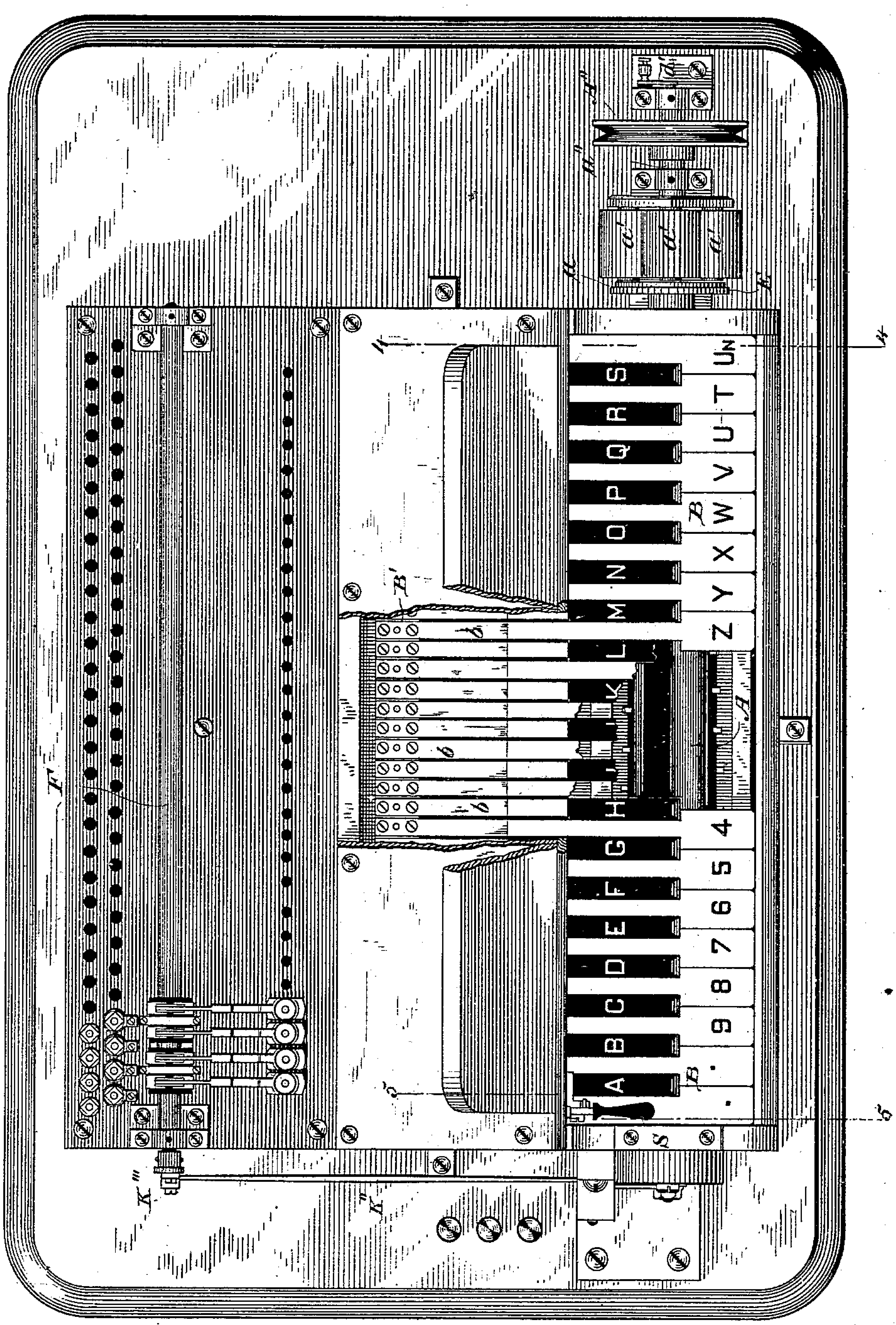
(No Model.) 5 Sheets—Sheet 1.

H. VAN HOEVENBERGH.

TRANSMITTER FOR PRINTING TELEGRAPHS.

No. 259,610. Patented June 13, 1882.

Fig. 1.



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(No Model.) 5 Sheets—Sheet 2.

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TRANSMITTER FOR PRINTING TELEGRAPHS.

No. 259,610. Patented June 13, 1882.

Fig 2.

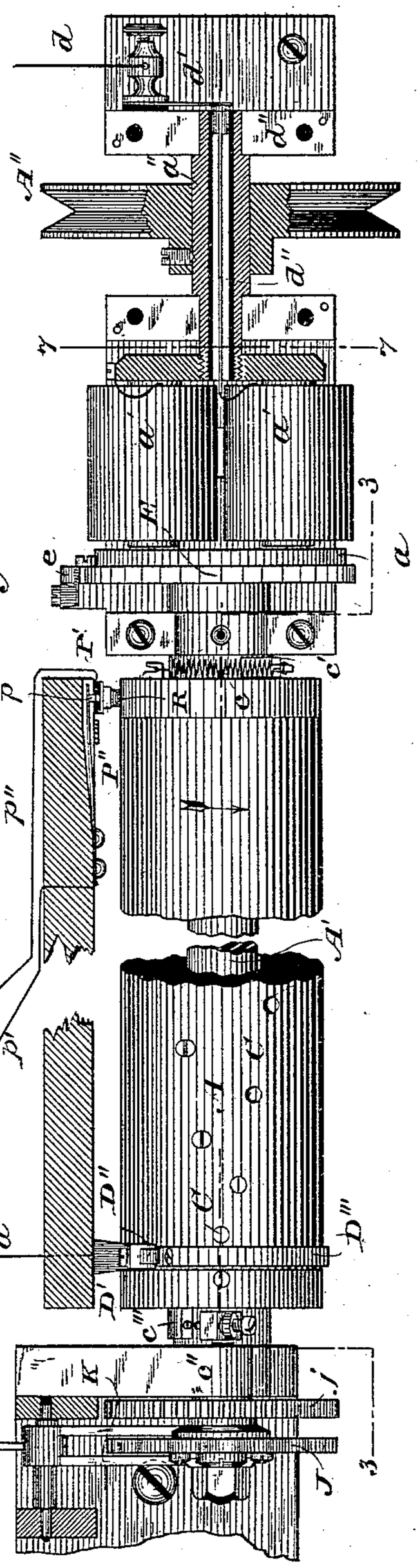
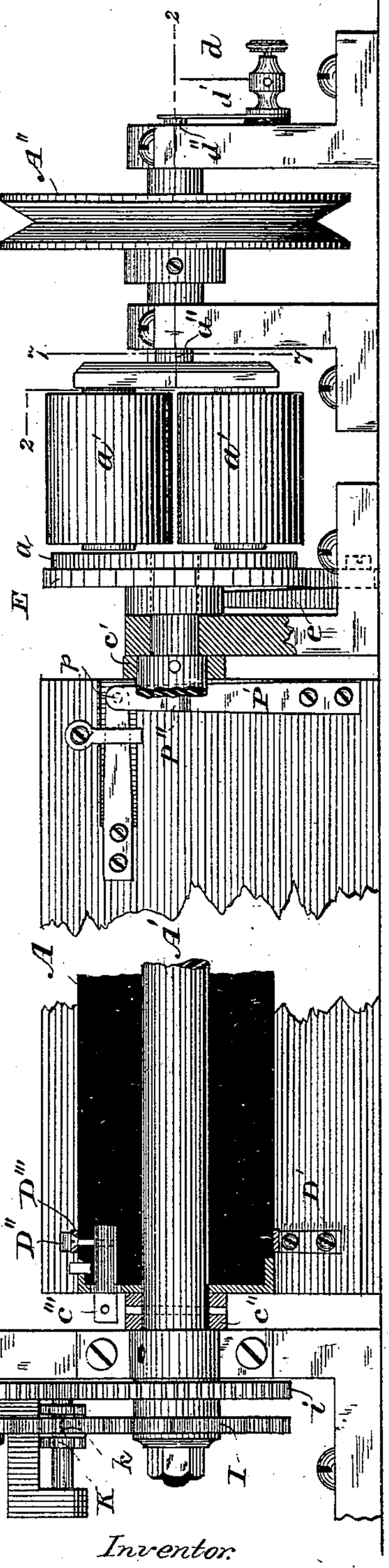


Fig. 3.



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(No Model.) 5 Sheets—Sheet 3.

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Fig. 4.

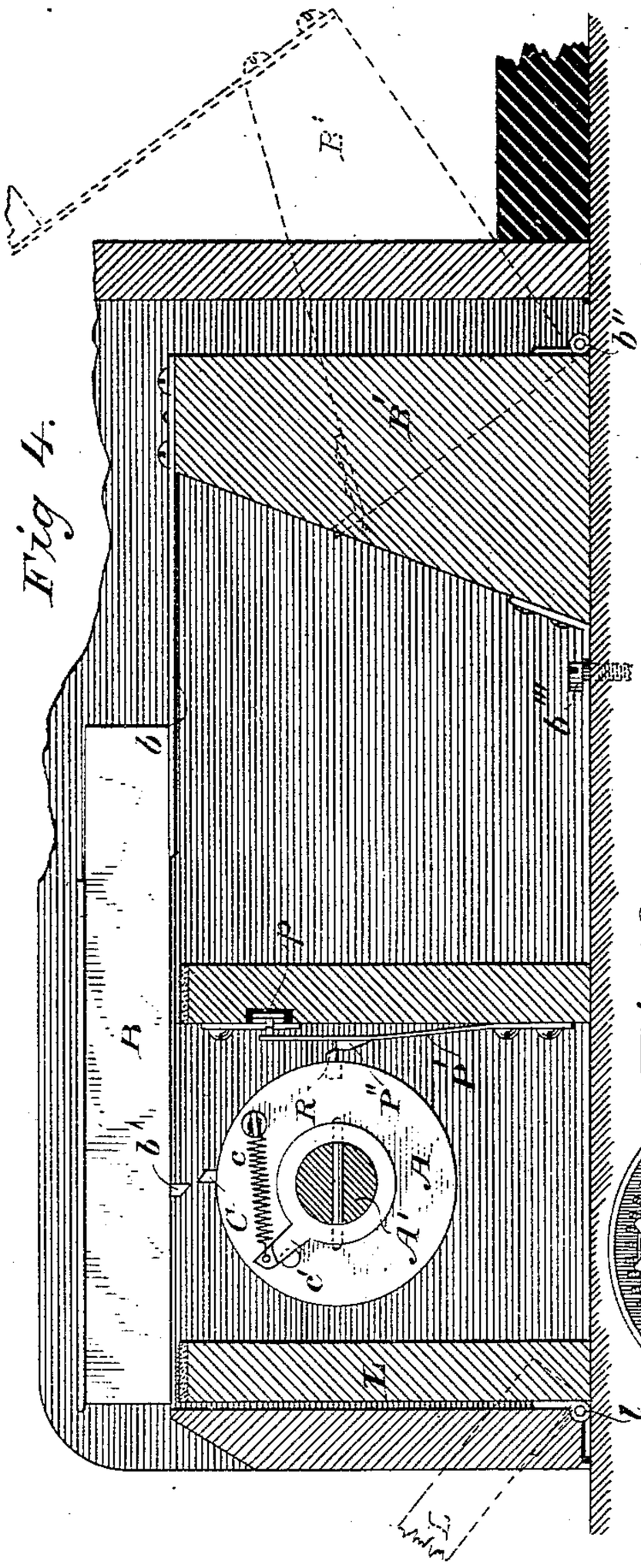

Fig. 5.

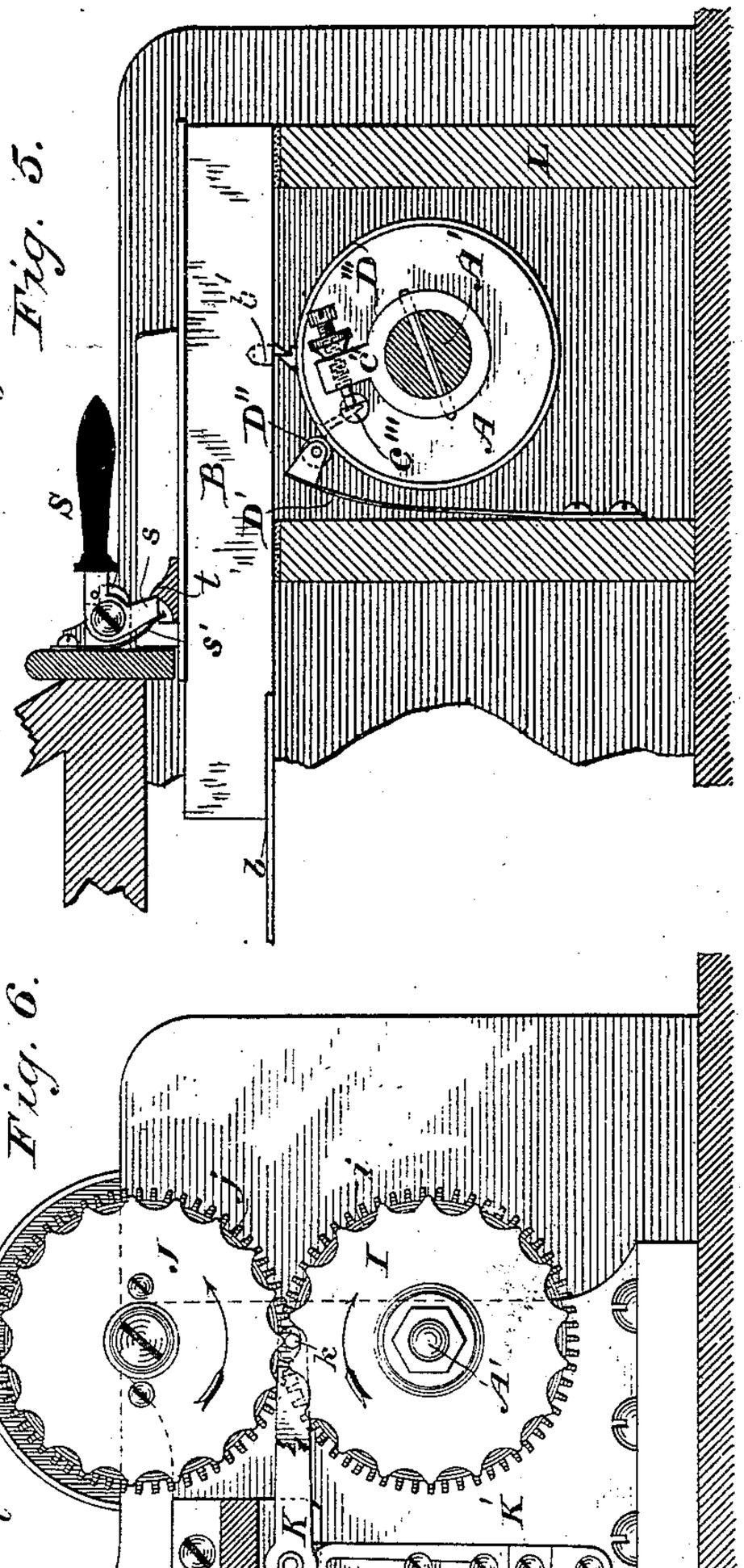

Fig. 6.

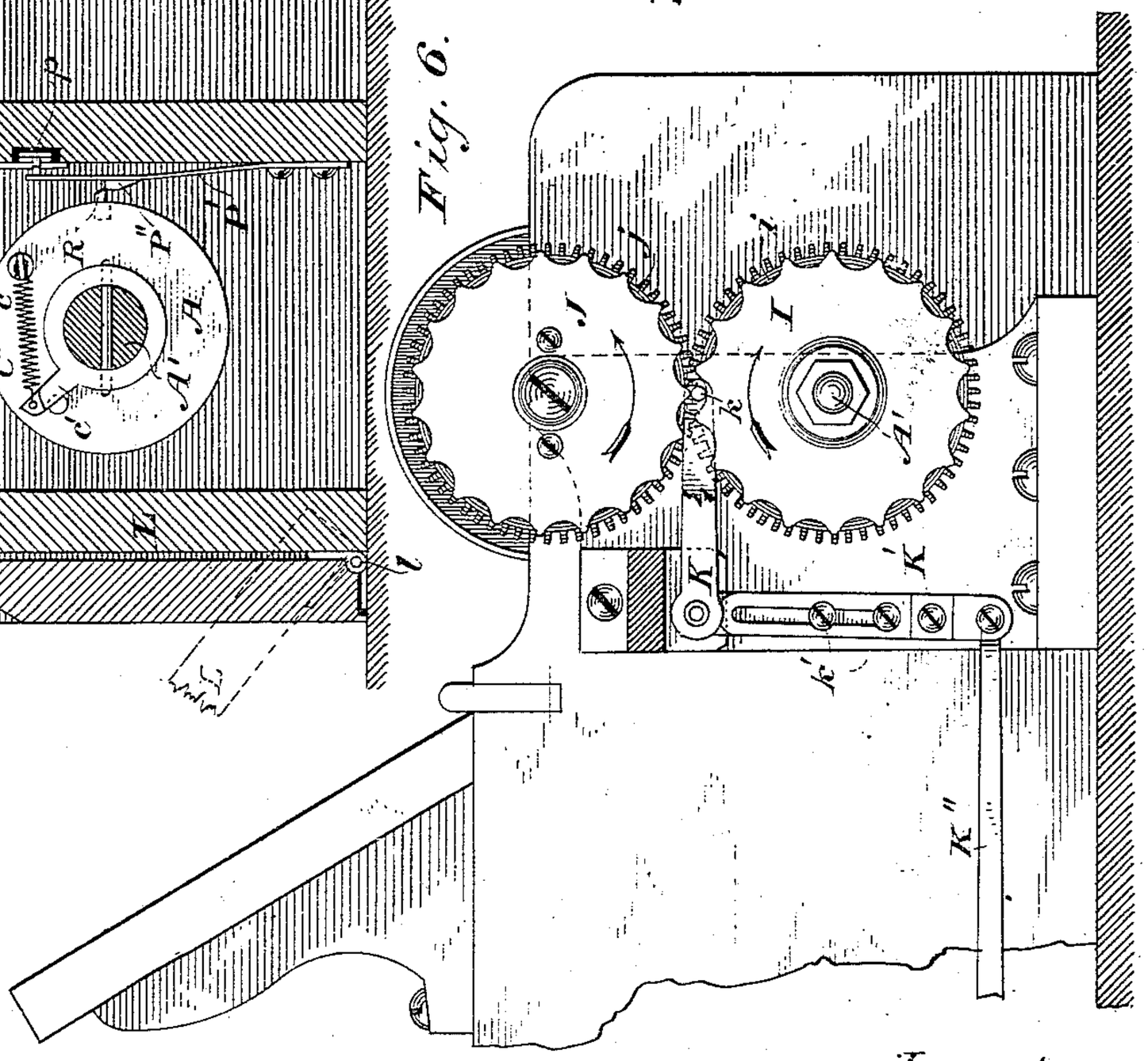

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Fig. 10.

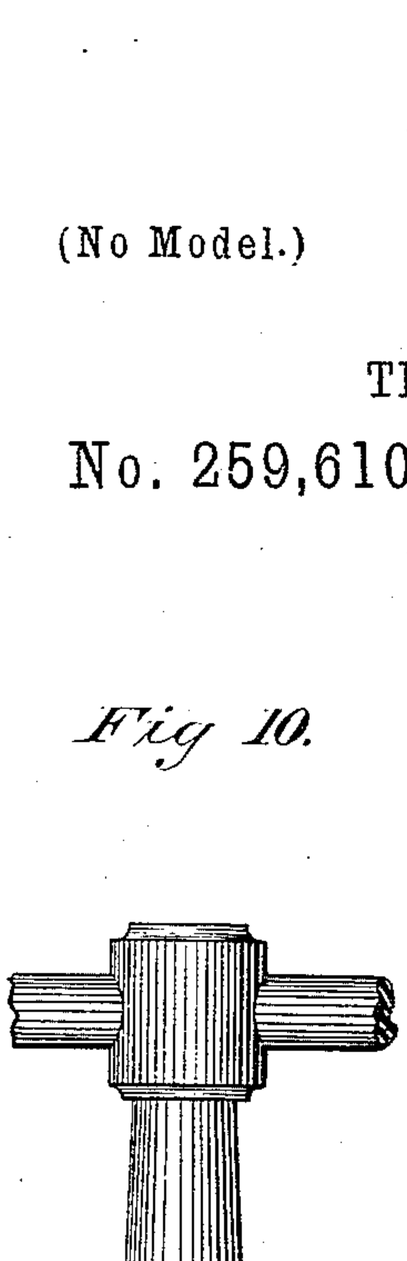


Fig. 8.

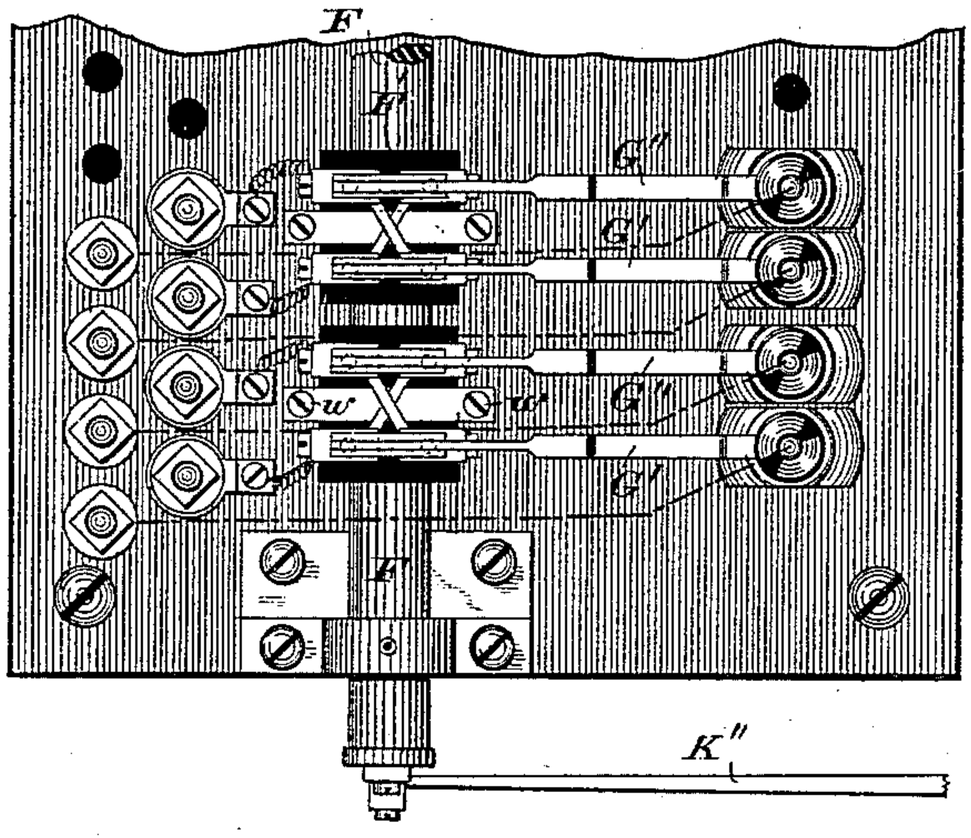


Fig. 9.

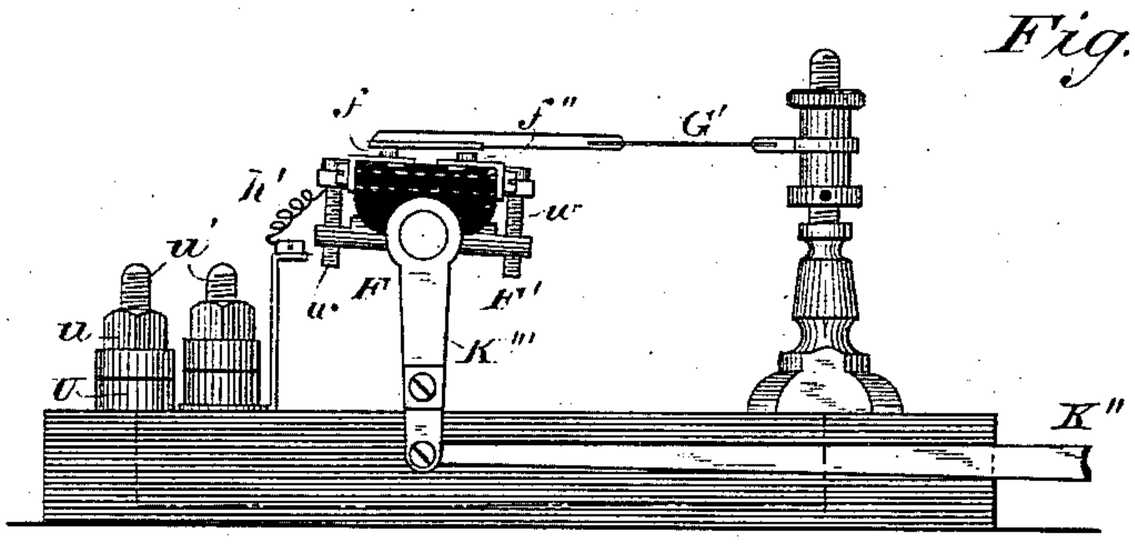
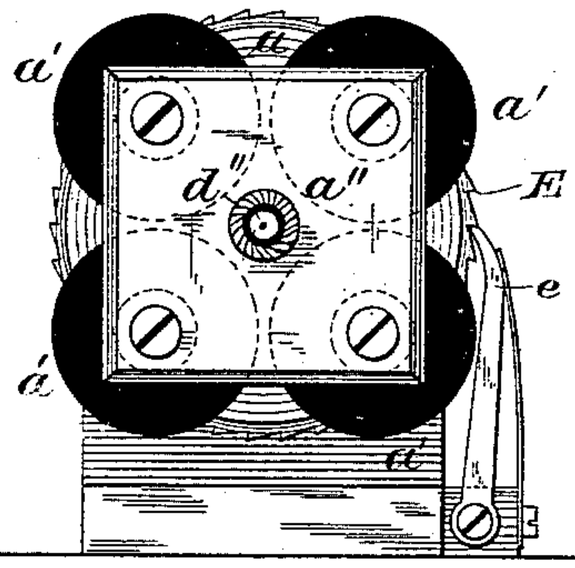


Fig. 7.



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TRANSMITTER FOR PRINTING TELEGRAPHS.

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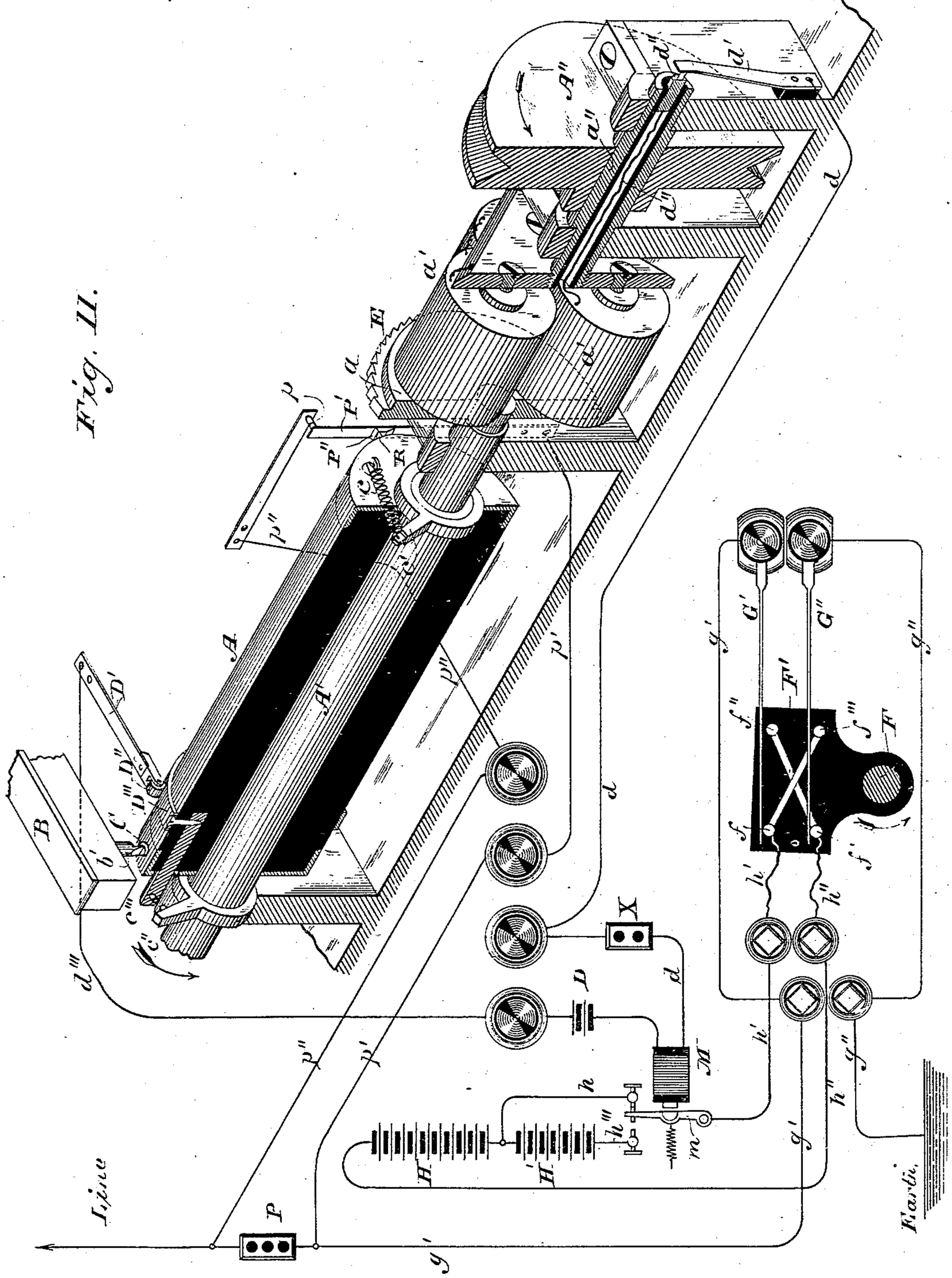
Fig. II.



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UNITED STATES PATENT OFFICE.

HENRY VAN HOEVENBERGH, OF ELIZABETH, NEW JERSEY.

TRANSMITTER FOR PRINTING-TELEGRAPHS.

SPECIFICATION forming part of Letters Patent No. 259,610, dated June 13, 1882.

Application filed November 27, 1880. (No model.) Patented in England December 10, 1880, No. 5,162.

To all whom it may concern:

Be it known that I, HENRY VAN HOEVENBERGH, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Transmitters for Printing-Telegraphs, (for which I have obtained a patent in Great Britain, dated December 10, 1880, No. 5,162,) of which the following is a specification.

My invention relates especially to that class of printing-telegraphs which are designed to be operated automatically by means of electric pulsations proceeding from a suitable transmitter which is situated at a point more or less distant from the receiving instrument or instruments.

The general object of the invention is to increase the rapidity and certainty or operation of such an apparatus and to furnish an improved means of maintaining the synchronism between the transmitting-cylinder at the sending-station and the type-wheel at the receiving station or stations by causing the same to be regularly or automatically adjusted once during each revolution, instead of at irregular intervals and at the will of the transmitting operator, as in the apparatus heretofore in general use.

In an application for Letters Patent filed by me on or about the 25th of October, 1880, I have described the construction, arrangement, and mode of operation of a receiving-instrument adapted to my improved system. My present invention relates more particularly to the apparatus intended to be used at the sending-station in connection with the receiving apparatus described in my former application hereinbefore referred to.

My invention consists, first, in the combination of a series of pins mounted upon a revolving cylinder, a series of keys corresponding thereto, any one of which, when depressed, arrests the motion of said cylinder at a determinate point in its revolution, and a commutator actuated by the shaft of said cylinder, with a second and continuously-revolving shaft which is normally coupled to the cylinder-shaft by virtue of the attraction between a charged electro-magnet and its armature and a circuit-changer which is brought into action upon the arrest of the commutator-shaft by a key, whereby said electro-magnet is demagnetized and the commutator-shaft instantly disconnected from its motor when so arrested; second, in the combination of a series of keys, an intermittently-revolving shaft whose movements are controlled thereby, a rock-shaft which performs a determinate number of oscillations during each revolution of said shaft, and two or more independent commutators mounted upon said rock-shaft, whereby any required number of separate and independent lines or circuits may be actuated from a single key-board and transmitter; third, in the combination of a series of keys and an intermittently-revolving cylinder under control of said keys with a circuit-changer which is automatically actuated by said cylinder to momentarily augment the normal strength of current in the main line at one and the same determinate point in each and every revolution of the cylinder, whereby, through the agency of suitable mechanism at the receiving-station, the type-wheel of the receiving-instrument is automatically brought into unison with the transmitter once during each revolution; fourth, in the combination of a series of pins upon a revolving cylinder, a series of keys each one of which, when depressed, engages with its corresponding pin, and thereby arrests the motion of said cylinder, a yielding mechanical connection between said cylinder and its driving-axis, and a ratchet-wheel and click which acts to prevent a retrograde motion of the driving-axis, whereby the same is held in position after having been disconnected from the driving-pulley and until the key is released; fifth, in the combination of a revolving cylinder and a zero-key which, when depressed, arrests said cylinder at a determinate point in its revolution, with a cam which maintains said key in a position to arrest the cylinder, and a spring for automatically throwing said cam out of position and arresting said key when the latter is depressed by the operator, whereby the transmitting apparatus is automatically started from the initial point by the act of depressing the zero-key.

In the accompanying drawings, Figure 1 is a plan view of my transmitting apparatus with the upper case and keys partly broken away in order to show the construction of the trans-

mitting-cylinder. Fig. 2 is a plan view showing the transmitting-cylinder, the electro-magnetic clutch, and the mechanism for actuating the pole-changer, the view being partly in section on the line 2 2 of Fig. 3. Fig. 3 is a side elevation of the same, partly in section on the line 3 3 of Fig. 2. Fig. 4 is a vertical transverse section on the line 4 4 of Fig. 1. Fig. 5 is a similar section on the line 5 5 of Fig. 1. Fig. 6 is an end elevation, partly in section, showing the mechanism for actuating the pole-changers. Fig. 7 is a transverse section on the line 7 7 of Figs. 2 and 3. Fig. 8 is a plan view of the pole-changers. Fig. 9 is a side elevation of the same. Fig. 10 is a view partly in section and partly in elevation of one of the binding-screws and its key. Fig. 11 is a theoretical diagram illustrating the arrangement of the electric circuits and their connection with the mechanical portions of the apparatus.

The complete transmitting apparatus may conveniently be regarded as composed of three divisions, the first of which controls the transmission of the positive and negative pulsations by which the intermittent rotation of the type-wheel of the receiving-instrument is effected, the second produces the impression of the required character after the type-wheel has been brought into position, and the third controls the synchronism of the type-wheel at the receiving-station and keeps it in correspondence with the transmitting-cylinder at the sending-station.

The first part of the apparatus consists of the cylinder A, (see Figs. 1, 2, and 3,) mounted upon the driving-shaft A′, which is driven by a pulley, A″, the connection between the pulley and the shaft being effected through the agency of a peculiar clutch, the construction and operation of which will hereinafter be more particularly described. The cylinder A is placed directly beneath the key-board B B, which may be constituted of any required number of keys, somewhat similar to those of a piano or other musical instrument. I have illustrated a transmitter having thirty-six keys, corresponding in number to the number of characters and spaces upon the type-wheel of the receiving-instrument. Two rows of metallic pins or stops are inserted in the cylinder A perpendicularly to its length. Each of these pins projects vertically from the surface of the cylinder in such a position that a line drawn through any one of them and the axis of the cylinder will form an angle equal to one thirty-sixth part of the circumference with reference to the line passing through the next following pin and the axis. It will therefore be understood that the eighteen pins in one row form half of a spiral line around the cylinder, of which the eighteen pins of the other row constitute the remaining half. Upon the under side of each key B is a pin or stud, *h*′, (best seen in Fig. 5,) which, when the key is depressed, projects into the path of the corresponding pin or stop upon the cylinder A, and thus arrests its forward motion. It will be understood, therefore, that each one of the series of keys B B, when depressed, will arrest the motion of the cylinder A at a determinate point in its revolution. So long as none of the keys are depressed the cylinder A turns with a continuous and uniform motion in the direction indicated by the arrow, being driven, as before explained, by the pulley A″, around which passes a belt or band connected with any suitable or convenient source of power.

In order to disconnect the cylinder A from the pulley A″ whenever the former is arrested by the depression of one of the keys B B, I make use of an electro-magnetic clutch, the construction and operation of which will now be explained.

Referring to Figs. 1, 2, and 3, *a* is a disk or plate of soft iron, which is rigidly fixed to the axis A′ of the cylinder A and revolves with it. *a*′ is an electro-magnet, preferably having four poles, arranged with reference to each other as shown in Fig. 7. This electro-magnet, together with the pulley A″, is rigidly attached to the shaft *a*″, which turns in suitable bearings in line with the shaft A′, upon which the cylinder A is mounted. The electro-magnet *a*′ is so adjusted that its four poles revolve in contact with the plane surface of the soft-iron plate or disk *a*. The effect of this arrangement is that when the electro-magnet *a*′ is rendered powerfully magnetic the attraction exerted by it upon the soft-iron disk *a* is so great that the latter, together with the shaft A′, is compelled to revolve with it, and by this means the motion of the revolving electro-magnet *a*′ is communicated to the shaft A′ and cylinder A. The disconnection takes place instantly upon the demagnetization of the electro-magnet *a*′. This demagnetization is effected by means of suitable mechanism, which will be best understood by reference to Fig. 11. The cylinder A, which is preferably composed of non-conducting material—such as hard rubber—is not attached rigidly to the shaft A′, upon which it is mounted, but is loose upon it. The mechanical connection between the cylinder A and shaft A′ is a yielding one, and consists of a spiral spring, *c*, one end of which is attached to a hook inserted in the end of the cylinder, while the other end is attached to the arm *c*′, the latter being rigidly attached to the shaft A′. At the opposite end of the shaft A′ is another similar arm, *c*″, which, by virtue of the tension of the spring *c*, normally rests against an arm, *c*‴, projecting from the cylinder A. The arms *c*″ and *c*‴ are provided with electrical contact-points. When these points are pressed together an electric circuit from a local battery, D, traverses the coils of the electro-magnet *a*′. The circuit may be traced as follows: from one pole of the battery D, by the wire *d*, to the insulated spring *d*′, which bears against the end of an insulated conductor, *d*″, passing through the interior of the

shaft a'', which is made hollow in order to accommodate it. The conductor d'' is connected with one terminal of the four connected coils of the electro-magnet a', the other terminal of which is connected directly with the metallic frame upon which the apparatus is mounted. The arm c'' upon the shaft A′ is necessarily in conducting connection with the metallic frame through the bearings in which it is mounted. The arm c''' is connected with a metallic ring, D‴, surrounding the cylinder A. Upon this ring, as it revolves, rests a metallic spring, D′, which is preferably provided with a friction-roller, D″. The spring D′ is connected with the other pole of the battery D by a wire, d'''. It will therefore be understood that when the cylinder A revolves freely the arms c'' and c''' will be maintained in contact with each other by the action of the spring c, and that the current of the local battery D will traverse the coils of the electro-magnet a' and keep the same constantly magnetized, thereby coupling the pulley A″ to the cylinder A; but if one of the keys is depressed by the operator, as shown, for example, at B in Fig. 11, the pin b' is thrown into the path of the pin C and the cylinder A is arrested, while the shaft A′ moves forward, and thus breaks the local circuit between the points c'' and c''', which instantly demagnetizes the electro-magnet a'. The latter, however, continues to revolve freely with the pulley A″, but without carrying with it the shaft A′ and its attachments. The ratchet-wheel E, provided with a spring-click, e, as best seen in Fig. 7, serves to prevent any retrograde movement of the shaft a' after the cylinder A has been arrested by the depression of the key and the motor-shaft disconnected. When the key B is released by the operator the cylinder A is left free to revolve, the local circuit between c'' and c''' is again closed, and the apparatus moves forward as before until arrested in a similar manner by the depression of some other key.

In order to actuate the escapement which controls the movements of the type-wheel of the receiving-instrument, it is necessary that thirty-six electrical pulsations should be transmitted over the line during each complete revolution of the cylinder A. These pulsations are transmitted alternately from the positive and negative poles of the battery by means of a commutator of peculiar construction, which is termed a "pole-changer," the operation of which will be best understood by reference to the diagram in Fig. 11, in which F represents a shaft, upon which is fixed a piece of hard rubber or like insulating material, F′. In this are inserted four metallic pins, $f\ f'\ f''\ f'''$. Upon these pins rest two metallic springs, G′ and G″, which are so arranged in reference to the said pins that when the shaft F is in one position, which is that shown in the figure, the spring G′ rests upon the pin f and the spring G″ upon the pin f'. If, however, the shaft F be caused to revolve a short distance in the direction indicated by the arrow, the spring G′ will be brought into contact with the pin f'', and thereby lifted from pin f, and in like manner the spring G″ will rest upon pin f''' and be lifted from the pin f'. The spring G″ is electrically connected with the earth through the wire g'', while the spring G′ is connected with the line leading to the receiving station or stations by the wire g'. The pins f and f''' are connected together and with the copper pole of the battery H by the wires h' and h. The pins f' and f'' are connected with each other and with the zinc pole of the battery H by the wire h''. Thus it will be understood that if the shaft F be caused to oscillate or rock backward and forward alternate positive or negative pulsations from the battery H will be transmitted over the line.

In practice any required number of separate and independent lines may be operated from one key-board and transmitter by making use of as many separate commutators or pole-changers as there are single lines to be operated and mounting them all upon a single shaft, F. I have shown in Figs. 1 and 8 two pole-changers thus operated in connection with the transmitter, and it is obvious that an indefinite number of them may in like manner be operated by the single shaft F, which will hereinafter be termed a "rock-shaft."

The description which has been given of the construction and mode of operation of the pole changer is sufficient to illustrate its general principle. Such a pole-changer in principle is not new, and in itself forms no part of my present invention. I prefer, however, to construct my pole-changers for actual use in an improved form, which will be best understood by reference to Figs. 8 and 9. The two contact-springs G′ and G″, which are connected respectively with the line and with the earth, instead of being placed one above the other, as in the diagram Fig. 11, are placed side by side in the same horizontal plane, as in Fig. 8. By this arrangement I am enabled to place all the four contact-points $f\ f'\ f''\ f'''$ upon the upper surface of the insulating-block F, which supports them. By this mode of construction a very important advantage is gained, inasmuch as the adjustment of the contact-points with reference to each other and to the contact-springs which work upon them is much more easily performed, for the reason that all four of the contacts are visible to the eye and are conveniently accessible at the same time.

Screws $w\ w$ are also provided on opposite sides of the rock-shaft F, which screws serve the double purpose of securing the support F′ of the contact-points to the rock-shaft F and of enabling the same to be adjusted upon the shaft with reference to the arm K‴.

The oscillation of the rock-shaft F is effected by means of the hereinafter-described mechanism.

Upon the end of the shaft A′ which carries the cylinder A is fixed a wheel, I, having its

periphery formed into alternate recesses and projections of a wave-like form, as best seen in Fig. 6. Directly above and in the same plane with the wheel I is mounted another precisely similar wheel, J. The number of projections and recesses upon each of these wheels, taken together, is equal to the number of pins upon the cylinder A, and also to the number of characters and spaces upon the type-wheel of the receiving-instrument. The wheels I and J are connected to each other by means of toothed wheels *i j*, having each a like number of teeth, the wheel *i* being fixed to the shaft A′ and communicating its motion to the wheel *j*. The wheels I and J are so mounted with reference to each other that the projections of one wheel are precisely opposite to the recesses of the other as they revolve, as will be best understood by reference to Fig. 6. The space between the wheels I and J is just sufficient to admit a pin, *k*, which is inserted in the arm R of a right-angled or bell-crank lever, K K′, the other arm of which is connected by a rod, K″, with an arm, K‴, which is fixed upon the rock-shaft F. It will be understood, therefore, that as the wheels I and J revolve in the direction denoted by the arrows an oscillatory motion will be communicated through the pin K to the lever K K′, and thence to the rock-shaft F, upon which the pole-changers are mounted, and that the number of oscillations during each revolution of the cylinder A will be determined by the number of projections and recesses upon the wheels I and J. The amplitude of the oscillations of the pole-changers is capable of being adjusted within the necessary limits by lengthening and shortening the vertical arm K′ of the bell-crank lever, which is made in two parts clamped together by screws *k′* in order to facilitate such adjustment.

In order to render the mechanism beneath the key-board conveniently accessible for purposes of inspection, repairs, or adjustment, I have mounted the key-board in such a manner that it may readily be turned back out of the way when necessary. Each of the keys B B is attached to a flat spring, *b*, extending rearward therefrom, and secured by screws or otherwise to a longitudinal wooden support, B′. (See Fig. 4.) This support B′ is secured to the base upon which it rests at its lower rear corner by hinges *b″*, and is preferably held in position by a movable catch, *b‴*. By this arrangement the operator is enabled to turn the key-board and its support B′ backward into the position indicated by the dotted lines in Fig. 4, and thus to obtain ready and convenient access to the mechanism beneath. The cover L, which protects the mechanism in front, is hinged in a like manner at *l*, so as to be capable of being turned forward out of the way, as also indicated by the dotted lines in Fig. 4.

The next part of my invention has reference to the method of bringing the printing mechanism of the receiving-instrument into action, which is effected by augmenting the normal strength of the actuating current after the type-wheel has been brought into position, without reference to the polarity of the final pulsation, whether positive or negative. The particular manner in which this increased strength of current is made available in order to actuate the printing mechanism of the receiving-instrument has been fully described and explained in my former application for Letters Patent hereinbefore referred to, and therefore need not be detailed here.

The manner in which the necessary increase in the strength of the current for this purpose is brought about by the transmitting apparatus will now be explained.

M is an electro-magnet of the usual construction, provided with an armature and lever, *m*. The armature lever *m* oscillates between contact-stops, as shown in Fig. 11, the whole, in fact, constituting a relay of the ordinary and well-known construction, with the exception that the lever M makes electrical contact with its rear stop as well as with its front stop. The coil of this electro-magnet M is included in the circuit of the local battery D, which controls the electro-magnetic clutch hereinbefore described. The armature-lever *m* of the relay-magnet M, when in contact with its front stop, (the circuit of the local battery D being closed,) forms a connection between the wires *h′* and *h* of the main-battery circuit. When the armature-lever *m* rests against its back contact the route of the circuit is transferred from the wire *h* to the wire *h‴*. Included in the circuit of the latter wire is an auxiliary main battery, H′, containing such a number of cells as may be required to produce an addition to the normal current of the battery H which shall be sufficient to actuate the printing mechanism at the receiving-station. It will be readily understood, therefore, that when the circuit of the battery D is broken (and this occurs each time that the motion of the cylinder A is arrested by the depression of a key) the armature-lever *m* falls on its back contact, thus momentarily throwing the current of the auxiliary battery H upon the main line during the time of the pause in the movement of the cylinder A, as hereinbefore described.

The next part of the invention relates to the method of actuating the unison mechanism. This mechanism in the receiving-instrument is controlled by a series of single pulsations of considerably more than the normal strength of the current which is required to effect the printing, which pulsations are sent through the line by the transmitter at the instant of passing the zero-point in each revolution of the cylinder and its corresponding type-wheel. This zero-point upon the cylinder and type-wheel corresponds with the white key at the extreme left of the key-board, and the apparatus is so arranged that at the instant the corresponding pin upon the cylinder in its revolution comes opposite the pin upon the

under side of the zero-key, whether the latter be depressed or not, the strength of the current is momentarily increased. I prefer to effect this by short-circuiting or shunting an artificial resistance, P, Fig. 11, which may be placed at any convenient point in the circuit of the main line g'. This shunt-circuit is formed by the wire p'', contact-point p, metallic spring P′, and wire p'. Whenever the spring P′ touches the contact-point p the resistance P is cut out, and the strength of the current on the main line thereby augmented. This is effected momentarily once in each revolution at the required point by means of the pin R on the cylinder A, (best seen in Fig. 4,) which engages with a cam-shaped projection, P″, on the spring P′, and thus throws the latter momentarily into contact with the point p. The manner in which this pulsation acts upon the receiving-instrument to maintain the same in correspondence with the transmitting-cylinder will be best understood by reference to my pending application hereinbefore referred to.

When the transmitting apparatus is at rest and in readiness to commence the transmission of a message or communication it is necessary that the cylinder A should always stand at the zero-point. I therefore provide a small right-angled lever or cam having a suitable handle, S, which is pivoted to the frame of the instrument just above the zero-key at the extreme left of the key-board, as seen in Figs. 1 and 5. When the handle S is in a horizontal position, as in Fig. 5, the short end s of the lever presses against the cam-shaped projection t on the upper surface of the zero-key, and thus depresses it, so that the type-wheel is arrested by the action of the zero-key in the usual manner. When it is desired to commence the transmission of a communication a slight touch of the operator's finger upon the zero-key withdraws the projection t from its contact with the short arm s of the cam-lever, whereupon the spring s' throws the handle S into an upright position, in which it remains until the operator again wishes to lock the transmitting-cylinder at zero, when he places the handle in a horizontal position, as before.

It is obvious that numerous changes may be made in the arrangement of the circuits at the transmitting-station by means of which the required results are produced at the receiving-station. For example, the increase of strength which is required to actuate the printing mechanism might be obtained by shunting a normal resistance instead of making use of an auxiliary battery. On the other hand, an auxiliary battery might be employed to actuate the unison mechanism instead of the devices which I have shown. The manner of arranging these modifications will be obvious to those skilled in the art, and will therefore require no detailed explanation in this place. I prefer to construct the binding-posts for the attachment of the line, ground, and battery wires in the manner shown in Fig. 10, in which U is the base of the post, from which projects the screw u', preferably formed from the same piece of metal. The connecting-wire is bent into a loop and clamped between the base U and a nut, u, in a manner well understood. The upper part of the nut u is made rectangular in form, so as to admit of a key, V, with a rectangular hole in it, being applied in the manner of a wrench, so as to clamp the nut u forcibly against the wire.

An adjustable resistance, X, may be placed in the circuit of the local battery D, (see Fig. 11,) for the purpose of regulating the strength of the electro magnet a' when necessary or desirable.

I do not herein claim specifically the combination of a continuously-revolving shaft which is normally coupled to another shaft in line with itself by means of the attractive force exerted between an electro-magnet mounted upon one of said shafts and its armature mounted upon the other. Neither do I herein claim the combination, with the devices above specified, of an electrical generator and a circuit-breaker which is brought into action by the movement of the last-named shaft to destroy the attraction between said electro-magnet and its armature, as these combinations will be included in the subject-matter of a separate application for Letters Patent.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a series of pins or stops mounted upon a revolving cylinder, a series of keys corresponding with said pins, each one of which, when depressed, engages with its corresponding pin, and thereby arrests the motion of said cylinder at a determinate point in its revolution, a commutator or pole-changer actuated by the shaft of said cylinder, a continuously-revolving shaft which is normally coupled to the commutator-shaft by the attraction between an electro-magnet mounted upon one of said shafts and its armature mounted upon the other, and a circuit-breaker which is brought into action by the engagement of any one of the keys with its corresponding pin upon the cylinder to demagnetize said electro-magnet and disconnect the commutator-shaft from its motor.

2. The combination, substantially as hereinbefore set forth, of a series of keys, an intermittently-revolving shaft, the movements of which are controlled by said keys, a rock-shaft which performs a determinate number of oscillations during each revolution of said shaft, and two or more independent commutators for actuating separate circuits mounted upon said rock-shaft.

3. The combination, substantially as hereinbefore set forth, of a series of keys, an intermittently-revolving cylinder the movements of which are controlled by said keys, and a circuit-changer which is automatically actuated by said cylinder to momentarily augment the normal strength of current in the

main line at one and the same determinate point in each and every revolution of the cylinder.

4. The combination, substantially as hereinbefore set forth, of a series of pins or stops mounted upon a revolving cylinder, a series of keys corresponding with said pins, each one of which, when depressed, engages with its corresponding pin, and thereby arrests the motion of said cylinder, a yielding mechanical connection between said cylinder and its driving-axis, and a ratchet-wheel and click for preventing a retrograde motion of the driving-axis.

5. The combination, substantially as hereinbefore set forth, of an intermittently-revolving cylinder, a key which, when depressed, arrests said cylinder at a determinate point in its revolution, a cam which acts to maintain said key in a position to arrest the cylinder, and a spring which automatically throws said cam out of position and releases said key when the latter is depressed by the operator.

In testimony whereof I have hereunto subscribed my name this 23d day of November, A. D. 1880.

HENRY VAN HOEVENBERGH.

Witnesses:

NELSON ZABRISKIE,

MILLER C. EARL.