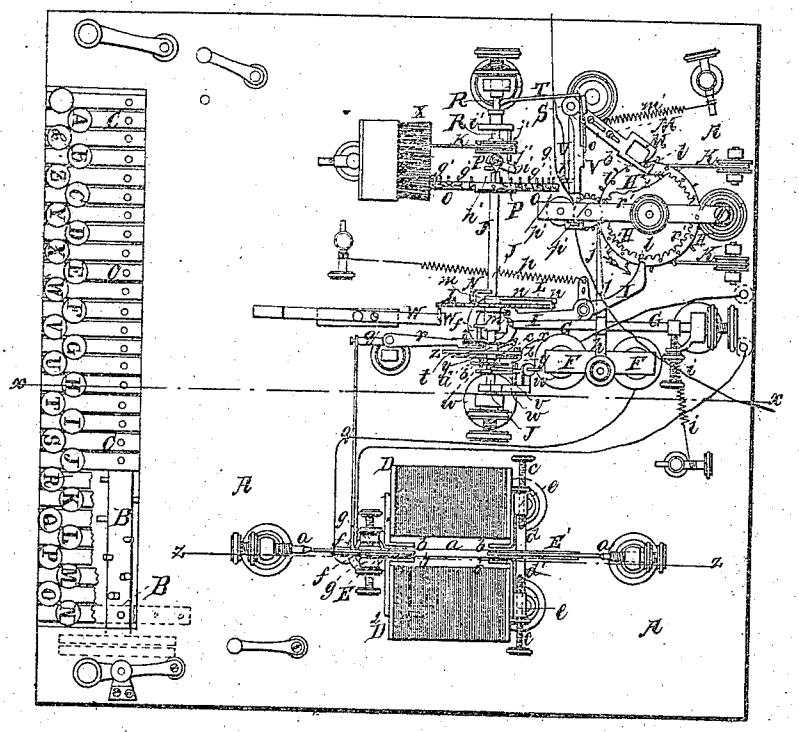
3 Sheets Sheet 1

# R. K. Boyle,

## Printing Telegraph.

No. 81,871. Patented Sep. 8, 1868.

Fig. 1.



Witnesses.

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3 Sheets. Sheet 2

# R. K. Boyle,

## Printing Telegraph.

No. 81,871. Patented Sep. 8, 1868.

Fig. 2.

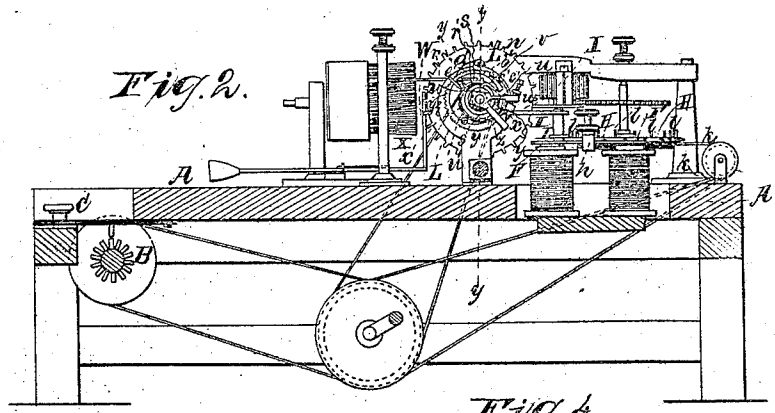
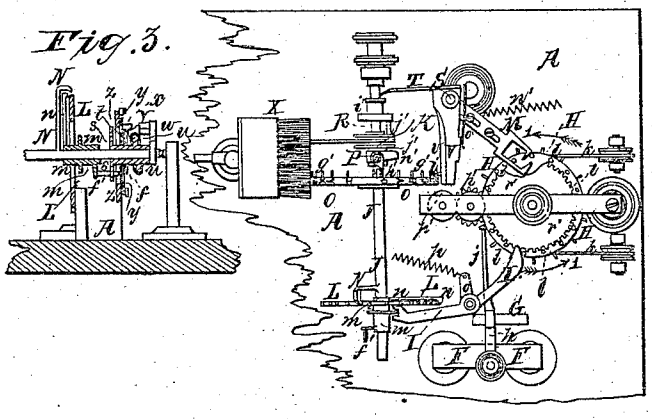


Fig. 4.

Fig. 3.



Witnesses.

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R. K. Boyle, 3 Sheets-Sheet 3

Printing Telegraph.

No. 81,871. Patented Sep. 8, 1868

Fig 5.

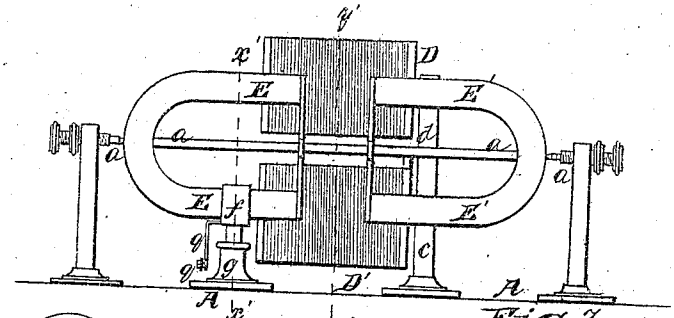



Fig 6.

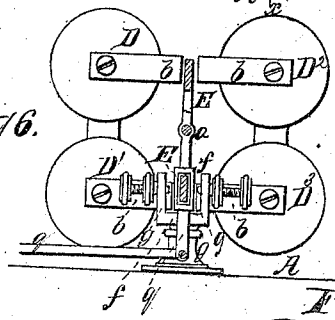



Fig 7.

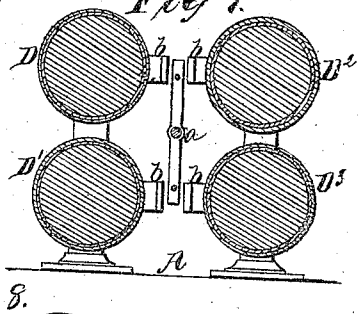
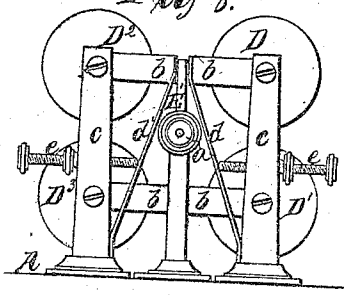



Fig 8.




Witnesses.

J. A. Fraser
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Inventor.

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# United States Patent Office.

ROBERT KIRK BOYLE, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND GIUSEPPE TAGLIABUE, OF SAME PLACE.

*Letters Patent No.* 81,871, *dated September* 8, 1868.

## IMPROVEMENT IN PRINTING-TELEGRAPH INSTRUMENTS.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, ROBERT KIRK BOYLE, of the city, county, and State of New York, have invented a new and improved Telegraph-Instrument; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to a new telegraphic-printing apparatus, which is so arranged that it will adapt itself to every variation of the weather, and that it will utilize the whole power of the current.

The invention consists, first, in a new arrangement of connecting the horse-shoe magnet with the electro-magnets.

In my new apparatus four electro-magnets are employed, a pair being arranged on each side of the horse-shoe magnet.

The two electro-magnets on each side are arranged one above the other.

Two horse-shoe magnets are firmly secured to an oscillating horizontal bar, in such a manner that each end of each horse-shoe is between the two opposite electro-magnets.

By means of this arrangement the through current, which is generally obtained, is avoided, and the horse-shoe magnet will more easily change its position, when the polarity of the electro-magnet is reversed.

The invention also consists in the application of two springs, of which one is arranged on each side of the horse-shoe magnets, so as to be forced back by the magnet, when the same is attracted to one side, and to aid in repelling it to the other side, when the current is changed.

By means of these springs the motion of the horse-shoe magnet can be regulated, in case the electro-magnets on one side should be stronger than those on the other side.

By setting the spring, which is on the same side with the stronger coil, by means of a set-screw, closer to the horse-shoe, thus strengthening it, and by weakening the spring on the weaker coil, the horse-shoe will be repelled with the additional force of the stronger spring, when attracted by the weaker electro-magnet.

The invention consists, third, in a new method of connecting the horse-shoe magnet with the local magnet, by which the connection of the horse-shoe magnet with the printing-apparatus is produced.

This connection consists of two wires, which reach from the coil of the local magnet to its battery, and thence to a slotted standard, in which the horse-shoe oscillates, and to a sleeve in which the horse-shoe is held, respectively, the said sleeve being held between the two arms of the aforesaid standard.

As soon as, by the action upon the keys, the motion of the armature is arrested, the sleeve will be brought in contact with the standard, and the circuit between the two wires of the local magnet will be established, so that the same will draw down its armature.

The invention, fourthly, consists in connecting the local magnet with a forked lever, acting as an escapement to a toothed wheel, which has a tendency to revolve, but is detained by the aforesaid lever.

As soon as the armature of the local magnet is drawn down, the wheel will be released, and will revolve until it is stopped by another forked lever connected with the type-wheel, as will hereinafter be more fully described.

By such a motion of the wheel, the same will, by means of pins, act upon a lever, which draws a clutch into the teeth of a stationary disk, the number of teeth on the same corresponding with the number of letters on the type-wheel.

The type-whel is mounted on an axle, which carries an arm that strikes against the aforesaid clutch, when the same catches into one of the teeth of the aforesaid stationary disk, and which thus stops the motion of the axle, to which it is attached, and consequently also the motion of the type-wheel. The type-wheel is thus brought to a stop and ready for printing.

The invention also consists in imparting to the axle, to which the type-wheel is attached, motion from a sleeve, turning upon a stationary axle, which is a continuation of the aforesaid type-wheel axle.

To the sleeve is pivoted an elbow-cam, which strikes against a pin on the type-wheel, and thereby revolves the same as the sleeve is revolved.

But as soon as the type-wheel is stopped in the aforesaid manner, the cam will not be able to move it any more, and will, as it is attached to the revolving sleeve, be forced against the pin on the type-wheel, and will thereby be turned around its pivot-pin, so that its other arm will strike against a pin on another sliding sleeve, which, as it is thus moved, acts upon a lever projecting from an oscillating shaft.

As the latter shaft is turned it will press a cushion which is attached to it against the type-wheel, and will thereby impress the required letter upon the paper, which is between the cushion and the type-wheel.

The invention also consists in connecting with the oscillating axle, which carries the printing-cushion, the forked escapement-lever, which arrests the motion of the toothed wheel, that has been released by the action of the local magnet, as above described.

When, by the stopping of the type-wheel, the said forked lever is moved, it acts to again release the toothed wheel, so that it may be locked by the lever which is connected with the local magnet.

A spring acts to draw the printing-cushion and all the parts connected with the oscillating axle to which it is attached into the original position again.

The paper to be printed is fed between two drums, which are moved by the intermittent rotary motion of the toothed wheel that is connected with the local magnet.

While the aforesaid toothed wheel was turned, when released from the fork that is connected with the printing-cushion, it acted upon the lever which carries the clutch, fitting into the toothed disk, so as to draw the clutch out, and thereby allow the type-wheel and its axle to revolve again.

The invention also consists in the device for connecting the aforesaid apparatus with the armature of the main magnets.

The oscillating armature operates an oscillating escapement, which acts upon a toothed wheel, mounted on a sleeve that is fitted upon the type-wheel axle.

The little toothed wheel has half as many teeth as there are types, and its sleeve is connected with the sliding clutch which locks into the toothed disk.

As the toothed wheel is released by the oscillations of its lever, and moved by the action of a spring, the clutch-arm will move with each move of the toothed wheel, opposite to another tooth of the toothed disk, and when the oscillations of the escapement are stopped, the clutch will be opposite that tooth into which it is to be locked by the action of the local magnet.

When the arm on the type-wheel shaft strikes the clutch, the required type of the wheel will stand opposite the printing-cushion.

The correctness of the operation is evident, as each motion of the armature makes one corresponding motion of the toothed escapement-wheel and one motion of the clutch-arm, which moves opposite the toothed disk, the disk having as many recesses as there are types.

Each recess represents one type, and that one into which the clutch-arm is locked will be the representative of that type, which will be brought opposite to the printing-cushion.

The invention consists also in the device for winding up the spring, which moves the escapement-wheel.

The outer end of this spring is attached to an annular ratchet-wheel, which is held on the side of a stationary ring, and which is connected with a suitable pawl.

On the same sleeve to which the escapement-wheel and the inner end of the spring are attached, is also attached an inclined cam, upon the edge of which straddles a forked lever, pivoted to an arm that projects from the type-wheel shaft.

As the shaft revolves, the fork is moved on the cam, and if the spring is unwound, it will be wound up again by an arm projecting from the fork, which arm only strikes a block on the spring when it moves over that portion of the edge of the cam which is nearest to the annular ratchet-wheel.

The type-wheel is inked by means of a brush, which is mounted on a revolving axle, which is at right angles to the type-wheel shaft.

A suitable device is obtained to arrest the type-wheel at a stop, before beginning a sentence.

In the accompanying drawing—

Figure 1, Sheet I, represents a plan or top view of my improved telegraph-apparatus.

Figure 2, Sheet II, is a vertical transverse section of the same, the plane of section being indicated by the line *x x*, fig. 1

Figure 3, Sheet II, is a detail vertical longitudinal section of the same, the plane of section being indicated by the line *y y*, fig. 2.

Figure 4, Sheet II, is a detail plan view of the same, showing the parts in the position ready for printing.

Figure 5, Sheet III, is a vertical transverse section of the same, the plane of section being indicated by the line *z z*, fig. 1.

Figure 6, Sheet III, is a detail vertical sectional view, the plane of section being indicated by the line *x' x'*, fig 5.

Figure 7, Sheet III, is a similar view, taken on the line *y' y'*, fig. 5.

Figure 8, Sheet III, is an end elevation of the electro-magnets.

Similar letters of reference indicate corresponding parts.

A represents the platform of the apparatus, made of wood or other suitable material, of suitable size.

are the keys, provided with pins in the ordinary manner

suitable circuit-wheel is attached to the axis of the keys, and is connected in the ordinary manner, by means of wires, with the battery, and with the printing-apparatus.

$D$, $D^1$, $D^2$, and $D^3$, are the four electro-magnets, arranged horizontally, two on each side of the horse-shoe magnets, E and E′, which are mounted on an oscillating axle, *a*, as shown in fig. 5, the said axle having its bearings in suitable supports, as shown.

The electro-magnets D and $D^1$ are arranged on one side of the horse-shoe magnet, and $D^2$ and $D^3$ on the opposite side.

The electro-magnets, on each side of the horse-shoes, are arranged one above the other, as shown, and are held in suitable supports, as is clearly represented in figs. 7 and 8.

Face-plates, *b b*, are secured to the ends of each electro-magnet, as shown in figs. 1 and 7.

The four face-plates on that pair of electro-magnets which is on one side of the horse-shoes, are opposite the poles of the horse-shoes, and those on the other pair are also opposite the poles.

Thus it will be seen that when the apparatus is set in operation, the diagonally-opposite electro-magnets will respectively attract and repel the horse-shoes, and that, as the polarity of the electro-magnets is reversed, the action upon the horse-shoes will be reversed, and that thus an oscillating motion is imparted to the latter.

It will be seen that by this arrangement and combination of the magnets, only one pole of each horse-shoe shall be attracted by only one pole of the same electro-magnet, and that there will thus be two distinct electro-magnets to attract one horse-shoe, and two to repel the same.

In all other devices now in use, both poles of the horse-shoe, or other permanent magnet, are attracted to the same side by the electro-magnet.

Thereby a magnetic circuit is created which prevents the free action of the electric current, as the permanent magnet cannot be released with the required rapidity.

By my apparatus, no such circuit is obtained, and the action of the permanent magnet will consequently be more certain and reliable than it is with any ordinary or other apparatus.

To the supports *c c*, by which the electro-magnets are held, are attached springs *d d′*, which are, by means of screws, *e*, regulated so as to press against the sides of the horse-shoe magnet with greater or less force, as may be desired.

Thus, if one pair of the electro-magnets should be stronger than the pair on the opposite side of the horse-shoe, these springs might be adjusted so as to repel the horse-shoe with greater force towards the weaker, and to detain it when attracted by the stronger electro-magnets.

But even if the electro-magnets on the two sides of the horse-shoes are alike, these springs will be of great service, as those on one side will yield when the horse-shoe is attracted by the electro-magnet towards them, while they will, when the current is changed and the horse-shoe attracted to the opposite side, accelerate the motion of the horse shoe with the rebound.

By means of the screws *e* the springs can be made strong or weak, as may be desired, and when they are properly adjusted the horse-shoe magnet will move in the centre of the whole force.

The magnetic combination is thus made permanent for all kinds of weather and degrees of current.

To one of the horse-shoes is attached an insulated sleeve, *f*, which oscillates with the horse-shoe, between two arms projecting from a pillar, *g*, as is clearly shown in fig. 6.

The pillar, as well as the sleeve *f*, is connected, by means of wires, with a battery, and with a local magnet, F, as is indicated in fig. 1.

As long as the horse-shoe oscillates, the contact between the sleeve and pillar-arms will be of too short duration to establish a circuit between the two wires, but when the motion of the horse-shoe ceases, by the action upon the keys C, the sleeve will rest against one arm of the pillar, or against an adjustable stop arranged in the same, and a connection between the two wires of the local magnet will thus be established whenever the oscillations of the horse-shoe magnet cease.

The armature F of the local magnet is drawn down upon its coils only when a connection between its two wires is established, during the rest of the horse-shoe magnet.

Armature F of the local magnet is secured to an arm, *h*, which projects from an oscillating horizontal shaft, G, said shaft having a crank to which a strong spring, *i*, is attached, which has the tendency to raise the armature F of the local magnet as soon as the connection between its wires is interrupted.

An arm, *j*, which projects from the axle G, acts as an escapement for a toothed wheel, H, which is mounted on an upright axle, as shown, and which has a constant tendency to revolve in the direction of the arrow 1, figs. 1 and 4, it being connected with a revolving belt, *k*, as shown.

On the surface of the friction-wheel H are set a number of upright pins, *l l*, as is clearly shown in the drawings.

I is an oscillating lever, pivoted near the middle to the platform A, and connected at one end with a sleeve, *m*, which slides and turns on a horizontal shaft, J, as shown in fig. 1.

From this sleeve *m* projects radially an arm, *n*, having a bent-out arm at its outer end.

The arm *n* is in front of an annular disk, L, which has slots cut into its rim, as shown in fig. 2, the number of such slots or recesses being equal to that of the keys C.

The lever I has an arm, *o*, which is connected with a spring, *p*, that tends to draw the sleeve *m* towards the disk L, so as to lock the projecting arm of the bar *n* into a recess of the disk L.

Only when the back end of the lever I is held by one of the pins *l* of the wheel H, as in fig. 1, will the bar *n* be held out of the disk L, as in fig. 1, but as soon as, by the stopping of the horse-shoe magnets, the local magnet is drawn down, so as to raise the escapement *j*, the wheel H will be turned by its belt or cord, and

will thereby release the lever I, which will be acted upon by the spring *p*, so that the bar *n* will be locked into the disk, as shown in fig. 4.

The wheel H, when it is thus released by the action of the local magnet, will not turn far, as it will soon be stopped by another escapement-lever, M, attached to and swinging on an upright axle, as shown in fig. 4, in which also the manner of stopping the wheel H by this lever M is represented.

The connections of the lever M will be hereinafter described.

The horse-shoe magnets E E′ are, by means of suitable-levers, *q*, or directly, connected with an oscillating escapement-lever, *r*, which engages a toothed wheel, *s*, that has half as many teeth as there are keys C.

The wheel *s* is mounted on a sleeve, *t*, which is arranged around the shaft J, as is more fully shown in fig. 3.

The sleeve *t* carries a disk, *u*, which is set in an inclined position upon the sleeve, as shown in fig. 3, and a forked bar, *v*, pivoted to an arm, *w*, that projects from the axle J, straddles the edge of the cam *u*, as shown in fig. 2.

The sleeve *t* receives its motion from a hair-spring, *x*, of which the inner end is attached to the sleeve, while the outer end is attached to an annular ratchet-wheel, *y*, which is fastened on a stationary disk, *z*, that is secured to the platform, as shown in fig. 2, the wheel *y* being free to turn around its axis in one direction, and a pawl, *a′*, preventing rotation in the opposite direction, as shown.

At the junction of the spring *x* with the ratchet-wheel *y*, projects from the face of the latter a block or pin, *b′*, which can be reached by the end of an arm, *c′*, which projects from the fork *v*, as shown in figs. 1 and 2, when the said fork is on that portion of the edge of the cam *u* which is nearest to the ratchet-wheel *y*.

As the shaft J is, by devices to be hereinafter described, revolved with great velocity, it is evident that the fork *v*, which is pivoted to an arm, *w*, projecting from the shaft J, will be carried around the disk *u*, which is rotated but slowly by the escapement-motion of the wheel *s*.

Whenever the end of the spring *x* will be unwound, or nearly so, the bar *c′* will reach the block *b′*, and will turn the ratchet-wheel *y*, so as to wind the spring partly up again, and thus the spring will be constantly automatically wound up as it is being unwound.

The cam *u* is not so much inclined as to allow the bar *c′* to be locked for too long a time with the pin *b′*, so that the spring cannot be overwound; but still, to prevent any possible overwinding of the spring, a projecting pin, *e′*, has been attached to the sleeve *t*.

When the spring is quite wound up, the pin *b′* strikes against the pin *c′*, and the further turning of the ratchet-wheel *y* is then prevented.

The sleeves *m* and *t* are connected by means of a pin, *f′*, which is attached to one of them, and fits through a hole in the other.

The sleeve *t* can only turn on the shaft J, but the sleeve *m* can also slide on the same.

By means of the rotation which is, by the action of the spring *x* and by the motion of the escapement-lever *r*, imparted to the wheel *s*, and consequently also to the sleeve *t*, and by means of the constant connection between the sleeves *t* and *m*, the latter is also rotated, and with it its bar *n*.

During each move of the sleeve *t*, which is occasioned by its temporary release from one of the pins of the escapement *r*, the end of the bar *n* will be moved from one recess to the other of the disk L, and during a complete revolution of the sleeve *t*, the bar *n* will also have made one complete revolution, and will stand opposite to the recess in the disk L from which it started.

From the shaft J projects an arm, N, with hook-shaped outer end.

This arm, when the bar *n* is out of the disk L, fits over the end of the bar *n*, and allows the latter to revolve freely, being itself not detained, as indicated in fig. 3. But as soon as, by the action of the local magnet, as before described, the end of the arm *n* is thrown into one of the recesses of the disk L, the said bar *n* will have been moved into the track of the arm N, the end of which will strike against the end of the arm *n*.

Thus, by the locking of the bar *n* into the disk L, the further revolution of the sleeves *m* and *t* is stopped, but also that of the shaft J, owing to the arms *n* and N coming in contact with each other while one of them is firmly locked.

Thus, as the horse-shoe magnet ceases to move, by the action upon the keys, the rotation of the sleeves *t* and *m*, and of the axle J, is stopped.

Between every two such stoppages, the bar *n* moves across an equal number of recesses of the disk L as the horse-shoe has made oscillations; and the number of the latter were equal to the number of keys between the two last-touched keys.

The shaft J carries the type-wheel O, on the periphery of which the required types are arranged.

The number of types is equal to that of recesses in the disk L, and equal to the number of keys C, and double the number of teeth on the wheel *s*.

From one face of the type-wheel O project pins, *g′*, one opposite to every type, as shown in figs. 1 and 4.

The shaft J receives its rotary motion by means of a cam, P, which strikes against a pin, *h′*, that projects from the face of the type-wheel, as shown.

The cam P is pivoted to a pin that projects radially from a shaft, R, which shaft is a continuation of the shaft J, but not part of the same, as shown.

The shaft R receives its motion by means of a cord, from a treadle or other suitable mechanism.

*i′* is a sleeve, sliding on the shaft R, and revolving with the same, as a pin, *j′*, that projects from the sleeve, fits through a pulley, *k′*, that is mounted on the shaft R.

S is an upright pin or tube, pivoted to the platform A, and carrying three arms, M, T, and U, which are firmly secured to it.

The arm M acts as an escapement for the wheel H, as hereinbefore described.

The arm T leans against a shoulder that is formed on the sleeve $i'$, and the arm U carries a wedge, $l'$, which is forced between the pins $g'$, as will hereinafter be more fully described.

A spring, $m'$, which is attached to an arm projecting from the pin S, has the tendency to so hold the pin that the arm T presses the sleeve $i'$ towards the type-wheel, so that the pin $j'$ will press against an arm, $n'$, that projects from the cam P, and will thereby turn the said cam into the position shown in fig. 1, which is such that the cam will thereby stand against the pin $h'$, so as to revolve the type-wheel. At the same time, the arm U will be withdrawn from the edge of the type-wheel, as shown in fig. 1, and the arm M will rest upon the face of the wheel H, so as to hold a pin, $l$, between its forked arms without detaining it, as shown, so that the wheel H may revolve if released by the escapement $j$. As soon as, by the action of the arms $n$ and N, the further revolution of the type-wheel shaft J is stopped, the shaft R will continue to revolve, and the cam P will then be brought with such force against the then stationary pin $h'$ that the power of the spring $m'$ will be overcome, and the cam will be turned, so that its arm $n'$ will force the sleeve $i'$ back, by means of the pin $j'$.

By this motion of the sleeve, the end of the arm T will be moved back too, and thereby the arm U will be moved against the edge of the type-wheel, bringing its wedge $l'$ between two of the pins $g'$ on the same.

By the same motion of the arm T will the arm M be moved, to release a pin, $l$, which was brought against one of its ends by the rotation of the wheel H while the same was being released from the escapement $j$.

To the pin S is also pivoted an arm, V, which carries a cushion in one face, and which, when the pin S is turned by the stopping of the type-wheel, is, by means of a strong spring, $o'$, which is firmly secured to a pin projecting from the arm U, pressed against the edge of the type-wheel.

The paper to be printed is fed between corrugated rollers, $p'$ $p'$, which are set in motion by the intermittent rotation of the wheel H, on the axle of which a gear-wheel, $r'$, is mounted, which meshes into a pinion on one of the rollers $p'$, as shown.

The paper rests upon the wedge $l'$, and is by the same held at the proper height.

By the aforesaid rotation of the cushion-arm V, the paper is pressed by the said arm against that type on the wheel which is opposite to the cushion, and thus receives the required imprint.

To recapitulate the operation of the machine, it should be borne in mind that the oscillations of the horse-shoe magnet between every action of the keys C are equal in number to the number of keys that are between the two last-touched keys.

While the horse-shoe oscillates, the arm $n$ traverses an equal number of recesses on the disk L as there are moves made by the horse-shoe, and when the horse-shoe stops the arm $n$ stops also, and is locked into that one of the recesses which is as far from the recesses into which it was locked before, or rather as many recesses distant from the same as there have been oscillations made by the horse-shoe.

Then the arm N arrests the motion of the type-wheel shaft, and locks the same in a position which brings the required type in front of the printing-cushion.

The relative position of the type-wheel is, (as it is stopped by the arm $n$, the motion of which is regulated,) such, that the same number of types will be distant between the type last printed and that to be printed, as there are keys between the two keys last touched.

When the friction-wheel H is by the action of the local magnet released, it turns and releases the lever I, which is by the spring $p$ moved so as to lock the bar $n$ into the disk L.

The further revolution of the wheel H is stopped by the forked arm M, one of the ends of which receives a pin, $l$, as shown in fig. 2.

While, then, the type-wheel is stopped in the manner described, and the paper is being printed, the arm M is moved in the manner set forth, and releases its pin $l$, so that the wheel H may be turned until it is again arrested by the lever $j$.

By this turn of the wheel H, the lever I is again moved so as to release the arm $n$ from the disk L, thus allowing the further revolution of the type-wheel shaft, and the paper is at the same time also fed further ahead to take the printed portion of the type-wheel, and thus, by this slight motion of the arm M, the whole apparatus is again set for further operation.

As soon as the type-wheel shaft J is again free to revolve, the cam P will assume the original position, and will revolve the shaft as the sleeve $i'$ will be moved by the arm T towards the type-wheel, so as to bring the cam P against the side of the pin $h'$, as shown in fig. 1.

W represents a lever, pivoted to the platform A, and provided with a suitable handle, so that its end can be moved into a certain recess of the disk L, to arrest the type-wheel at the stop, when a sentence is to begin.

X represents an inking-brush.

The same is mounted on a horizontal shaft, which stands at right angles to the type-wheel shaft.

The brush will be revolved by the type-wheel, and, by supplying the brush with a small quantity of ink, the same will be rapidly spread all over the brush, owing to the rapidity with which it revolves, and will keep the types uniformly blacked, besides keeping the letters free from gumming up.

The wedge $l'$, on the arm U, serves, besides being a support for the paper, as a means to prevent the type-wheel from turning back during the printing operation.

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

1. Arranging a pair of electro-magnets on each side of two horse-shoe magnets, which are fastened to an oscillating shaft, substantially as herein shown and described, so that one pole of each horse-shoe shall be attracted by but one electro-magnet, for the purpose specified.

2. The application of the adjustable springs $d$ $d'$ to the stationary part of the apparatus, said springs aiding to repel the horse-shoe magnet, and to adjust the same in the centre of forces, substantially as herein shown and described.

3. The insulated sleeve *f*, attached to the horse-shoe magnet, in combination with the slotted pillar *g*, and with the wires of the local magnet, all made and operating so that when the oscillations of the horse-shoe magnet will cease, the connection of the wire of the local magnet will be completed, substantially as and for the purpose herein shown and described.

4. Connecting the local magnet F, by means of an escapement-lever, *j*, with the friction-wheel H, substantially as and for the purpose herein shown and described.

5. The lever I, when connected with the sleeve *m*, in combination with the friction-wheel H and spring *p*, all made and operating substantially as herein shown and described.

6. The device herein shown and described for locking the bar *n* into the toothed disk L, by the action of the horse-shoe and subsequently of the local magnet, said device consisting of the sleeve *m*, lever I, spring *p*, and friction-wheel H, the latter having upright pins *l*, and all made and operating substantially as and for the purpose herein shown and described.

7. Connecting the friction-wheel H with the escapement-levers *j* and M, all made and operating substantially as and for the purpose herein shown and described.

8. Connecting the sleeve *m*, which is operated by the action of the local magnet F, with the sleeve *t*, which is moved by the action of the horse-shoe magnets E E′, substantially as herein shown and described.

9. The device herein shown and described for winding up the hair-spring *x*, by which the sleeve *t* is turned, said device consisting of the cam *u*, arm *w*, forked bar *v*, arm *c′*, ratchet-wheel *y*, and block or pin *b′*, all made and operating substantially as herein shown and described.

10. Combining the horse-shoe magnet and the local magnet in such a manner with the type-wheel shaft that, by the action of the horse-shoe magnet, it receives the required motion, while, by the action of the local magnet, it is instantaneously stopped in the desired position, substantially as herein shown and described.

11. The arm N, when secured to and projecting from the shaft J, in combination with the arm *n*, which projects from the revolving and sliding sleeve *m*, and which, by being locked into the stationary disk L, also locks the shaft J, substantially as and for the purpose herein shown and described.

12. The type-wheel O, when provided with a pin, *h′*, in combination with the turning-cam P, sleeve *i′*, on shaft R, pin *j′*, on sleeve *i′*, arm T, and spring *m′*, all made as described, and operating in combination with each other, substantially in the manner set forth.

13. The sliding sleeve *i′*, which is moved when the type-wheel shaft is stopped, and which is combined with the pin S, having the arms M, T, and U, and operating the printing-cushion V, substantially as and for the purpose herein shown and described.

14. The feed-rollers *p′ p′*, when receiving motion from the friction-wheel H, and when combined with the support *l′* U, and with the printing-cushion V, all made and operating substantially as and for the purpose herein shown and described.

15. The printing-cushion V, when pivoted to an upright pin, and when operated by a spring, *o′*, which is secured to one of the arms of the pin S, substantially as herein shown and described, so that it will be forced with sufficient power against the edge of the type-wheel, and will still be yielding, as set forth.

ROBERT KIRK BOYLE.

Witnesses:

WM. F. MCNAMARA,

ALEX. F. ROBERTS.