* is continuously rotated by the driving gear *o*, but the rotation of the disk *v* and the sleeve *u* is prevented by the stop arm *z*. As soon as the stop arm *z* is rocked, thereby releasing the disk *v*, the friction between the clutch members *t* and *w* and the gear *q* and disk *v* is sufficient to cause rotation of said disk and the sleeve *u*, together with the brush Q. A substantially similar clutch device operating on the same principle is provided between the commutator D and the gear *o*. As shown, the shaft 34 is concentric with the commutator D, and in this instance the brush Q′ is connected directly to said shaft, the commutator being stationary. On the shaft 34 is provided a stop disk 35 having a stop 38 adapted to coöperate with the stops 37 and 38 on the stop arm 39, which is connected to the rock shaft 40. Said shaft is provided with an arm 41 forming the armature of the magnet T. The pinion 42 meshes with the driving gear *o* and is loose on the shaft 34. Said pinion is pressed against a sleeve 43 fast to the shaft by means of a spring 44 arranged between the pinion and another sleeve 45 fast to the shaft. According to this construction the pinion 42 is continuously rotated, and when the stop disk 35 is released the friction between the pinion and the collar 43 is sufficient to rotate the shaft 34 and the brush Q′ through one revolution. The same arrangement of double stops is provided for the disk 35 as is provided for the disk *v*.

In the construction of the brushes Q and Q′, the contact which is adapted to bear upon the segments is made double as shown in Fig. 6, so that adjacent contacts are always bridged as the brush rotates, thereby never breaking the circuit between adjacent contacts which are energized, and thus enabling dashes to be sent over the line as well as dots.

In the operation of the apparatus, let it be assumed that the key lever E is depressed. In this case it will be seen that there are no contact fingers L adapted to coöperate with said key lever because a single dot represents the letter E in the Morse alphabet, and the circuits and connections are so devised that the depression of the lever E will send a single dot over the line. This is accomplished as follows: Upon depressing lever E contact is made between the lever and the spring finger 50 connected to the strip W which is in circuit with magnet T. A circuit will be completed as follows: from the battery U, by wire 24, to magnet T, by wire 26 to strip W, through contact 50 and lever E to the frame of the machine to the point 28 and back by wire 27 to the local battery U. The magnet T is energized and attracts the arm 41, thereby rocking the rock shaft 40 and moving the arm 39 out of contact with the stop disk 35, thereby releasing said disk and permitting the shaft 34 to rotate through one revolution until the stop 36 comes against the stop 38. The contact R′ of brush Q′ on commutator D was normally at rest upon the insulated segment 15^c and as the brush Q′ swept over the segments on said commutator a circuit was instantaneously completed as follows: from the line J to the point 19, thence to the point 16, by wire 1^a to the point 51, thence by wire 1^d to contact 1^c as the brush swept over said contact on commutator D, thence through brush Q′ to wire 52, back by said wire to the point 53, thence by wire P′ to point 20, and out by the line K. The brush Q′ comes to rest again upon the insulated segment 15^c. Since none of the other segments on the commutator D were included in the circuit when the key lever E was depressed, no other signals will be sent over the line and the operator at the distant station will receive the indication of one dot representing the letter E.

It will be seen that as the brush Q or Q′ starts from a position of rest to rotate through one revolution, a circuit will always be instantaneously completed through either the contact 1^b or the contact 1^c. It has been shown how a circuit is completed over the line through contact 1^c on the commutator D, and a similar circuit is also completed from contact 1^b on commutator C at every revolution of the brush Q. If the magnet S had been energized instead of the magnet T, the brush Q would be released and as it swept over the segments a circuit would be completed through contact 1^b as follows: from the line J to the point 19, to the point 16, by wire 1^a to segment 1^b, thence through the brush Q and out by wire P to the point 20 and the line K, thereby sending the signal of one dot over the line.

When any key lever is depressed a contact is made through one or the other of the strips V or W, thereby energizing one or the other of the controlling magnets S and T, and causing one or the other of the brushes Q or Q′ to be operated, and a circuit is always completed through one or the other of the segments 1^b or 1^c. For instance if the key lever O was depressed to send the letter O over the line in the Morse alphabet, the signal for this letter is two dots. It will be seen that in Fig. 1 there is one spring contact finger 55 on the strip 4, and there is also a contact 56 on the strip W, both of which contacts coöperate with the lever O. As said lever is depressed the first impulse, representing the first dot, is sent over the line as the brush Q′ sweeps over contact 1^c as hereinbefore described, because when lever O is depressed a circuit will be completed through magnet T, thereby releasing the brush Q′. Another circuit will be completed between the lever O and the contact 55 on the strip 4 as follows: To send the impulse representing the second dot over the line, current flows from the line J to point 19, to point 16, thence by

wire 17 to the point 18 on the frame of the machine, through said frame to the key lever O, thence through spring finger 55 and strip 4, by wire 4^a to segment 4^d, thence through the brush Q' as the brush sweeps over said segment and back by wire 52 to the point 20 and line K. Two impulses therefore representing two dots will be sent over the line to represent the letter O.

In general it may be said that whenever a given key lever is depressed the circuits will be completed through appropriate segments on one or the other of the commutators in order to automatically send dots and dashes over the line to represent the proper letters or numerals, or other indications. A dash is indicated by three of the contact spring fingers L arranged on adjacent strips O.

Let it be assumed that the letter K is desired to be sent over the line. This letter is represented in the Morse alphabet by a dash, a dot, and another dash. When the key lever K is depressed the circuit is first completed through said key lever and the contact 60 on the strip V, thereby completing a circuit through the magnet S, energizing said magnet and causing it to attract the armature or arm 31, thereby rocking the shaft 30 and moving the stop arm *z* out of contact with the disk *v*, thus permitting the brush Q to rotate through one revolution. As said brush sweeps over contact 1^b on commutator C a circuit will be completed from the line J to point 19, to point 16, through wire 1^a, to contact 1^b, through brush Q, back by wire P to the line K. It will be seen, however, that spring fingers 61 and 62 on strips 2 and 3 also make contact with the lever K, and therefore the segments 2^b and 3^b are also energized as the brush Q sweeps over them. Since the contact R on said brush bridges adjacent contacts a long impulse representing a dash will be sent over the line J—K because the circuit is not broken until the contact R leaves the segment 3^b. Another single impulse representing a dot is sent over the line when the brush R bears upon segment B^5, because this segment is included in circuit through spring 63 on strip 5, which makes contact with the lever K. Another dash is sent over the line as the brush passes over segments 7^b, 8^b and 9^b because said segments are included in circuit through contacts 64, 65 and 66 on strips 7, 8 and 9, which contacts make contact with the lever K.

Obviously some features of this invention may be used without others and the invention may be embodied in widely varying forms,

Therefore, without limiting the invention to the devices shown and described, and without enumerating equivalents, I claim and desire to obtain by Letters Patent the following:

1. In a telegraphic transmitter the combination of a keyboard and key levers, the line circuit, sets of electric contacts arranged in series, each of which sets is adapted to be connected to the line circuit by the operation of a key lever, and each set of contacts corresponding to a signal, a transmitting device having divisions corresponding with the said sets of contacts, and circuits and connections so devised and arranged that signals corresponding to the particular key levers operated are automatically transmitted over the line.

2. In a telegraphic transmitter the combination of a keyboard and key levers, the line circuit, series of individual electrical contacts, each of which is adapted to make contact with a key lever, the individual contacts in different series being arranged in sets, and each set corresponding to a signal, a transmitting device having divisions corresponding with the said series of contacts, and circuits and connections so devised and arranged that signals are automatically transmitted over the line corresponding to the particular key lever operated, and means controlled by said key levers for controlling the transmitting device.

3. In a telegraphic transmitter the combination of a keyboard and key levers, the line circuit, series of contacts adapted to make contact with the key levers, a transmitting device, circuits and connections between the series of contacts and the transmitting device, means for actuating said device, and means controlled by the key levers for controlling said device.

4. In a telegraphic transmitter the combination of a keyboard and key levers, the line circuit, conducting strips arranged upon the keyboard, contacts connected to said strips in predetermined arrangement and adapted to make contact with the key levers in sets corresponding to different characters, a transmitting device, means for actuating the same, and circuits and connections so devised and arranged that signals are automatically transmitted over the line corresponding to the particular key levers operated.

5. In a telegraphic transmitter the combination of a keyboard and key levers, the line circuit, conducting strips arranged along the keyboard in proximity to the key levers, contacts connected to said strips and arranged in rows or sets opposite the respective key levers and extending transversely of the keyboard, said transverse sets of contacts representing signals corresponding to the particular characters designated by the key levers, a transmitting device, means for actuating the same, and circuits and connections devised and arranged to transmit the signals by operating the key levers.

6. In a telegraphic transmitter the combination of a keyboard and key levers, the line circuit, series of contacts adapted to make

contact with the key levers, a transmitting device, comprising a commutator and brush, circuits and connections between the series of contacts and the transmitting device, means for actuating said device, and means controlled by the key levers for controlling said device.

7. In a telegraphic transmitter the combination of a keyboard and key levers, the line circuit, conducting strips insulated from each other and arranged longitudinally of the keyboard in proximity to the key levers, contacts connected to said strips and arranged in sets opposite the respective key levers and extending transversely of the keyboard, said transverse sets of contacts representing signals corresponding to the particular characters designated by the key levers, a transmitting device, comprising a commutator and brush, means for moving one relatively to the other, and circuits and connections devised and arranged to transmit the signals by operating the key levers.

8. In a telegraphic transmitter the combination of a keyboard and key levers, the line circuit, contacts adapted to make contact with the key levers, two transmitting devices, one operating at higher speed than the other and circuits and connections for automatically transmitting signals corresponding to the designations of the key levers over the line.

9. In a telegraphic transmitter the combination of a keyboard and key levers, the line circuit, contacts adapted to make contact with the key levers, two transmitting devices, one operating at higher speed than the other and circuits and connections for automatically transmitting signals corresponding to the designations of the key levers over the line, and means controlled by the key levers for controlling both of said transmitting devices.

10. In a telegraphic transmitter, the combination of a keyboard and key levers, the line circuit, series of contacts adapted to make contact with the key levers, each series corresponding to a signal or character, a transmitting device having divisions, circuits and connections between the series of contacts and the divisions of the transmitting device, means separate from the key levers for actuating said transmitting device, and said key levers being connected to control the operation of the actuating means for the transmitting device.

11. In a telegraphic transmitter, the combination of a keyboard and key levers, the line circuit, series of contacts adapted to be connected to the line circuit by movement of the key levers, each series corresponding to a signal or character, a transmitting device having divisions, corresponding in number to the number of separate series of contacts on the keyboard, circuits and connections between the series of contacts and the divisions of the transmitting device, means separate from the key levers for actuating said transmitting device, and said key levers being connected to control the operation of the actuating means for the transmitting device.

12. In a telegraphic transmitter, the combination of a keyboard and key levers, the line circuit, series of contacts adapted to make contact with the key levers, each series corresponding to a signal or character, a transmitting device having divisions, circuits and connections between the series of contacts and the divisions of the transmitting device, a source of power separate from the key levers for actuating said transmitting device and said key levers being connected to control the operation of the actuating means for the transmitting device.

13. In a telegraphic transmitter, the combination of a keyboard and key levers, the line circuit, series of contacts adapted to make contact with the key levers, each series corresponding to a signal or character, a transmitting device having divisions, circuits and connections between the series of contacts and the divisions of the transmitting device, means adapted to be released and moved always in the same direction for actuating said transmitting device, and said key levers being connected to control the operation of the actuating means for the transmitting device.

14. In a telegraphic transmitter, the combination of a keyboard and key levers, the line circuit, series of contacts adapted to make contact with the key levers, each series corresponding to a signal or character, a transmitting device having divisions, a contact adapted to make contact with the divisions on said transmitting device and bridge said divisions whereby dashes are sent over the line directly, circuits and connections between the series of contacts and the divisions of the transmitting device, means separate from the key levers for actuating said transmitting device, and said key levers being connected to control the operation of the actuating means for the transmitting device.

15. In a telegraphic transmitter a line circuit, the combination of key levers, a series of conductor plates insulated from each other, a number of sets of contacts arranged in series, each set adapted to connect electrically a different combination of the conductor plates to said line circuit and a switch or brush adapted to pass over said conductor plates and means controlled by said key levers for actuating said brush.

16. In a telegraphic transmitter the combination of the keyboard and key levers, the line circuit, a transmitting device, a number of sets of contacts arranged in series, each set adapted to be connected to the line circuit by the movement of a key lever, circuits from said contacts to the transmitting device, and

means controlled by said key levers for actuating said device.

17. In a transmitter the combination of a set of key levers, the line circuit, sets of contacts adapted to make contact with the key levers, a transmitting device, connections between the sets of contacts and the transmitting device, means for actuating said device, and means for controlling said device.

18. In a telegraphic transmitter the combination of a keyboard and key levers, the line circuit, sets of contacts adapted to make direct contact with the key levers, a transmitting device, comprising a commutator and brush, circuits and connections between the sets of contacts and the transmitting device, means for actuating and controlling said device.

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

GEORGE A. CARDWELL.

Witnesses:
WILLIAM R. CONKLIN,
FREDERIC J. SWIFT.