No. 791,491. PATENTED JUNE 6, 1905.

H. R. PALMER.

FACSIMILE TELEGRAPH APPARATUS.

APPLICATION FILED FEB. 25, 1901.

5 SHEETS—SHEET 1.

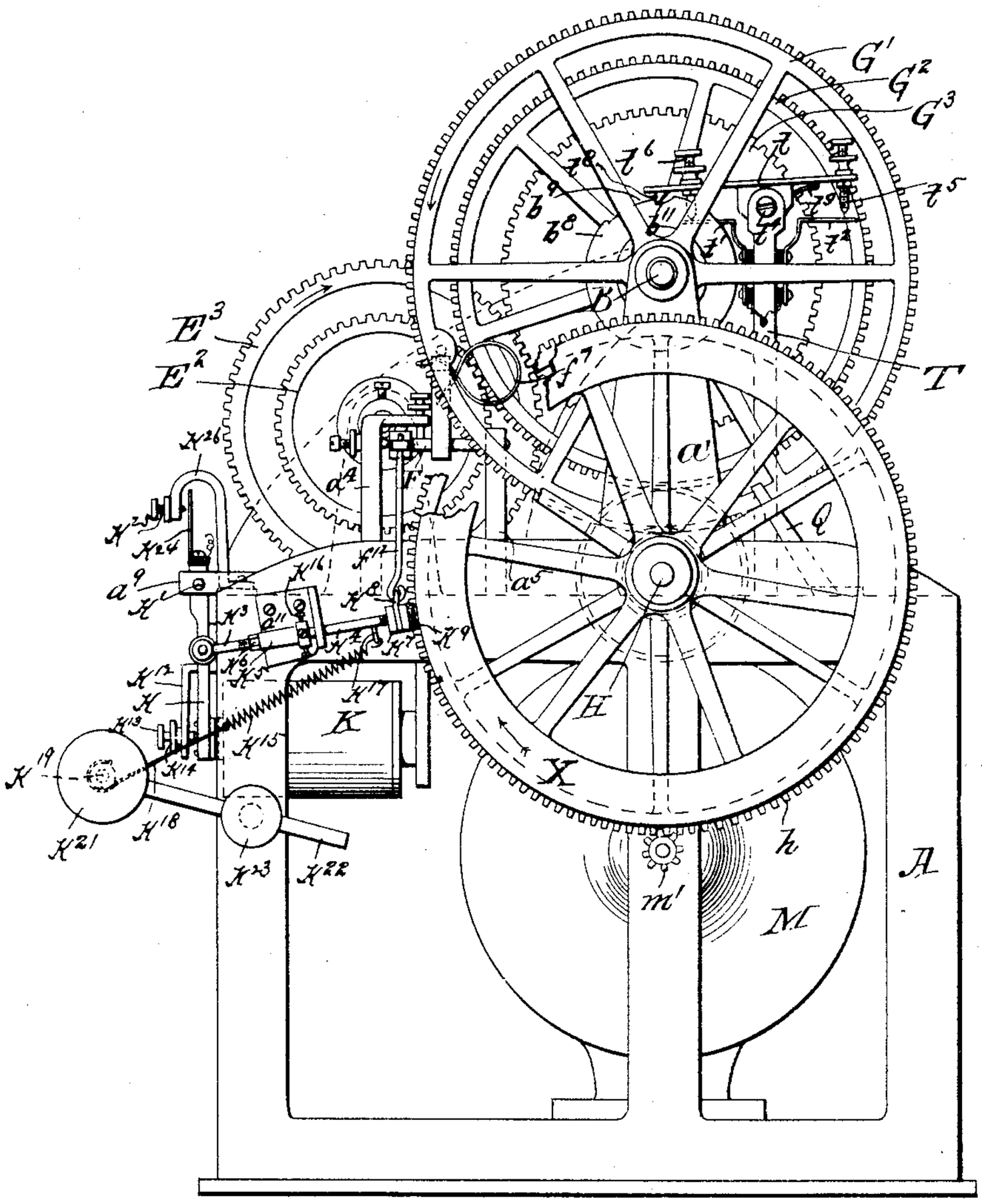

Fig. 1.

Witnesses,
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F. D. Ammen

Inventor,
Herbert R. Palmer,
By his Attorneys,
Thurston & Bates.

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5 SHEETS—SHEET 2.

Fig. 2,

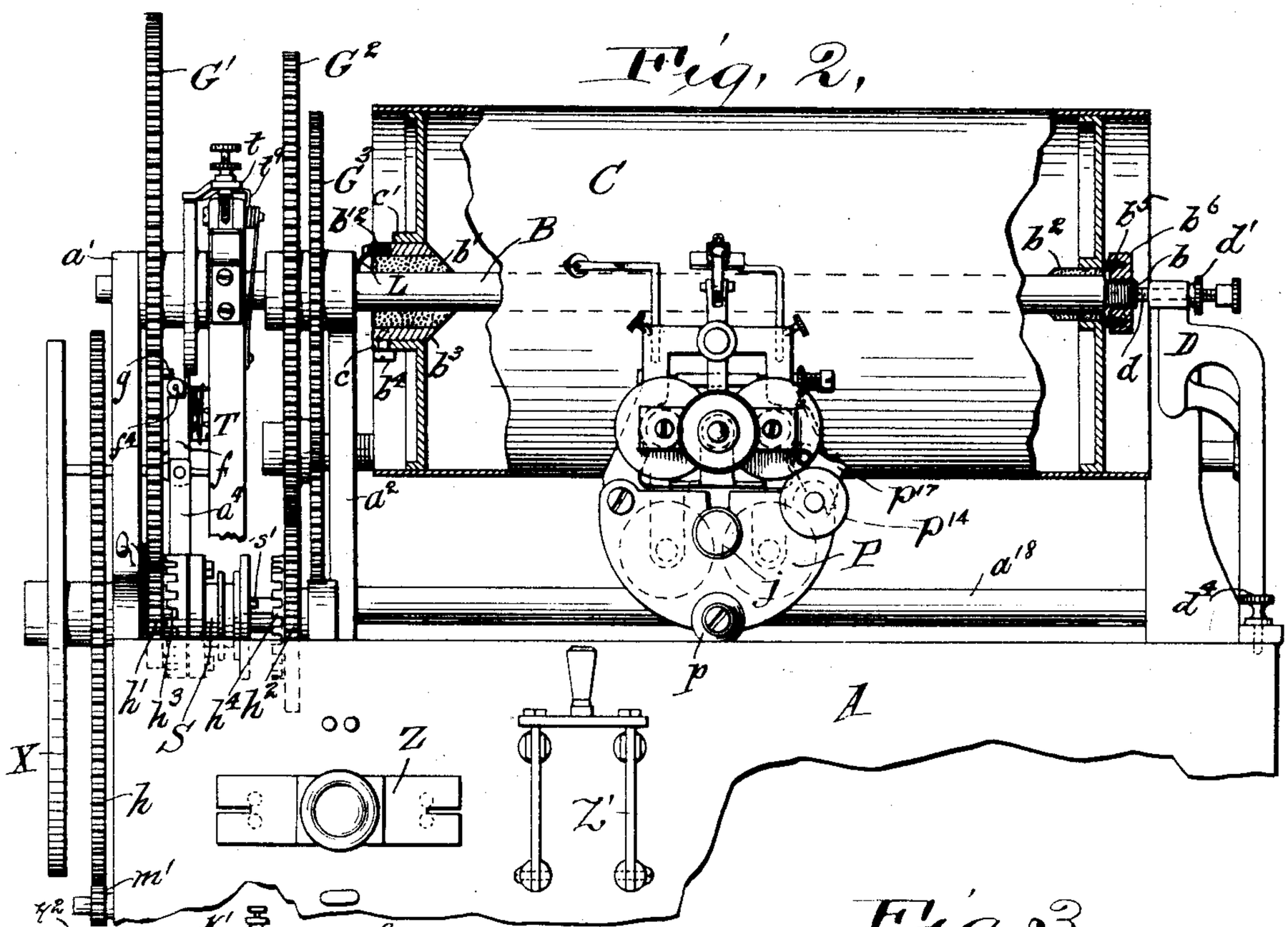

Fig. 3,

Witnesses,
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PHOTO-LITHOGRAPHED BY SACKETT & WILHELMS LITHO. & PTG. CO. NEW YORK.

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5 SHEETS—SHEET 3.

Fig. 4,

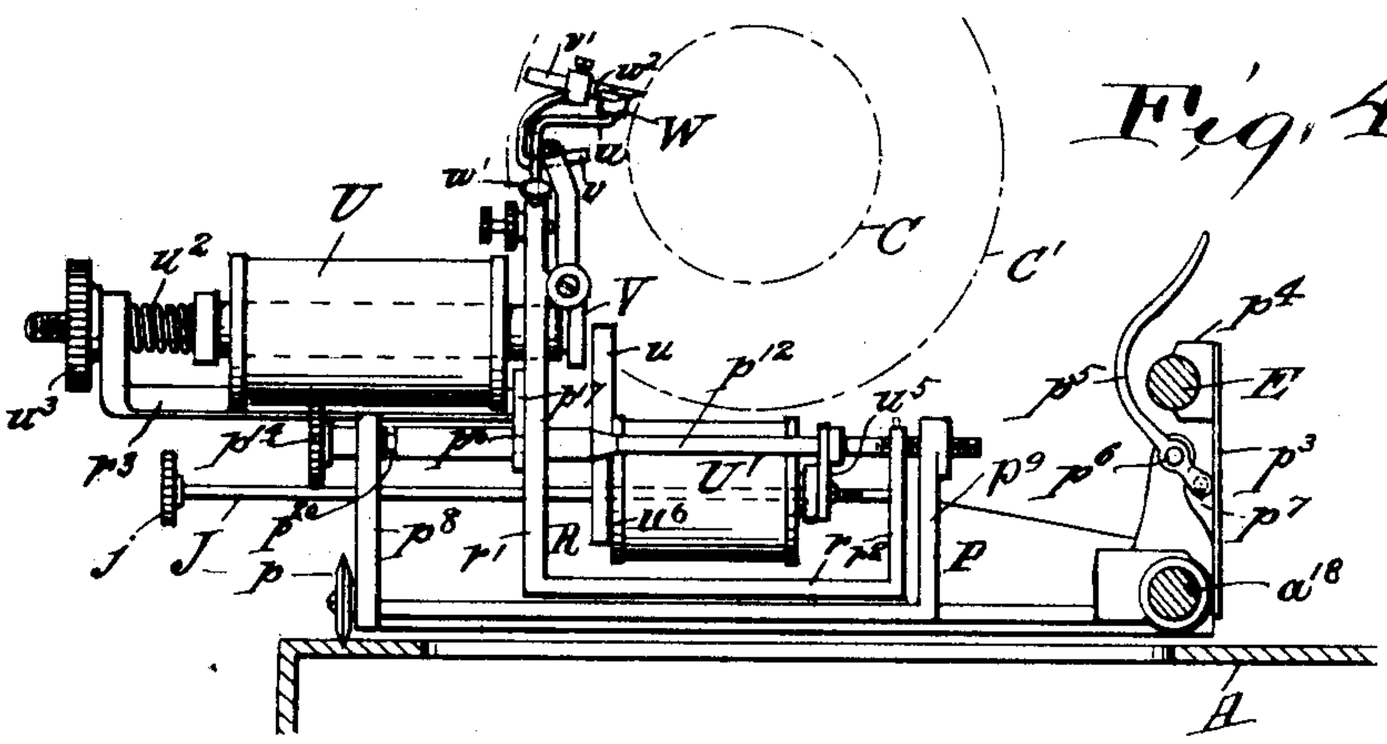


Fig. 5,

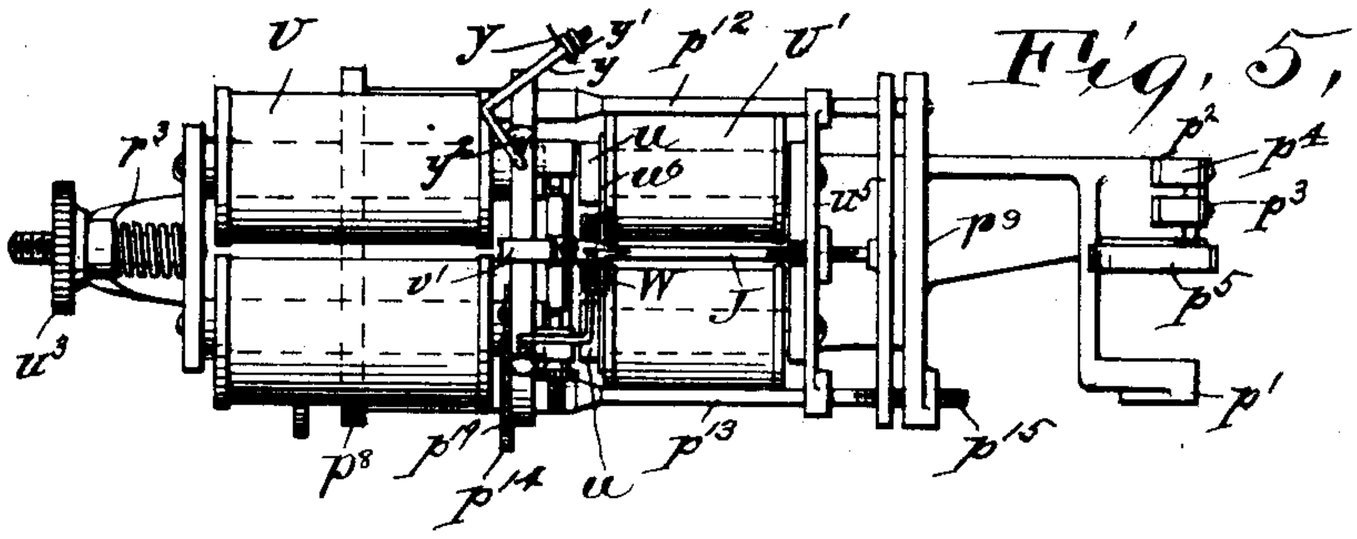


Fig. 6,

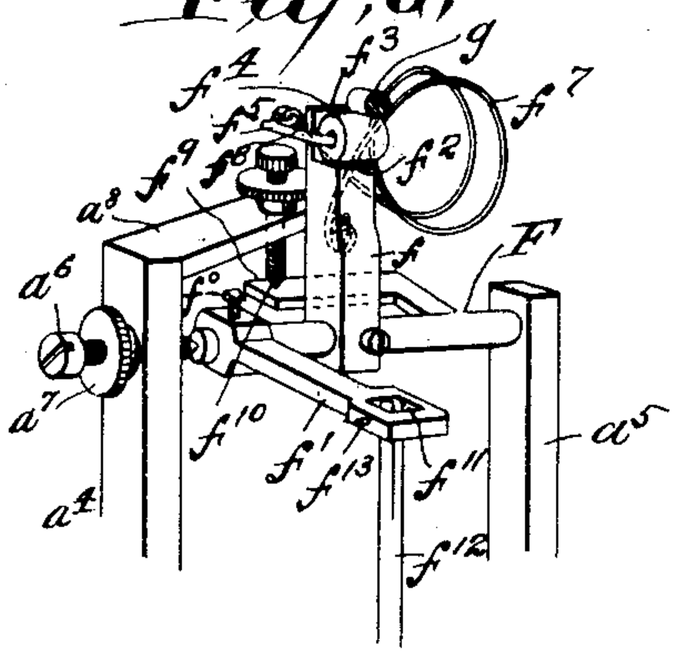


Fig. 7,

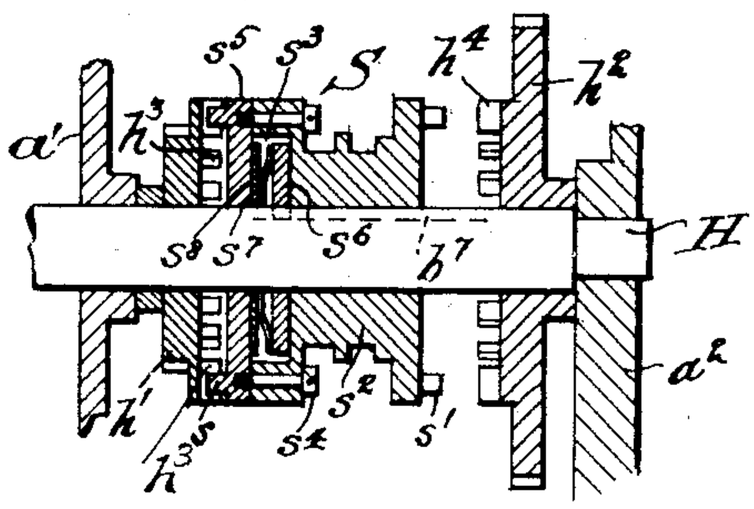
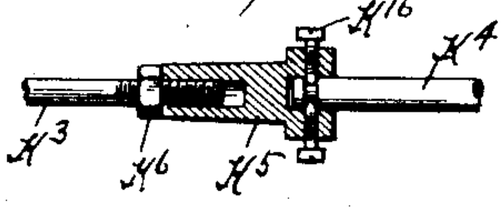


Fig. 8,



Witnesses,
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5 SHEETS—SHEET 4.

Fig. 9.

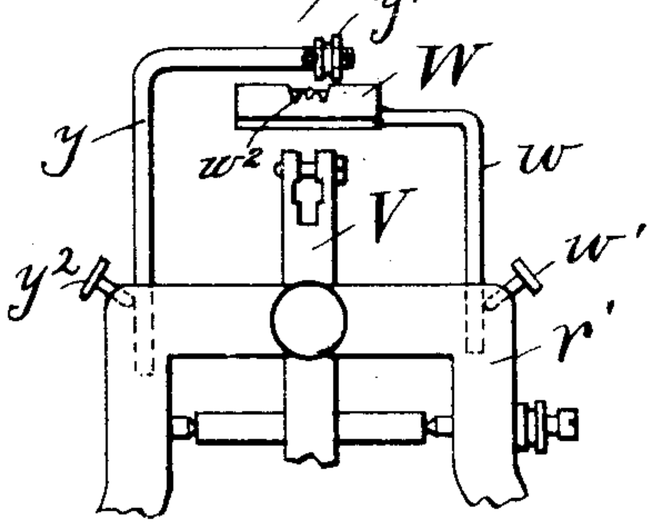

Fig. 10.

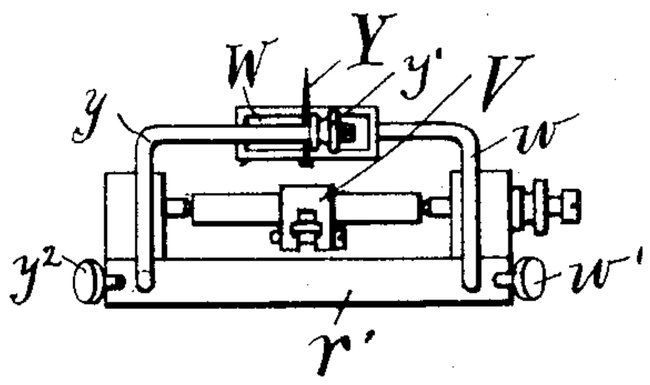

Fig. 11.

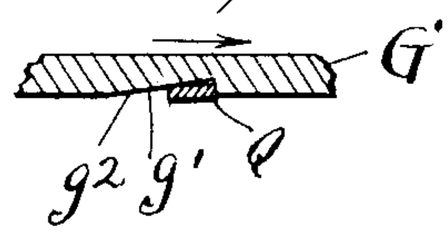

Fig. 12.

Witnesses
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No. 791,491. PATENTED JUNE 6, 1905.

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FACSIMILE TELEGRAPH APPARATUS.

APPLICATION FILED FEB. 25, 1901.

5 SHEETS—SHEET 5.

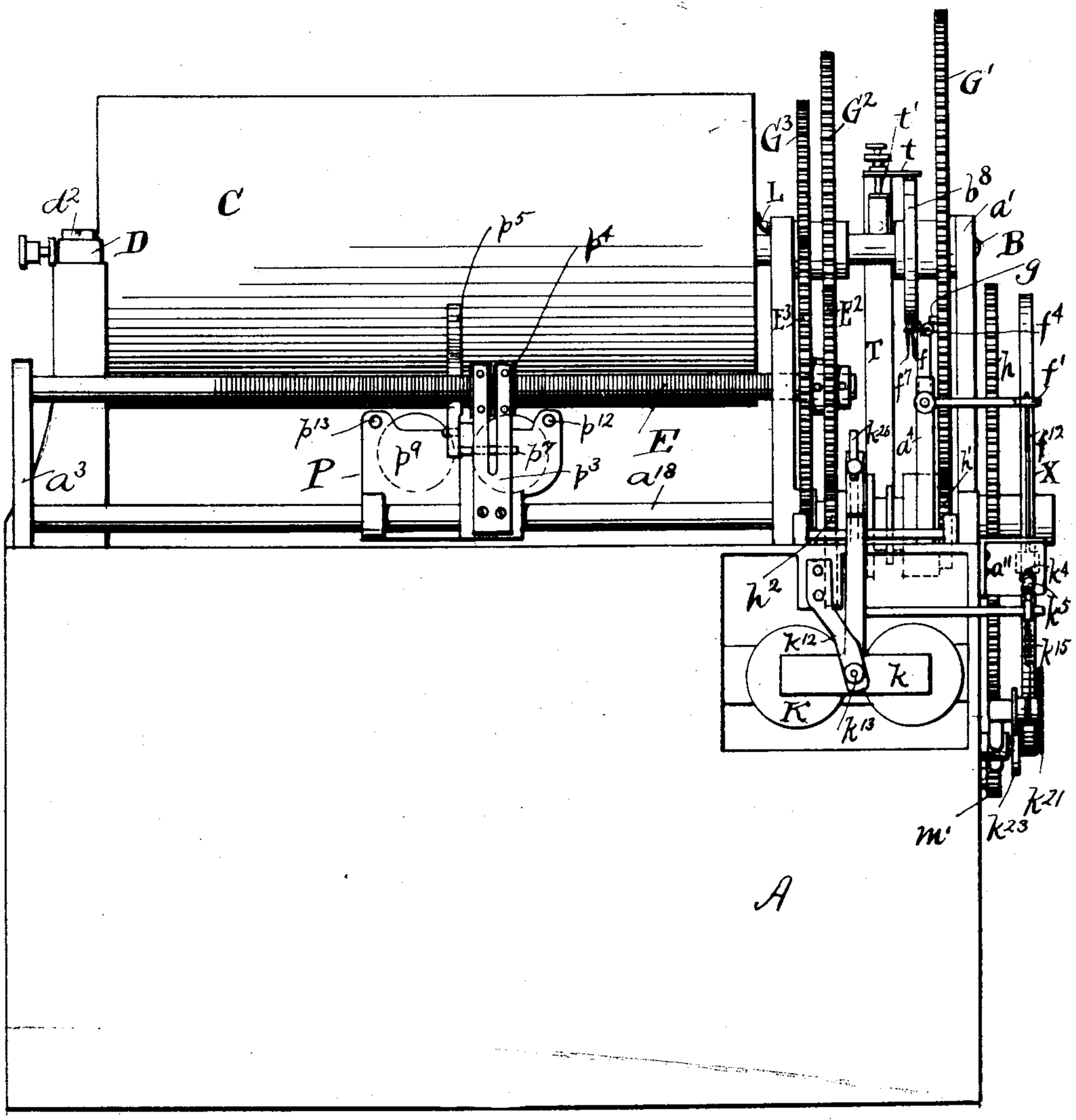
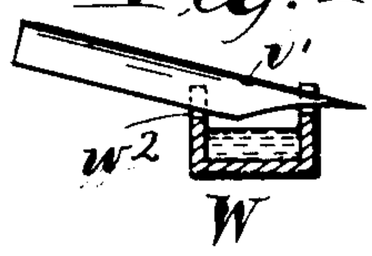


Fig. 13.

Fig. 14.



Witnesses.
E. B. Gilchrist
B. W. Brockett

Inventor
Herbert R. Palmer
By his attorneys
Thurston & Bates

No. 791,491. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

HERBERT R. PALMER, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ELECTROGRAPH COMPANY OF AMERICA, OF CLEVELAND, OHIO, A CORPORATION OF DELAWARE.

FACSIMILE-TELEGRAPH APPARATUS.

SPECIFICATION forming part of Letters Patent No. 791,491, dated June 6, 1905.

Application filed February 25, 1901. Serial No. 48,797.

To all whom it may concern:

Be it known that I, HERBERT R. PALMER, a citizen 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-Telegraph Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

My invention relates to receiving and transmitting instruments which are used in facsimile telegraphy as set forth in the patent to myself and Wm. P. Dun Lany, No. 650,381, dated May 29, 1900, and is especially concerned with apparatus of this class in which synchronously-rotating cylinders are used in coöperation with a moving stylus or a recording-pen. In machines of this class a transmitting-plate carrying non-conducting and conducting surfaces defining the picture to be transmitted is held on the periphery of a transmitting-cylinder, a sheet of paper or other material is placed upon a synchronously-revolved receiving-cylinder, and a stylus which contacts with the transmission-plate controls, by means of an electric current, the operation of the recording-point at the receiving instrument.

The object of the invention is to render the apparatus more sensitive and at the same time more accurate and positive, thus increasing its efficiency and capacity.

The particular parts of the apparatus to which my improvements are directed are the mechanism for synchronizing the revolution of the transmitting and receiving cylinders, the electromagnetic arrangements at the receiving end, the receiving-pen and the arrangement for supplying it with ink, the traveling carriage, and the means for attaching the cylinder to its shaft.

The invention consists in the means I employ to the above ends, and it may be defined as lying in certain construction of the parts and combinations thereof, as definitely set forth in the claims.

In the drawings, which fully illustrate my invention, Figure 1 is an end elevation of an instrument embodying my invention. Fig. 2 is a front elevation of the same, parts of the cylinder being shown in section to disclose more fully its construction. Fig. 3 is a plan of the instrument, part of the cylinder being broken away to disclose the carriage beneath. Fig. 4 is a vertical sectional view through the upper part of the frame of the instrument, showing the carriage in elevation. Fig. 5 is a plan of the carriage. Fig. 6 is a perspective view of details of the synchronizing mechanism. Fig. 7 is a longitudinal vertical section of the slip-joint forming part of the cylinder-driving mechanism. Fig. 8 is a detail of a part of the synchronizing mechanism. Figs. 9 and 10 are details in front elevation and plan, respectively, showing the stylus-holder and inking device. Fig. 11 is a detail in section of a detent mechanism appearing in Fig. 1. Fig. 12 is a diagram illustrating the electric circuits. Fig. 13 is a front elevation of Fig. 1 looking from left to right, and Fig. 14 is a detailed view of the ink-receptacle.

Referring to the parts by letters, A represents the base or frame of the instrument, and is, preferably, a box-like structure containing the driving-motor. It has near one end a pair of upwardly-extending standards a' a^2, which constitute supports and bearings for the horizontal shaft B. The end of the shaft B has a conical recess b drilled in alinement with its axis, in which takes a conically-pointed journal-pin d. This pin is a screw with a milled head and is mounted in a threaded hole in the bracket D, to which it may be clamped by the jam-nut d'. The bracket D, Figs. 2 and 3, is pivoted to the frame at d^2, and its foot is further provided with a notch d^3, which takes around the shank of a thumb-screw d^4, whereby it may be clamped to the frame A. Therefore loosening this thumb-screw d^4 and rotating the bracket D upon its pivot allows the cylinder C to be slid off the shaft upon which it is removably mounted in the manner now to be described.

Near each extremity of the shaft B are rigidly fastened the insulating-bushings b' b^2, the inner one, b', of which is surrounded by a ring

b^2, which is rigidly secured to it and carries a lateral projection, such as a small machine-screw b^4, whose head takes into a longitudinal notch c in the end of the hub c' of the cylinder C. The bushing b^2 is of smaller diameter than the other, but is in a similar manner rigidly fastened to the shaft B. Its outer end is flush with the head of the cylinder C, against which abuts a washer b^5 of insulating material set into a follower-nut b^6, taking onto the threaded head of the shaft and retaining the parts in place. The bushings are beveled on their inner ends, as shown, to facilitate the cylinders being slid on or off, and the ring b^3 is beveled also, as shown, for the same purpose.

I shall now describe the driving mechanism.

Within the frame A is the motor M on a local circuit, for which I provide an ordinary knife-switch Z'. The shaft m of this motor carries a pinion m', which pinion meshes with a gear-wheel h on the shaft H, which is mounted in the frame-standards a' a^2 near their lower ends. This shaft H carries loosely upon it the two pinions h' and h^2, each of which has a circular row of laterally-projecting teeth, indicated, respectively, by h^3 and h^4. Between these two pinions h' and h^2 and slidably mounted upon the shaft is a sleeve S, the opposite end faces of which are provided with laterally-projecting dogs s s', which may take between the teeth h^3 or h^4, so that the rotation of the sleeve may be transmitted to either of them. Now referring especially to Fig. 7, in its construction the sleeve S consists, essentially, of a body s^2, loose on the shaft and having a recess s^3, over which recess is fastened the plate s^5 by means of the screws s^4. Within the recess s^3 is a rubbing-disk s^6, which is feathered into a slot b^7 in the shaft H. A convoluted disk-spring s^7, backing against a felt washer s^8, causes the disk s^6 to contact frictionally with the bottom of the recess s^3. Hence the rotation of the disk may be transmitted to sleeve S. The two pinions h' h^2 are of different sizes, as shown, and they mesh, respectively, with the gears G' G^2, which are readily secured upon the shaft B. From the construction described it will appear that the shaft B may be driven at either of two speeds, according to which of the gears h' or h^2 is in engagement with the sleeve S. Furthermore, as the driving power is communicated to those gears by friction only it follows that if the rotating cylinder and shaft were stopped from any cause the movement of the motor would continue, while the disk s^6 would slip upon and transmit no motion to the sleeve-body s^2. The shaft B carries another gear, G^3, rigid upon it, and this gear G^3 and the gear G^2 mesh, respectively, with the two gears E^3 E^2, which are carried by the feed-screw E, which is journaled in the upright columns a^2 a^3 of the frame A. One or the other of these gears is normally loose upon the feed-screw E, while the other is tight upon the same and may cause it to rotate. The small set-screws e^2 e^3 afford means for securing either of these gears rigidly to the feed-screw E. Hence it is possible to drive the feed-screw at two different speeds, and each of these speeds corresponds to one of the two different speeds of the cylinder-shaft B, which has already been referred to.

Coming now to the synchronizing mechanism, I may say for the better understanding of the detailed description that in general the mode of operation of such mechanism consists in arresting the rotation of the more advanced cylinder until the following cylinder has caught up with it, when an electric circuit is automatically closed, which operates to release the arrested cylinder, the two cylinders then proceeding in unison.

In proximity to the plane of rotation of some moving part of the driving mechanism or near the gear G', I provide means, such as the columns a^4 a^5 on the frame A, for supporting a horizontal arbor F, whose axis is preferably in a plane parallel with the gear G'. At the ends of the arbor it is journaled by conical points, as frequent in delicate machinery. One of the supporting-points is carried by a screw a^6, which takes through a threaded hole in the column a^4 and is provided with a jam-nut a^7 for locking it in place. The details of the construction are most fully illustrated in Fig. 6. Upon this arbor F are adjustably secured, by means of a set-screw f^0, the arms f f', the arm f being substantially vertical, while the latter is substantially horizontal. The arm f has a substantially horizontal end face f^2 and a vertical projecting wing f^3 at its rear. A small roller or stop f^4 lies in the angle formed by this wing, and through its bore loosely projects the draw-wire f^5. A very light spring f^7, having one end secured to the arm f and the other end, f^8, to the rear of the draw-wire f^5, operates to press the roller f^4 horizontally against the vertical face of the wing f^3, previously referred to. A wing f^9 projects rearwardly from the arbor F and is normally in contact with the tip of a screw f^{10}, which takes through an arm a^8 and is provided with a thumb-nut for locking it in place. Upon the inner face of the gear G' is secured a laterally-projecting pin g, which in each rotation is adapted to contact with the roller f^4 to arrest the movement of the gear, as has been described.

The mechanism which operates to rock the arbor F, so as to allow the gear G' to advance, will now be described.

Near the extremity of the arm f' is an opening f^{11}, in which opening is the upper end of a link f^{12}, which is suspended upon the pin f^{13}. At its lower end this link f^{12} is hooked into a stirrup k^8, Fig. 1, which is fastened to a shoe k^7, preferably with a rubbing-strip k^9, of felt or similar material. This shoe hangs

close to the face of a friction-wheel X, carried rigidly by the shaft H. It will appear from this arrangement that if the shoe k^7 were moved against the face of the wheel X, which is rotating in the direction of the arrow, the frictional force so developed could cause an upward thrust in the link f^{12} which would be sufficient to rock the arbor F, thereby moving the roller f^4 out of engagement with the pin g, as has been described. Electromagnetic means is provided for applying the shoe to the wheel X, at the same time allowing it perfect freedom of movement in a vertical plane. Fixed to the frame is an electromagnet K, which is shown in dotted lines in Fig. 3, near the projecting cores of which is suspended the armature k. It is suspended, as shown, on a trunnion k', to which it is rigidly secured, which trunnion is journaled in the lugs a^9 a^9, which project from the rear side of the frame A. It carries near its middle point a horizontal bar k^2, which projects past the end of the frame A, to which bar is pivoted the shoe-rod, which shoe-rod I prefer to make in two parts k^3 and k^4. These two members are coupled together adjustably by means of the sleeve k^5, Fig. 8, one end of the base of which may be threaded to receive the threaded end of the member k^3, a nut k^6 locking the same. The member k^4 is held within the sleeve by the set-screws k^{16}. The inner end of the member k^4 is threaded and takes into the shoe k^7. Behind this armature k a finger k^{12} projects from the frame A, and in it is mounted a screw k^{13}, which projects over close behind the armature and is locked by the thumb-nut k^{14}. The inner end of a helical spring k^{15} takes into a pin k^{17}, fixed in the member k^4, the outer end of said spring being secured to a cord k^{18}, which is adapted to be wound on the shank of a friction-arbor k^{19}, having a milled head k^{21}. This arbor turns stiffly in the arm k^{22}, which is adjustably clamped to the frame A by means of the thumb-screw k^{23}. The member k^4 passes through and is guided by an opening in the flange of a bracket a^{11}, which is fastened to the end of the frame, as shown.

From the above arrangement it will now appear that the spring k^{15} normally holds the shoe k^7 away from the wheel X and the armature k against the stop-screw k^{13}, and evidently if the magnet K be energized the shoe would be applied to the wheel X, and by means of the link f^{12} the arbor F would be rocked with the effect already mentioned.

In order that a very light current on the main line may cause the desired engagement between the shoe and friction-wheel, I arrange the circuits so that the magnet K acts substantially as a relay throwing in a local circuit. This I accomplish very simply without the use of an extra magnet by causing the armature k to short-circuit the magnet through a local battery, which energizes it with the desired force even if the main-line current is just strong enough to throw the armature. The electric circuit will be hereinafter explained in the diagram. As shown in the drawings, the connections are established by an insulated terminal k^{24}, carried by the upper end of the armature, which contacts with an adjustable point k^{25}, carried by the insulated yoke k^{26}.

The portion of the synchronizing mechanism which governs the circuit and causes energization of the magnet K when the two cylinders are in unison will be described later in connection with the diagram. For the present suffice it to say that the magnets K at the two ends of the line are normally inactive, but become active simultaneously and only when the two cylinders are in unison at the point in the revolution where the two pins g would engage the rollers f^4.

It will be observed from the above-described synchronizing mechanism that it includes three places where a comparatively light movement may throw in operation a much greater force. Thus, first, the magnet K need simply be energized by the main line sufficient to throw the armature. This connects in the much more powerful local circuit. Second, such local energization causes the friction between the shoe and the friction-wheel, which, acting in the direction it does, is able to move the link f^{12} with a much greater force. Third, this link throws back the arm f, and a very slight movement of the arm is sufficient to release the pin g, because as soon as that pin has come onto the front side of the roller f^4 the tendency of the gear G′ to rotate will cause it to do so, the pin g assisting the roller and arm in the backward movement. Thus the arm f need move back only slightly and easily. The shoe k^9 need only lightly grasp the friction-wheel, and still more gently need the armature move to establish the contact between the terminals k^{24} and k^{25}. This mechanism has been tried in practice and found to be marvelously sensitive and at the same time perfectly positive in its action.

I have found in practice that there is a tendency for the arrested mechanism to rebound. In order to prevent this, I provide a detent Q, which is preferably a leaf-spring secured to the frame and pressing lightly against the outer face of the gear G′. A notch g', Fig. 11, in the face of the gear is so situated that this detent will spring into it just at the moment that the pin g has contacted with the roller f^4. The engaging edge of this notch is abrupt to prevent the gear's rebound, while the other edge being beveled, as at g^2, does not prevent the gear's advance.

The carriage, upon which is mounted the recording pen or stylus, includes a frame P, the forward end of which carries a wheel p, having a knife-edge and the rear end of which has a pair of sleeves p' p^2, slidably mounted upon the guide-rod a^{18}, which has its ends car-

ried by the frame A. One or more leaf-springs p^3 are fastened to the rear end of the frame P and carry fragmentary nuts p^4, which normally mesh with the feed-screw E, already referred to. A lever p^5, pivoted at p^6 and carrying a pin p^7, affords means for throwing these nuts out of engagement with the feed-screw, so that the carriage may be returned or otherwise moved by hand. At its forward end the carriage has an upward-extending vertical web p^8 and toward the rear end a similar parallel web p^9, and connecting these webs are a pair of truss-rods p^{12} p^{13}. These rods have their shanks reduced, as shown. The former rod is fixed, while the latter is provided with a head p^{14} and at the other end with threads p^{15}, which take into threaded holes in the web p^9. Slidable upon these rods is a saddle R, which has the base-plate r and front and rear webs r' r^2. These webs r' r^2 have openings through which pass the truss-rods p^{12} p^{13}, affording a support for the saddle. On the enlarged portion of the rod p^{13} abrupt notches p^{20} p^{16} are cut, and a stop p^{17}, carried by the web r', is adapted to take into either notch, being pressed by a spring p^{19}, Fig. 2. Pivoted to the forward web r' of the saddle is the armature-lever V, to the upper end of which is secured the penholder v, which carries the pen v'. A pair of opposed magnets U U', carried by the saddle, operate upon this armature. The magnet U tends to swing the pen against the cylinder, and the magnet U' (located, preferably, beneath the cylinder and having an upward-extending core u) tends to draw the pen away from the cylinder. As will be hereinafter explained in connection with the diagram, the main line is connected with windings of each of these magnets in series; but the magnet U' has another winding in the opposite direction which is on a local circuit through a battery, the result being that the current on the main line will neutralize the magnetism caused by this local circuit and allow the magnet U to bring the pen against the cylinder-wheel. When the current in the main line ceases flowing, the local circuit energizing the magnet U' will draw the pen away from the cylinder. As stated, the two magnets and the pivoted armature are all carried by the saddle R, which is unitarily adjusted to fit different sizes of cylinders by being slid upon the truss-rods p^{12} p^{13} and locked by the stop p^{17}. I prefer to use two sizes of cylinders, (indicated by the dotted circles C' C in Fig. 4,) and there are thus provided two notches p^{20} p^{16}. Where intermediate sizes of cylinders are used, corresponding notches will be employed. In either position of the saddle it may be finely adjusted by turning the rod p^{13} on its axis. Either magnet U or U' may be adjusted independently. Thus the magnet U is carried by the arm r^3, projecting forward from the saddle, and has surrounding its shank a spring u^2, forcing it toward the armature, and a screw-threaded nut u^3, adapted to draw it in opposite direction. This nut furnishes means for adjusting it. The magnet U' is carried at its rear end by a plate u^5, which slidably takes around the rods p^{12} p^{13}, and at its forward end by a non-magnetic plate u^6, which takes around the rod J, which has a bearing in the forward web r' of the saddle and is swiveled to the rear web thereof and has a screw-threaded end engaging the plate u^5. This rod extends forward through an opening in the carriage-web and has a head j, by which it may be rotated to adjust the magnet U'.

As explained, the armature V carries the receiving-pen v'. This pen is an ordinary steel pen, so held that it inclines absolutely downward toward its point, so that the ink will flow by gravity, and the direction in which it points is in a line passing above the axis of the cylinder, the cylinder on the side toward the pen rotating upward. Now the amount that the nibs of the pen spread depends on the pressure with which the pen bears against the cylinder, wherefore not only may the width of the lines on the received picture be varied by adjusting the pen and the parts that carry it, but the pen responds very accurately to the irregularities in the conductivity at the transmitting-plate, for example, causing the magnet U to pull harder and the pen to make a heavier line. Moreover, if the pen-point happens to gather on one stroke lint or other material from the paper the nibs open to the succeeding stroke, and it drops out, as I have observed in actual practice. To feed the pen, I provide an ink-receptacle W, which is supported directly beneath the pen, preferably by an independent bent rod w, which takes into the web r' at the forward end of the saddle and is adjustably held by a thumb-screw w'. On the rear side the ink-receptacle has a pair of notches w^2 for the two edges of the pen to lie in, and on its front side a single notch is provided, through which the pen-point projects, as shown in dotted lines in Fig. 9 and also in Fig. 14. The lower edges of the pen thus lie in the receptacle, as appears from Fig. 4, and the ink in the receptacle is in capillary communication with the ink carried by the pen. The capillarity is increased by placing paraffin on the inner side of the receptacle. I have found this a very satisfactory arrangement. The receptacle may carry conveniently enough ink for a complete picture of the heaviest sort or for several ordinary pictures and continuously feeds the pen without any danger of running over the edge, owing to the capillarity and slight viscosity of the ink. The object of supporting the ink-receptacle W upon an independent arm in a position so that the ink on the point will attract the ink in the receptacle by capillary attraction is for the purpose of permitting the pen to vibrate

freely without having to carry along with it the ink-receptacle. It will be seen from the above that this makes the operating mechanism of the pen much more sensitive.

The transmitting-stylus is adjustably carried by the web r' of the saddle. The stylus consists, preferably, of an ordinary pen-point Y, which extends through an opening in the bent rod y and is adjustably clamped therein by the nut y', screwing onto the rod and abutting the pen. The rod is adjustably held in the web r' by the thumb-screw y^2. During receiving the stylus is turned back idly, as shown in Fig. 5, and during transmitting the pen-point is idle.

Referring now to Fig. 1 for the circuit-governing portion of the synchronizing mechanism, T represents a hollow mast which is carried by and in electric contact with the frame of the machine and carries, insulated from itself, two resilient brackets or switch-terminals t' t^2. A switch-lever or teeter t is pivoted at t^4 to the mast and carries anvil-screws t^5 t^6. A disk-cam or contact-maker b^8 is carried rigidly by the shaft B and is provided with a notch in its periphery, which consists of a long shallow depression b^9 of uniform depth and a depression b^{11} of greater depth at one end of it. A nib t^8 on the switch-lever, having its inner face inclined, as shown, is pressed against the periphery of the contact-maker by a spring t^9. The anvil-screws t^5 t^6 are so adjusted that when the nib is in contact with the unbroken periphery of the contact-maker b^8 the screw t^5 is in contact with the bracket t^2. When the nib drops into the shallow portion b^9 in the notch, contact between the teeter and either bracket is broken, and when the nib comes into the notch b^{11}, and not until then, contact is made between the screw t^6 and the bracket t'. A brush L, insulated from the frame, contacts with the ring b^3 on the bushing b', and thus is in electrical engagement with the cylinder and transmitting-plate thereon, except for a portion of the revolution when such contact is interrupted by the insulating-block b^{12}, set into this ring. This block corresponds in length and position to the notch b^9.

The operation of the mechanism just described will be best understood in connection with the diagram Fig. 12. A switch Z is provided on the machine which is adapted to place it in position for transmitting or receiving. When this switch, as shown in Figs. 2 and 12, is in the vertical position, the machine is a transmitter. When it is in the horizontal position, it is a receiver. In operation there is placed on the transmitting-cylinder a suitable plate formed of conducting and non-conducting areas representing the picture. This plate may be a metallic plate having insulating-surfaces, or it may be an insulating-sheet impregnated with a conducting fluid. Either the conducting or non-conducting portion of the plate may represent the picture. The conducting portion is adapted to electrically connect the stylus with the surface of the cylinder, and the insulating portion will break such connection. The receiving instrument may carry on its cylinder simply a piece of paper which will be marked by the ink according to the image on the transmitting-plate. Starting first with the transmitting end of the line and assuming the switch Z to be in the vertical position, the circuit will start with the ground or return wire and through the main battery 1 to the line 2, to the frame A, to the transmitting-stylus Y, to the picture on the cylinder, and to the cylinder, to the ring b^3, to the brush L, to the line 3, to the switch-point z, and via the switch to the point z', to the line 4, and to the main line 5. Therefore when the brush L is in contact with the ring b^3 the circuit is made or broken at the transmitting end, according to whether the stylus is on an insulated or metallic portion of the plate, while if the brush L be on the insulating portion b^{12} the contact is absolutely broken. Now at the other end of the line the instrument is a receiver. The switch Z is in a horizontal position. The current comes in from the main line 5, via the line 4, to the switch-point z^2, thence through the switch to the point z^3, to the line 6 around the windings 7 and 8 of the two magnets U' and U, and via the line 9 to the bracket t^2. Thence with the parts in normal position the current continues through the anvil-screw t^5 to the teeter t, to the mast T, to the line 2, and to the other main line or ground. Thus the magnets U and U' are on the main line, as already stated. The local circuit around the magnet U' is formed by the winding 11 and the conductors 12 and 13, which are adapted to be connected together at the switch-points z^4 and z^5 and one of which lines, as 13, passes through the adjustable rheostat 14 and the local battery 15. A branch line 16 from the main line 5 passes to the synchronizing-magnet K and thence via the magnet 17 to the bracket t'. This line is normally open; but, as heretofore stated, when the nib t^8 drops into the deep notch b^{11} the anvil-screw t^6 engages the bracket t, whereupon the circuit continues via the bracket t' and the anvil-screw t^6 and the teeter and the mast T to the ground-line 2, whereupon (provided the brush L has come onto the metallic part of the ring b^3 at the other end of the line) a main circuit is established through the magnet K. The armature k being thus attracted causes the terminal k^{24} to engage the terminal k^{25}. The former of these terminals is connected by a branch line 18 with the line 16 and the latter by a line 19 through a local battery 21 to the ground-line. This makes a short circuit through the magnet K and the battery 21 via the lines 19, the line 2, the mast T, teeter t, anvil-screw t^6, bracket t', line 17, and line 18.

The result is that the magnet K is strongly energized and forces the shoe k^7 with the desired force against the friction-wheel X. This engagement, as stated, causes the removal of the stops f^4, which retain those wheels, and the two cylinders rotate simultaneously. This tips back the teeter t, breaking the contact between the anvil-screw t^6 and the bracket t', which opens both the main and local circuits through the magnet K.

The transmission-plate and accordingly the picture received do not occupy the full cylinder, the portion unoccupied corresponding more or less closely to the notch b^9 and the insulation b^{12}. Thus while the picture is being transmitted the only making and breaking of the circuit that occurs is at the transmitting-stylus. While the uncovered portion of the cylinder at each end is passing the transmitting-stylus or the pen the circuit is broken at both ends both by the notch b^9 and the insulation b^{12}, and as the cylinders reach the ends of these interrupted portions whichever cylinder happens to be ahead (if they are not absolutely synchronized) is held up until the other reaches the same position by reason of the circuit being broken at the other end until the instrument at the other end reaches the same position, when the two instruments proceed in unison.

The above-described arresting of a cylinder coming at a point when the receiving and transmitting members are idle does not interfere with the picture and happening once a revolution enables a very accurate synchronization to be made. The motors are easily controlled by their own rheostats, so as to revolve very nearly at the same speed. They are of course never so far out of unison that the contact would be remade after being broken at one end of the line before it was broken at the other, (the notch b^9 and the insulating portion b^{12} being long enough to provide for the widest divergence,) and the operator can easily tell from whether his instrument is arrested or otherwise how his motor is running with reference to the motor at the other end and can make his adjustment to bring it into very close synchronization.

Having described my invention, I claim—

1. In a facsimile-telegraph instrument, power mechanism for driving the instrument, controlling mechanism for governing the application of such power, actuating mechanism adapted to be operated by the power mechanism and govern the controlling mechanism, and electric means for connecting said actuating mechanism with the power mechanism, substantially as described.

2. In a facsimile-telegraph instrument, in combination, power mechanism for frictionally driving the instrument, mechanism for retarding the instrument, a device for controlling such retardation operated by such power mechanism, and an electric device for causing the application of such power to such retarding mechanism, substantially as described.

3. In a facsimile-telegraph instrument, the combination of a continuously-driven member, a shoe adapted to engage the same, an electromagnet for governing such engagement, a frictionally-driven member, and means for retarding it actuated by the movement of said shoe, substantially as described.

4. In a facsimile-telegraph instrument, in combination, a rotatable wheel, a shoe normally out of engagement with, but adapted to be applied to said wheel, an electromagnet controlling the application of said shoe and means operated by said shoe for controlling the rotation of said instrument, substantially as described.

5. In a facsimile-telegraph instrument, in combination, a wheel, a shoe adapted to be applied thereto, an electromagnet adapted to apply said shoe, means operated by said shoe for controlling the rotation of said instrument, and automatic means for periodically closing a circuit through said magnet, substantially as described.

6. In a facsimile-telegraph instrument, a rotating member, a shoe adapted to contact therewith, an electromagnet adapted to move said shoe into contact with said rotating member, said shoe being free to move in the direction of motion of the moving part it contacts, and means operated by such movement of said shoe for controlling the rotation of said instrument, substantially as described.

7. In a facsimile-telegraph instrument, in combination, rotating mechanism, means for periodically arresting a part thereof, a shoe normally out of engagement but adapted to contact with a rotating part of said mechanism, and means for releasing said mechanism from arrest, said means of release being controlled by said shoe, substantially as described.

8. In a facsimile-telegraph instrument, in combination, rotating mechanism, means for periodically arresting a part thereof, a shoe adapted to contact with a rotating part of said mechanism, an electromagnet adapted to apply said shoe, and means for releasing said mechanism from arrest, said means of release being operated by the frictional engagement of said shoe with said rotating mechanism, substantially as described.

9. In a facsimile-telegraph instrument, in combination, rotating mechanism, a motor for driving the same, a friction connection adapted to transmit the driving force therefrom, a wheel driven positively by said motor, a shoe adapted to be applied thereto, means for arresting said rotating mechanism periodically, an electromagnet adapted to apply said shoe to said wheel, and means operated by the frictional force developed upon said shoe for releasing said mechanism from arrest, substantially as described.

10. The combination of a pair of rotating members, frictionally connected, a projection on one of said members, a stop adapted to engage the same, a shoe adapted to engage the other member and by the movement caused thereby throw said stop, and means for causing such engagement of the shoe, substantially as described.

11. In a facsimile-telegraph instrument, in combination, a wheel adapted to rotate when said instrument is in operation, a projection carried thereby, a stop adapted to contact with said projection, a shoe adapted to contact with a moving part of said instrument, an electromagnet controlling the same, and means operated by said shoe to withdraw said stop, substantially as described.

12. In a facsimile-telegraph instrument, in combination, a wheel adapted to rotate when said instrument is in operation, a projection carried thereby, a stop, a spring normally holding said stop in the path of said projection, a rotating member, a shoe adapted to be applied thereto, an electromagnet controlling said shoe, and means operated by said shoe for withdrawing said stop, substantially as described.

13. In a facsimile-telegraph instrument, in combination, a member adapted to rotate when said instrument is in operation, a pin carried thereby, a pivoted arm, a stop carried by said arm and normally lying in the path of said pin, a rotatable wheel, a shoe adapted to contact therewith, an electromagnet adapted to apply said shoe, and a link connecting said shoe with said pivoted arm, substantially as described.

14. In a facsimile-telegraph instrument, in combination, a rotatable member, a projection carried thereby, a stopping device adapted to stand in the path of said projection, means for withdrawing the stopping device, said stopping device including a pivoted arm and a stop-block seated thereon, the arm and block being adapted to form a strut when engaged by said projection or to buckle intermediately allowing the tendency of said member to rotate to assist in the withdrawal of said stop, substantially as described.

15. In a facsimile-telegraph instrument, in combination, a frictionally-driven rotatable member, a stopping device adapted to engage a projection or shoulder thereon, means adapted to engage and move said stopping device with reference to said shoulder, said stopping device being so arranged that when said means thus partially removes it from the path of said shoulder the tendency of said member to revolve completes the removal, substantially as described.

16. In a facsimile-telegraph instrument, in combination, a rotatable member, a projection carried thereby, a stop normally held in the path of said projection, said stop having a rounded face toward said path and seating on a movable arm, and means adapted to engage and move said arm to shift said stop with reference to the path of said projection, substantially as described.

17. In a facsimile-telegraph instrument, in combination, a rotatable member, a pin carried thereby, a pivoted arm having a recess, a stop-roller, a spring holding the same in said recess, means whereby said arm normally holds said roller in the path of said pin, and means for withdrawing said arm, substantially as described.

18. In a facsimile-telegraph instrument, in combination, a rotatable member, a pin carried thereby, a pivoted arm having a recess with a substantially horizontal and a vertical face, a roller lying therein, a spring constraining said roller against said vertical face, means for normally holding said roller in the path of said pin, and means for withdrawing the same with reference thereto, substantially as described.

19. In a facsimile-telegraph instrument, in combination, a rotatable member, mechanism for frictionally driving the same, means for periodically arresting the rotation of said member without disturbing the frictional engagement thereof, and a spring-detent adapted to prevent the rebound of said member, substantially as described.

20. In a facsimile-telegraph instrument, in combination, a rotatable member, means for periodically arresting the rotation of the same, a spring-detent adapted to engage a shoulder moving with said member at the moment of its arrest preventing the rebound of said member but not interfering with its continued rotation, substantially as described.

21. In a facsimile-telegraph instrument, in combination, a rotatable member having a notch abrupt at its end which is forward with reference to the direction of rotation of said member, said notch being inclined at its other end, means for periodically arresting the rotation of said member, a detent-spring pressed toward said member in the path of said notch said detent being adapted to take therein at the moment of arrest of said member, substantially as described.

22. In a facsimile-telegraph instrument, in combination, a rotary cylinder, a single cam having three distinct operating-faces, and a member coöperating therewith and adapted when operated by one of said faces to make one connection, when operated by another of said faces to make an entirely different connection and when operated by the third to be held from any connection substantially as described.

23. In a facsimile-telegraph instrument operating in continuous cycles, in combination, a rotating cylinder, a pivoted switch-lever, a pair of coöperating switch members adapted to engage therewith, means for maintaining contact between said switch-lever and one of said members during a portion of the cycle,

means for maintaining it out of contact with either member during another portion of the cycle, and means for maintaining it in contact with the other switch member during the third portion, substantially as described.

24. In a facsimile-telegraph instrument, a rotating cylinder adapted to carry a transmission-plate having a picture thereon composed of insulating and non-insulating portions, and a coöperating stylus, combined with a synchronizing device including switch mechanism adapted to maintain one pair of contacts while such picture is rotating past the stylus, and to cause another pair of contacts at a point when the picture is out of engagement with the stylus, and intermediately to interrupt both contacts which interruption is also at a point when the picture is out of engagement, substantially as described.

25. In a facsimile-telegraph instrument, in combination, a rotary cylinder, a rotary disk having an irregular peripheral surface, a pivoted switch member, a part connected therewith which engages such surface, a spring adapted to bring about such engagement, and a pair of switch members with either or neither of which said switch member may engage according to the surface of the disk engaged, substantially as described.

26. In a facsimile-telegraph instrument, a rotating cylinder adapted to carry a transmission-plate having a picture thereon composed of insulated and non-insulated portions, a coöperating stylus, the combination with a synchronizing device, of a cam having irregular faces adapted to maintain one pair of contacts, while said picture is rotating past the stylus, and to cause another pair of contacts at a point when the picture is out of engagement with the stylus and intermediately to interrupt both contacts which interruption is also at a point when the picture is out of engagement.

27. In a facsimile-telegraph instrument, in combination, a shaft adapted to receive cylinders of different diameters, a carriage adapted to be driven longitudinally of said shaft, a saddle mounted on said carriage, means for locking said saddle to said carriage at different points, means for making a fine adjustment between the saddle and carriage when they are thus locked, and means carried by the saddle for engaging material on the cylinder substantially as described.

28. In a facsimile-telegraph instrument, in combination, a shaft adapted to receive cylinders of different diameters, a carriage adapted to be driven longitudinally of said shaft, a saddle mounted on said carriage, means for locking said saddle to said carriage at different points, two magnets carried by said saddle, an armature between the magnets adapted to be operated in one direction by one magnet and in the other direction by the other magnet, means for independently adjusting said two magnets with reference to the armature-lever, and means operated by the armature-lever for engaging material on the cylinder substantially as described.

29. In a facsimile-telegraph instrument, in combination, a rotatable cylinder, a carriage movable along the same, said carriage including a pair of transverse rods one of which is rotatable and screw-threaded therein, a saddle supported on said rods and adapted to be locked to the said screw-threaded rod, an armature pivoted to said saddle, a magnet carried by said saddle, and means operated by said armature and adapted to engage material on the cylinder substantially as described.

30. In a facsimile-telegraph instrument, in combination, a rotatable cylinder, a carriage movable along the same, said carriage having a relatively adjustable transverse rod with peripheral shoulders thereon, a saddle slidable upon said carriage and adapted to be locked to said shoulders, an electromagnet, an armature carried by said saddle, and means operated by the armature and adapted to engage material on the cylinder substantially as described.

31. In a facsimile-telegraph instrument, in combination, a shaft adapted to receive cylinders of different diameter, a carriage slidable along the same, a saddle mounted in said carriage and laterally movable thereon, an armature-lever and two magnets operating to move the lever in opposite directions carried by said saddle, means for locking the saddle in different positions relative to the carriage corresponding to the different-sized cylinders, and means carried by the saddle for engaging material on the cylinder substantially as described.

32. In a facsimile-telegraph instrument, the combination of a pair of magnets, a lever operated thereby, means coöperating with the lever to make an impression, said magnets each having a main winding and one of said magnets having an additional winding, and circuit connections whereby a main circuit is established over said main winding and a local circuit with a source of current is established over said additional winding, substantially as described.

33. In a facsimile-telegraph instrument, in combination, a shaft, a carriage adapted to travel along the same, a pivoted armature-lever, a pair of magnets operating said lever, one in one direction and one in the other, a cylinder adapted to be supported on said shaft and engaged by a pen carried by said armature-lever, one of said magnets being oppositely wound with two conductors, and circuit connections whereby a local circuit is established over the extra conductor, and the main circuit over the common conductor for the two magnets, substantially as described.

34. In a facsimile-telegraph instrument, in combination, a rotating member, a switch op-

erated according to the position thereof, retarding mechanism, a magnet, a main-line connection to said magnet, connections and mechanism whereby said magnet closes a local circuit for operating said arresting means, said local circuit being adapted to be opened by said switch, substantially as described.

35. In a facsimile-telegraph instrument, in combination, a cylinder, frictionally-connected mechanism for rotating the same, mechanism for retarding the said cylinder, a magnet for governing said retarding mechanism, a switch operated by the rotation and adapted to govern the circuit through said magnet, a local circuit governed by the armature of said magnet and passing through said switch and through a source of power and through said magnet, substantially as described.

36. In a facsimile-telegraph instrument, the combination of a vibrating lever, a magnet for operating the same, a pen-point carried by said lever, a stationary ink-receptacle independently supported on the under side of said pen-point, and adapted to carry ink engaging that in the pen-point, substantially as described.

37. In a facsimile-telegraph instrument, in combination, a rotating cylinder, a pen having a split point, means for causing it to vibrate toward or from said cylinder, an ink-receptacle beneath the pen adapted to carry ink engaging that in the pen, said pen inclining downward toward its point whereby the ink may flow by gravity, substantially as described.

38. In a facsimile-telegraph instrument, in combination, a rotatable cylinder, a pen-point, means for causing it to vibrate toward and from said cylinder, an ink-receptacle beneath said pen and in a position to feed ink to the point thereof, said pen projecting beyond the forward wall of said receptacle in an inclined position thereby permitting the ink to flow down said pen by gravity.

39. In a facsimile-telegraph instrument, in combination, a rotating cylinder, a traveling carriage, a vibrating lever, a magnet supported by the carriage, a pen operated by said lever, an ink-receptacle adjustably and rigidly carried by said carriage underneath the pen-point, substantially as described.

40. In a facsimile-telegraph construction, in combination, a rotating cylinder, a traveling carriage, a vibrating lever and mechanism supported by the carriage, a pen operated by said lever, an ink-receptacle underneath said pen and having recesses in the side walls thereof for the reception of the side portions of said pen and another recess for the reception of the nib of the pen.

41. The combination of a rotating cylinder, a carriage adapted to travel along the same, a rod supported by said carriage and adjustable with reference thereto, a pin-point extending through said rod, and a nut screwing onto the rod and adapted to abut against and clamp said pin, substantially as described.

42. In combination with a rotating cylinder, a carriage adapted to travel along the same, a saddle adjustable laterally of said carriage, a magnet carried by said saddle, an armature-lever pivoted to said saddle, a pen carried by said armature-lever, a rod carried by said saddle, a stylus carried by said rod and adapted to engage the cylinder, said rod being adjustable with reference to said saddle for the adjustment of said stylus and also to allow the stylus to be moved out of the way, substantially as described.

43. The combination with a rotatable cylinder, a carriage adapted to travel along the same, a saddle adapted to be adjustable transversely of the carriage, a magnet carried by said saddle, an armature-lever pivoted to said saddle and operated by said magnet, a pen carried by said lever, an ink-receptacle carried by said lever underneath said pen, substantially as described.

44. In a facsimile-telegraph instrument, in combination, a rotatable shaft, insulating-bushings carried at each end thereof, a metal ring taking around the inner one of said bushings, a hub of said cylinder taking over said ring, a projection carried by said ring, said hub having a notch into which said projection takes, and means for preventing said cylinder from sliding outwardly on said shaft, substantially as described.

45. In a facsimile-telegraph instrument, in combination, a frame, a rotatable shaft, an insulating-bushing carried by said shaft a metallic ring rigidly secured around said bushing, a cylinder, a hub within said cylinder and adapted to take over said ring, and a brush insulated from said frame and adapted to contact with said ring, substantially as described.

46. In a facsimile-telegraph instrument, in combination, a frame, a rotatable shaft, an insulating-bushing secured to said shaft, and having a tapered end portion, a metallic ring rigidly secured around said bushing and having its end portion beveled to form a continuation of the tapered end portion of said bushing, a cylinder, a hub within said cylinder arranged to take over said metallic ring, and a brush insulated from said frame and adapted to contact with said ring, substantially as described.

47. In a facsimile-telegraph instrument, in combination, a frame, a rotatable shaft mounted therein, insulating-bushings rigidly secured thereto, a metal ring secured around the inner one of said bushings, a hub of said cylinder taking over said ring, another hub of the same taking around the outer bushing, an insulating-washer lying against the outer side of said hub, said shaft having a threaded end, and a

follower-nut taking thereon and forcing said washer against said hub, substantially as described.

48. In a facsimile-telegraph instrument, in combination, a rotating cylinder, carriage mechanism adapted to travel along the same, a supporting-web upon said carriage, an armature-lever for holding the pen and carried by said web, a socket in said web, and a bent support for a pin-point secured in said socket, said support being bent and arranged in a manner such that said pin-point may engage the cylinder and may be turned back out of the way when not in use.

49. In a facsimile-telegraph instrument, in combination, means for holding paper to receive the impression, a pen having a split point adapted to be brought against said paper, and an ink-receptacle beneath the pen-point said ink-receptacle having a pair of notches in which the edges of the pen lie, the receptacle being adapted to carry ink in capillary engagement with the ink in the pen, substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

HERBERT R. PALMER.

Witnesses:

ALBERT H. BATES,

H. M. WISE.