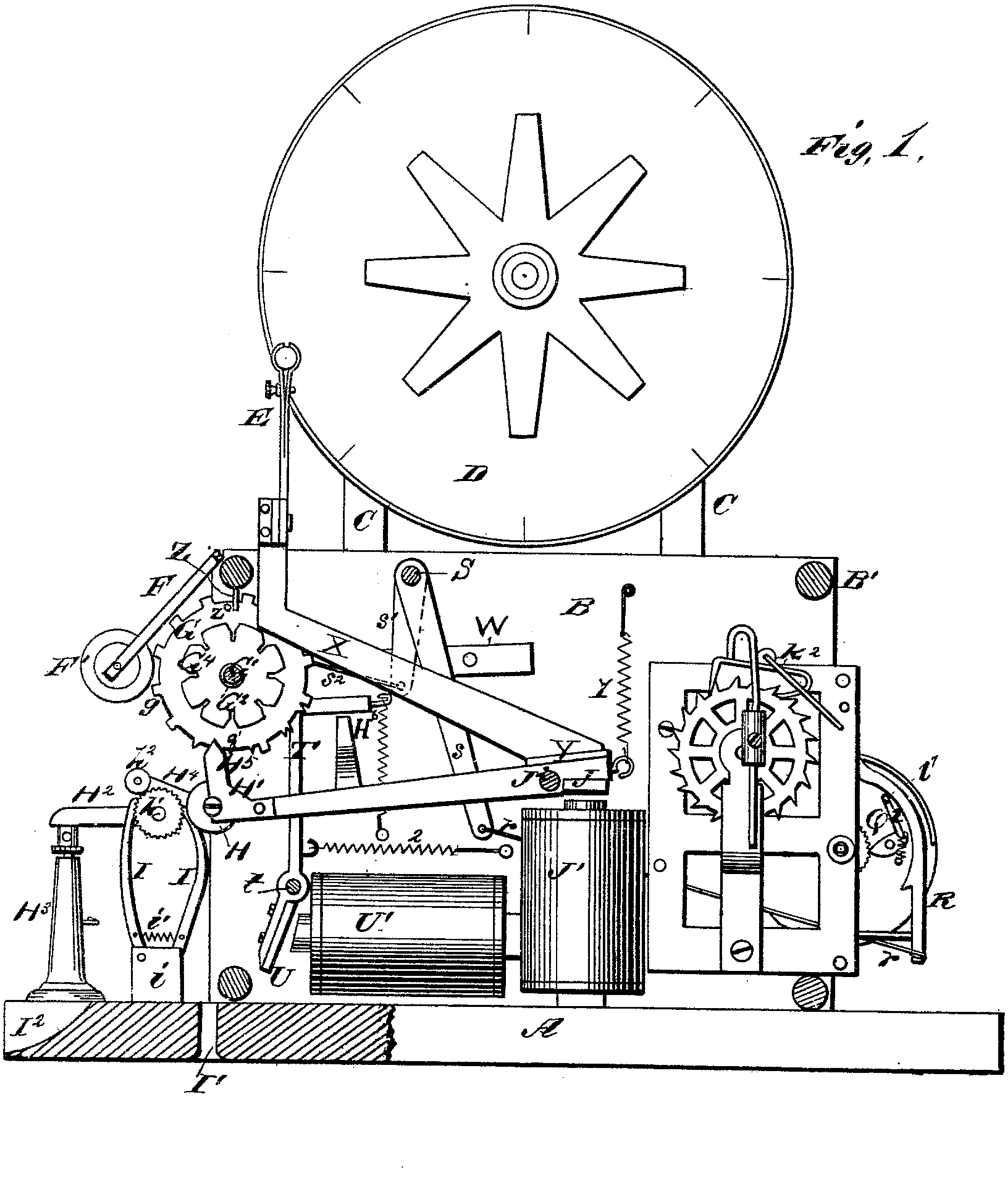
2 Sheets—Sheet 1.

H. ENNIS.

PRINTING TELEGRAPH.

No. 183,149. Patented Oct. 10, 1876.

Fig. 1.



WITNESSES

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2 Sheets—Sheet 2.

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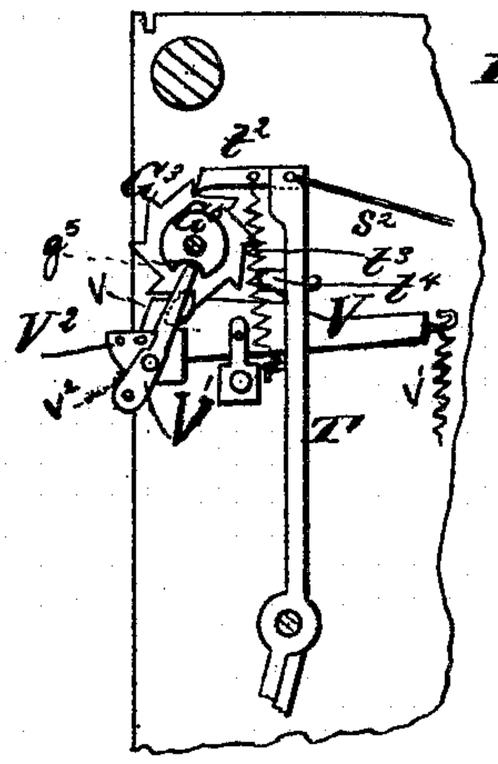
Fig. 2.



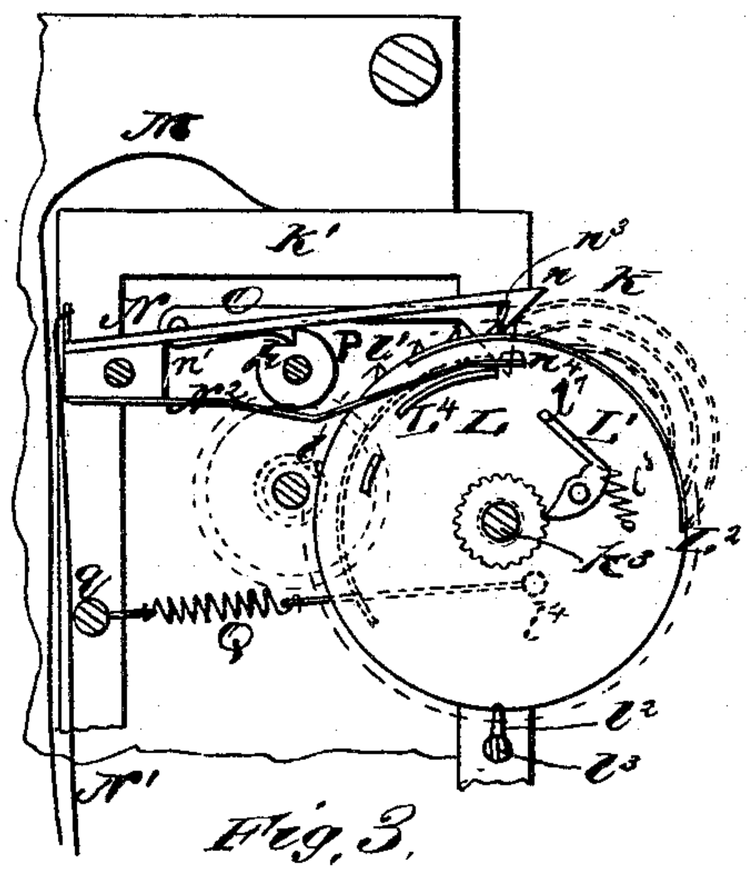


Fig. 3.

Fig. 4.

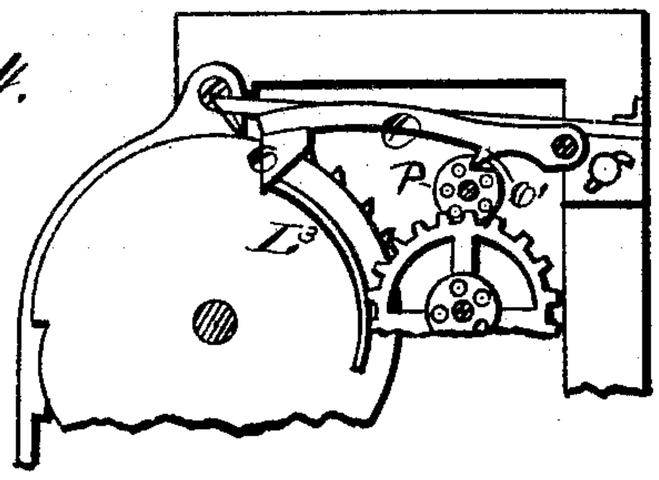


Fig. 5.

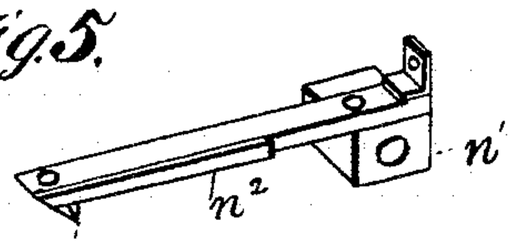


Fig. 6.

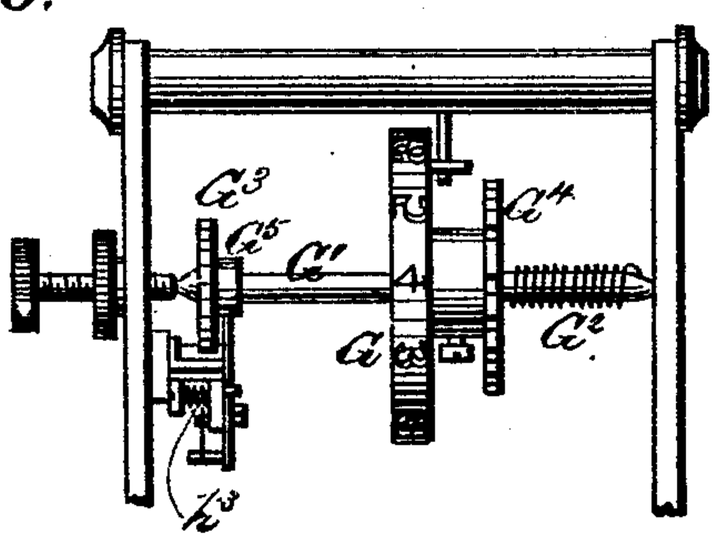
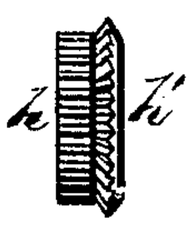


Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY ENNIS, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR OF ONE HALF HIS RIGHT TO JAMES F. OYSTER, SAME PLACE.

IMPROVEMENT IN PRINTING-TELEGRAPHS.

Specification forming part of Letters Patent No. **183,149**, dated October 10, 1876; application filed September 2, 1876.

To all whom it may concern:

Be it known that I, HENRY ENNIS, of Washington, in the county of Washington and District of Columbia, have invented a new and valuable Improvement in Telegraphic Receiving-Instruments; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a front elevation of my telegraphic receiving-instrument part sectional; and Figs. 2, 3, 4, 5, 6, and 7 are detail views thereof.

My invention relates to receiving-instruments for printing-telegraphs, and is especially applicable to fire-alarm telegraphs; and it consists in circuit-closing and type-wheel operating devices, and auxiliary devices, as will be hereinafter particularly set forth and claimed.

In the annexed drawings, A designates the pedestal or bed-piece of the device. Said bed-piece may be provided with brackets and attached to a wall, or with legs and placed upon a table or shelf; or it may be arranged in any secure and suitable manner. B designates one of two parallel vertical plates, which form a protecting casing for the apparatus hereinafter described. Said plates are fastened together by cross-bolts B′, and secured below to the said pedestal or bed-piece A. C C designate standards, which are rigidly secured to said casing near the top thereof, and which support a train of wheels, forming clock-work, that turns a dial, D, adapted to be marked by a pencil carried in a holder, E, and operated by devices hereinafter described. The object of these devices (C D E and the clock-work) is to record the time when a message or signal is received, and they form a useful adjunct to the apparatus embodying my invention; but they are not essential to the operation thereof.

The ends of the casing formed by upright plates B B are left open. To the upper corners of said plates at the left end of said casing is pivoted a detachable hanging frame, F, which carries at its lower extremity a pivoted inking-roller, F′. Said inking-roller bears against and inks the types *g* on the periphery of type-wheel G. Said type-wheel rotates forward to present the proper figures and other characters, and is thrown back to be ready for a second imprint, these forward and backward rotary motions being effected by devices hereinafter described.

H designates a paper-carrying roller, pivoted in the end of a pivoted frame, H^1, under said type-wheel G. H^2 indicates a forward extension of said frame, which is supported, when at its lowest point, by a vertical standard, H^3, rigidly attached to pedestal or bed-piece A. To the side of said extension is pivoted a small cog-wheel, *h*, Fig. 7, to which is rigidly secured a small spur-wheel, h^1, that meshes with minute teeth on the edge of paper-roller H. A friction-wheel might be substituted for said spur-wheel h^1. H^4 is an arm pivoted to said extension, secured thereto at its outer end by a retracting-spring, h^3, and carrying a pressure-roller, h^2. I I are toothed jaws or pallets, which are pivoted at the bottom to a bracket, *i*, fast on bed-piece A, and are attached together by a contracting-spring, *i′*, that causes said pallets to engage with said cog-wheel *h*. Said pallets are so constructed that when said cog-wheel is raised through them they turn the said wheel. The paper ribbon which receives the message passes up through a vertical slot, I^1, in said pedestal or bed-piece, thence behind and over paper-roller H, between presser and guide roller h^2 and spur-wheel h^1, and finally out through inclined channel or way I^2, in the end of bed-piece A.

By the above-described devices said ribbon is fed forward whenever the long end of frame H^1 is tilted upward, and the same upward tilting motion of said long end of said frame brings the said paper ribbon carried on paper-roller H into contact with the lowermost type on type-wheel G, whereby the printing is effected. Said tilting motion of said frame is produced by an armature, J, of an upright electro-magnet, J^1. Said armature is rigidly secured to the short end of said frame H^1 beyond its pivot-shaft J^2.

Said magnet may be operated by a short

local circuit, and its circuit is closed by means of the following apparatus: K, Fig. 3, is a coiled spring, operating a train of wheels inclosed in an inner casing, K^1, and ending in an escapement. Said spring rotates a shaft, K^3, on which is a loose wheel, L, (shown in Fig. 3,) that is attached to said shaft by a pawl-and-ratchet attachment, L^1, for preventing the independent backward motion of said wheel. Said wheel is provided on its periphery with a single forward tooth, *l*, and four rearward teeth, l^1, said single tooth being ahead of said teeth l^1 in the direction of the circuit-closing rotation of said wheel, a considerable space intervening between said forward tooth *l* and the first of the succeeding four. Said wheel is also provided with a shoulder, L^2, which limits its backward movement (when freed from the pawl-and-ratchet connection already described) by striking against a stud or lug, l^2, on a fixed cross-bar, l^3. Said wheel is also provided on the side nearest to spring K with a curved flange, L^3, (shown in Fig. 4,) and with a pin or stud, l^4.

M designates a wire or wires, connecting one pole of the battery which operates electro-magnet J^1 with the casing of the device, and with the wheels and shafts communicating with wheel L, so as to make said wheel one of the termini of the broken circuit. The other terminus is a circuit-closing arm, N, provided with connecting-wire N^1, and pivoted at its rear end to inner casing K^1. The front end of said arm is provided with a beveled tooth, *n*, and said arm is insulated by means of an insulating-block, n^1, about its pivot, a side strip, n^2, and a small block, n^3, of ivory or similar hard non-conducting material on the inner side of tooth *n*. When wheel L rotates forward with its shaft said ivory block n^3 rests upon its surface and prevents the circuit from being closed; but when tooth *l* comes in contact with tooth *n* said circuit is closed, and the printing is automatically effected. If undisturbed, said wheel will rotate with the rest of the apparatus actuated by spring K until they are all automatically stopped by the following devices: O designates a stopping and starting arm, pivoted by its rear end to casing K^1 on the opposite side of wheel L from circuit-closing arm N, and capable of vertical motion on said pivot. Said arm O is provided with a beveled lug, *o*, on its front part, which rides over the surface of curved flange L^3 as said wheel L turns forward, and also with a tooth, *o'*, which is adapted to catch into a notch, *p*, of a small wheel, P, operated by spring K and the train of wheels actuated thereby. So long as beveled lug *o* continues to be upheld by flange L^3, tooth *o'* is held up above notch *p*; but when the end of said flange passes from under said beveled lug said arm O drops, and said tooth, catching in said notch, locks and detains the entire train of wheels, and wheel L with them. When said wheel is thrown back, as hereafter described, the beveled edge of said flange L^3 strikes against the beveled lug *o*, raising arm O, so as to liberate wheel P, when the apparatus actuated by spring K will again be in condition to operate.

Q is a retracting-spring, one end of which is attached to pin or stud l^4 on wheel L, and the other end to a fixed cross-rod, *q*, extending from side to side of inner casing K^1. The tendency of said spring is to throw said wheel L backward upon its shaft; but it is ordinarily prevented from doing this by pawl-and-ratchet attachment L^1, already described. Said pawl-and-ratchet attachment may, however, be tripped at will by the following devices: To the tail of said pawl is secured a bent rod, l^7, and a retracting-spring, l^8. Said rod, when struck or pressed inward, throws said pawl and ratchet out of engagement. When the pressure is released, spring l^8 throws said pawl and ratchet into engagement again. Said pressure or stroke is applied by means of a curved lever, R, which is pivoted at its upper end to casing K^1. The inward movement of the lower end of lever R is limited by a projection of said casing K^1. A cord or other suitable connection, *r*, runs from the lower end of said lever to a long arm, *s*, of a rock-shaft, S, which also carries a similar short arm, s^1, that is connected by a rod or cord, s^2, to the upper end of the long arm of a vertical vibrating lever, T. Said lever is pivoted by means of cross-rod *t* to the outer casing B, and its short arm is secured to the armature U of a horizontal electro-magnet, U', which is operated by the closing of the main circuit. The construction of rock-shaft S with its short and long arms enables lever T to exert a greater force upon lever R than could be exerted through a rod or cord running from the top of the former lever to the bottom of the latter lever.

By the above-described apparatus, whenever the main circuit is closed by the transmitter, the hanging lever R trips the pawl-and-ratchet connection L^1, and the wheel L is thrown back, as described. Thus the action of the transmitter is really to throw the devices which do the recording into condition for automatic operation, and not to directly operate them, as in other telegraphs. The simplest form of circuit-closer will effect this transmission, no correspondence in construction and operation being required between the transmitting-instrument and the receiving-instrument.

The short-circuit-operating electro-magnet J^1 and armature J are kept open by the following devices, while wheel L is thrown backward: Said wheel is provided with a curved flange, L^4, on the side away from spring K. N^2 is a metal plate, secured at its rear end to insulating-block n^1, which, as already described, is also secured to the rear end of pivoted circuit-closing arm N. On the free end of said plate N^2 is a beveled shoe, n^4. When wheel L turns forward, said shoe n^4 passes under said flange

L^4; but when said wheel is thrown backward said beveled shoe rides over said flange, thereby raising both said plate N^2 and said circuit-closing arm N. The teeth *l* l^1 on wheel L are thus enabled to rotate without coming into contact with tooth *n* on said arm N.

Frame H^1 and armature J are provided with a retracting-spring, 1, which operates to withdraw said armature from its magnet and paper-holding roller H from type-wheel G, whenever said electro-magnet is demagnetized. Lever T is also provided with a similar retracting-spring, 2, which, in like manner, draws armature U out of contact with electro-magnet U′, when said electro-magnet is demagnetized. Said spring 2 also serves to throw said lever T out of operation upon the devices hereinafter described, when said demagnetization of electro-magnet U′ takes place. The type-wheel G is fast upon, and revolves with, a shaft, G^1, which is pivoted in the sides of casing B. Said shaft is provided with a coiled reversing-spring, G^2, which is secured by one end to one of the plates B of said casing, the other end being secured to said shaft. Said spring operates to throw backward said shaft and wheel. Said shaft also carries round with it a ratchet-wheel, G^3, a notched wheel, G^4, and a small wheel, G^5, having a single notch.

Frame H^1 is provided with an upwardly-extending pointed lug, H^5, which catches into one of the notches of said notched wheel whenever the long end of said frame is thrown upward, and thereby holds type-wheel stationary while the paper ribbon is receiving an imprint from one of types *g*. Ratchet-wheel G^3 is used for rotating the said type-wheel G forward far enough to bring the desired type undermost. The spaces between the ratchets of said wheel G^3 therefore correspond to the spaces between the types *g* on type-wheel G. Thus it is necessary only to drive the said ratchet-wheel G^3 forward in a step-by-step motion to present for printing any type desired. This is accomplished by means of an impelling-pawl, t^2, on the upper end of lever T, which pawl engages with said ratchet-wheel whenever the main circuit is closed, forcing said wheel forward one tooth at each impulse.

Said pawl is controlled by a small spring, t^3, which allows it to yield a little, but keeps it in position to operate. Said ratchet-wheel is prevented from rotating more than one tooth at a time by a fixed lug, t^4, on said lever T. Said ratchet-wheel is prevented from being reversed, after each impulse, by means of a retaining-dog, *v*, which is carried by a pivoted lever, V, the longer inner end of which is drawn down by a retracting-spring, v^1. Said dog *v* is thrown out of operation whenever the long end of frame H^1 is tilted upward. This is effected by means of an elbow bar or plate, H^6, secured rigidly to the side of said frame, which elbow bar or plate strikes against the long end of pivoted lever V, thereby depressing the short end of said arm, which carries dog *v*. Said dog is temporarily held out of operation, after frame H falls, by means of a pivoted metal finger, V^1, which bears against the periphery of a small wheel, G^5, that is fast upon shaft G^1. Said wheel G^5 is notched or recessed on its periphery at g^5, said notch or recess corresponding to the starting-point of type-wheel G.

By these devices spring G^2 is allowed to throw type-wheel G back to its starting-point as soon as the long end of frame H^1 falls. When that point is reached finger V^1 passes into notch or recess g^5, and thereby allows detaining-dog *v* to engage with ratchet-wheel G^3. Said finger is held in position by a spring, v^2, and is pivoted to a block, V^2, on the short end of arm V.

The backward movement of lever T is limited by a stop-bar, W, Fig. 1, secured to one of the casing-plates B. Said lever T may have a bell or bell-hammer attached to its upper end, as in my previous Patent No. 178,750.

The time-recording-pencil holder E is operated by a lever or long bar, X, fast upon a plate, Y, which is rigidly connected with the short end of tilting frame H^1. Wheel G is provided with a side pin, *z*, which strikes against a downward-extending pin, Z, fast upon one of the cross-bars B′, and thereby limits the rotation of said type-wheel G. The circuit-wires of both circuits pass up through pedestal or bed-piece A. The pivots of the armatures and rotating and rocking shafts are preferably detachable, and the various parts of the apparatus are so constructed and attached that they may be easily separated for inspection and cleansing.

When the apparatus is used for fire-alarm telegraphs, the types represent the numerals 1, 2, 3, 4, &c.

The operation is then as follows: Let thirty-four (34) be the precinct or station where the fire has taken place. Three successive impulses are quickly given by closing the main circuit three times at the transmitting-station. The first of these impulses trips detaining device L^1, and allows wheel L to be thrown backward by its retracting-spring, so as to bring the first circuit-closing tooth *l* some distance beyond tooth *n*. This backward movement of wheel L trips the detaining device O *p*, and thus allows the train of wheels actuated by spring K to be set in motion. At the same time said impulse turns type-wheel forward, so as to present figure 1 toward the paper-holding wheel. The next impulse is given before the teeth *l* and *n* meet, and again throws back wheel L, the spring K and its train of wheels still operating, but the frame H^1 remaining still stationary. This impulse presents figure 2. The third impulse repeats the effects of the second, but presents figure 3. The transmitter then pauses, and this pause allows the teeth *n* and *l* to close the circuit which operates frame H^1, thereby feeding forward the paper a short distance and printing upon it the fig-

ure 3. As said frame H^1 descends said type-wheel G is thrown back to the starting-point by apparatus already described. Four impulses are next given in like manner, and then a pause, when the apparatus again feeds forward the paper one space or degree, and prints the figure 4 upon the blank place thus presented. This completes one round.

The longer space between the rounds is produced in the following manner: After, in the instance above given, the figure 4 has been printed, the reversing devices, already described, throw type-wheel G back to its starting-point. Said wheel is constructed with a blank or typeless space, g^1, which is now presented to the paper-roller H.

In order to have the required blank space on the paper ribbon it is only necessary to continue lifting the long end of frame H^1, and thereby feeding the paper while allowing the devices for rotating the type-wheel to remain inactive. This is accomplished by allowing wheel L to rotate freely, whereby teeth l^1, four in number, successively make connection with teeth n, thus feeding forward the paper ribbon four degrees, which gives the required space between rounds. Meanwhile, the type-turning devices remain inoperative, as the main circuit is open. The train of wheels operated by spring K rotate until stopped by locking device O p, when wheel L stops also; but after the last of teeth l^1 has passed tooth n the paper will cease to be fed forward. The apparatus is then in readiness for a new round.

It is not necessary to wait until the said train of wheels is locked by the devices O p, as described.

In case the above apparatus is used for ordinary printing telegraphy, the letters of the alphabet are substituted for the numerals upon the type-wheel G. My invention is thus applicable to all printing-telegraphs.

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

1. The combination of spring K, with its train of wheels, circuit-closing wheel L, actuated thereby, pivoted arm O, having tooth or lug o, and wheel P, having notch p, substantially as and for the purpose set forth.

2. The combination of wheel L, having a tooth, l, and a series of teeth, l^1, arranged as shown, with pivoted circuit-closing arm N, substantially as set forth.

3. Lever R, in combination with pawl-and-ratchet attachment L^1, and a tripping-rod attached thereto, substantially as set forth.

4. The wheel L, in combination with the arm N, and devices for detaining the circuit-closing train of wheels, said wheel L being adapted to trip said detaining devices, substantially as described.

5. The combination of flanged wheel L with pivoted stopping and starting arm O, and devices for locking the automatic mechanism when said arm O falls, substantially as set forth.

6. The combination of type-wheel G with its reversing-spring, arm T, bearing an impelling-pawl, ratchet G^3, dog v, finger V^1, the notched wheel G^4, and a rigid actuating bar or arm on frame H^1, substantially as set forth.

7. A circuit-closing wheel, L, having teeth l^1, in combination with frame H^1, carrying roller H, type-wheel G, having a typeless space, g^1, and devices operated by the circuit closed by wheel L for tilting frame H^1, substantially as and for the purpose set forth.

8. Type-wheel-reversing mechanism, in combination with devices which allow said mechanism to operate only immediately after the paper is withdrawn from said type-wheel, substantially as set forth.

9. In a fire-alarm-telegraph receiving-instrument, which is adapted to print and space, a printing device which operates after the signal, or a component part of it, is sent, and after the full signal, substantially as described.

10. In a fire-alarm-telegraph receiving-instrument which is adapted to print and space numbers, a printing device which operates after the signal, or a component part of it, is sent, and after the full signal, to operate for the purpose of distinguishing one signal from another, substantially as described.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

HENRY ENNIS.

Witnesses:
JOHN F. ACKER, Jr.,
C. H. MCEWEN.