No. 650,381. Patented May 29, 1900.

W. P. DUN LANY & H. R. PALMER.

FACSIMILE TELEGRAPH.

(Application filed Mar. 31, 1899.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

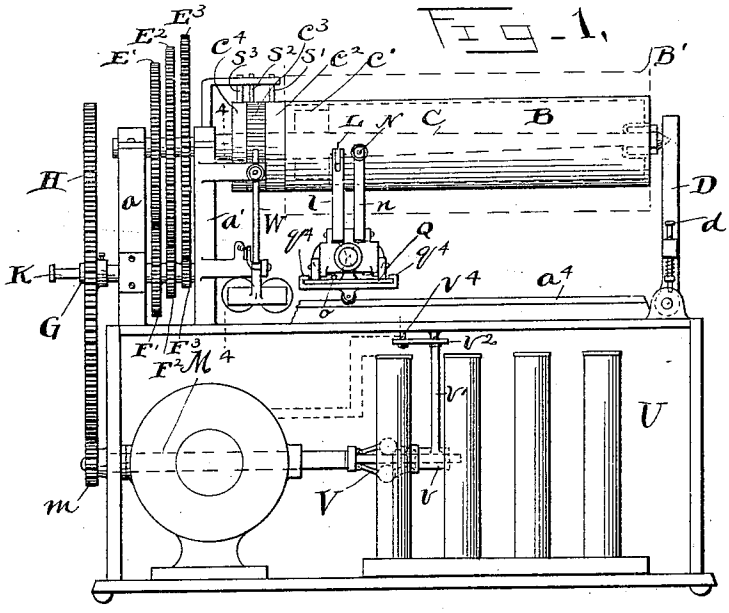

FIG. 2.

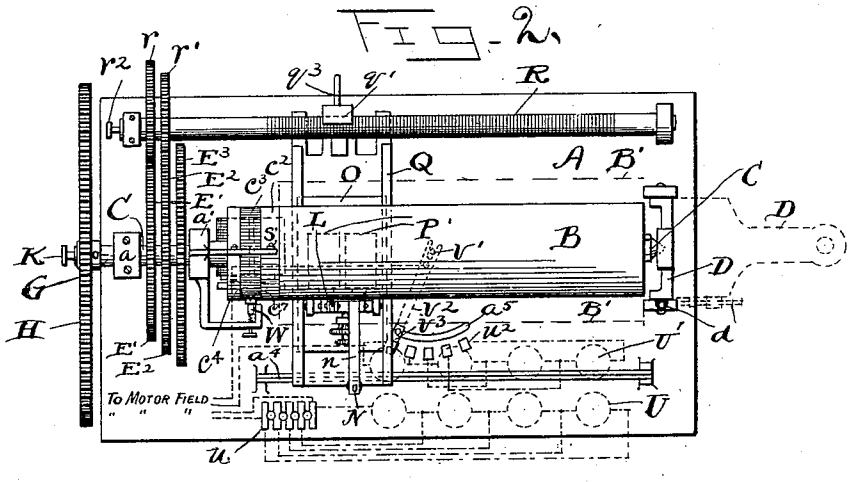

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Fig. 3.

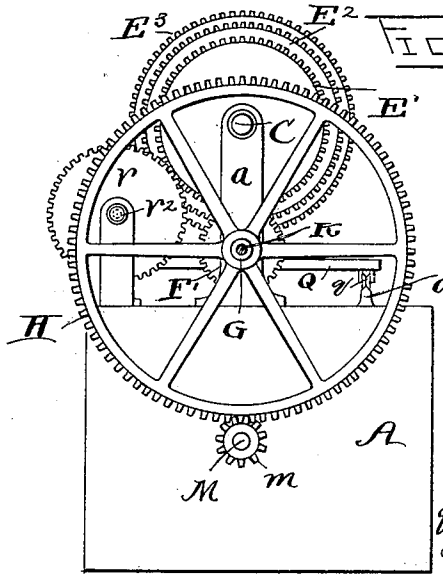

Fig. 4.

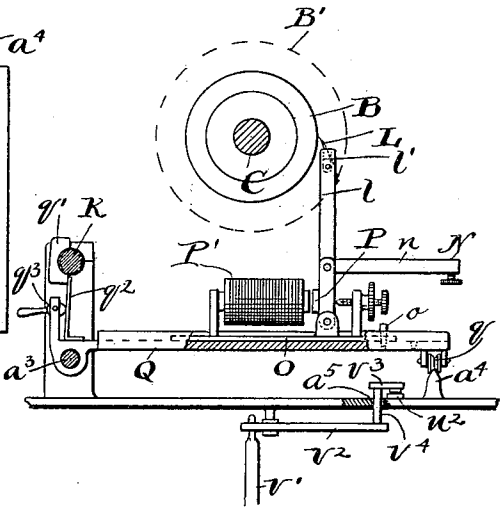

Fig. 5.

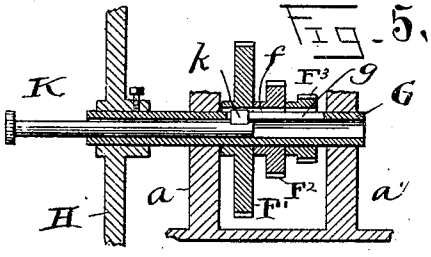

Fig. 6.

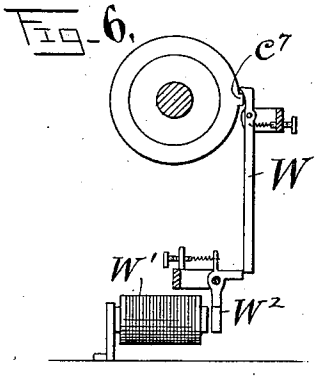

Fig. 7.

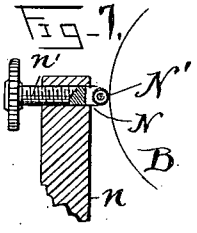

Fig. 9.

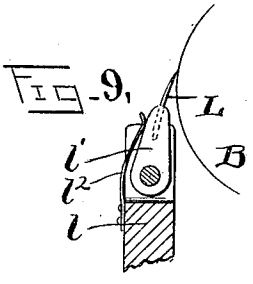

Fig. 8.

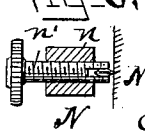

Fig. 10.

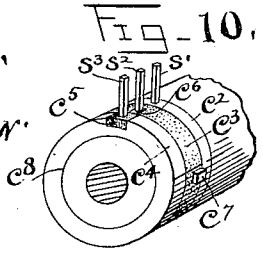

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Fig. 11.

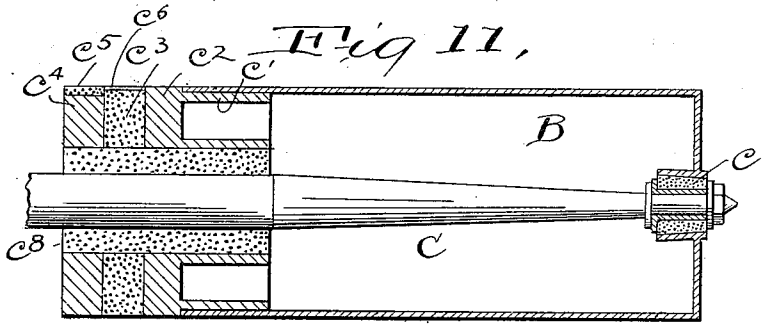


Fig. 12.

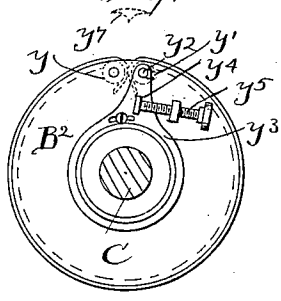


Fig. 13.

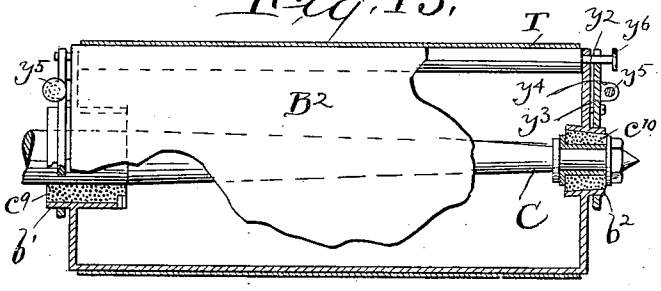


Fig. 14.

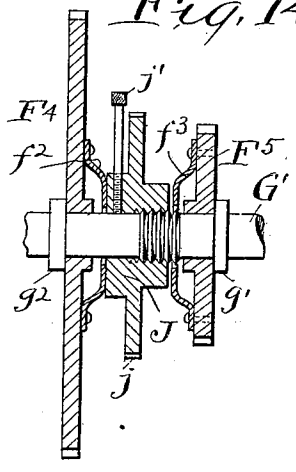
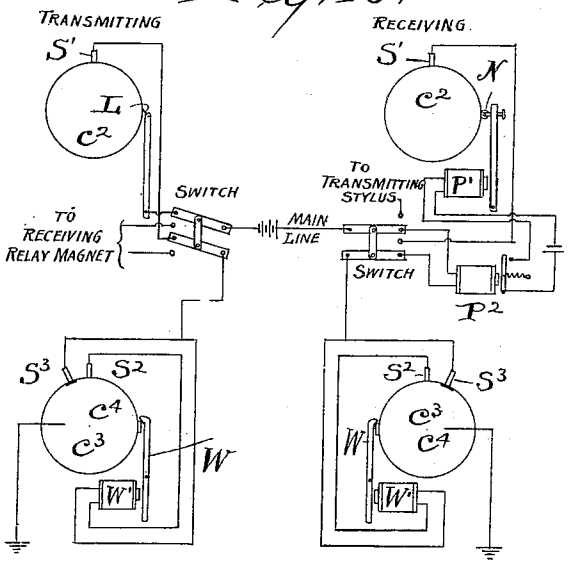


Fig. 15.



Witnesses.
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Herbert R. Palmer,
By Thurston & Baker, attys.

UNITED STATES PATENT OFFICE.

WILLIAM P. DUN LANY AND HERBERT R. PALMER, OF CLEVELAND, OHIO, ASSIGNORS TO THE INTERNATIONAL FACSIMILEGRAPH COMPANY, OF SAME PLACE.

FACSIMILE TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 650,381, dated May 29, 1900.

Application filed March 31, 1899. Serial No. 711,271. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM P. DUN LANY and HERBERT R. PALMER, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Facsimile Telegraphs, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

Our invention relates to that class of facsimile telegraphs wherein a message or picture is transmitted by means of a stylus on a relatively-moving surface which make and break connections according as the stylus is on a conducting or insulating portion of the surface.

The object of the present invention is to simplify such telegraph instruments, render them more accurate and efficient, more easily adjustable to meet the varying conditions presented, and adapt them to receive a message or picture by a direct impression or a hammer and anvil movement instead of by an electrochemical change in the receiving-surface.

The invention may be best summarized as consisting in the means to the above ends, as hereinafter described, and definitely set out in the claims.

In the drawings, which clearly disclose our invention, Figure 1 is a side elevation, Fig. 2 a plan, and Fig. 3 an end view. Fig. 4 is a vertical section on the line 4 4 of Fig. 1. Fig. 5 is a detail in vertical central section of the means for varying the speed of rotation. Fig. 6 is a detail in side elevation of the synchronizing mechanism. Figs. 7 and 8 are details in vertical and horizontal sections, respectively, of the receiving-hammer. Fig. 9 is a detail in vertical section of the transmitting-stylus. Fig. 10 is a vertical section through the cylinder-shaft looking toward the cylinder and showing perspectively the synchronizing rings or disks. Fig. 11 is a vertical longitudinal section through the platen or rotating cylinder. Figs. 12 and 13 are respectively an end view and a side elevation, partly sectional, of another form of platen or cylinder. Fig. 14 is a vertical central section of a frictional coupling and speed-changer which may be employed, and Fig. 15 is a diagram illustrating the operation of the telegraph.

Referring first to Figs. 1 to 10, inclusive, A represents a suitable frame or box which carries on its upper surface the telegraph instrument proper. The instrument includes a rotating cylinder, which is designated B. This cylinder is removably carried by the tapering spindle or shaft C, which is journaled in suitable bearings a a', carried by the frame, and also in the movable outboard-bearing D, which receives the conical end of the spindle C. This outboard-bearing may be turned down, as indicated in dotted lines in Fig. 2, a thumb-latch d being provided for holding it in its elevated position, the point of the latch taking into a stationary notch. The cylinder B is removably supported by engaging at its outer end with an insulating-thimble c on the spindle and at the other end by engaging with a larger cylindrical head c', carried by the spindle. The head is insulated from the spindle and has the exposed metal part c^2. Thus the cylinder is electrically connected with the ring c^2, but is otherwise insulated.

Gears E' E^2 E^3 on the shaft C mesh the corresponding gears F' F^2 F^3 on the shaft G, to which latter shaft is rigidly secured the gear H, which meshes with the pinion m on the armature-shaft of the motor M. The gears E' E^2 E^3 are always in mesh with the corresponding gears F' F^2 F^3; but the latter are all loose on the shaft G, and only one at a time is clamped to it. Thus according to which one is clamped the speed of rotation of the cylinder is changed. Fig. 5 shows a simple and efficient means for changing the gear which is clamped to the shaft G. This shaft is made tubular and contains the plunger K, which carries at its inner end a projection or blade k, taking through a slot g of the shaft into grooves f in the gears. Thus by moving the plunger inward or outward the blade k may be caused to engage with any of the gears and lock it to the shaft, the other gears being free on the shaft.

The cylinder B carries on its surface the transmitting or receiving sheet and is rotated by the means above set out. At the same time

it is necessary that the transmitting-stylus or the receiving-hammer, as the case may be, should travel along the cylinder. This operation is provided by the following mechanism: The transmitting-stylus L and the receiving-hammer N are carried by arms l and n, which are pivoted to the armature-head P, which is pivoted to a suitable frame O, carried by the traveling carriage Q. This carriage travels along the stationary rod a^3 at the rear of the instrument and along the rib a^4, on which takes a small wheel q at the front of the instrument. The carriage is driven by means of the nut q', which it carries, through a spring-bar q^2, and which engages with the screw R, which is rotated at either of two speeds by the gears r and r', which engage, respectively, with the gears E' E^2. Either gear $r\,r'$ is locked to the screw by means of the plunger r^2, the construction being similar to that shown in Fig. 5 and heretofore described. The nut q' is held in engagement with the screw by means of the eccentric q^3, which bears against the spring-bar q^2. Fig. 4 shows such engagement. When the eccentric-handle is turned up, the resilience of the bar q^2 withdraws the nut from the screw. This allows the return of the carriage to its initial position at the completion of an operation.

It is desirable that the machine be adapted to carry more than one size of cylinder for the efficient transmission of different-sized pictures and also that the receiving-cylinder may be able to enlarge or reduce the image transmitted. In order that such enlargement or reduction shall maintain the proportions of the original picture, the cylinders vary in proportion to the speeds at which the screw is adapted to turn, and thus if the speed at which the cylinder is moving by the stylus or hammer in a rotary direction is increased or diminished the speed at which it moves by in a longitudinal direction is varied the same amount.

The enlarging or reducing feature is illustrated in the drawings, wherein the gears are so proportioned that one speed of the screw is about one and a half times the other speed and the cylinder B' (shown in dotted lines) is about one and a half times the diameter of the cylinder B. Using different-sized cylinders it is necessary to shift the transmitting or receiving members, and this is accomplished by means of a frame O referred to, which carries the magnet P' and the transmitting-stylus and the receiving-hammer. This frame is a plate guided between flanges q^4, extended across the carriage. In the form shown in the drawings where but two sizes of cylinders are used but two positions of this frame are needed, and it is held in either position by a peg o.

In transmitting the stylus L makes or breaks contact by reason of engaging with a metallic surface or an insulating surface of the picture or message secured to the cylinder. The metallic lines continue the circuit to the cylinder and out through a suitable brush s', engaging with the ring c^2. When transmitting, the arm l is turned up into the vertical position and the stylus engages with the material on the cylinder, while during the receiving the arm n is turned up into this position, and the other arm in each case is turned down into the horizontal position shown. The circuit, which extends from the ground to the brush s' and through the cylinder and transmitting picture and the arm l, continues along the main line and at the other end actuates (either directly or through a relay) the magnet P' carried by the frame O, which attracts the armature P and draws the hammer N against the receiving material.

The receiving-hammer consists of a very finely-toothed wheel N, carried by a screw n', as shown, or in other manner. This wheel is adapted to be brought, by the actuation of the armature, against the material on the receiving-cylinder, which may be alternate sheets of white paper and carbon paper. Now, if the receiving-point remains in sliding contact with the material it cannot bear hard enough to produce the mechanical impression we desire without tearing the paper. On the other hand, if it is solely in rolling contact and is of narrow enough tread to make an accurate picture it will cut the paper. After much experimenting we have found that if the wheel have its periphery made in the form of very fine and sharp teeth it will neither tear nor cut the paper, on the one hand, nor, on the other hand, spoil the impression-line, the lines being composed of a series of dots so close together as to apparently make a continuous line. Figs. 7 and 8 show on an exaggerated scale the notches in the wheel. In practice we have used with perfect success a wheel one-sixteenth of an inch in diameter having sixty teeth on its periphery, the teeth being so small as to be invisible to ordinary observation.

The transmitting-stylus L projects from the pivoted piece l', which is carried in the bifurcated end of the arm l and has its sides engaging with such forked end. A spring l^2, carried by the arm l, bears against the edge of the piece l'. The stylus may thus play back and forth lightly on the surface of the cylinder, but is guided against longitudinal movement by the forked end of the arm l, which engages with each side of the piece.

The speed of the motor M is regulated approximately by the resistance-coils U and the plates and plugs u, which are adapted to cut portions of such resistance into or out of the field of the motor. For a more accurate regulation we place on the armature-shaft the centrifugal governor V, which as the speed increases draws toward the armature the sleeve v, from which extends upward the arm v', which engages with the rear end of the pivoted arm v^2. The pivot of this arm is electrically connected with the field of the motor, and the arm carries (by means of the pin v^4,

extending through the slot a^5) the piece v^3, which is adapted to contact with any of the plates u^2, which are connected with the coils U', the circuit continuing from these coils back to the field of the motor. This is a fine regulation and operates to cut in more resistance as the speed increases, thus keeping the speed adjusted.

In order to absolutely synchronize the cylinders, the following mechanism is provided: Surrounding the bushing c^8 on the shaft C is the insulating-band c^3 and next to it the metallic band c^4. At a certain point the surface of this metallic band is interrupted by a piece of insulation c^5, and at a corresponding point the insulating-band c^3 is interrupted by the metallic piece c^6, electrically connected with the band c^4. A lug c^7 is secured to one of these bands and is adapted to be in engagement with a pivoted detent-lever W at the same time that the interrupting pieces of metal and insulation c^5 c^6 are in engagement with a pair of brushes s^2 s^3. The detent-lever W is normally held in engaging position by the bell-crank armature W^2, which is adapted to release the detent-lever when attracted by the magnet W'. The line from the brush s' at the transmitting end of the line and from the magnet P' at the receiving end each pass to the ground by a divided circuit partly through the magnet W' to the brush s^2 and partly directly to the brush s^3. Now during most of the revolution the current has the direct path to the brush s^3. When, however, the lug c^7 is just coming into engagement with the detent-lever, the insulated part c^5 cuts off this path for the current, and the only path the current has is through the magnet W' and the brush s^2. It can take this path if both brushes s^2 s^3 are on their metallic pieces c^6, and this will release the lever W and allow the continued rotation. If, however, one cylinder is a little ahead of the other, one of the brushes s^2 will not stand on the metallic surface and the circuit will be broken, and whichever cylinder is ahead will be held up by its detent until the other arrives. The motor governs the cylinder closely enough so that the brush s^2 at one end will not be on the metallic surface c^6 until the brush s^3 is on the insulating portion c^5 at the other end. Thus the cylinders are synchronized absolutely once each revolution.

Figs. 1 and 2 show the cylinder adapted to be used with a tube of alternate sheets of receptive and transfer paper. These tubes are slipped onto the cylinder over the end of it, the outboard-bearing D being turned down for that purpose.

Figs. 11 and 12 show an arrangement of the cylinder, which allows the use of a sheet not made into the form of a tube. Thus at the transmitting end an ordinary zinc plate, with insulating-ink on it, may be wrapped around the cylinder and have its ends secured, and at the receiving end a mimeograph-sheet may be similarly secured. The means we provide for thus securing the edges of a flat sheet are as follows: The cylinder B^2 has flanges b' b^2, which engage with the insulating-thimbles c^{10} and c^9 on the shaft C. A slit is formed in this cylinder along its edge, and within the cylinder, close to this slit, is journaled the roller y. Another roller y' is within the cylinder and has gudgeons y^2, which extend beyond the cylinder, passing through slots in the ends thereof, and are carried by arms y^3, pivoted at the axis of the cylinder by surrounding the flanges b' b^2. On these arms are lugs y^4, against which bear the ends of thumb-screws y^5, carried at each end of the cylinder. At the outer end of the shaft y^2 is formed the knurled head y^6, by which the roller may be conveniently turned. The sheet T^2 is wrapped around the cylinder and its edges tucked between the two rollers y and y'. The thumb-screws y^5 are then tightened up until the rollers get a good grip on the sheet, when the turning of the head y^6 of the roller y' draws the sheet tightly into place, and thereafter the thumb-screws y^5 are turned up tight to hold it in this position. The depression between the rollers y and y' may be filled after the sheet T is in place by a bar of proper shape (indicated by y^7 in Fig. 12) suitably held in place.

In the form shown in Figs. 1 and 2 when the detent-lever W stops the synchronizing-disks by engaging with the stop c^7 the disks slide on the bushing c^8, surrounding the shaft on which they ride. If desired, however, the slip connection may be anywhere between the motor and detent, and if it is placed on the shaft G it has the advantage of stopping the screw R at the same time that the cylinder stops. Fig. 14 shows a slip connection adapted to be so placed. The connection also is adapted to take the place of one of the gear-changing mechanisms heretofore described and shown as used both on the screw and on the shaft G.

In Fig. 14 on the shaft (designated G') between two rigid collars g' and g^2 are loosely placed two gears F^4 and F^5 of different sizes. On the sides of these gears, which face each other, are the springs f^2 and f^3, and between these springs and screw-threaded around the shaft G' is the clamping-block J. This block is adapted to be locked in position by the set-screw j', which it carries. When that set-screw releases the block, it is adapted to be conveniently turned by its flange j into engagement with either spring f^2 or f^3 with the desired pressure and may then be locked by the set-screw. This construction not only provides means for adjusting the friction of the slip connection, but likewise provides a very simple speed-changer.

In the diagram shown in Fig. 15 we have for convenience of illustration separated the ring c^2, which is shown above, from the rings c^3 and c^4, shown below. If the switch shown at the left-hand part of the diagram is brought into a position corresponding to that at the

right hand and the right-hand switch into the position which the left-hand now occupies and the transmitting-stylus and receiving-hammer at the two ends interchanged, the mechanism will be in condition to transmit from the opposite direction.

When transmitting from an insulating picture on a metallic sheet and receiving by means of a transfer impression, it is desirable to break the circuit at the magnet P′ when it is made at the stylus, and vice versa, so that the picture itself and not the background will be made by the impression. This we accomplish by having the main line connect with a relay-magnet, (indicated in the diagram by P^2,) which when the main line is closed opens a local line through the magnet P′, and vice versa.

Having described our invention, we claim—

1. The combination of a platen, an electromagnet, a hammer adapted to strike against material on the platen under the influence of the electromagnet, said hammer consisting of a very small wheel having around its circumference very fine and very-closely-placed teeth, there being approximately two to four teeth to a hundredth of an inch of circumference, substantially as described.

2. In a facsimile-telegraph instrument, in combination, the platen, the arm l, the stylus-point L, the block l' from which said point projects, said block being pivoted in the bifurcated end of the arm l and guided by having its sides in contact with the inner surface of such arms, and the spring l^2 pressing the block toward the platen, substantially as described.

3. In a facsimile-telegraph instrument, a pair of rings, one a conductor interrupted by a relatively-small non-conductor and the other a non-conductor interrupted by a relatively-small conductor, a lug c' rigid with said rings, in combination with a lever W with which said lug is adapted to engage, a lever W^2 normally holding said lever W in the path of said lug, and a magnet W′ adapted to withdraw said lever W^2 from said lever W, and brushes contacting with the said small non-conducting and conducting parts of said rings at the time said lug is in engagement with said lever W, substantially as described.

4. In a facsimile-telegraph instrument, a rotating head or shaft adapted to receive cylinders of different diameters, a receiving-hammer or transmitting-stylus, means for causing it to travel along the cylinder, there being provided a plurality of cylinders of different diameter and there being means for varying the speed with which the hammer or stylus moves by the cylinder in the proportion of said diameters, substantially as described.

5. In a facsimile-telegraph instrument, in combination, a shaft, means for rotating it and means for removably supporting a cylinder by it, a carriage, mechanism for causing the same to travel along the cylinder, a movable frame carried by said carriage and adapted to be moved crosswise thereon, a receiving-hammer or a transmitting-stylus carried by said frame and adapted to engage with the cylinder whereby said hammer or stylus may stand in a plurality of positions, and a plurality of cylinders of different sizes, each adapted to be carried by the revolving shaft and engaged by said hammer or stylus, substantially as described.

6. In a facsimile-telegraph instrument, the combination with a cylinder, of means for revolving the same, a stylus adapted to trace over said cylinder, said cylinder having a slot through its surface, a pair of rollers within the cylinder near the slot, one of said rollers being adjustable with reference to the other, means for so adjusting said roller and means for turning one of the rollers on its axis, substantially as described.

7. In a facsimile-telegraph instrument, the combination of a cylinder, a pair of rollers y and y' within the same, one of said rollers having its axis extended beyond the cylinder and having a head thereon for turning it, arms y^3 supporting one of said rollers, and thumb-screws y^5 adapted to force the roller carried by said arms into gripping engagement with the other roller, substantially as described.

8. In a facsimile-telegraph instrument, the combination of a shaft, a pair of gears loose thereon, an intermediate member between said gears, said intermediate member being screw-threaded on the shaft, circular dish-shaped springs secured to the inner faces of said gears and having openings which loosely surround the shaft, whereby said intermediate member by being rotated one way or the other may frictionally clamp either gear, and a set-screw carried by said intermediate member and adapted to lock it in desired position, substantially as described.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses.

WILLIAM P. DUN LANY.
HERBERT R. PALMER.

Witnesses:
ALBERT H. BATES,
PHILIP E. KNOWLTON.