(No Model.) 4 Sheets—Sheet 1.

B. F. MERRITT & J. M. JOY.

PRINTING TELEGRAPH.

No. 558,506. Patented Apr. 21, 1896.

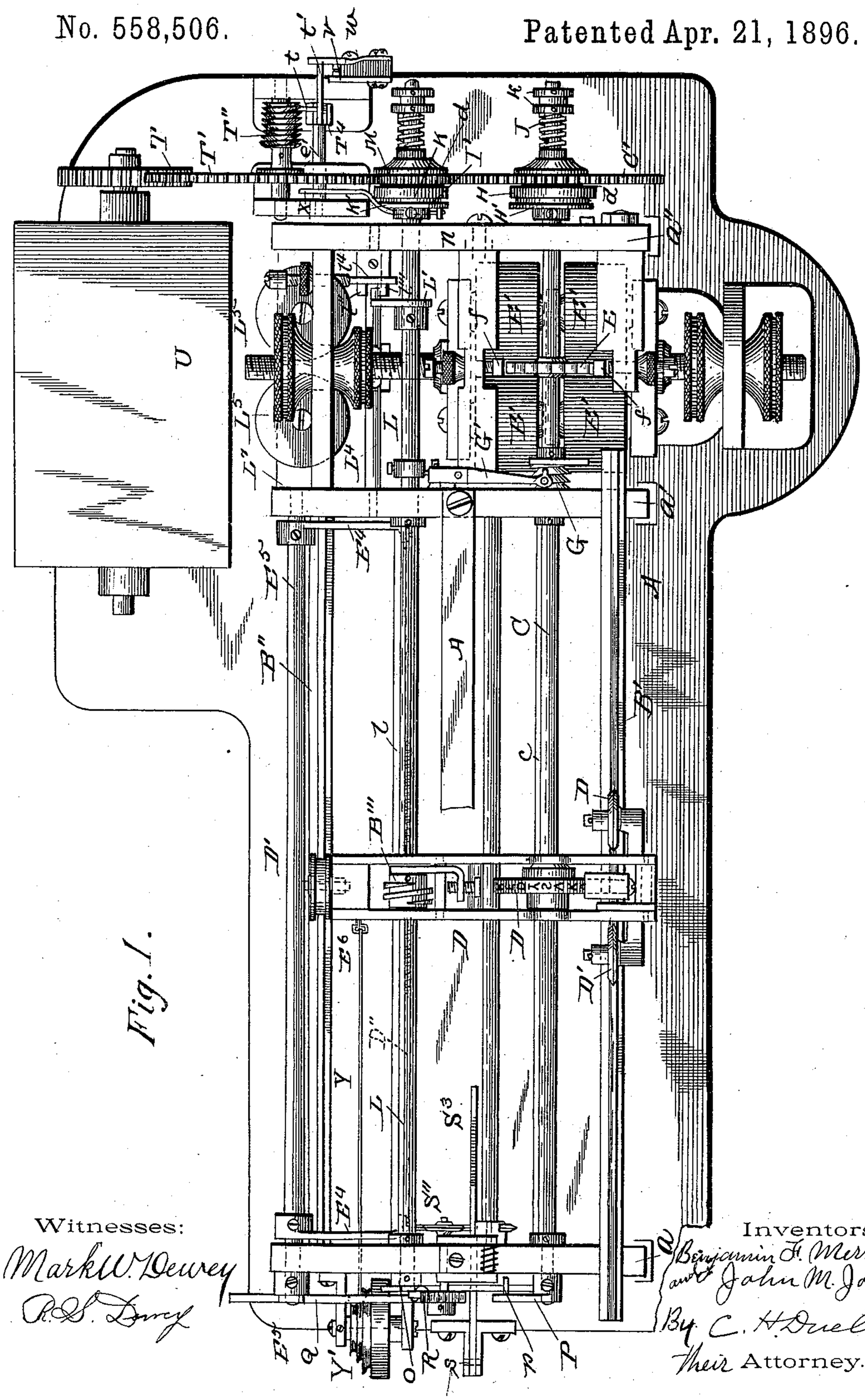

Fig. 1.

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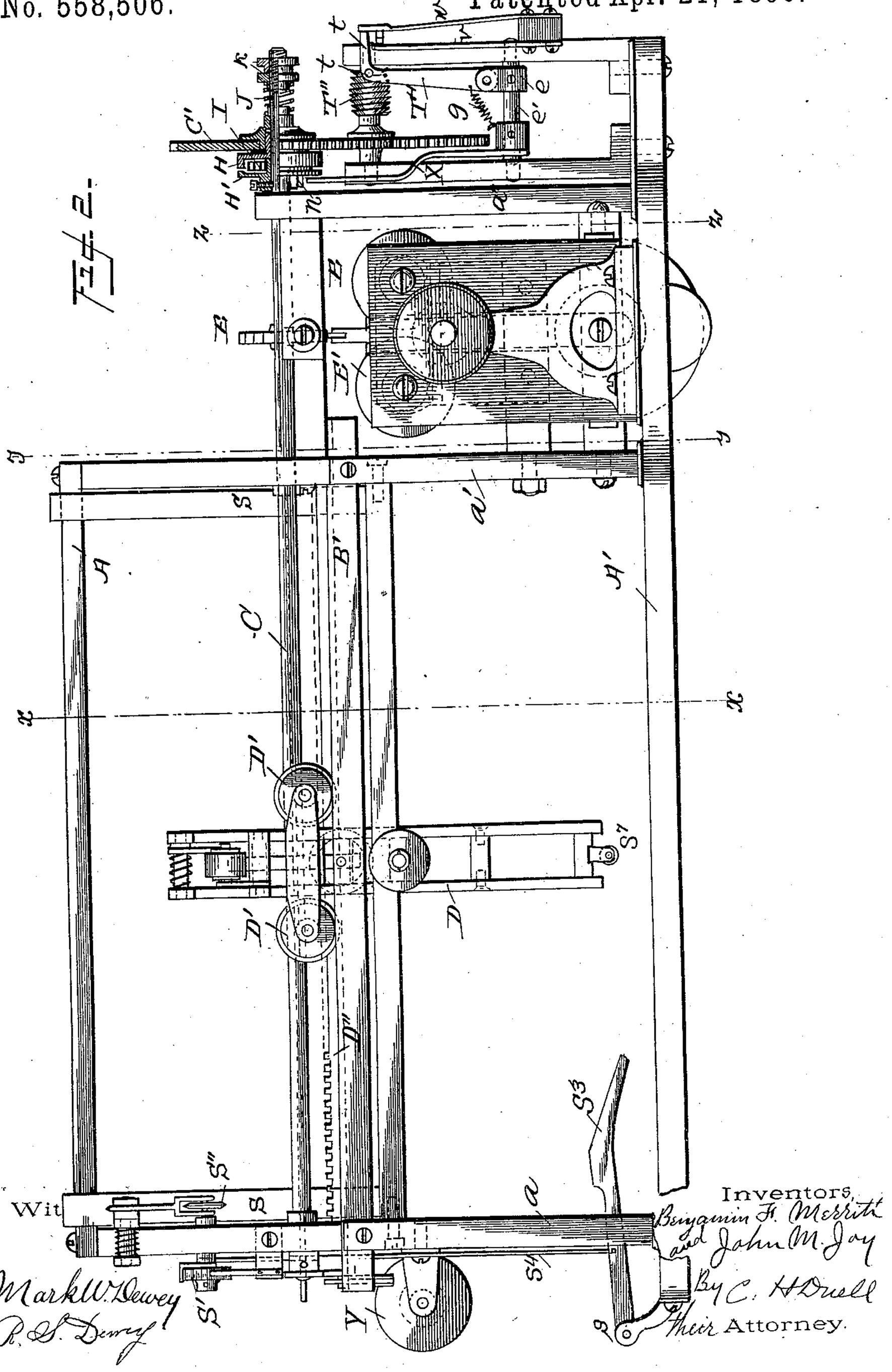
(No Model.) 4 Sheets—Sheet 2.

B. F. MERRITT & J. M. JOY.

PRINTING TELEGRAPH.

No. 558,506. Patented Apr. 21, 1896.

FIG. 2.



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(No Model.) 4 Sheets—Sheet 3.

B. F. MERRITT & J. M. JOY.

PRINTING TELEGRAPH.

No. 558,506. Patented Apr. 21, 1896.

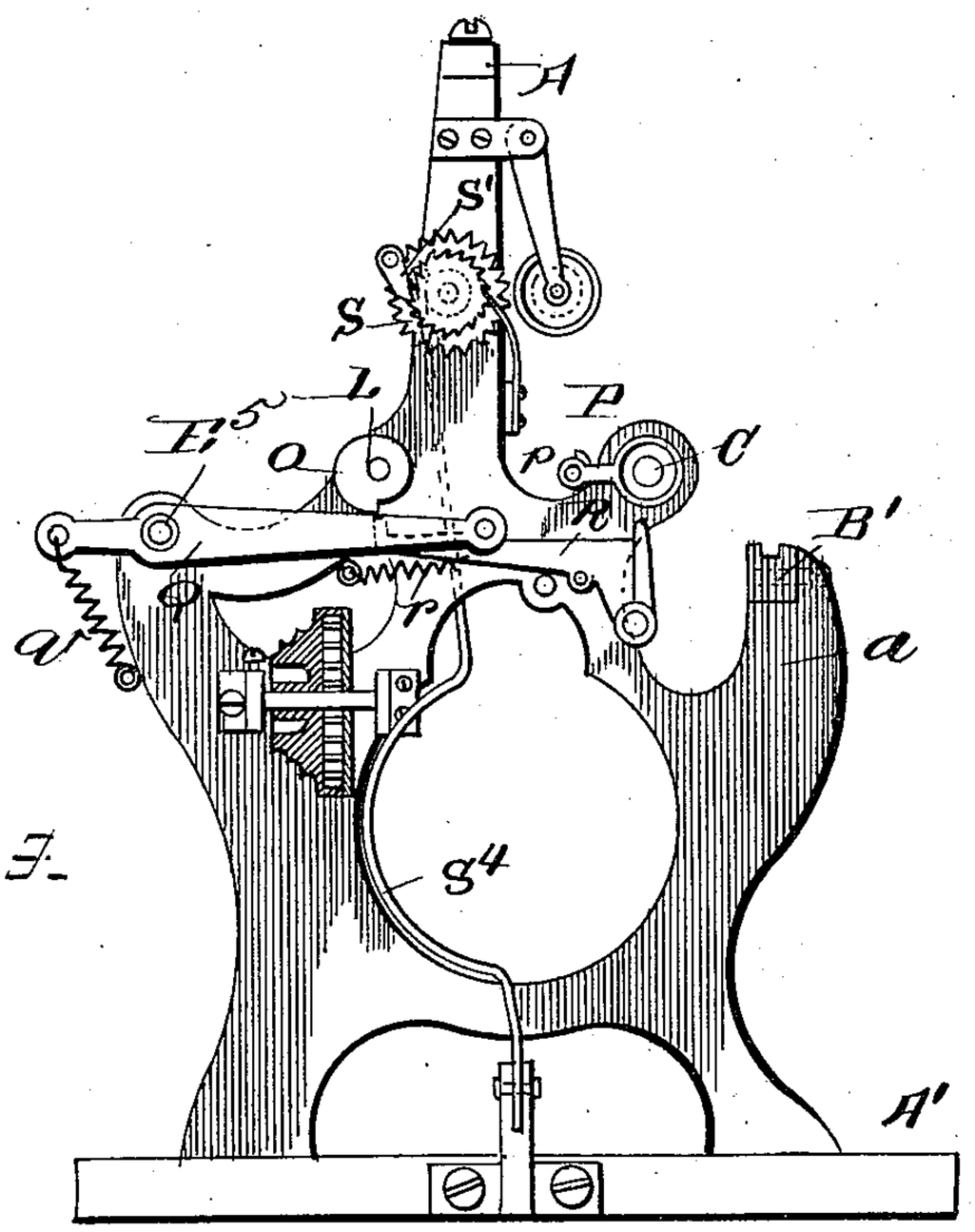

Fig. 3.

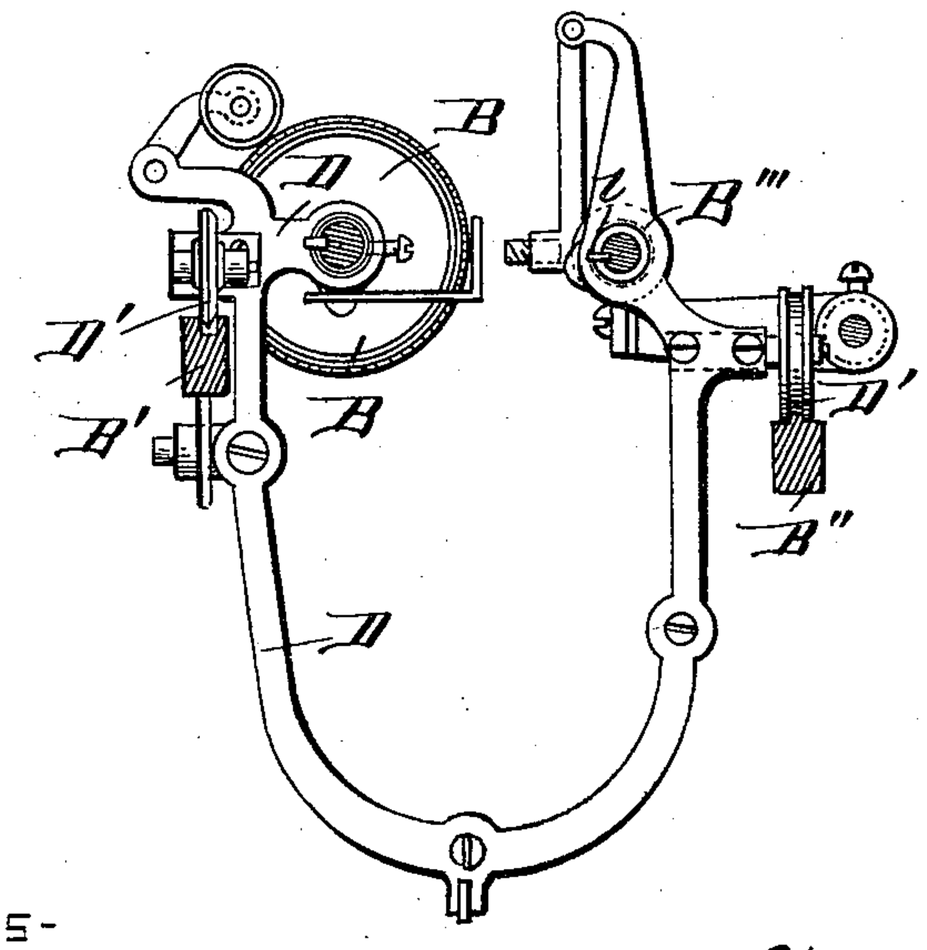

Fig. 4.

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(No Model.) 4 Sheets—Sheet 4.

B. F. MERRITT & J. M. JOY.

PRINTING TELEGRAPH.

No. 558,506. Patented Apr. 21, 1896.

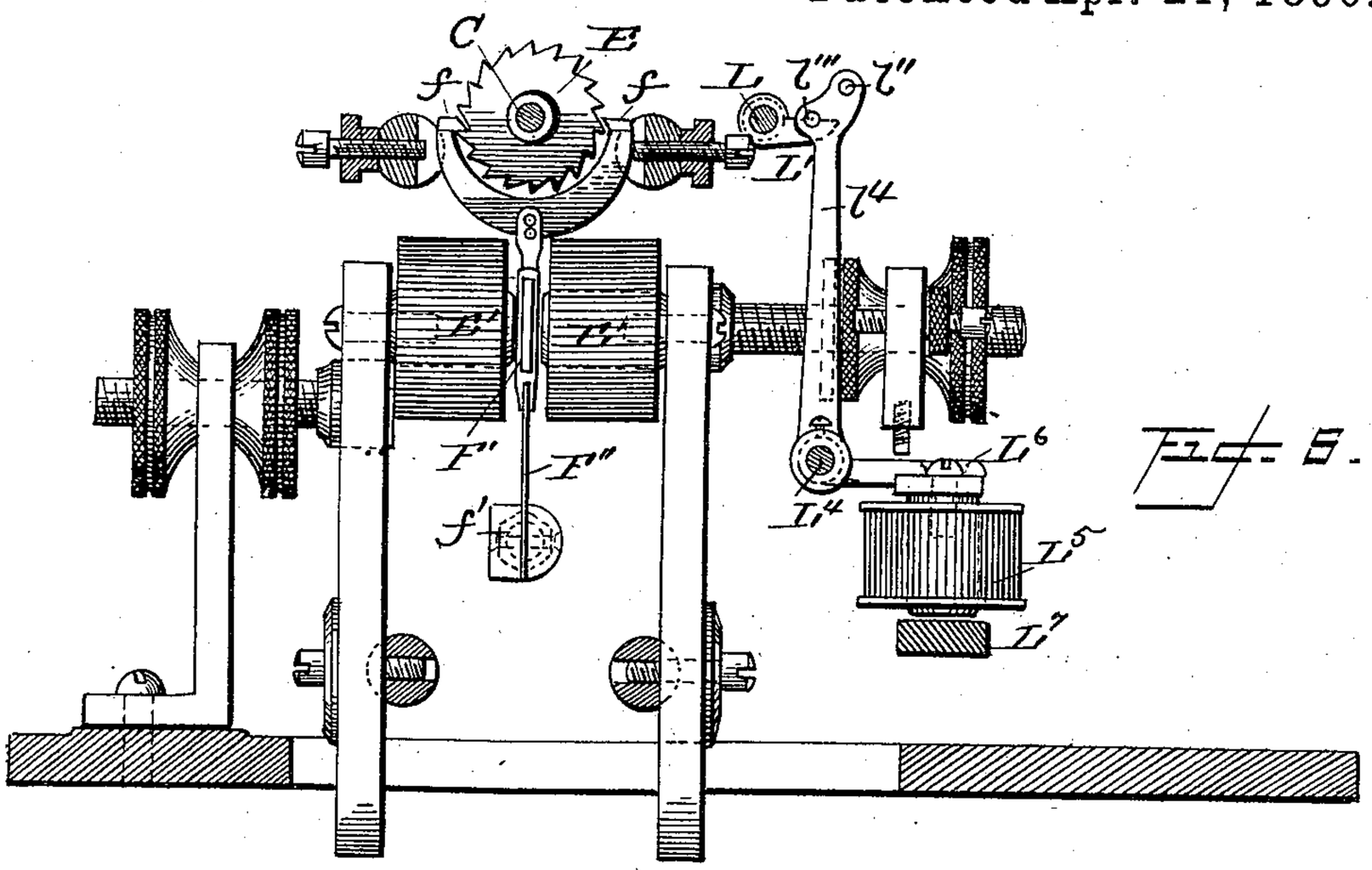

Fig. 5.

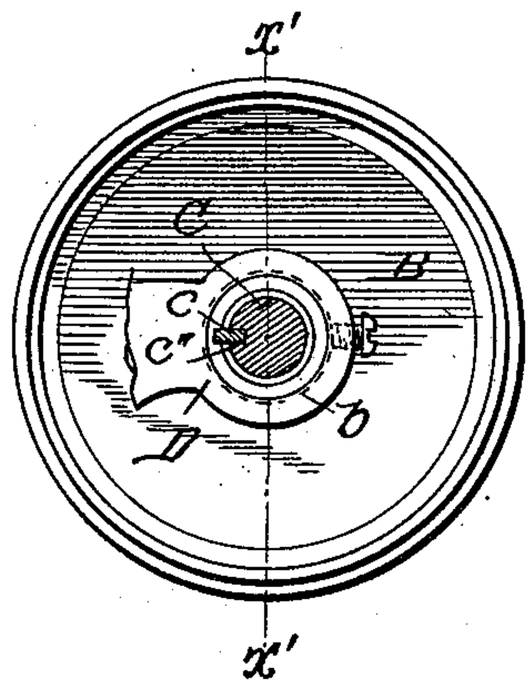

Fig. 6.

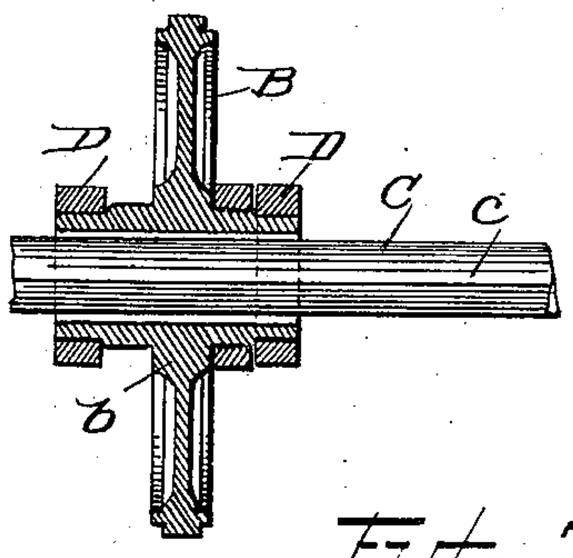

Fig. 7.

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UNITED STATES PATENT OFFICE.

BENJAMIN F. MERRITT, OF NEWARK, NEW JERSEY, AND JOHN M. JOY, OF NEW YORK, N. Y., ASSIGNORS TO THE CONSOLIDATED TELEGRAPH AND NEWS COMPANY, OF NEW YORK, N. Y.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 558,506, dated April 21, 1896.

Application filed June 29, 1895. Serial No. 554,475. (No model.)

To all whom it may concern:

Be it known that we, BENJAMIN F. MERRITT, of Newark, in the county of Essex, State of New Jersey, and JOHN M. JOY, of New York, in the county of New York, in the State of New York, have invented new and useful Improvements in Printing-Telegraphs, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

Our invention relates to improvements in printing-telegraph receivers of the class known as "page-printers," or those wherein the message is printed upon a page or sheet of paper line by line after the manner of a type-writer, (and has most particular relation to the system of page-printing,) as hereinafter described. In this system the type-wheel is driven step by step by means of clockwork controlled by an escapement actuated by an electromagnet responding to rapid alternations of current over the circuit. The type-wheel executes rapid intermittent advances until the letter to be printed is brought opposite the paper, whereupon it stops by the cessation of the electric impulses and the printing mechanism is brought into operation, which impresses the letter against the paper. The printing mechanism consists of a platen or hammer behind the paper, which presses it against the type-wheel, the movement of the hammer being controlled by the action of an electromagnet called the "printing-magnet." After each impression the type-wheel, which is pivoted in a carriage movable in a lateral direction, is moved one space toward the right to a position opposite that space on the paper where the succeeding character is to be printed. The paper is mounted in a holder or frame adapted to move upwardly, but not laterally. After each impression the type-wheel, which is mounted to slide on a shaft, is moved laterally to the right against the tension of a retractile device by a worm engaging with the teeth of a movable rack-bar connected to the type-wheel. When the end of the line is reached, the type-wheel is permitted to return to its original position by lifting the worm out of the teeth of the rack-bar. The carriage in returning to its starting-point sets in motion a device which raises the paper the distance from one line to the next. The receiving instrument operates in unison with the transmitting instrument, and, in order to start them with like characters on the respective type-wheels facing the paper, means are provided for unisoning the type-wheels.

The object of our invention is to increase the efficiency and ease of operation of such a receiver.

To this end our invention consists in mounting the type-wheel carriage on rollers and journaling the type-wheel and the worm on this carriage in such a manner that neither the type-wheel nor the revolving worm will slide on a shaft or shafts. This is done to avoid friction and to insure a perfectly free movement of the type-wheel.

The invention consists also in providing an electric motor for operating the receiver, having a device by which, when the transmitting-operator has ceased to send, the motor is automatically stopped, and when the operator commences to send the motor is automatically started.

It consists also in providing means whereby the escapement will operate more rapidly; and our invention consists also in making the printing-magnets movable, instead of the armature; and our invention consists also in certain combinations of parts hereinafter described, and specifically set forth in the claims.

In the drawings hereto annexed and forming part of this specification, Figure 1 is a top plan view of our improved telegraph-receiver drawn about three-fourths the size of the full-sized machine; Fig. 2, a front elevation of the same; Fig. 3, an elevation thereof from the left-hand side; Fig. 4, a vertical transverse sectional view taken on the line $x\ x$ of Fig. 2, showing the traveling carriage in side elevation; Fig. 5, a vertical transverse section looking from right to left on line $z\ z$ of Fig. 2, showing the escapement devices in elevation; Fig. 6, an enlarged side elevation of the type-wheel and its bearings on the carriage, and Fig. 7 a sectional view of line $x'\ x'$ of Fig. 6.

Referring specifically to the drawings, A

designates the fixed frame of the instrument, which is provided with a base A′ and uprights *a*, *a′*, and *a″*, &c.

For the sake of ready reference, and in order that the construction and mode of operation of our improved instrument may be easily and quickly understood, the following description is divided into headings, and the corresponding parts are designated by the same reference-letters in all the figures.

Mechanism for governing the motion of the type-wheel.—The type-wheel B is rotated by means of the shaft C, which is supported by bearings in the uprights *a*, *a′*, and *a″* of the frame, and is rotated by frictional contact from the power-driven wheel C′. The shaft C is provided throughout its entire length with a spline *c*, which engages a longitudinal groove *c″* in the hub of the type-wheel B. The type-wheel is supported and journaled by its hub *b* in bearings carried by the type-wheel carriage D. The spline *c* is to impart a rotative motion to the type-wheel. The weight of the wheel is borne entirely by the carriage D, and not by the shaft C, which rotates the wheel, as heretofore explained.

The rotation of the type-wheel is governed by means consisting of the escape-wheel E, having half as many teeth as there are characters on the type-wheel, the escape-wheel being governed by the armature F′, which carries at its upper and free end the pallets *f f*, which engage the wheel. The number of teeth on the escape-wheel of course depend upon the number of characters on the type-wheel, which is usually thirty-six, and which allows eighteen teeth to the escape-wheel E. Heretofore the armature F′ has been pivoted; but we prefer to mount it on the end of a spring F″, rigidly secured at its opposite or lower end to a support *f′*, fixed to the frame. When in its normal position, the spring F″ extends in a vertical position, its center or neutral line being on a plane extending through the axis of the escape-wheel shaft.

With armatures responding to rapid alternations of polarity, such as are used to control the revolution of type-wheels, the inertia of the armature, pallets, and dependent hangings brings in a factor which offers no small amount of opposition when a very high rate of vibration is desired. The inertia of the moving parts of the escapement not only retards the rapidity with which the armature may start after a pause, but also has a tendency to decrease the amplitude of oscillation as the rapidity of the alternations increase, so that the armature does not complete its full stroke. These facts have prevented the attainment of a high rate of speed, which with our improvement is practicable.

The advantage of suspending the armature and pallet by a spring is that the rigid spring always has a certain amount of potential force with which to move the armature back over its path in addition to the magnetic force and before that magnetic force is set up. This is obvious from the fact that the alternating current which actuates the armature has a pause of slight duration between its phases. During this pause the armature gains its neutral point and it is already on its way to the position it will assume on reversing the current, thus increasing the speed of oscillation which can be imparted to the armature and its dependent pallets.

The unisoning device is the same or similar to that heretofore employed and is shown at G, G′, and G″, the first reference-letter designating the worm or thread for actuating the lever G′. This device being well known, it will be unnecessary to describe it at length.

The motion to rotate the type-wheel shaft, as has been before stated, is imparted through friction by the power-driven wheel C′. Between the gear-wheel C′ and H is placed a disk of flexible friction-giving material *d*, preferably cloth, and between H and the disk H′ is placed a flat coil-spring I of sufficient power to rotate the shaft C, while the wheel C′ and its attendant friction device are at rest and to continue its movement until the spring is unwound. The spring I is fast to H at the outer end and to H′ at the inner end. The plate or disk H′ is securely pinned to the shaft C. The spiral spring J, with its controlling tension-nuts *k*, acts to press the wheel C′ against its friction-disk *d*, and thus to give motion to the parts H and H′. The operation of these devices is as follows: The power-driven wheel C′, carried loosely on the shaft C, actuates, through the friction-disk *d*, the part H, also carried loosely on the said shaft. The part H gives motion in turn to the plate H′ through the coil-spring I. The plate H′ being secured rigidly to the shaft, the latter is rotated with it. The function of the spring I will be referred to hereinafter when the automatic cut-out device is described.

The type-wheel and worm-wheel carriage.—The frame of the type-wheel carriage D is supported on its wheels D′, which run on track-bars B′ and B″, and is moved longitudinally by the worm-wheel B‴, which engages in the rack. The worm-wheel is rotated by the shaft L by means of a spline *l*, hub, and bearings in carriage-frame D in the same manner as the type-wheel. When the worm-wheel B‴ is revolved, it being engaged by rack D″, the carriage is forced along the paper (not shown) from left to right one step in advance for each revolution of the worm B‴. Power for rotating the shaft L is obtained from the power-impelled gear M through a friction device, consisting of a spring I′ and plates K K′, as hereinbefore described, for rotating the shaft C. The rotary motion of the shaft L is governed by the engagement of the flier L′ with the stop-pins *l″* and *l‴*, which stop-pins are carried on the end of an arm l^4, supported and rocked by shaft L^4, the shaft being moved by the electromagnet L^5, connected in the main line.

The motion of the flier L′ and shaft L^4 with

its attendant arm and stop-pins and the magnet is similar to the operation of such parts in other receivers. The controlling-magnets E′ of the escapement *f f* and the magnet L^5 may be connected in series or multiple, the principle being that the alternating currents cause the polarized coils to respond readily and quickly, while the coil of the magnet L^5 not being polarized will act slowly and will not respond or act during the rapid alternations of the current. To still further widen the margin of adjustment between the effect of the alternating and direct currents, the magnet L^5 is suspended by its yoke on arm L^6, which is rigidly recured to the shaft L^4. The operation of this part of the apparatus is as follows: During the time the alternating current is passing and actuating the escapement *f f* the magnet L^5 remains stationary, owing to its being less sensitive to the alternating current and also owing to the fact that its inertia keeps it steadily in a position away from its armature. At the instant, however, a prolonged impulse is sent for the purpose of printing a letter the magnet L^5 is energized and attracted to its stationary armature L^7, which is supported by the uprights *a′* and *a″*, thus causing the shaft L^4 and its attendant arm and stop-pins to rotate and allow the flier L to make one revolution. When the type-wheel carriage has reached the right-hand end of its run and it is desired to return it to a starting-point for another line, the rack D″, which is hung on the free ends of arms E^4, supported by shaft E^5, pivoted in and extending between the uprights *a* and *a′* of the frame, is dropped out of engagement with the worm-wheel B‴. The power to return the carriage from right to left is transmitted by means of a flexible connection Y, extending from point E^6 to and winding upon a spirally-cut spring-actuated fusee Y′. It has been found in practice that the pitch of the fusee can be made to give the desired variation of tension at any point in the run of the carriage.

Mechanism for governing the return of the type-wheel carriage.—On the shaft C, at its extreme left-hand end, is mounted the crank P, bearing upon its end the pin *p*, and having such a radius that at a given point of rotation of the type-wheel shaft it will interfere with the movement of the point R′. On the worm-wheel shaft L and at its extreme left-hand end is mounted the cam O, being of such a diameter as to actuate the rocker-bar R on its pivot *r*, the return of said rocker-bar being effected by the tension of the spring *r′*. The lever Q is fixed to the shaft E^5, and it is held with a tendency to rise by spring *q*. It will be obvious that as the rack D″ is journaled at one end in a bearing in the lever Q the rack would be thrown out of engagement with the worm-wheel should the lever be depressed. The depression of the lever Q is effected as follows: When the shaft C has been rotated so that its crank P extends downward from the shaft in a vertical position, the crank P and the point R′ on a lever R being in line and the cam O is revolved, the depression of said lever by the cam causes the lever R not only to move on its pivot *r*, but also tends to depress the pivot as the lever is supported by pin P at point R′. In any other position of the type-wheel shaft and its crank P the lever R, being unsupported at point R′ during the rotation of the cam O, will simply rotate on its pivot *r* and will not depress the lever Q.

From the above description it will be seen that to return the type-wheel carriage it is only necessary to rotate the type-wheel to an arbitrary position and then make a stroke of the printing mechanism, thereby saving time over old methods of releasing a carriage.

The controlling device for raising the paper.—This consists of the paper-guides S S, which support the sides of the paper after leaving its roll. (Not shown.) The paper is moved upward by well-known devices consisting of a ratchet and its attendant pawls S′ with the prick-wheel and its attendant pressure-wheel S″. Motion is given to the ratchet by means of the lever S^3 through the rod S^4. The lever S^3, being depressed and through its attendant devices rotating the prick-wheel S″, raises the paper at the left-hand end of the run of the carriage, the depression being effected by the action of the roller S^7 on the lower part of the carriage upon the inclined end of the lever S^3, which is pivoted to a bracket *s*, extending upward from the end of the base A′ It will be obvious, however, that the ratchet may be operated by the carriage through other suitable and well-known means—as, for instance, by means of an Archimedean screw.

Were there no attendant mechanism both shafts C and L would revolve in opposite directions and proportionally. Upon the shaft carrying the gear-wheel T′ is mounted a worm T″, with which a point *t*, carried on the end of a pivoted arm T^4, engages. The point *t*, with the finger *t′*, when in a position at the right-hand end of travel in the worm, presses on a spring *w* and forces it away from the spring *v*, opening the electric circuit between the points of contact on and between the two springs, the said circuit being the driving-circuit of the motor U. The arm T^4 is pivoted at its lower end in a block *e*, which is pinned on a shaft *e′*. A spring *g*, connected to the said arm, returns it to its original position to the left-hand end of the worm when the point is released from the worm T″. The point is released by rocking the shaft *e′* in its bearings. The shaft *e′* is rotated by the engagement of a pin *n*, mounted on a plate or disk K′, which is rigidly connected to the worm-wheel shaft L.

It is obvious that upon rotating the shaft L to make the first printing stroke after the stoppage of transmission the shaft *e′* will be rotated by lever X, throwing the point *t* out of engagement with the worm T″, allowing

the contact-points on the springs *w* and *v* to close the circuit and start the motor U. The power for making the first printing stroke is obtained from the coil-spring I, hereinbefore referred to, the spring being wound by the momentum of the motor after the stoppage of the motor.

We do not wish to be limited to the rollers on the type-wheel carriage, as it will be obvious that the carriage may be provided with ball-bearings or may simply slide on rods of any suitable shape, as the paper-carriages of ordinary type-writing machines.

This receiver may be used with any transmitter which sends alternations for governing the rotation of the type-wheel and prolongations of said alternations for printing the letters when the type-wheel has been brought to a given point. It may also be used beyond repeating relays which are in circuit in the main line with the transmitter in a manner well known to those familiar with the art.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a printing-telegraph receiver, a carriage provided with rollers, a track for the rollers, a retracting device for moving the carriage in one direction, a worm-wheel pivoted in and supported by the carriage, a shaft passing through the worm-wheel and connected to the same by a spline and groove, a type-wheel also pivoted in and supported by the carriage, a shaft passing through the type-wheel and connected to the same by a spline and groove, a motor adapted to rotate both shafts, a rack adapted to be moved toward and from the worm-wheel, and means to move the rack to allow the carriage to be moved by the said retracting device, as set forth.

2. In a printing-telegraph receiver, a carriage provided with rollers, a track for the rollers, a retracting device for moving the carriage in one direction consisting of a spring-actuated fusee and a flexible connection between the same and the carriage, a worm-wheel pivoted in and supported by the carriage, a shaft passing through the worm-wheel and connected to the same by a spline and groove, a type-wheel also pivoted in and supported by the carriage, a shaft passing through the type-wheel and connected to the same by a spline and groove, a motor adapted to rotate both shafts, a rack adapted to be moved toward and from the worm-wheel, and means to move the rack to allow the carriage to be moved by the said retracting device, as set forth.

3. In a printing-telegraph receiver, a carriage, a track for the carriage, a worm-wheel mounted on the carriage, a shaft adapted to rotate the wheel, a type-wheel mounted on the carriage, a shaft adapted to rotate the type-wheel, both shafts being driven by a suitable motor, an arm on the type-wheel shaft adapted to form a stop for the end of a lever, a lever, a cam on the worm-wheel shaft to engage the opposite end of the lever, a lever mounted on the frame of the machine and carrying the fulcrum of the first lever on its free end, a rack movable toward and from the worm-wheel and connected to the said lever, and springs to retract the levers, as set forth.

4. In a printing-telegraph receiver, a carriage, a track for the carriage, a worm-wheel mounted on the carriage, a shaft adapted to rotate the wheel, a type-wheel mounted on the carriage, a shaft adapted to rotate the type-wheel, both shafts being driven by a suitable motor, an arm on the type-wheel shaft adapted to form a stop for the end of a lever, a lever, a cam on the worm-wheel shaft to engage the opposite end of the lever, a lever mounted on the frame of the machine and carrying the fulcrum of the first lever on its free end, a rack movable toward and from the worm-wheel and connected to the said lever, a spring connected between the lever and the frame to restore it to its normal position, and a spring-actuated fusee mounted on the frame and connected to the carriage by a flexible connection, as and for the purpose described.

5. In a printing-telegraph receiver, a carriage to move along a stationary sheet of paper, a worm-wheel carried by and pivoted in the carriage, a shaft extending through said wheel and connected thereto, a type-wheel carried by and pivoted on the same carriage, a shaft parallel with the first-mentioned shaft and extending through the type-wheel and adapted to rotate the same, a motor geared to both shafts, an escapement to govern the rotation of the type-wheel shaft having its pallets mounted on the upper end of a spring, a rack to engage the worm-wheel, mechanism for removing the rack from said wheel, and means to retract the carriage, as set forth.

6. In a printing-telegraph receiver, a type-wheel, a shaft to rotate the type-wheel, means for printing from said type-wheel upon a sheet of paper, an electric motor connected to said shaft through a friction device and a train of gearing, a worm carried by the shaft of one of the gear-wheels, a universally-movable lever having a point on its free end engaging the worm, a spring carrying an electric contact and normally engaging another contact, said contacts being in the motor-circuit and adapted to be separated by the said lever, means to remove the lever from the worm, and means also to return its free end to the opposite end of the worm, as set forth.

7. In a printing-telegraph receiver, a type-wheel, a shaft to rotate the type-wheel, means for printing from said wheel, an electric motor connected to said shaft through a friction device and a train of gearing, a worm carried by the shaft of one of the gear-wheels, a universally-movable lever having a point on its free end engaging the worm, a stationary contact, a movable contact connected in the mo-

tor-circuit, an arm carried on the free end of the said lever to operate the movable contact and open the circuit, an arm secured to the shaft of the lever, a pin mounted on a disk on another shaft of the gearing to operate the arm, as set forth.

8. In a printing-telegraph receiver, a type-wheel, a shaft to rotate the type-wheel, means for printing from said wheel, an electric motor connected to said shaft through a friction device and a train of gearing, a flexible coupling also in the connection consisting of a pair of disks connected with each other by a coil-spring, a worm carried by the shaft of one of the gear-wheels, a universally-movable lever having a point on its free end engaging the worm, a stationary contact, a movable contact connected in the motor-circuit, an arm carried on the free end of the said lever to operate the movable contact and open the circuit, an arm secured to the shaft of the lever, a pin mounted on a disk on another shaft of the gearing to operate the arm, as set forth.

9. In a printing-telegraph apparatus, a shaft to operate the same, an electric motor connected to said shaft through gearing, a worm operated by said gearing, contacts in the motor-circuit, means adapted to engage the worm for moving one of the contacts, a lever to remove said means from the worm to return the contact to its original position, and a pin on a disk secured onto the type-wheel shaft to operate said lever, substantially as specified, as and for the purpose described.

10. In a printing-telegraph receiver, the combination of the type-wheel and the worm-wheel mounted on a carriage, a shaft connected to each wheel and to gearing impelled by a motor, an arm on the worm-wheel shaft, pins carried on a lever to engage the said arm, an electromagnet connected by the arm carrying the pins to oscillate the same, and a stationary armature for the magnet, as set forth.

11. In a printing-telegraph receiver, the combination with the carriage mounted on wheels, the tracks for the wheels, and the type-wheel and worm-wheel mounted on the carriage, a rack to engage the worm-wheel, means for moving the rack, the spring-drum and connection for moving the carriage, a roller on the carriage, a lever pivoted on the frame with an inclined side to engage the roller, a rod leading from the lever to a ratchet, feed-wheels for the paper operated by the ratchet, and a paper-holder, substantially as described and shown.

12. In a printing-telegraph receiver, the combination with the carriage mounted on wheels, the grooved rail and the ribbed rail for the wheels to run on, the type-wheel and worm-wheel pivoted in and supported entirely upon said carriage, and a shaft extending through each wheel to rotate the same, of the swinging rack for the worm-wheel, means to operate the rack, the spring-impelled fusee to move the carriage, a roller on the carriage, a lever pivoted to an arm extending from the base and having a side adapted to engage the said roller during the movement of the carriage, a rod connecting the lever with a ratchet, a prick-wheel, operated by the ratchet, a feed-wheel bearing against the prick-wheel, and guides for the side edges of the paper, as set forth.

In testimony whereof we have hereunto signed our names.

BENJAMIN F. MERRITT. [L. S.]
JOHN M. JOY. [L. S.]

Witnesses:
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