(No Model.) 8 Sheets—Sheet 1.

S. V. ESSICK.

PRINTING TELEGRAPH.

No. 365,059. Patented June 21, 1887.

Fig. 1.

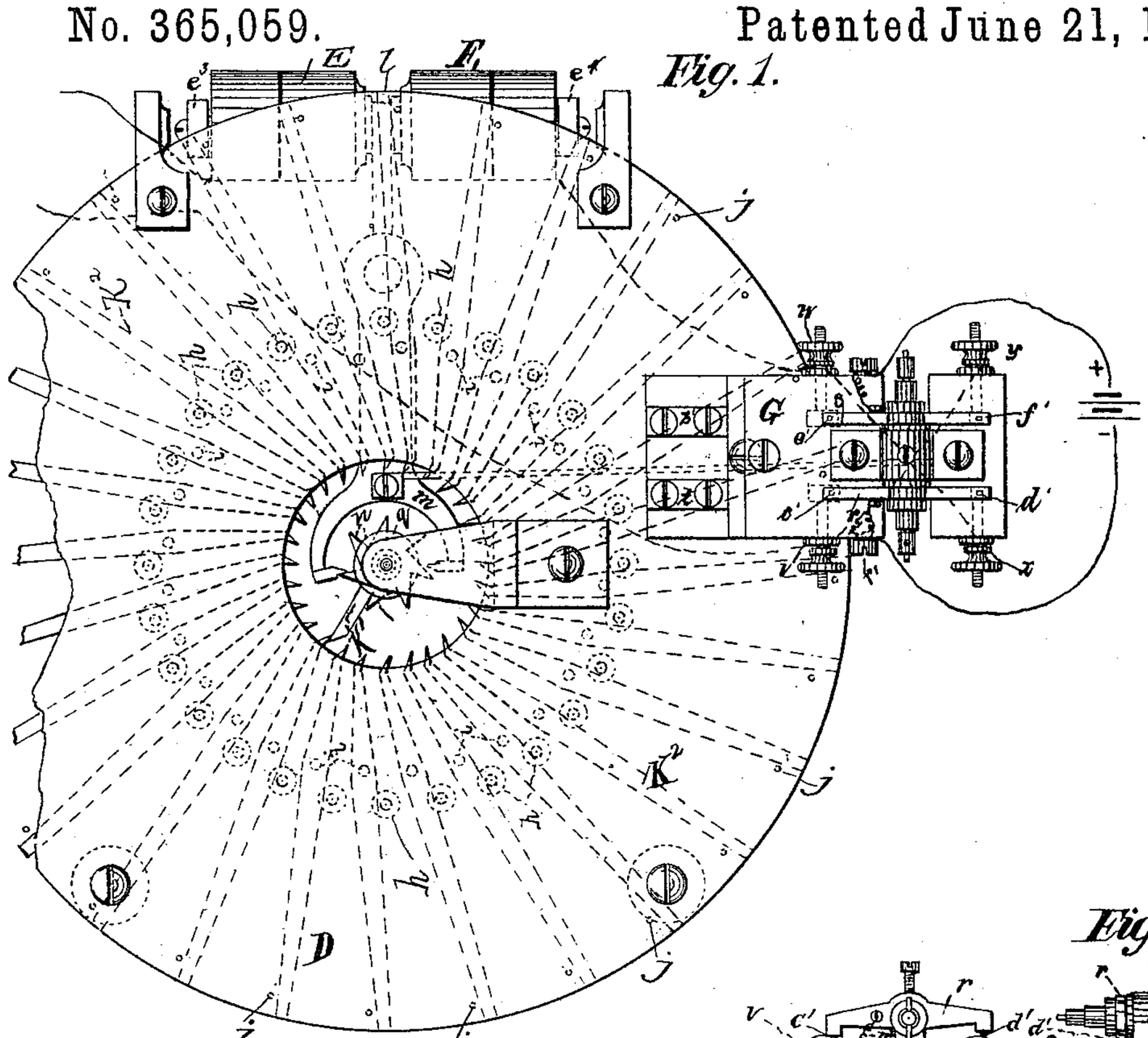


Fig. 2.

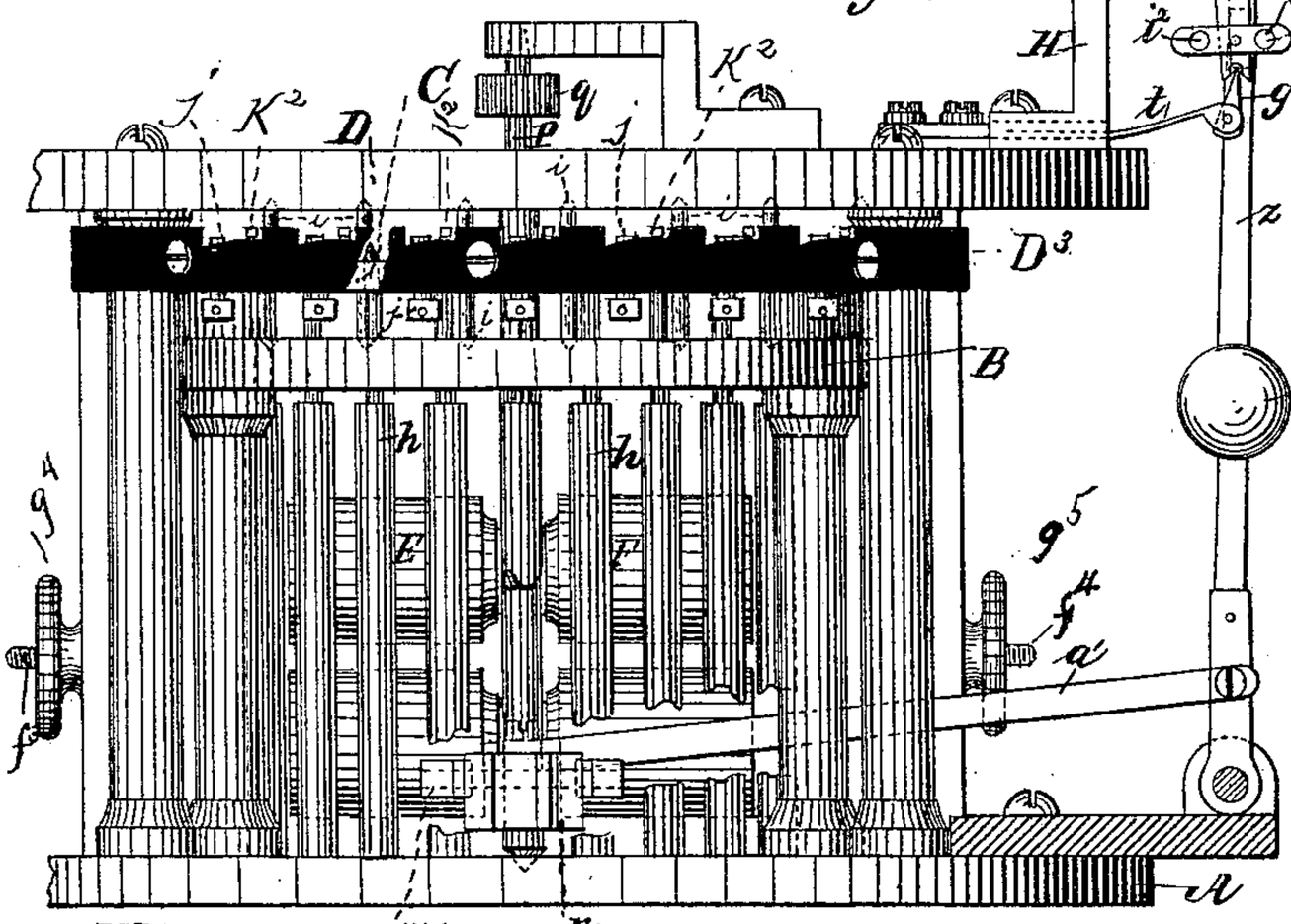
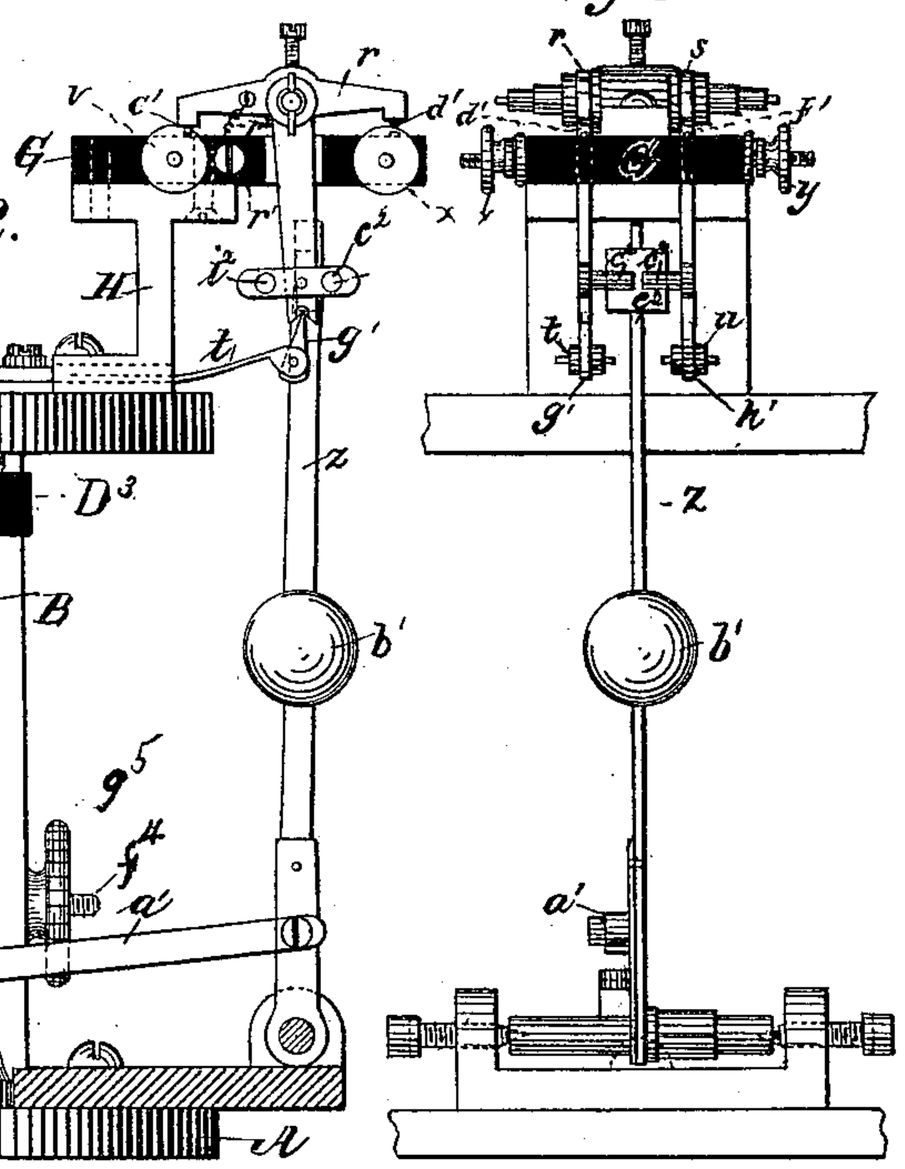


Fig. 3.



Witnesses:
C. H. Longfellotte.
T. B. Farnsworth.

Inventor
Samuel V. Essick

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 2.

S. V. ESSICK.

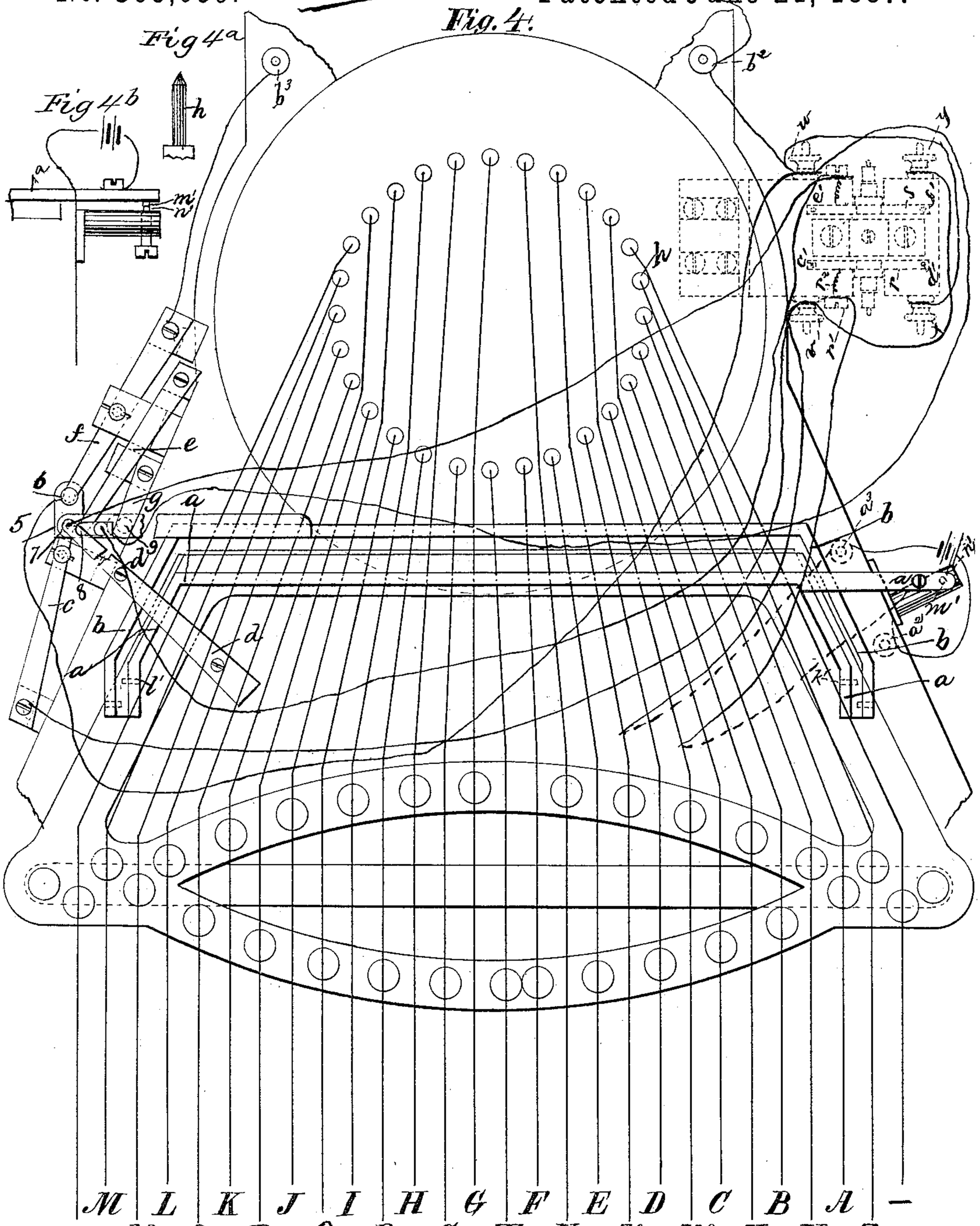
PRINTING TELEGRAPH.

No. 365,059. Patented June 21, 1887.

Fig 4a

Fig 4b

Fig. 4.



Witnesses:
E. H. Sawtelle.
T. B. Farnsworth.

Inventor
Samuel V. Essick

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.)

8 Sheets—Sheet 3.

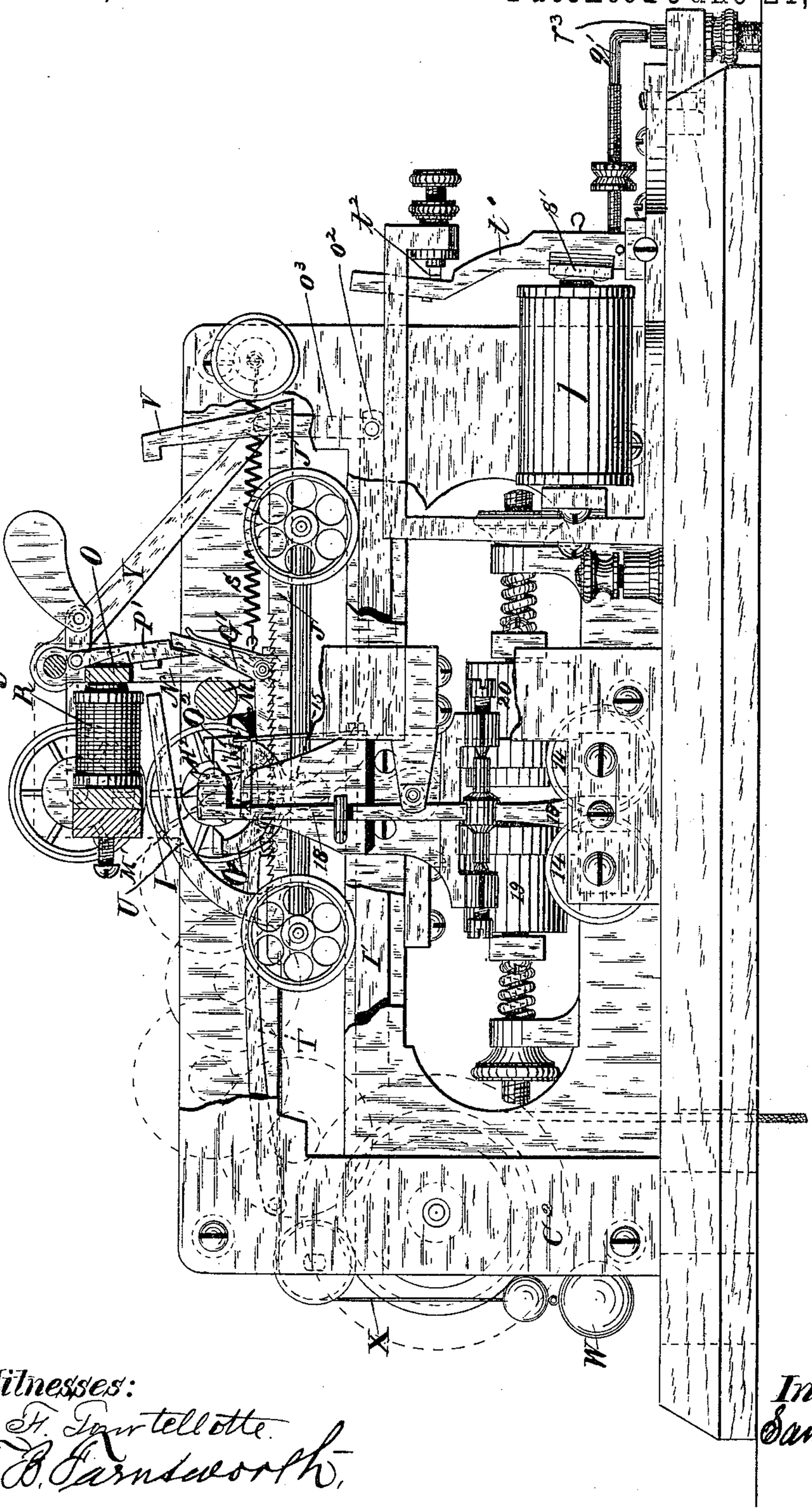
S. V. ESSICK.

PRINTING TELEGRAPH.

No. 365,059.

Patented June 21, 1887.

Fig. 5.



Witnesses:
E. F. Fourtellotte.
T. B. Farnsworth.

Inventor
Samuel V. Essick

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

8 Sheets—Sheet 4.

S. V. ESSICK.

PRINTING TELEGRAPH.

No. 365,059. Patented June 21, 1887.

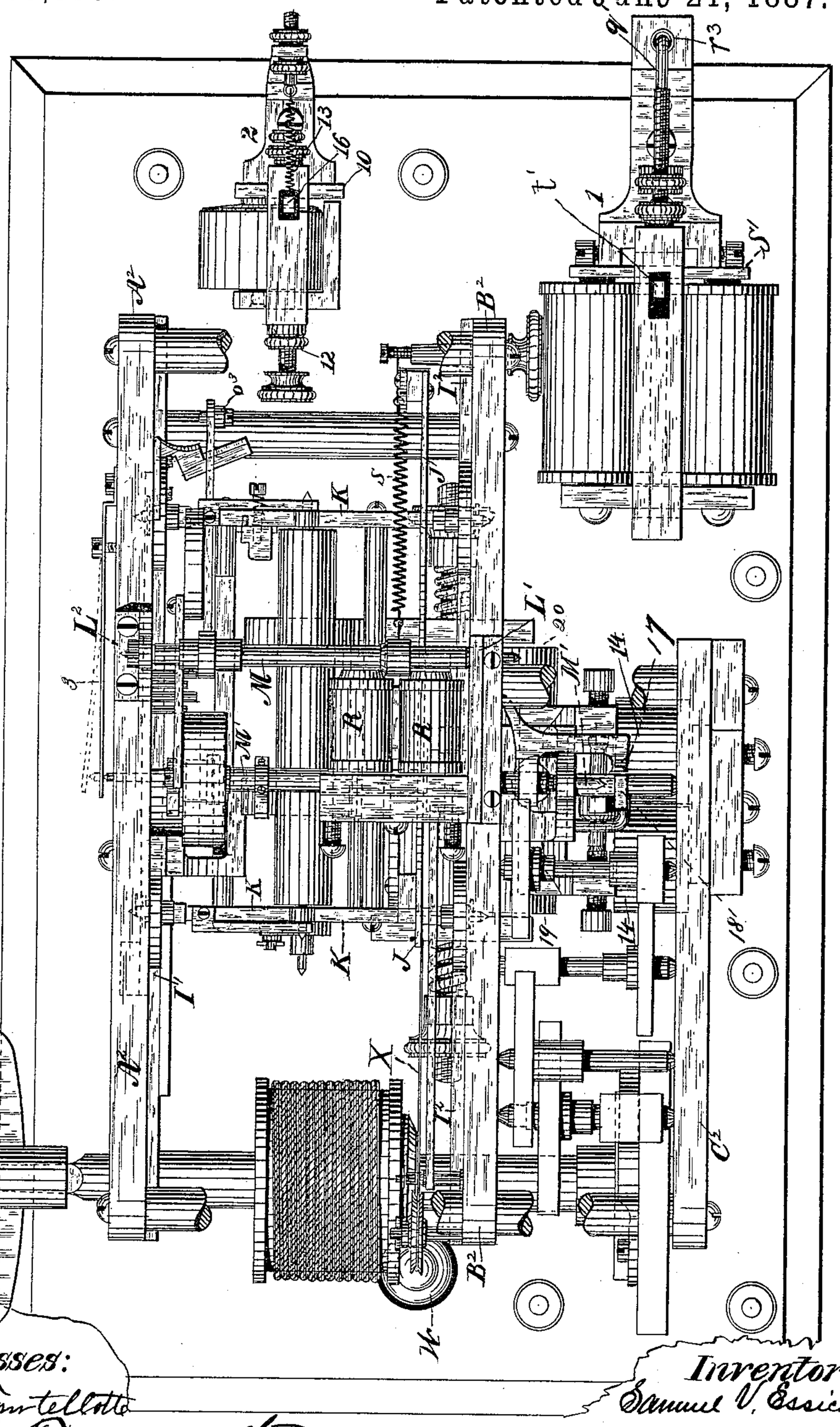


Fig. 6.

Witnesses:
E. F. Lawtellotte
S. B. Farnsworth,

Inventor
Samuel V. Essick

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

8 Sheets—Sheet 5.

S. V. ESSICK.

PRINTING TELEGRAPH.

No. 365,059. Patented June 21, 1887.

Fig. 8.

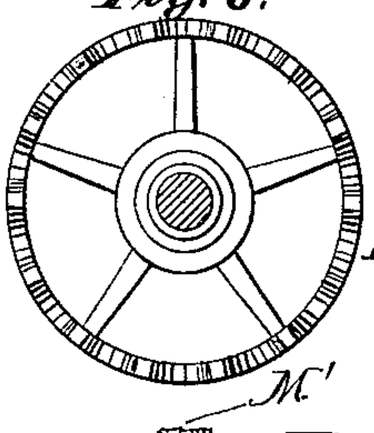


Fig. 15.

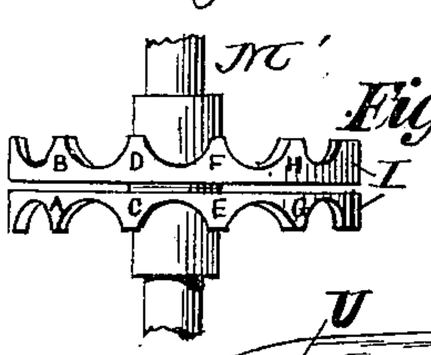
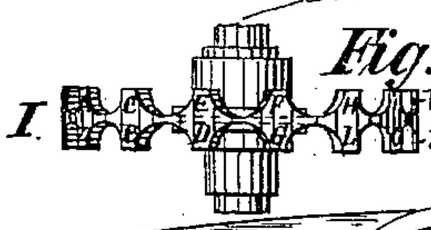


Fig. 7.

Fig. 9.



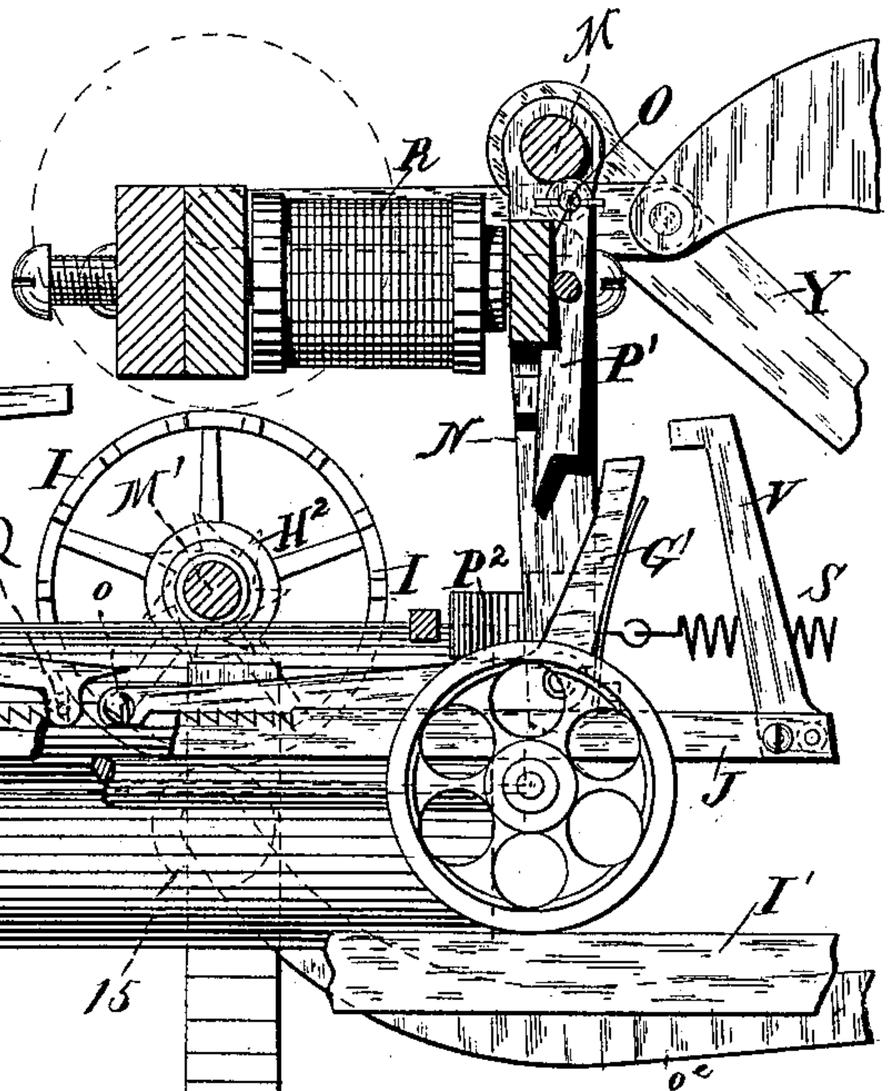
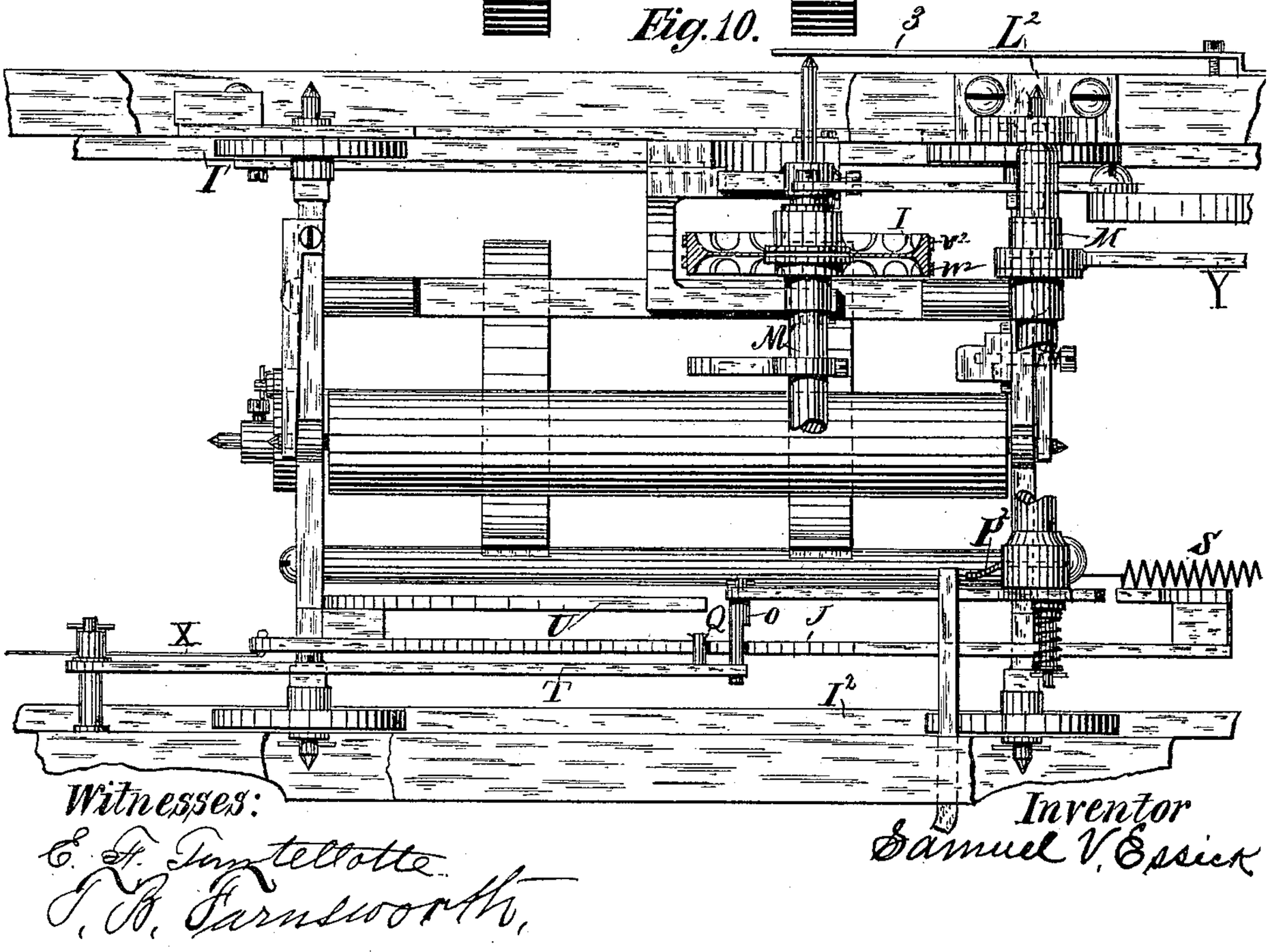


Fig. 10.



Witnesses:
E. F. Tompkins
T. B. Farnsworth.

Inventor
Samuel V. Essick

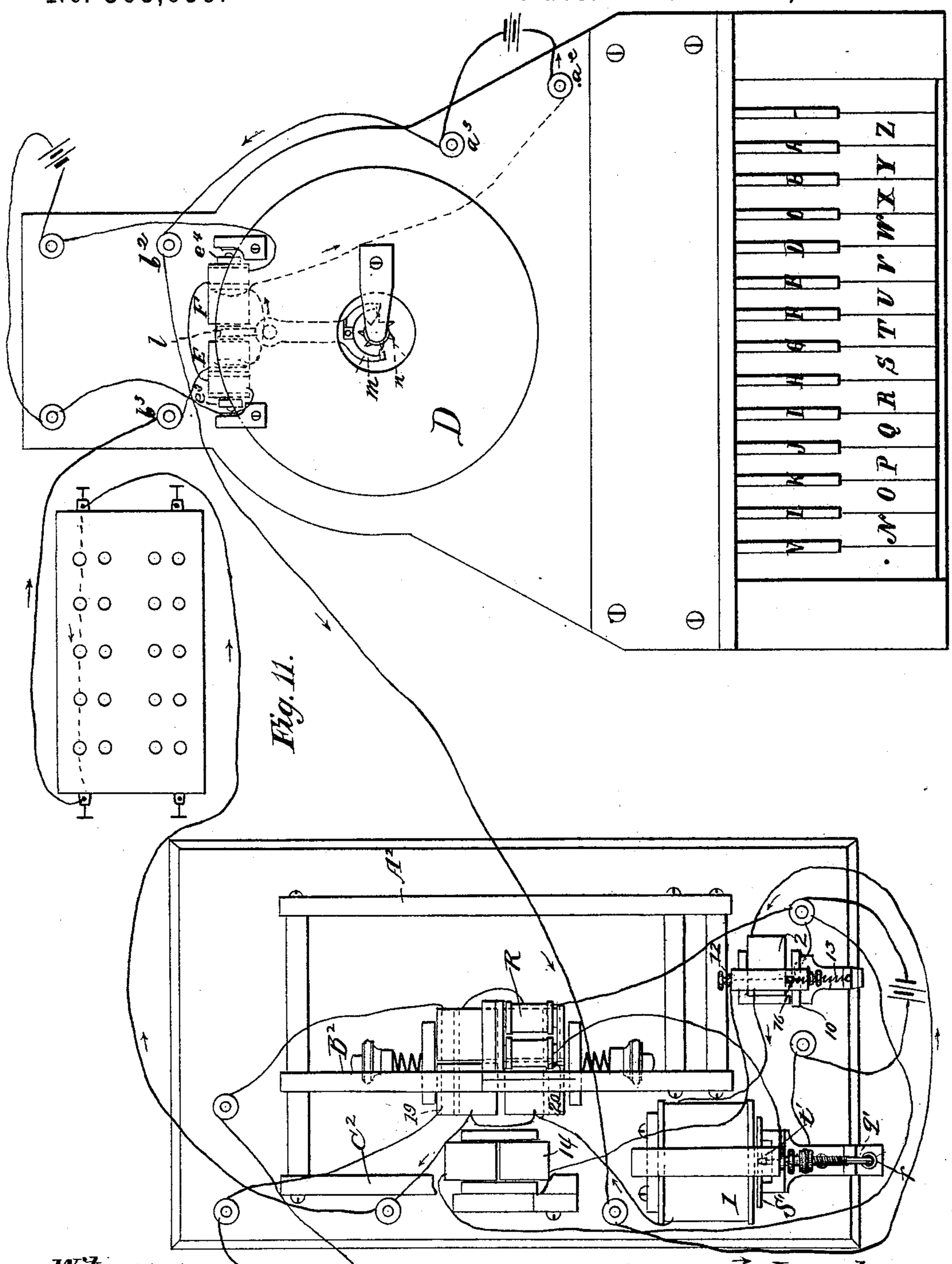
N. PETERS, Photo-Lithographer. Washington, D. C.

(No Model.) 8 Sheets—Sheet 6.

S. V. ESSICK.

PRINTING TELEGRAPH.

No. 365,059. Patented June 21, 1887.



Witnesses:
E. F. Tourtellotte
T. B. Farnsworth.

Inventor:
Samuel V. Essick

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 7.

S. V. ESSICK.

PRINTING TELEGRAPH.

No. 365,059. Patented June 21, 1887.

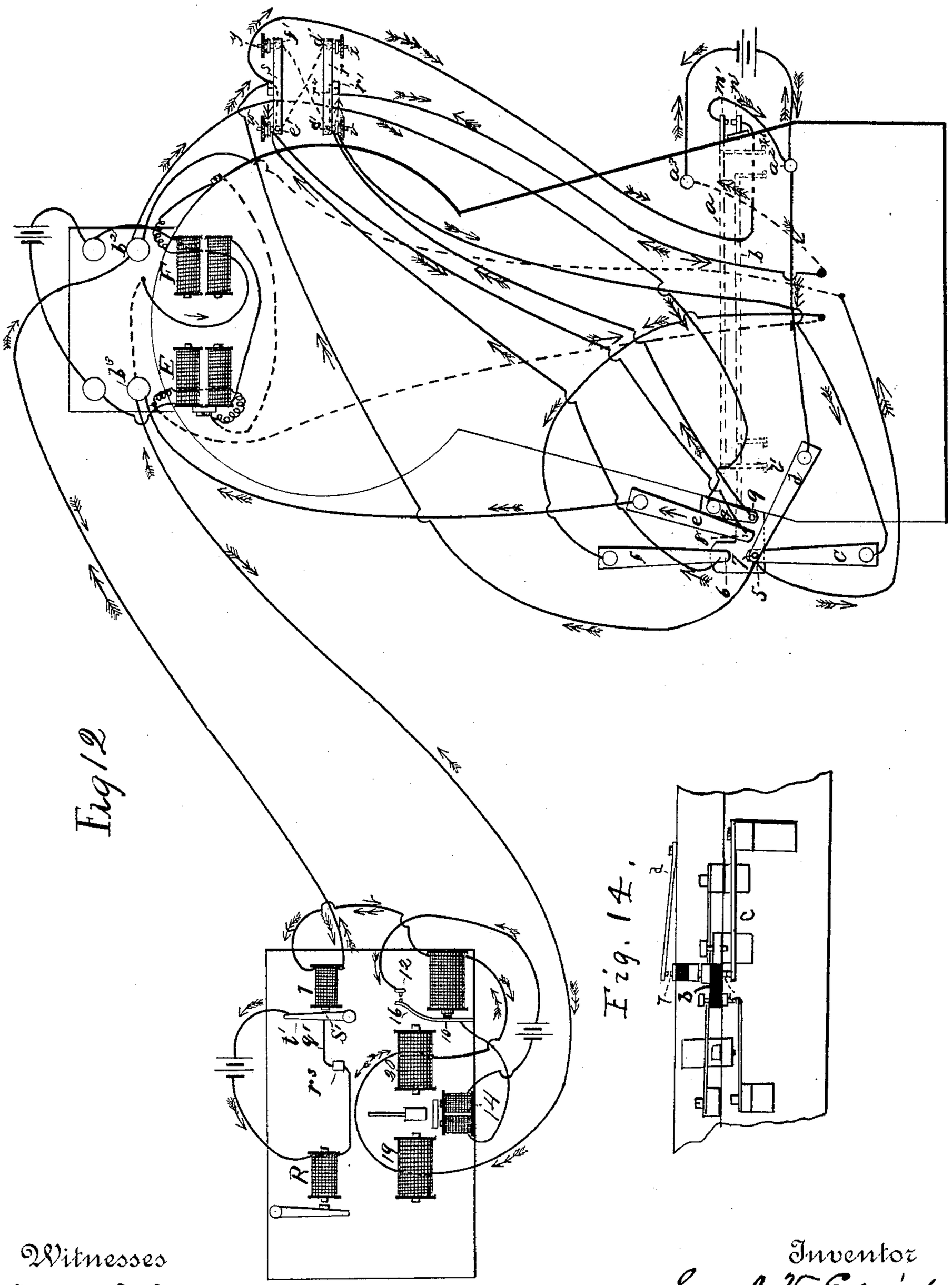


Fig 12

Fig. 14.

Witnesses
Norris A. Clark
E. C. Brown

Inventor
Saml. V. Essick
By his Attorney A. L. Smith

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.)

8 Sheets—Sheet 8.

S. V. ESSICK.

PRINTING TELEGRAPH.

No. 365,059. Patented June 21, 1887.

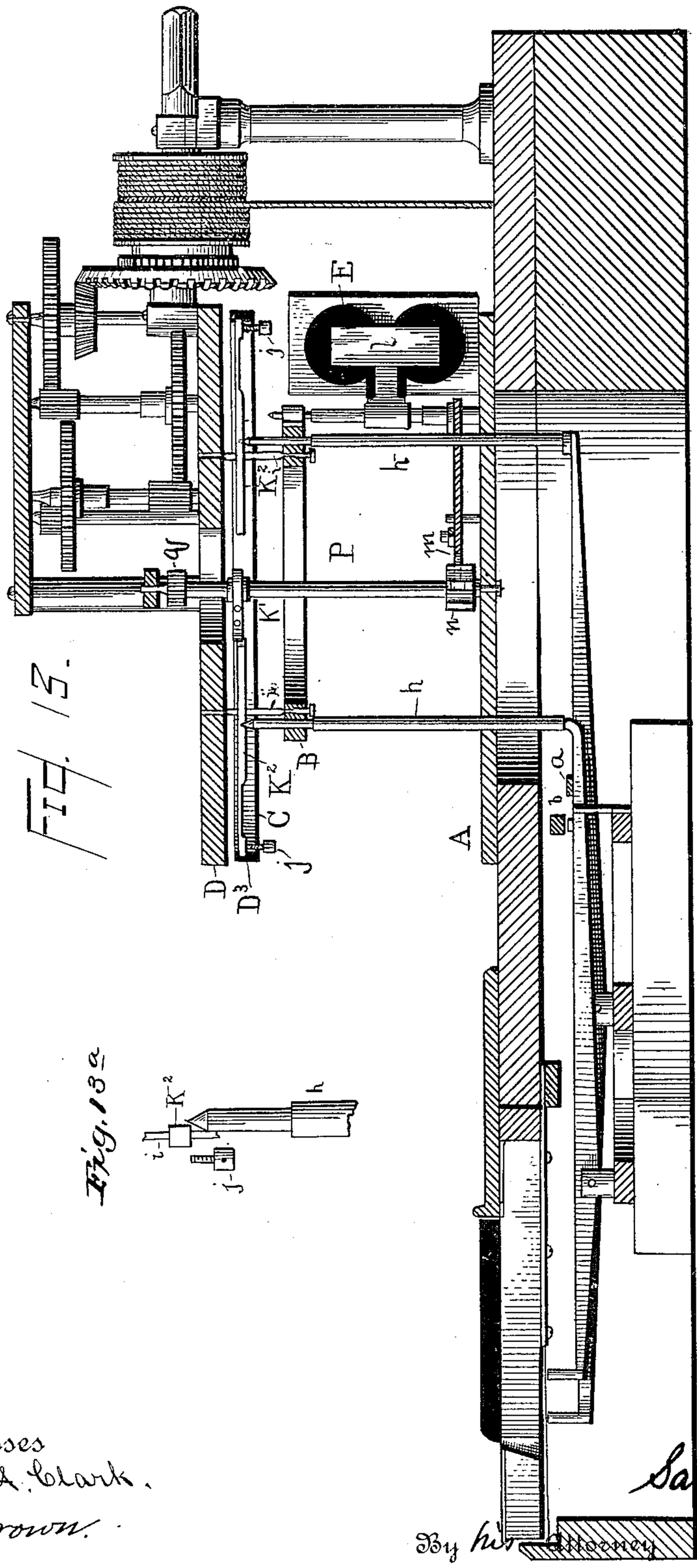


FIG. 13.

Fig. 13a

Witnesses
Louis A. Clark.
E. C. Brown.

Inventor
Saml. V. Essick
by his Attorney
A. M. Smith

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

SAMUEL V. ESSICK, OF ALLIANCE, OHIO.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 365,059, dated June 21, 1887.

Application filed September 28, 1885. Serial No. 178,323. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL V. ESSICK, a citizen of the United States, residing at Alliance, in the county of Stark and State of Ohio, have invented new and useful Improvements in Printing-Telegraphs, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification.

My invention relates to certain improvements in printing-telegraphs, and more especially to that form of printing-telegraph for which I obtained Letters Patent bearing date June 19, 1883, and which are numbered 279,550; and my present improvements have reference particularly to a new form of commutator, by which, with each alternate impulse, I reverse the currents on the line and thereby effect a more perfect discharge of the line with each impulse, and dispense with the necessity of a commutator for the receiver; also to an improvement of the feed and shipping device of the paper-carriage, by means of which a better action is secured.

My present improvements also relate to a means for increasing the speed of the said instruments by dividing the alphabet, spaces, &c., on the periphery of the type-wheel into two rows instead of one, as shown in my original patent, and by means of which, with the other parts connected with the same, only one-half the vibrations of the pallets of the commutator and transmitter are required to revolve the circuit-breaking arm of the transmitter and type-wheel of the receiver, which are required to revolve the same, as shown in my original patent, referred to above; and my present improvements also further relate to a means of breaking the circuit at one point while it is completed at another, by depressing a key, and causing the circuit to remain broken until the key is released and allowed to return to its normal position, thus securing ease of operation.

In the accompanying drawings, Figure 1 is a top view of the working portion of the transmitter, showing the escapement-magnets and the commutator. Fig. 2 is a side elevation of the same. Fig. 3 is an end elevation of the commutator. Fig. 4 is a top view showing the levers of the key-board, the make-and-break cross-levers *a* and *b*, and the make and-break springs *c*, *d*, *e*, *f*, and *g*. Fig. 4ª is a detached view of the upper end of one of the pins *h*. Fig. 4ᵇ is a detached view showing the contact-points *m' n'* between the bar *a* and the body of the transmitting-instrument. Fig. 5 is a side elevation, and Fig. 6 a top view, of the receiver. Fig. 7 is a side elevation of the paper-carriage with its connections and the type-wheel. Fig. 8 is a side view of the type-wheel. Fig. 9 is an edge view of the type-wheel. Fig. 10 is a top view of the paper-carriage with its connections. Fig. 11 is a diagram showing the connection of the transmitter and receiver and the relation of each to the other. Fig. 12 is a similar view showing more in detail the transmitter-circuits, and Fig. 13 is a vertical section through the transmitter, showing one of the transmitting-keys and its connections. Fig. 13ª is a detached view illustrating the operative position of one of the pins *h* relative to the corresponding make-and-break lever K^2. Fig. 14 is a detached view showing the contact-points between the springs *c d* of the transmitter. Fig. 15 is a detached view of a modified arrangement of the type-carrying devices.

A is the base-plate of the working part of the transmitter, above which are supported in the order named plates B, C, and D. Plate A is provided with a circular series of perforations to receive the lower ends of pins *h*, which said lower ends project below the plate and rest each upon the rear end of one of the key-levers. The upper ends of these pins *h* project through perforations in plate B, the plates being arranged such distance apart as to admit of the slight vertical play of pins *h* upon depressing the keys. Between plates B and D are journaled in a circular series spindles *i*, each carrying a circuit-breaking lever, K^2. The plate or piece C is a metallic ring interposed between plates B and D and insulated from the other parts of the transmitter, but connected with the line-magnets by suitable wire. This ring C encircles the circular series of pins *h* and spindles *i*, and is provided near its outer edge with contact-screws *j*, one for each lever K^2, the periphery of said ring C being fitted with a band of hard rubber, upon which the outer ends of levers K^2 normally rest. The levers K^2 are free to move laterally within certain limits, either into or

out of contact with their respective contact-screws *j*. Normally they are out of contact therewith, but are moved into contact through the medium of the pins *h* whenever the key-levers are depressed. They are driven back to their first position by a circuit-breaking arm, K′, which is fixed to a shaft, P, having its bearings in the lower plate, A, and in a bracket attached to the upper plate. On the same shaft are also fixed a toothed wheel, *n*, and a pinion, *q*. The former acts in connection with a pallet, *m*, to form an escapement for operating the circuit-breaking arm K′. The latter is connected with a train of clock-work, by means of which the shaft P and its connections are driven, the said clock-work being actuated by a weight or spring.

The pallet *m* is formed on or secured to an extension of an armature which plays between the electro-magnets E and F. These magnets are supported upon brackets e^3 e^4, and are made adjustable with relation to their armature by means of nuts g^4 g^5 and screws f^3 f^4. The magnets are polarized, preferaby by means of a local battery, as shown. They may, however, be polarized in the ordinary way by means of strong permanent magnets. Upon each core of said magnets is wound two coils. At the end nearest the armature of the pallet is wound a coil of high resistance—*e. g.*, from one hundred and fifty to two hundred ohms. This coil is connected with the line, and through it the line-current passes. At the rear end of each of said cores is wound a coil of low resistance—*e. g.*, about two ohms—and this coil is connected with a local battery of about three or four volts. The line-coil of one magnet is connected with the line-coil of the other. So, also, the polarizing coil of one magnet is preferably connected with the polarizing-coil of the other, and when thus connected the said polarizing-coils are so wound or coupled that the current passes in one direction through the coils of one magnet and in the opposite direction through the coils of the opposite magnet, so that when the line-current is sent in one direction through the line-coils one magnet is increased in strength, because it circulates in the same direction as the current of the local battery through the polarizing-coil of the said magnet, while the strength of the other magnet is neutralized, because the line-current flows in a direction opposite to that of the local current as it passes through the polarizing-coil of the said other magnet, and thus the alternating currents which are sent through the line and through said line-coil by means of the commutator hereinafter described, give force to one and neutralize the force of the other alternately, and thus impart vibratory motions, through the armature *l* of magnets E F, to the pallet *m*.

When the instrument is not in use, the pallet *m* acts as a detent to the clock-work and keeps it from rotation. As soon, however, as a key is depressed and the line-circuit closed the commutator above referred to begins to act and the pallet *m* is vibrated, allowing the toothed wheel *n* to advance the distance of one tooth at each half-vibration in a manner well understood. The commutator is supported upon a bracket, H, which is mounted on the plate D. A piece of hard rubber, G, is secured to the bracket H for insulating from each other various parts of the commutator.

The chief operating parts of the commutator, electrically considered, are the parts *r* and *s*, which are mounted on a transverse shaft of the commutator, but in such a manner as to be insulated from each other by way of the shaft. The parts *r* and *s* have each two points, *c′ d′* and *e′ f′*, respectively, which connect through corresponding points with the screws *v x* and *w y*, and through said screws, by means of wires, with the line-coils of the magnets E F, and thence with the line. The line-circuit is connected on one side, as shown in Fig. 1, with the vibrating part *r* by means of a binding-screw, *r′*, and a fine wire, r^2, and it is similarly connected on the other side with the vibrating part *s*. The line-wires running from the commutator being joined to the binding-screws *v* and *w*, it is evident that the current from the line-battery will pass directly out to line from the vibrating parts *r* and *s* through the line binding-screws, when the points *c′* and *e′* thereof rest upon their corresponding points; but when the points *d′* and *f′* rest upon their corresponding points, which latter are connected with the binding-screws *x* and *y*, there is no such direct connection with the line, and the only passage for the current is from screw *y* to *v* and from screw *x* to *w*, by way of the cross-wires shown in dotted lines in Fig. 1. This will send the current to line in an opposite direction.

In order to send alternating currents to line for causing, among other things, the vibration of the pallet *m*, through the action of the magnets E F, it is only necessary to cause successive reversals of the vibrating parts *r* and *s*. This is accomplished automatically through the operation of the pallet. A shaft, *a′*, is connected at one end with the pallet *m* and at the other with the vertical lever *z*, and near the pivoted shaft of said lever, so that the upper end thereof receives extended motion by means of a limited motion of the pallet. As this lever is moved backward and forward it strikes alternately upon the insulating-pins c^2 c^3 and the similar pins, i^2 i^3, one of each of these pairs of pins being connected with T-shaped downward extensions of the vibrating parts *r* and *s*. These extensions are notched at their lower ends, and conical-shaped joints or pivoted pins *g′ h′* are pressed into the notches by means of the insulated springs *t u*, secured to the plate D. The office of the springs and joints is to press the points of the vibrating parts tightly against their corresponding points in either position of the vibrating parts. It will be seen that the reversed positions of the lever *z* determine which pair of the points shall be thrown into contact with the corre-

sponding pair, and the polarity of the magnets E F, due to a reversal of the contacts through the lever *z*, will always be such as to cause the said lever to be moved back in the opposite direction. In this way, so long as the line-circuit is closed, there will be a rapid change of the polarity in the magnets E F and a consequent rapid vibration of the pallet *m*.

a is an angular lever, which is pivoted at the points *k'* and *l'*, and which lies directly across the key-levers. The said lever *a* has a platinum point, *m'*, which rests upon the point *n'*, when said lever is in its normal position, and thereby completes the circuit at that point; but when said lever is elevated by depressing one of the keys of the transmitter (and thus elevating the said lever) the circuit is broken at the point *m' n'*, and remains thus broken until the said key is released and the said lever is allowed to drop to its normal position. The object of this device is to render the act of transmitting easier, and to prevent the key which has been depressed from interfering with the parts which are actuated by the current which is brought into action by the depressing of the key. If this break in the circuit did not occur, and if the circuit were complete at all points immediately on the depressing of a key, the current would at once actuate the machinery and the circuit-breaking arm K' might reach the circuit-connecting lever K^2 just acted on, and before the removal of the finger and the return of the key and its lever and pin *h* to their normal position, and the said circuit-connecting lever K^2 being held firmly, the said circuit-breaking arm could not act upon it, and the circuit would not be broken at the proper point, and the transmitter and receiver would thus be thrown out of unison; but by breaking the circuit at the points *m' n'* the current does not act until said key with its connections return to their normal position, thus releasing all interference with the action of said circuit-breaking arm K' and circuit-connecting lever K^2.

The object of breaking the line-circuit by the action of the arm K' will be explained hereinafter.

In the transmitting-instrument in which I have embodied this part of my invention, a^2 a^3 are the binding-posts for the line-battery, the former being connected directly with the bar *a*, and thence through the platinum points *m' n'*, by a suitable wire, with the vibrating part *s*, and the latter with the vibrating part *r*. The circuit of the instrument is best illustrated in Fig. 12, and may be traced as follows: from binding-post a^3 to vibrating part *r* and screw *v*, thence to a spring, *c*, which makes contact with a point, 5, the latter being connected by a wire with the binding-post b^2, and thence to line. The single arrows on the drawings indicate the normal course of the current. Returning, the line-circuit enters at binding-post b^5 and passes to the line-coils of magnet F, and from there to the plate C, still following the course indicated by the single arrows.

It will be remembered that there is a series of screws, *j*, fixed in the plate C, and that the arms K^2 are brought into contact with said screws when the key-levers are depressed. Whenever, then, any one of the said levers has been pushed down, electrical connection will be made between the plate C and some one of the arms K^2, and through one of the spindles *h* this connection will be continued to the frame of the apparatus in which the said spindles are mounted. The frame is itself connected by a wire with the line-coil of the other magnet, E, from which it passes to the spring *f*, and through the contact thereof to the binding-screw *w*, whence it returns to battery by the course already described, provided contact exists between the points *m'* and *n'*. It will be seen that by this arrangement the break or opening between any one of the screws *j* and the corresponding arm K^2 is located in the loop which connects the two parts of the polarizing line-coils.

The circuit above traced is the one that has most to do in the working of the apparatus. As will be hereinafter explained, however, it becomes necessary to the proper operation of the type-wheel of my receiver to send a stronger current to line, and I accomplish this by cutting out the high-resistance line-coils. By reference to Fig. 11 it will be seen that I provide two rows or banks of keys representing the different letters of the alphabet. It has already been stated that the cross-lever *a* lies across the key-levers and is operated whenever a key is depressed. Besides this lever, a second cross-lever, *b*, is arranged to lie across the said levers in such a way as to be operated by the depression of any one of the upper or secondary set of keys, but to be unaffected by the movements of a primary key. The cross-lever *b* carries at its outer free end insulated contact-points 5 and 6, which normally connect with points on the ends of the spring *c* and *f*. It also carries insulated contact-points 7, 8, and 9, which are normally out of contact with corresponding points on springs *d*, *c*, and *g*. When the lever is operated by the depression of one of the secondary keys, the original contacts are broken and the others are made, whereby a shunt-circuit cutting out the line-magnets is formed as follows, (see Fig. 12,) the shunt-circuit being indicated by the double arrows: From binding-post a^2 the circuit goes to spring *d* and by wire to vibrating part *s*. From there it passes through contact-point 8 and spring *e* to the binding-post b^3 and to line. Returning, it goes from binding-post b^2 to spring *g*, to screw *v*, to vibrating part *r*, and back to binding-post a^2 and to battery.

The circuit enters the receiver by way of the coils M' of the relay 1, and passes through the relay 2 and the line-magnets 19 20 of the receiver and back to line. The office of the relay 1 is to make and break the circuit of the printing-magnet R. The magnet of relay

1 is made with long cores to prevent their discharging too rapidly, so that during the rapid impulses on the line-circuit, due to the action of the transmitter-commutator, the armature S′ is held constantly in proximity to the ends of the said core without vibrating back and forth. When a key of the transmitter is depressed and released, and the line-circuit thus completed, the relay 1 attracts its armature and holds it attracted until the line-circuit is broken at the transmitter through the action of the circuit-breaking arm K′. Connected with the armature of the relay is a lever, *t*′, and an L-shaped screw, *q*′, the point of the latter being normally in contact with mercury in a cup, *r*³. The circuit of the magnet R passes through the mercury and the screw and is broken when the point of the latter is withdrawn from the cup by the attraction of the armature S′ and restored when the armature falls back.

The relay 2 is provided with an armature, 10, and an armature-lever, 16, which is normally held retracted by a spring, 13, the adjustment being such that the armature will be attracted only by a current of greater strength than the ordinary currents. When it is so attracted, the lever 16 is brought against the point of a contact-screw, 12, closing the circuit of a local battery (which may be the local printing-battery) through the magnet 14, for a purpose to be explained hereinafter. The magnets 19 20 of the receiver act in the same manner and at the same time as the magnets E F of the transmitter, and serve to control an escapement, by means of which the shaft that operates the printing-wheel is moved in perfect unison with the shaft P of the transmitter. The said magnets are also similarly wound, and they are polarized in like manner by a local battery.

The general operation of the receiver-magnets being thus set forth in advance, the apparatus comprising my receiver as a whole will now be described in detail.

A^2 B^2 C^2 represent the three upright parallel plates of the receiver, connected by suitable cross bars or ties, as shown. On the inner side of the plates A^2 and B^2 two horizontal bars, I′ I^2, are fixed, forming a track or way on which is mounted a reciprocating frame, K, which with its rollers carries the paper upon which the message is to be printed. Firmly attached to the one side of this frame K is the toothed rack J. Connected with the plates A^2 and B^2 are the upright brackets L′ L^2, which form supports for the journals of the shaft M. Upon this shaft M is firmly fixed the pendent lever N, and upon this pendent lever N is firmly fixed the armature O, and is also pivoted the cam-pointed lever P′ and the angular pawl G′. This pendent lever N is actuated by means of the magnet R, which acts upon the armature O, and the said lever is retracted by means of the spring S. When the said lever N is moved in the direction of the magnet R by the attraction of the same, (induced by the circulation of a current from a local battery through the coil of said magnet,) it carries with it said angular pawl G′ the distance occupied by one of the notches of the toothed rack J. When the V-shaped pin *o* drops into one of the notches of said rack, and when the said local current ceases and the magnet loses its attraction, the retracting-spring S takes effect upon said pendent lever, retracting said lever and carrying with it said angular pawl G′, and with it moves the paper-carriage, to which the rack J is firmly attached, the distance of the length of one of the teeth of said rack. The said lever N being limited in both its forward and backward motion, it moves only far enough in the direction of the magnet R to allow the pin *o* to drop between the teeth of the rack J; and when the said lever N is retracted to its rear limit it moves the said rack J and paper-carriage the distance of one tooth of said rack, when the pin Q of the detent T drops in one of the notches of said rack J and holds said rack and paper-carriage in position until said pawl G′ is again brought forward to feed the said paper-carriage the distance of another tooth. Thus the said paper-carriage is moved along, one tooth at a time, until the curved standard U strikes the cam-pointed lever P′ and moves said lever forward, causing it to lock with the pawl G′, and causing said pawl and lever to become rigid with the pendent lever N. Then the next forward motion of said lever N causes the said pawl to be lifted out of the notch which it occupied in the rack J, and as the end of the detent T overlaps the pin *o* of the pawl G′ the said detent is at the same instant elevated, so as to clear the notches of said rack J, and the said rack and paper-carriage are then brought back to the point for starting a new line on the paper by means of the cord X and weight W. When said carriage has dropped back its full limit, the standard V strikes the lever P′ and drives it from its rigid connection with the pawl G′, and allows the pin *o* of the pawl G′ to drop between the notches of said rack in position for again feeding said paper-carriage along. Firmly fixed upon the said shaft M is also the lever Y, which is connected with the printing-lever o^2 by means of the coupling o^3. At the forward end of said printing-lever is the printing-pad 15. This printing device is operated in connection with the feed of the paper-carriage in the following manner: When a key of the transmitter is actuated, the circuit of coil R is broken in the manner above described and its armature is released. This allows the spring S to retract the pendent lever N, and with it the lever Y and the other connections of the shaft M. When this action occurs, the pawl G′ being pivoted, as above described, to the lever N, and the pin *o* of said pawl being in a notch of the rack J, the said paper-carriage is moved the distance of one notch, and when the line-current ceases the point of the screw *q*′ drops into the mercury-

cup r^3, and thereby completes the local circuit of the printing-magnet R, and causes said magnet to act upon the armature O, which thereby causes the printing-pad 15 to press the paper against the proper letter of the type-wheel.

The characters and spaces upon the type-wheel I of my receiving-instrument are divided into two parallel rows surrounding the periphery of said wheel; and said characters and spaces are so arranged that they stand in pairs across the periphery of the said wheel. The said type-wheel is firmly fixed upon the shaft M′ and turns with said shaft as the same is allowed to revolve by the vibrations of the armature operating the escapement O^2. With each vibration of the pallet o^2 of said escapement, releasing one of the teeth of the wheel H^2, the said type-wheel carries to a fixed point two of the characters on the periphery of said wheel. The row V^2, as shown in Figs. 9 and 10, stands in the normal or primary position, where it is held by the spring 3.

The shaft M′ has both a lateral and circular motion, the shoulders of said shaft being such distance apart with reference to the sides of the bearings of the pivots of said shaft as to allow the said shaft to move laterally such distance that the secondary row W^2 may be moved so as to occupy the position of the row V^2 of the characters, &c., of said type-wheel.

The two sets of transmitter-keys spoken of as primary and secondary correspond to the rows of the letters, characters, &c., of the type-wheel of the receiver.

When a primary key is depressed by the operator and the line-circuit completed, the current passes from one pole of the battery through the commutator of the transmitter, and through the magnets of said transmitter to the line, and thence through all the coils of the receiver and its relays (except the polarizing-coils) back through the commutator to the other pole of the battery when moving in one direction, and when moving in the reverse direction the current passes first through the commutator to the receiver, thence through the coils of the receiver and relays back to the coils of the transmitter, and thence out through the commutator to the other pole of the battery. With each vibration of the pallet of the transmitter and corresponding vibration of the vertical lever *z* and vibrating parts *r s* the current is reversed, first moving in one direction and then alternating in the opposite direction. As the said impulses of the current are thus alternated, first in one direction and then in the opposite direction, the pallets of the transmitter and receiver are operated in unison, so that as one tooth of the wheel *n* of the transmitter is allowed to escape a corresponding tooth of the wheel H^2 in the receiver is allowed to escape, because the line-current operates both pallets at the same instant. Thus two characters on the type-wheel are moved to a position in which one character of the primary row stands immediately over the printing-pad 15 in position to receive the impression of said pad. Now, when one of the keys of the secondary set is depressed, the cross-lever *b* is elevated, and at the same instant the points 5 and 6, which connect with the points of the springs *e* and *f*, are disconnected with the points of said springs and the points 7 8 9 are brought into contact with the points of the springs *d e g*. By this means the magnets E F of the transmitter are switched out of the line and the current sent directly to the relays and magnets of the receiver. The magnets E F of the transmitter being of high resistance when they are switched out of the line, a current of much greater strength is sent through a relay, 2, which actuates the armature 10 and the lever 16, bringing the connecting-point of said lever 16 against the connecting-point of the screw 12. When the said points of the lever 16 and screw 12 are brought into contact, being in circuit with the battery which does the printing, or some other local battery, a current is thereby sent through the magnet 14, and the armature of said magnet 14 being thus acted on, the upper end of the vertical lever 18 is thereby brought forward, carrying with it the shaft M′, with its type-wheel and other connections, and pressing outward the spring 3 until the secondary row of characters on the type-wheel stands in the position, laterally, immediately before occupied by the primary row of characters. Thus, suppose the letters A and B to stand in a line across the periphery of the wheel, letter A standing in the line V^2 and letter B standing in the line W^2, or, to express it otherwise, letter A being in the primary row and letter B in the secondary row, when a key, A, of the primary, set as above described, is depressed, the letter A of said primary row is brought immediately over the printing-pad 15 in position for the paper to receive the impression of A; but when a key, B, of the secondary set is depressed the pallet o^2 of the escapement of the receiver operates the same number of times, so as to bring letter A into position for being printed; but a strong current having been sent through the magnet of relay 2, and the magnet 14 being brought into the circuit of the above-described local battery, the said secondary row of letters on the type-wheel is thrown into the position of the said primary row, so that when the vibrations of the pallet o^2 take place, which would primarily have brought letter A into position to be printed upon the paper, the said shaft being locked in its said secondary position by means of the latch 17, letter B, being immediately opposite letter A, will stand in position over said printing-pad 15, and the said letter B will therefore be imprinted upon the paper. Thus each letter of the alphabet is printed, the process being according to the set or row each may belong to; and by this means the pallets of the transmitter and receiver operate only one-half the number of times to bring each letter into position that would be required to bring any particular letter into po-

sition by the means described in my original patent above referred to.

When each letter of the set or series of the secondary row is printed, at the same instant and by the same operation of the magnet R upon the armature O the projection P′, which is firmly attached to the pendent lever N, strikes the latch 17 and releases the lever 18 and allows said lever 18, with the type-wheel I, to be driven back to their normal position by means of the spring 3.

Instead of a single type-wheel with the alphabet divided and arranged in two rows around the same, two wheels may be formed, each having a row of letters on its periphery corresponding with a row of letters on the above-described single wheel, and the said wheels placed upon a single shaft a suitable distance each from the other, so as to form parallel rows corresponding with the rows upon the single wheel, as above described.

As each successive letter is printed in the manner above described, the paper-carriage with the paper which receives the impression is fed along the distance of a letter, and a proper space for separating the letters, by the process above described, until the standard U strikes the lever P′ and locks it with the pawl G′, when said carriage drops back in the manner described, for the beginning of a new line.

It is of course understood that the short circuit caused by the depression of one of the secondary keys is maintained only while the said key is held down, and that its whole function is to cause a powerful current to be sent to line for shifting the type-wheel through the action of the magnet 14. After this has been accomplished and the secondary key released, the current passes through the line-magnets of both the receiver and transmitter and operates their escapements in unison, as above described.

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

1. In a commutator for printing-telegraphs, the combination, with the vibrating parts or arms *r s*, having the T-shaped extensions, the springs having a flexible connection with said extensions, and the pins c^2 c^3 i^2 i^3, of the lever *z* with its actuating mechanism, as and for the purpose set forth.

2. In a commutator for printing-telegraphs, a vibrating part or arm having a contact-point at or near each end and a T-shaped extension provided with a pair of pins or projections, a spring having a flexible connection with said extension, and a lever located between the said pins for operating the vibrating arm, said lever being connected with the armature of the electro-magnet, substantially as set forth.

3. In a commutator for printing-telegraphs, a pair of vibrating arms located in the circuit of a line-battery, each having a contact-point at or near each end, and each having a T-shaped extension provided with a pair of pins or projections located opposite each other, as shown, and a spring flexibly connected with said extension, in combination with a lever located between the said pins for operating the arms, the said lever being connected with the armature of a polarized magnet, substantially as set forth.

4. In a printing-telegraph, the combination, with the magnets E F, located in the line-circuit, the commutator operatively connected with the armature of the said magnets, the pallet *m*, and the escapement-wheel *n* at a transmitting-station, of the magnets 19 20, the pallet o^2, the escapement-wheel H^2 at a receiving-station, and a pair of relays located in the circuits of said magnets, substantially as and for the purposes set forth.

5. In a printing-telegraph, the combination, with an electric generator, of the magnets E F in the circuits thereof, the commutator operatively connected with the armature of the said magnets, the pallet *m*, the escapement-wheel *n*, and the circuit-breaking arm K′ at a transmitting-station, and the magnets 19 20, the pallet o^2, the escapement-wheel H^2, and the shaft carrying the type-wheel I at a receiving-station, substantially as and for the purposes set forth.

6. The combination, with an electric generator, of the magnets E F in the circuit thereof, the commutator operatively connected with the armature of the said magnets, the transmitting-keys, the make-and-break levers K^2, the circuit-closing arm K′, and the escapement *m n* at a transmitting-station, and the magnets 19 20 and the escapement O^2 H^2 at a receiving-station, substantially as and for the purposes set forth.

7. In a printing-telegraph, the keys of a transmitter, an angular lever, *a*, lying across said keys or their extensions and having contact-points *m′ n′* in the line-circuit, an angular lever, *b*, also lying across said keys and having the points 5, 6, 7, 8, and 9, insulated from each other and connecting with the springs *c*, *d*, *e*, *f*, and *g*, a battery, and the relay 2, substantially as described.

8. In a printing-telegraph, the combination of the angular lever *b*, with its connecting-points at 5 6 7 8 9, insulated each from the others, the springs *c d e f g*, with their connecting-points, a line-circuit, a battery, the keys of the transmitter, the relay 2, located within said line-circuit and forming contact in a local circuit, the magnet 14, and the lever 18, substantially as described.

9. In a printing-telegraph, the combination of the angular lever *b*, with its connecting-points 5 6 7 8 9, insulated each from the others, the springs *c d e f g*, with their connecting-points, a line-circuit, a battery, the keys of the transmitter, the commutator of the transmitter and its actuating mechanism, the relay 2, located within the line-circuit and making and breaking a local circuit, the magnet 14, the lever 18, the escapements *m n* of the transmitter and O^2 H^2 of the receiver, and the actuating mechanism of said escapements, the type-wheel I, and the printing-pad 15 and its

actuating mechanism, substantially as described.

10. The combination of the magnet R, placed within a local circuit, the armature O, the lever N, spring *s*, pawl G′, locking-lever P′, rack J, and standards U V, substantially as described.

11. The combination of the relay 1, having its magnet located in the line-circuit and having make-and-break points at t^2, with the magnet R, placed within a local circuit, the armature O, the lever N, spring *s*, pawl G′, locking-lever P′, rack J, and standards U V, substantially as described.

12. The combination of the magnet R, placed within a local circuit, the armature O, the lever N, spring *s*, pawl G′, locking-lever P′, rack J, standards U V, cord X, and weight W, substantially as described.

SAMUEL V. ESSICK.

Witnesses:
SIMON JOHNSON,
DAVID FORDING.