D. E. HUGHES. 4 Sheets—Sheet 1.

Printing Telegraph.

No. 22,770. Patented Jan. 25, 1859.

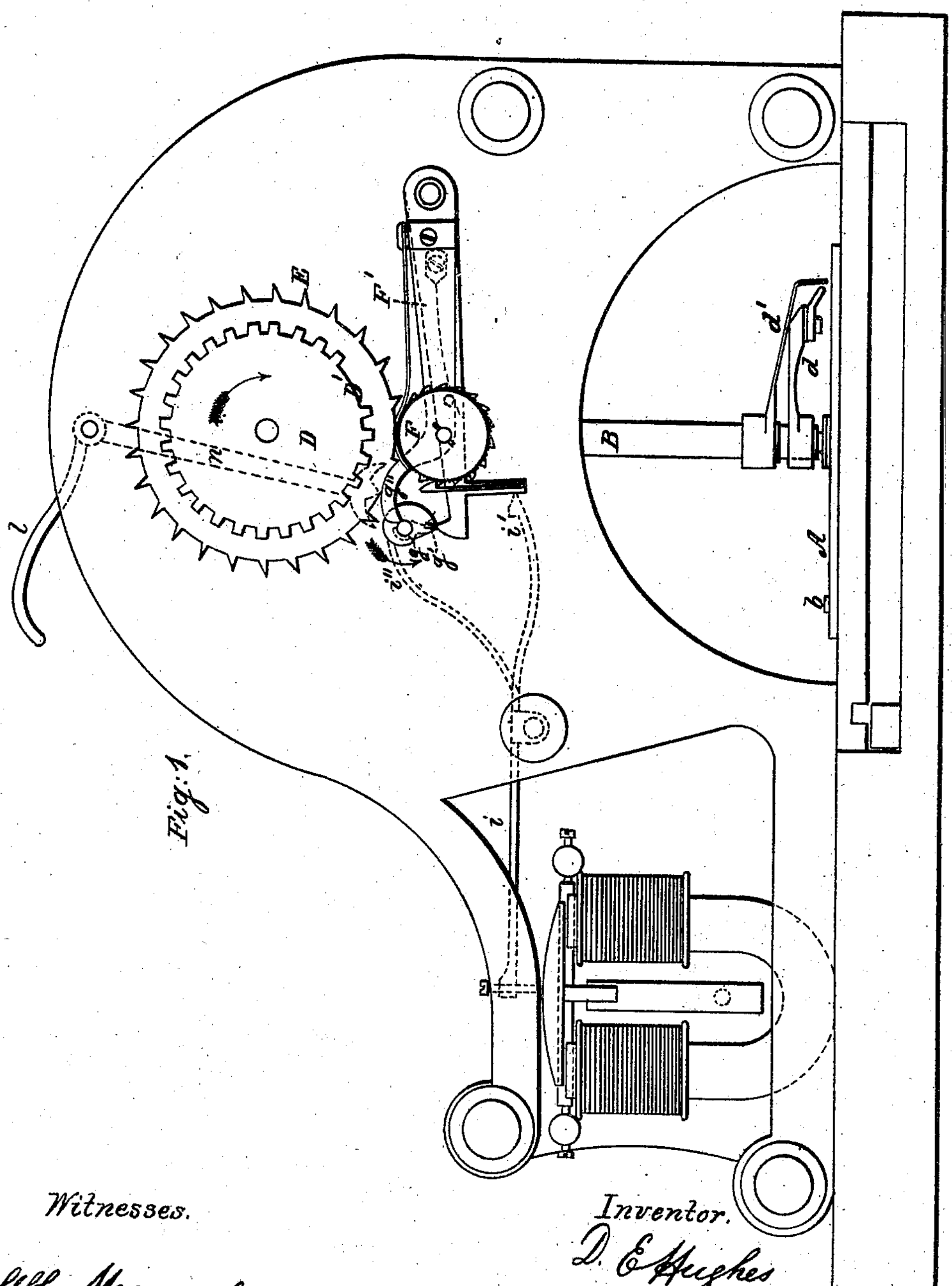

Fig. 1.

Witnesses.

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by his attorney

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4 Sheets—Sheet 2.

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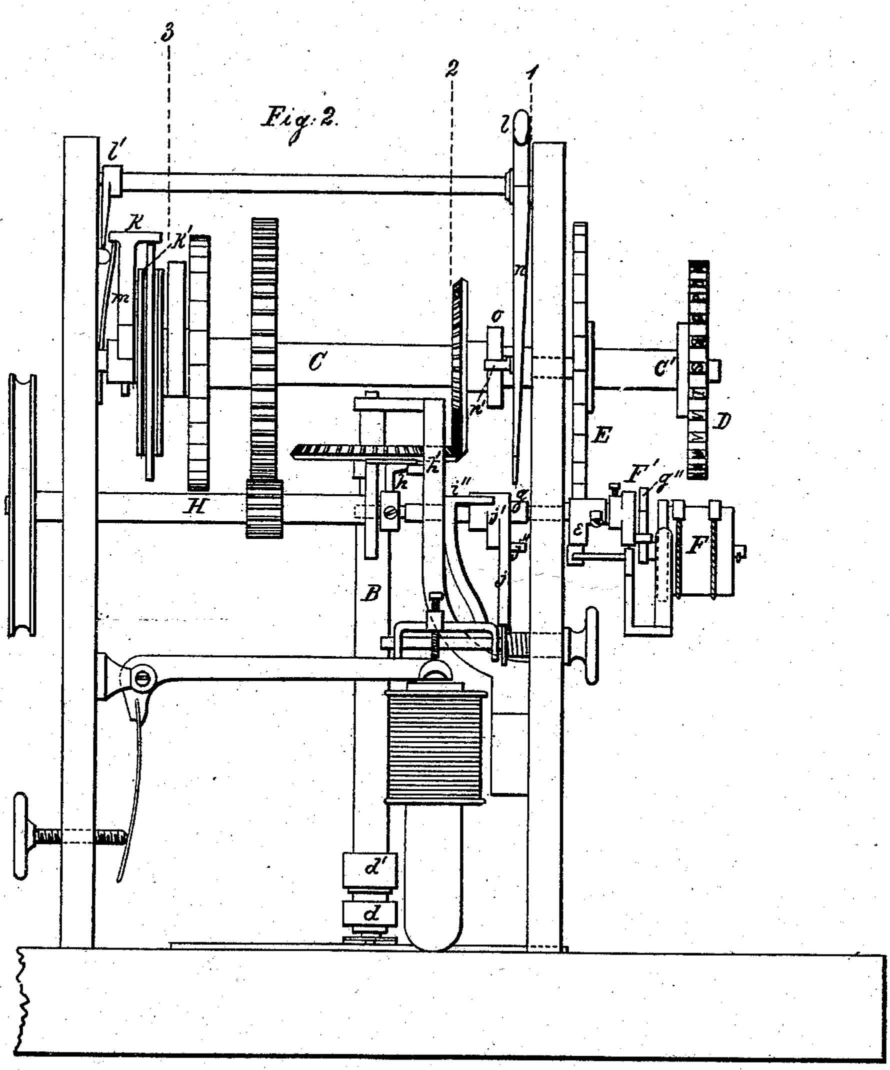

Fig. 2.

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Fig: 3.

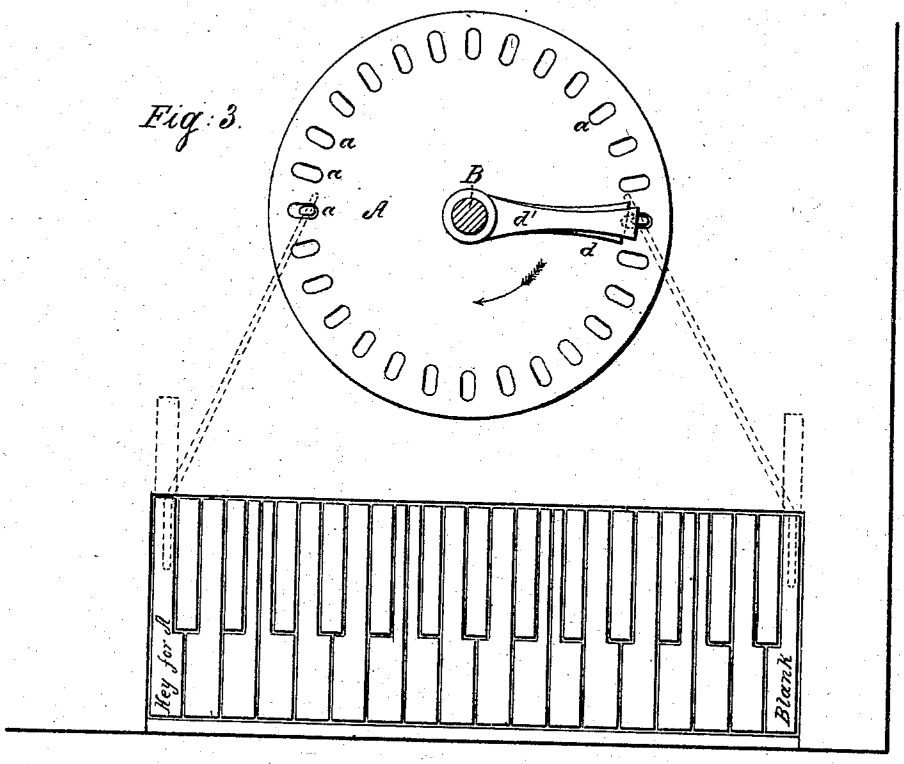

Fig: 7.

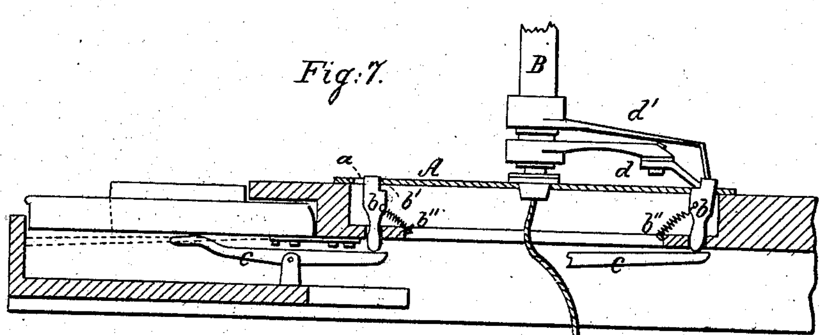

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Fig: 4.

Section on Line 1 of Fig: 2.

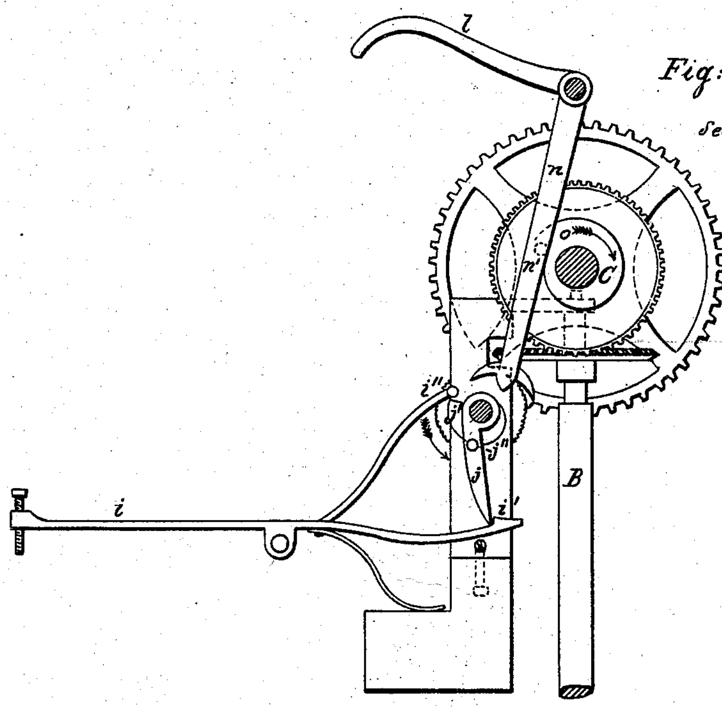


Fig: 6.

Section on line 3.

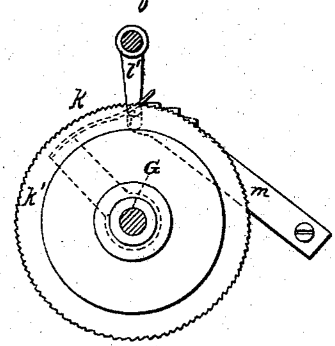
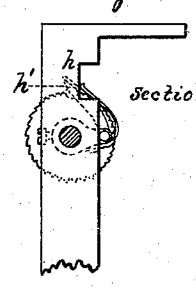


Fig: 5.

Section on line 2.



Witnesses.

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[redacted]

UNITED STATES PATENT OFFICE.

DAVID E. HUGHES, OF NEW YORK, N. Y., ASSIGNOR TO THE AMERICAN TELEGRAPH COMPANY.

IMPROVEMENT IN TELEGRAPHING-MACHINES.

Specification forming part of Letters Patent No. **22,770**, dated January 25, 1859.

To all whom it may concern:

Be it known that I, DAVID E. HUGHES, of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Telegraphing-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being made to the annexed drawings, making a part of this specification, in which—

Figure I is a side elevation. Fig. II is an end elevation. Figs. III, IV, V, VI, and VII are of parts in detail, and similar letters indicate similar parts throughout.

My invention consists in certain improvements in printing-telegraph instruments, said improvements having for their object the rendering the instrument more certain in its action in several particulars.

The first feature consists in an improved construction of the pins on the circuit-plate and in their connection with the operating-keys, whereby the closing or breaking of the circuit for any letter will be indicated to the touch of the operator; and the object of this part of my improvement is to prevent the transposition of letters, which defect is likely to occur in the old mode when no such indication is given.

The second feature consists in an improved mode of setting the type-wheels, so as to insure their always starting at a given point or zero.

The third feature is a self-adjusting apparatus for keeping the type-wheels always in their proper positions, so as to insure the printing of the proper letter as signalized.

These improvements are intended, chiefly, to be applied to the printing-telegraph already patented to me under date of the 20th of May, 1856. In that machine there is a circuit wheel or cylinder having pins upon it indicative of the letters or characters to be transmitted and printed, which cylinder must revolve in the same time and in the exact order of the distant type-wheel, so that the closing or breaking of the electric circuit by any given pin upon said wheel will insure the printing of any given letter intended to be indicated by said pin. After the type-wheels and cylinders have been so set that their pins and letters will accord they must therefore, in order to work correctly, revolve in exact unison so long as messages are being transmitted.

In the herein-described machine I use, instead of a revolving cylinder with pins indicating the letters, a fixed circular plate (shown at A, Figs. I, II, III, and VII) secured to the bed of the machine. A series of elongated holes is perforated in a circle near its edge, as shown at a, Figs. III and VII, there being as many holes as there are keys. Beneath the plate there is a circular opening on the bed as large as the circle of holes a, and around this there stands a row of metal pins of a peculiar shape. The top ends of these project through the holes, a pin in each hole. The bottom end of each pin rests upon the tail of one of the keys, as seen at Fig. VII, wherein b indicates the pins, and c the keys. The top of each pin has a notch, b', and to each is a pull-down spring, b'', which also tends to pull the top of each pin toward the center of the circular plate. When the key is not acted upon the spring b'' pulls the pin b down and also draws its head toward the center, so that the notch b' should catch upon the under side of the plate A, as seen at Fig. VII. Above the circuit-plate there is a vertical shaft, B, rising from its center. This carries an arm, d, near its lower end, which arm extends out to the circle of pins. The arm is composed of two pieces; the second piece, d', lying along d, extends over it, and has its end bent down to meet the end of the lower part, as seen in Fig. I. It is intended that this arm shall strike the pins only at such times as a key is touched, passing otherwise entirely free. The type-wheel shaft C lies at a right angle to B, and the two are geared together by equal bevel-wheels, as shown in Fig. II, whereby both are caused to revolve alike. The operation of this part is as follows: Whenever telegraphing is going on the arms d on the machines at both ends of the line are continually revolving, as are also their type-wheels. If key A is now pressed down, the end c, Fig. VII, will raise the pin b a short distance, being arrested by the notch b' striking the under side of the circuit-plate. This pin will now be in the way of the arm d and its end, which is beveled, will then interfere and strike against the pin's side, pushing the pin outward, and thus disengaging the notch b'. The key will then be allowed to descend still farther, also still farther elevating the pin b. This second movement, being sudden, is sensibly felt by the finger, and the operator consequently knows that the circuit has been established for the proper letter before he moves another key, and as one wire is attached to the plate and the other to the post B, of course the circuit is closed whenever the arm d strikes a pin, b, for then the end of the second spring-arm, d', rides over the top of the pin, and closes the circuit thereby, the arm d having its beveled end attached so as to insulate the same, its object being merely to throw the pin b forward, so as to disengage the notch in the same.

The second feature of my invention consists in a means for adjusting the type-wheel for errors in the rate of running, and is as follows: The type-wheel is seen at D, Figs. I and II, supported upon the projecting end of a horizontal shaft, C'. The driving power is applied to a cog-wheel attached to a hollow shaft, C, resting upon shaft C' for its bearings, so that by means of a coupling-clutch, C' and C can either be made to revolve together or be uncoupled, so that the moving power may continue to revolve C without revolving the type-wheel. The coupler, however, is not a rigid one, but but consists of a spring-catch acting upon a notch or roughened-surface wheel and holding it by friction, because these adjustments—*i. e.*, for error in the rate of timing—are required to be made while the type-wheel is revolving with its driving-shaft C.

At E is seen a toothed or notched wheel secured to the shaft C'. The notches on it correspond with the number of letters or signs upon the type-wheel, together with an additional one for the blank space on said wheel. Beneath the type-wheel is placed the platen F. This is a roller supported upon the end of an arm, F', which is hinged at its opposite end to the frame, and over this roller the fillet of paper to be printed upon lies and travels along. As the motion of the type-wheel is continuous while printing is going on, the platen has to be raised so as to press the fillet of paper against the letters while that is still moving onward. The timing of this part must therefore be very nicely adjusted, because if the platen should be moved up to the type-wheel a little too soon or too late to strike the letter exactly and fairly on its face as it passes, a false or imperfect impression will be the result. The arm which supports the platen is raised up by a crank-pin upon the end of a shaft, which revolves once for every letter printed, said shaft being seen at g and the crank-pin at g'. This pin g' strikes a projecting piece, g'', upon the end of the arm F', and thus lifts F. Immediately behind this, and upon the same shaft, there is a dog, as seen at e. At each revolution of the shaft g this engages a notch of the wheel E, and the dog and crank-pin are also so placed that the dog shall be in a notch when the latter has raised the platen up to the face of the type-wheel. The letters of the type-wheel and the notches being properly set, it will be seen that the dog will hold the type-wheel so that the proper letter shall thereby stand in its proper place when the platen is brought up. The effect of this will be that in case the type-wheel is gaining time the dog will, every time it enters a notch, retard the same, and vice versa if losing time. By this means a very exact coincidence between the running-time of any two machines is rendered unnecessary, for without such a regulator, should the driving-shafts B and C be revolving at a speed a little greater, for instance, than that of the distant machine, the time would arrive when, instead of the intended letter being printed, the one next in advance would occur, and so on, and this would happen sooner or later, according to the difference of rate in the running of the two machines. Now, as the dog e is liberated only by the distant operator and revolves once for each signal, while the type-wheel itself is in constant rotation, it will be seen that the dog must engage and pass through one of the cogs of the wheel E, each of which cogs stands opposite to a letter of its type-wheel. If the time of the type-wheel is in exact accord with the revolution of the circuit-breaker d of the distant machine the dog will pass between the teeth without touching them; but if the type-wheel is not in such accord the dog will strike one of the teeth on E, and either slightly advance the type-wheel or retard it, according as it is gaining or losing time, thus setting the wheel at each signal. If losing time, the dog will strike against the first cog and advance it precisely as we should set a clock-hand, and if too fast the back tooth will be struck and the wheel retarded.

It will be seen that the effect of an electric current sent from a distant station is to cause the shaft g to be turned one revolution. This is accomplished by the permanent magnet being released from the electro-magnet. The operation effects the engaging of a clutch (seen at h upon the shaft g) with the constantly-revolving shaft H, whereby the former shaft is rotated, thus bringing up the platen-roller F, with its fillet of paper upon it, in time to strike the proper letter on the type-wheel, in the manner already set forth. When one revolution has been given to g' it is uncoupled from H, and stands still until the next signal is given. The uncoupling is accomplished by means of a beveled fixed stud, h', against which a cross-piece on the top of the clutch strikes as the shaft g revolves, and, riding up the beveled surface, effects the lifting of its clutch from the roughened-surface wheel upon H, whereby the two become separated. When the permanent magnet flies up it acts upon one end of a lever, (seen at i,) the opposite end of which lever is divided or forked, as shown in Figs. I and IV. The lower branch has a hook at i', which engages a detaining-arm, j, Figs. II and IV, upon the shaft g. The end of the upper fork, i'', rests upon a spiral cam-piece, also upon the shaft g, as shown at j' in said figures. The office of the lower fork is to prevent rotation of the shaft g, while the upper has two offices. The first is to disengage the clutch from the beveled stud h', and the other is to effect, in connection with the cam, the return of the magnet upon that portion which becomes the electro-magnet. In Fig. IV the lever i is shown as engaged with j by its lower fork, while the end of the upper is on the edge of the cross-cut terminating the spiral edge of the cam j'. When the magnet rises it throws i' clear of j, and at the same time presses upon the cross-cut of the cam j', and thereby forces the shaft g to move. This movement carries the arm h, Figs. II and V off the clutch-piece past the stud h', and allows it to engage with the revolving shaft H, and thus effect the printing of a letter, in the manner already described. The return of the magnet is effected by the volute shape of the cam j' acting upon i'', as clearly seen in the figures. Before telegraphing can be begun the type-wheels must be started from a zero. This is accomplished by means of a clutch for engaging and disengaging the shaft C′ from C, so that the type-wheel will always be stopped and started from one position, which position is one when the blank in the said type-wheel will be opposite, or nearly so, to the platen F. The operator at the distant machine has therefore only to start the type-wheel by striking upon his blank signal-key, and the curved arm d' will then revolve in unison with the distant type-wheel.

Upon the inner end of the shaft C′ there is fixed a spring-clutch, (seen at k in Figs. II and VI,) and immediately adjoining this upon the inner end of the hollow shaft C is a roughened or finely-notched surface wheel, k'. A small cross-arm from the clutch overhangs this wheel, and engages with it whenever the detaching-lever is released, so as to allow of said arm being brought down by the force of its spring. The effect of the detaching and engaging lever is to cause the uncoupling of the type-wheel from the driving-shaft C, so as to bring it to a state of rest always in one unvarying position, and which position is shown in Fig. I, wherein the blank space D′ is seen standing a little to one side of the platen-roller F. The clutch is disengaged from k' by means of a spring-catch, which is fixed to the inner side of the frame of the machine in such position as to intercept said clutch at the place where the type-wheel is to be stopped. It is shown at m, Figs. II and VI, and consists of a piece of spring metal placed so as to lie flat against the frame when it is to be out of the way of the clutch, and to be sprung off when it is to engage it, the figures representing it in the latter position. The operation of uncoupling the type-wheel is effected by the hand of the operator pressing down a handle, l. This moves a lever, as seen at l', Figs. II and VI.

Upon the cross-shaft, to which the handle is attached, there are two arms, the first of which is near the front of the machine, as seen at n. From one side of this arm there is a pin, n', Figs. II and IV, projecting, and the bottom terminates in a three-pointed fork, as seen in Figs. I and IV. Upon the shaft C′ there is a volute cam or plate, shaped as seen at o in Figs. II and IV. This is to arrest the motion of the arm n by means of the pin, so as to prevent any action to disengage the clutch-spring before the right time, which time is indicated by the notched part in o, the dropping of n' into which, as seen in Fig. IV, permits the other arm, l', to engage the spring-stop m and force it off from the frame, in order to intercept the clutch-pin k, as seen in Fig. II. By pressing hard upon the handle l the pin n', as it drops into the notch in o, will force C′ onward faster than its regular speed. This will cause the cross-piece of k to ride up upon the inclined surface of the stop m, Fig. IV, and there be caught and held by one of the notches thereon, as shown. The raising of this cross-piece relieves the clutch from the friction-wheel k', and allows the shaft C to continue its motion upon C′ as an axis, the type-wheel being then stationary. The disengaging of the clutch is produced by the revolution of the shaft g.

Upon the side of the detaining-arm j there is a pin, j'', Figs. II and IV. This pin, when said shaft revolves, will engage in the forked end of n, and move it onward, thus removing the arm l' from the stop m, while at the same time it will move the type-wheel D onward one step or space. The second turn of g moves the arm again, and also the type-wheel, one more step. This brings the blank in the latter exactly over the platen, and at the same moment l' is clear of the stop, and the clutch is also clear, and engaged with the notched wheel k', so that the type-wheel now revolves, and printing may now be done in regular order by signals from the distant station.

The operation is as follows: The distant operator signals that he wishes to telegraph. The operator to whom the signal is sent sets his machine in motion, and brings his type-wheel to zero by pressing upon the handle l, in the manner already described. An electric current now comes over the wire, releasing the magnet, which, flying up, raises the lever i, disengages the shaft g, and couples it at the same time with the driving-shaft H. The pin j'' striking in the first fork of n moves it a step, while the dog e, engaging in a tooth of E, moves the type-wheel also one space. A second current acting in like manner throws the arm completely out of the way of the stop *m*, while the type-wheel, being moved one space farther, and carrying with it its clutch *k* past the engaging stop, commences to revolve in regular order. The distant circuit-arm *d'* will now revolve in the same time, and pass over the various stops connected with the key-board in the order of their letters, in the same time and order at which the letters of the type-wheel revolve past the platen F. Consequently the instant a signal is given for any particular letter, at that instant the platen will be raised and bring its fillet of paper to touch the corresponding letter on the type-wheel, which letter will be accordingly printed. As the operator strikes any key the pin *b* attached thereto will be partially raised, being arrested by its notch striking the circuit-plate on the under side. The arm *d* now comes along, and, striking the side of the pin by its beveled edge, pushes it outward in its slotted hole, thus disengaging the notch. The circuit-arm *d'* at the same time riding over the top establishes the electric current, and the signal is given accordingly. To prevent false printing, the second upward motion of the pin is felt by the finger in the additional depression of the key, and, further, so long as the key is held down the signal for that letter cannot be repeated, because the pin will be beyond the reach of the circuit-arm *d'*, which, being too short to touch, will necessarily pass clear inside of it, thus insuring that every letter sent must be an actual operation given by the hand of the operator.

I claim—

1. Giving to the key while still pressed by the operator a second motion at the instant that the circuit is closed or broken, as the case may be, so that an indication of said closing or breaking will be given to the operator, for the purposes set forth.

2. The method herein described of governing the position of the letters upon the type-wheel with respect to that of the platen or roller over which the paper travels, in order to insure an exact position of any particular letter at the moment of printing the same—viz., by so advancing or retarding the said type-wheel upon its shaft, whenever it has lost or gained in time in regard to the travel of the circuit-breaker at the distant station, that the letter indicated will be certain to stand directly over the said platen at the moment the latter brings the paper into contact with said letter.

3. Effecting the printing of each letter without arresting the motion of the type-wheel by causing the platen to revolve in the same direction and with the same speed as the type-wheel, while said platen is bringing up and holding the paper in contact, whereby the paper is advanced along with the type or letter from which it is receiving an impression.

4. The devices by which the type-wheel is started from its zero by an operator at a distant station, consisting of the shaft *g*, set in motion by the electric current, and acting in combination with the clutch-lever *n*, and the wheel E, whereby the type-wheel will be advanced up to the time that it becomes engaged with its driving-shaft, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

DAVID E. HUGHES.

Witnesses:

J. P. PIRSSON,

S. H. MAYNARD.