

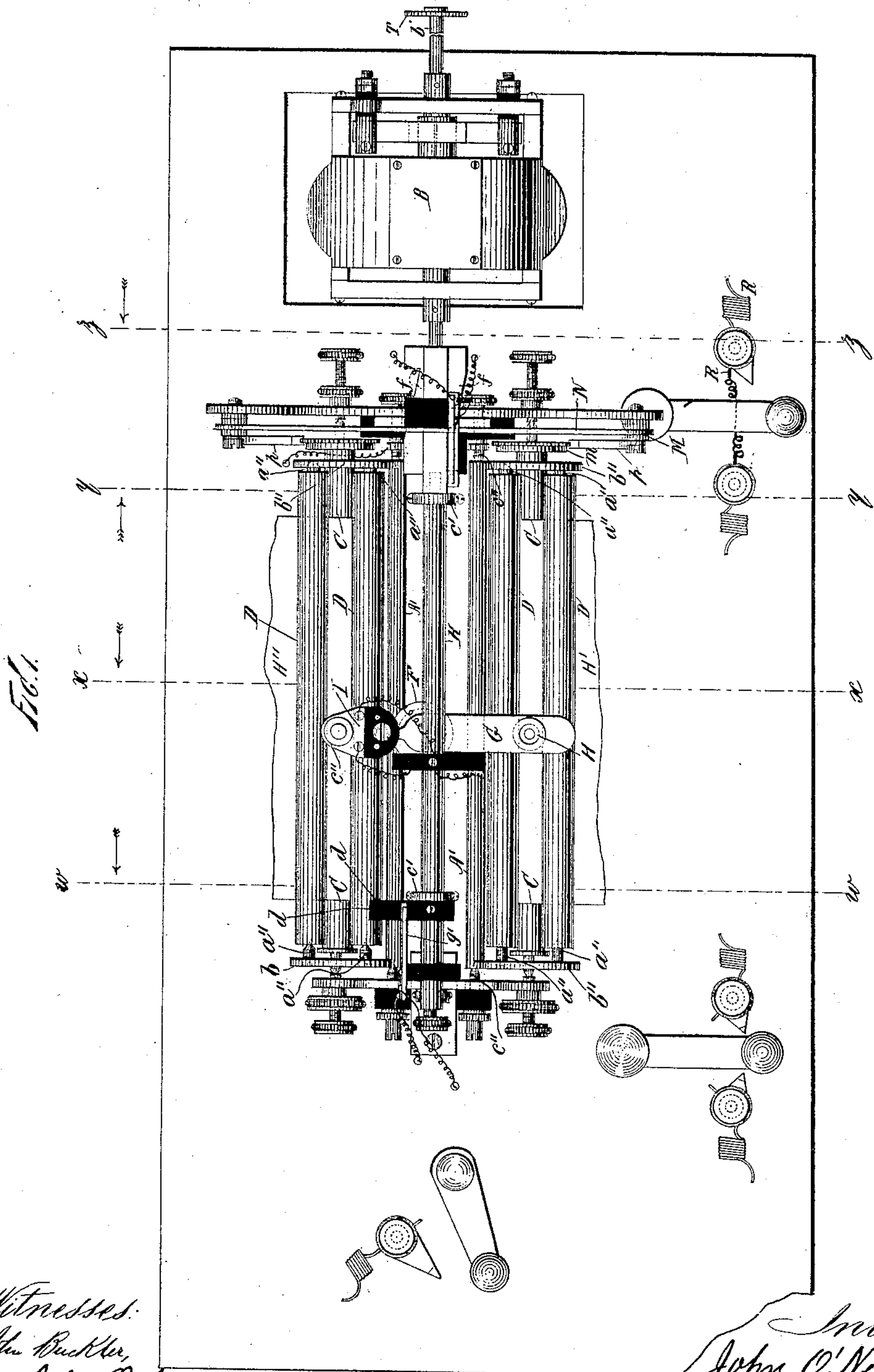
(No Model.)

5 Sheets—Sheet 1.

J. O'NEIL.
AUTOGRAPHIC TELEGRAPH.

No. 529,300.

Patented Nov. 13, 1894.



Witnesses:
John Buckler,
Jno. Bell-Rahar

Inventor
John O'Neil
by
James A. Whitney
Attorney.

(No Model.)

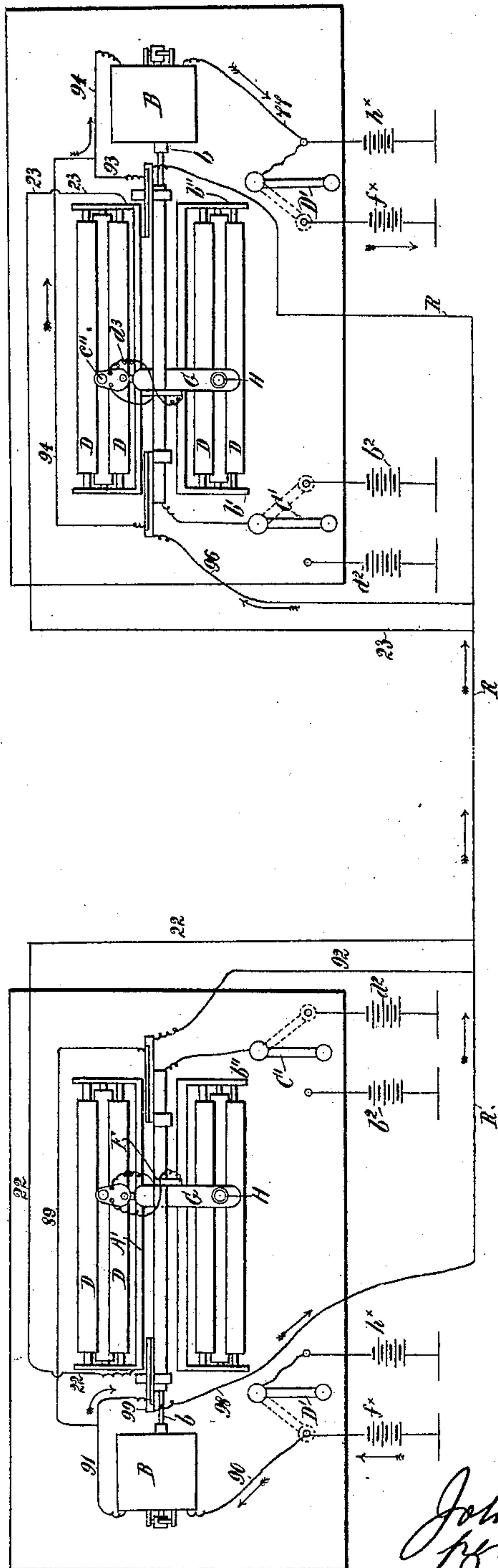
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J. O'NEIL.
AUTOGRAPHIC TELEGRAPH.

No. 529,300.

Patented Nov. 13, 1894.

Fig. 2.



Witnesses:
John Buckler,
Sydney Taylor

Inventor:
John O'Neil
per
James A. Whitney
Attorney.

(No Model.)

5 Sheets—Sheet 3.

J. O'NEIL.
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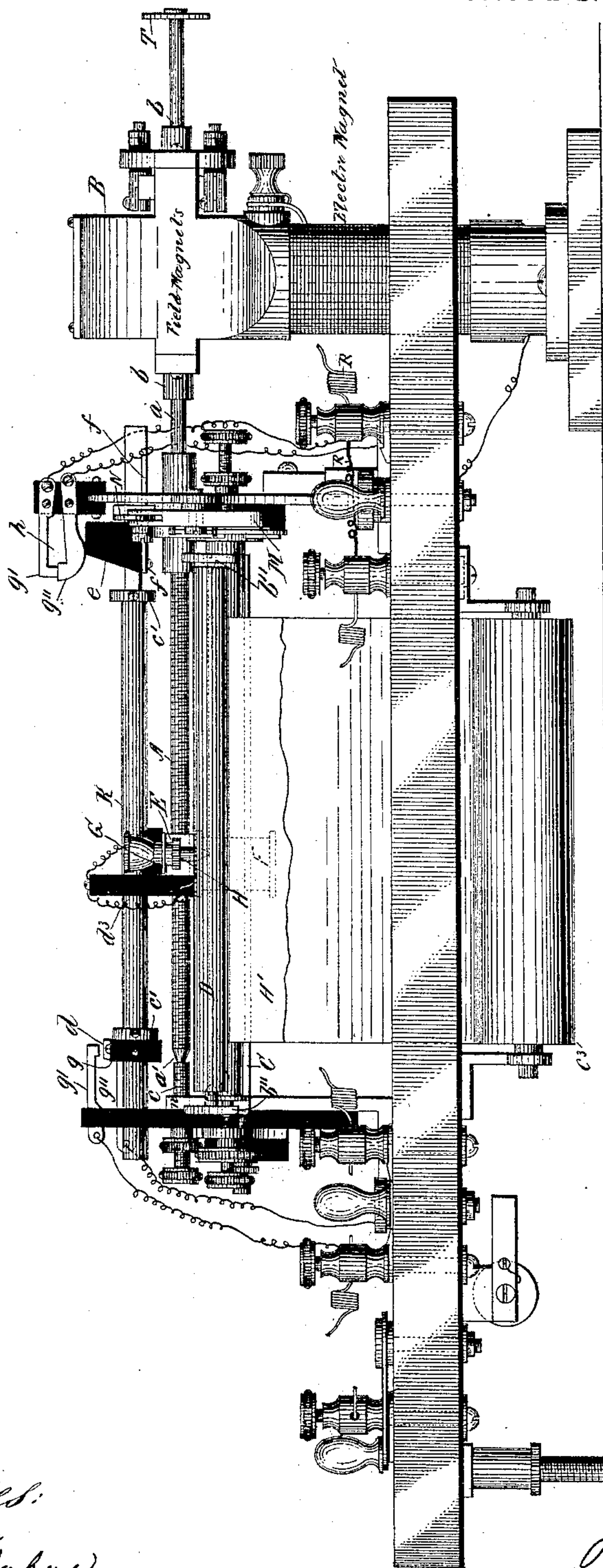


Fig. 3.

Witnesses:
John Buckler,
Jno M^cQuaker

Inventor.
John O'Neil
By
James A. Whitney
Attorney.

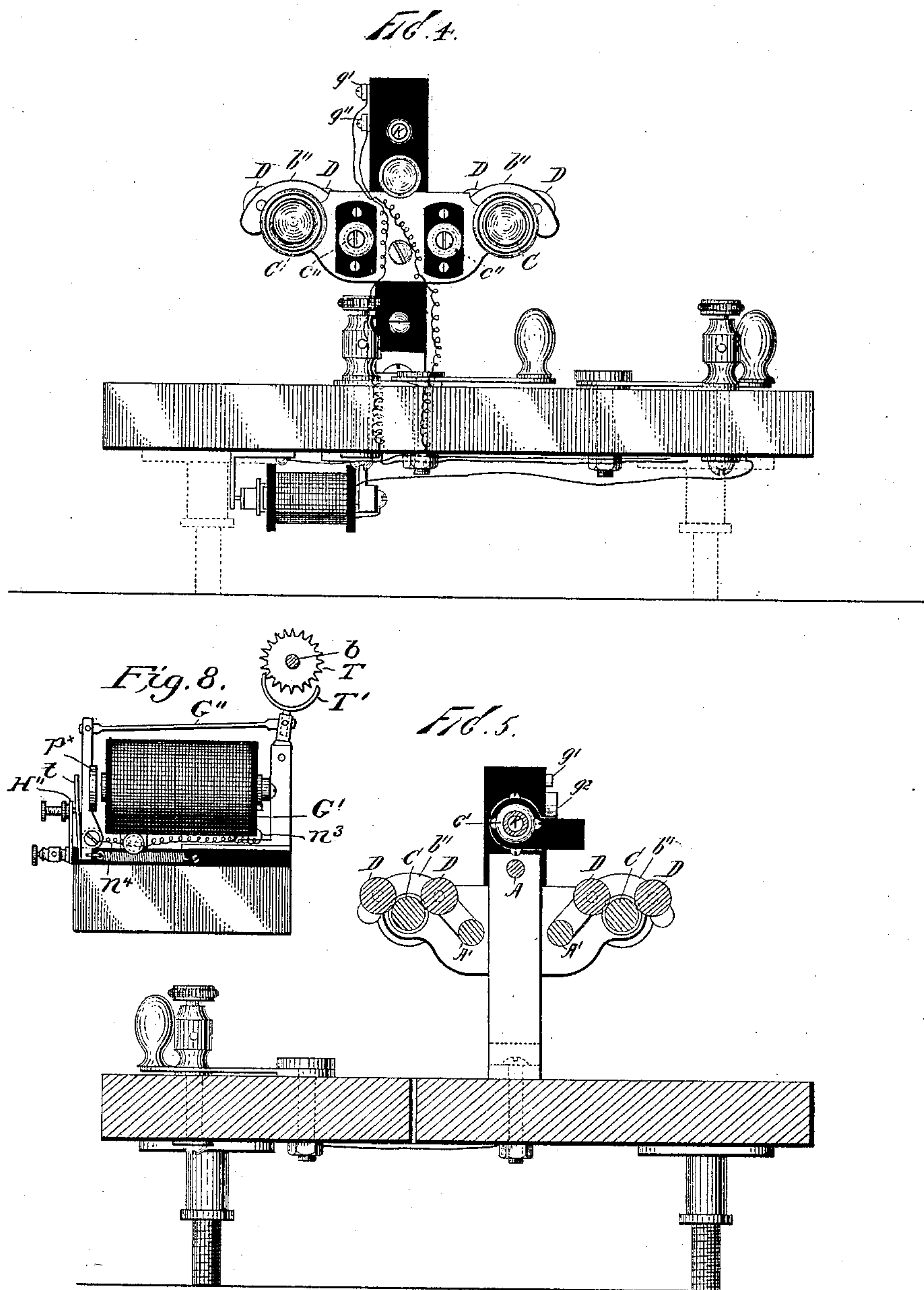
(No Model.)

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J. O'NEIL.
AUTOGRAPHIC TELEGRAPH.

No. 529,300.

Patented Nov. 13, 1894.



Witnesses:
John Buckler,
Jno. C. R. R. R.

Inventor:
John O'Neil
By
James A. Whitney
Attorney.

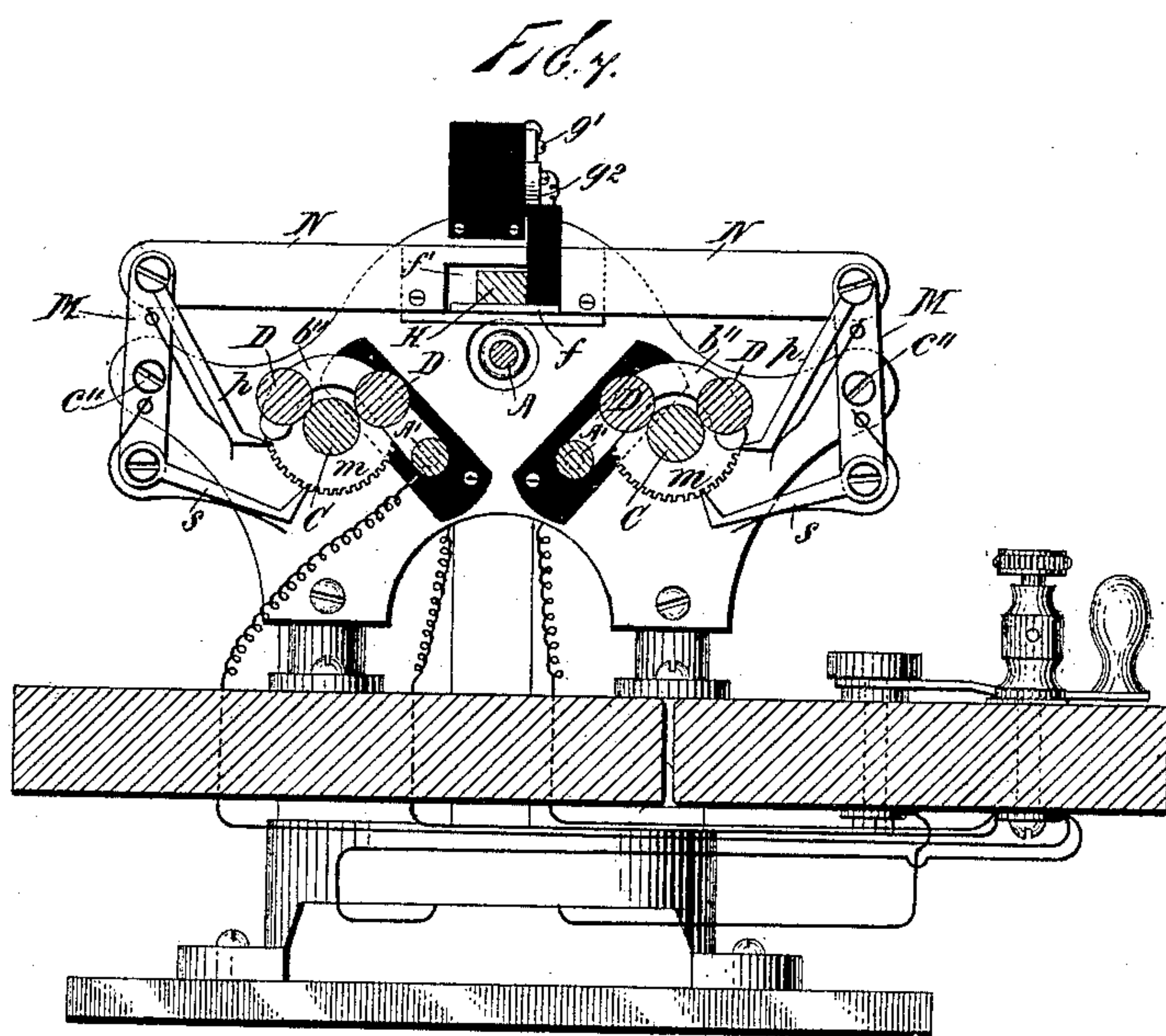
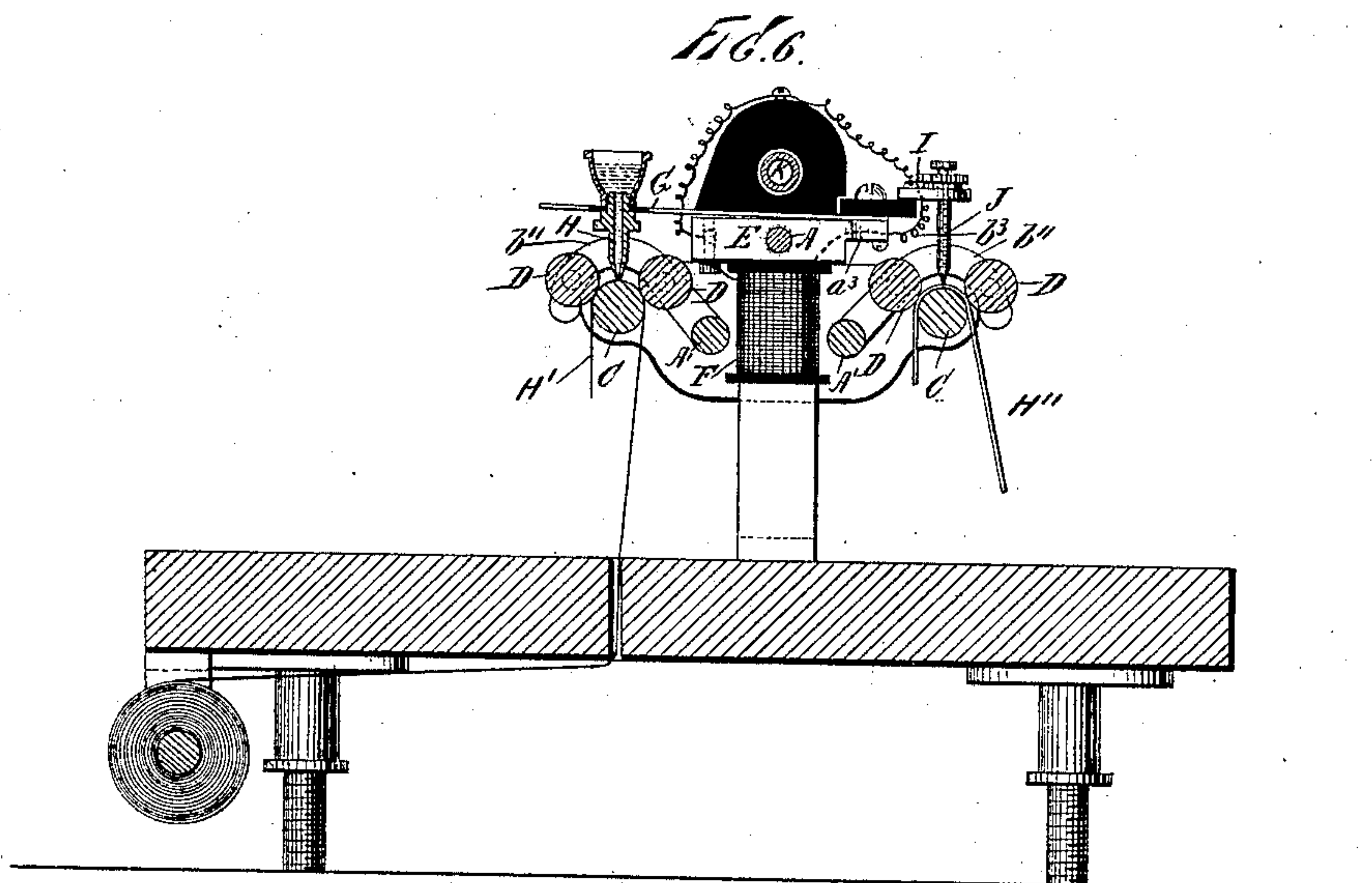
(No Model.)

5 Sheets—Sheet 5.

J. O'NEIL.
AUTOGRAPHIC TELEGRAPH.

No. 529,300.

Patented Nov. 13, 1894.



Witnesses:
John Buckner,
Jno. C. R. R. R.

Inventor:
John O'Neil
#14
James A Whitney
Attorney.

UNITED STATES PATENT OFFICE.

JOHN O'NEIL, OF NEW YORK, N. Y.

AUTOGRAPHIC TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 529,300, dated November 13, 1894.

Application filed November 27, 1893. Renewed October 13, 1894. Serial No. 525,819. (No model.)

To all whom it may concern:

Be it known that I, JOHN O'NEIL, of the city, county, and State of New York, have invented certain new and useful Improvements in Autographic Telegraphs; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1, is a plan view. Fig. 2 is a diagrammatic view of the circuits; Fig. 3, a side view of an autographic telegraph apparatus, made according to my invention. Fig. 4 is an end view of the same as seen from the left hand of Figs. 1, 2, and 3, as indicated by the arrow contiguous to said line *w, w*. Fig. 5 is a vertical, transverse sectional view taken in the line *w, w*, of Figs. 1 and 3, as seen in the direction indicated by the arrow in said Figs. 1 and 3. Fig. 6, is a like view taken in the line, *x, x*, of Figs. 1 and 3. Fig. 7 is a like view taken in the line, *y, y*, of Figs. 1 and 3, and as seen in a direction the reverse of Figs. 5 and 6, as indicated by the arrow contiguous to said line, *y, y*. Fig. 8 is a detail view of certain parts.

This invention relates to that class of electric telegraphic apparatuses with which a message written at one end of a telegraphic line or circuit is reproduced in fac simile at the opposite end of such line or circuit.

In the operation of my said invention the message to be transmitted is written or otherwise provided in non-conducting ink or other substance upon a conducting transmitting sheet in such manner that the interruption of the electric current through said sheet by the non-conducting characters thereon may, through suitable agencies, produce corresponding characters upon a receiving sheet provided at the opposite end of the telegraphic line.

The object of my invention is to provide an autographic telegraph system operating upon the principle just indicated in which simplicity of structure, ease of operation, accuracy in the reproduction of the message sent, and general convenience in use and application are combined, and this I accomplish by the means and combinations of parts hereinafter described and shown.

It is, of course, to be understood, that in

the use and operation of the invention a transmitting and receiving instrument is necessarily employed.

In my invention the instruments employed for receiving and transmitting comprise mechanism by which each instrument may be used indifferently for transmitting or receiving, as occasion may require. The two instruments at the opposite ends of the line are identical or substantially so in their structure. They are indicated at A^{xx} in the diagram. The description of one of said instruments of course, suffices also for that of the other.

Referring now to the drawings, A is a feed screw, see Fig. 3, supported in suitable bearings and capable of rotation in either direction. At one end of this feed screw is an electric motor B, of any suitable construction, capable, by appropriate changes in the electric current, of rotation in opposite directions to afford the like reversible motion to the feed screw, A. The bearings of the latter are of such a character as to allow its rotation without any longitudinal movement of the screw itself. Thus the one end, *a*, of said screw being coupled to or continuous with the axial shaft, *b*, of the motor, B, the screw, A, in such case, is, of course, placed in the axial line of the motor shaft, *b*, but any appropriate means of connecting the motor to the said screw which will transmit the reversible movements of the motor to the screw, may be employed as within the scope of my invention, and, when desired, additional bearings may be provided to support the screw and maintain it in due place and position. To prevent end-movement to the screw and to readily take up any looseness of the said screw in its bearings, it is preferred that the bearing at the end opposite that at which the screw connects with the motor shall comprise the conical point, *a'*, of an adjustable set screw, *c*, working through a fixed nut in the frame of the apparatus and the conical point, *a'*, of which fits into a socket of corresponding shape in the contiguous end of the screw.

At each side of the screw, A, and parallel therewith, is a feed roll, C—see Fig. 1—which is supported in suitable bearing at its ends. In the operation of the apparatus, each of these feed rolls rotates in one direction, and

the rotatory movement of each is intermittent during the act of transmitting a message, as hereinafter fully explained.

Parallel with each feed-roll, C, is one or
5 more clamping rolls, D. As shown in the drawings—see Fig. 1—two such clamping rolls are provided in connection with each feed-roll, and ordinarily this is to be preferred. Each clamping roll, or pair of such rolls, is
10 movable to and from its adjacent feed-roll C. To provide for this the ends of the said clamping rolls are journaled in bearings, a'' , in the outer ends of radial arms, b'' , which project from a rock-shaft, A' , which is itself pivoted
15 or journaled in suitable fixed bearings at its ends. Other equivalent pivotal connection for the arms, b'' , may be employed when preferred. The office of these clamping rolls is to press the sheet material which, as herein-
20 after explained, passes upon and over the feed-rolls, more snugly and smoothly thereon. The clamping rolls are enabled to do this by reason of their gravity which when necessary may be reinforced or substituted, by the ac-
25 tion of springs suitably arranged to press the said clamping rolls each upon or toward its adjacent feeding roll, or by placing additional weights upon the arms b'' , by which said clamping rolls are carried. This nut
30 is provided in a saddle, E, the screw passing through said nut so that the rotation of the screw, A, in the one direction or another, as hereinbefore explained, moves the saddle and the parts carried thereby longitudi-
35 nally in one direction or the other according to the direction of rotation of the screw. Upon the screw, A, is a traveling nut which meshes with the thread or threads of the said screw, so that when the screw is turned in
40 one direction the nut will move longitudinally thereon in one direction with a corresponding reversal of its movement when the rotary motion of the screw is reversed. This saddle, E, carries an electro-magnet, F, the
45 position of which is shown in dotted outline in Fig. 3, and which is more fully and in detail shown in Fig. 6, also an armature, G, which is in due relation to be actuated by the electro-magnet whenever the current is
50 passed through the latter to set the same in action. Preferably this armature, G, consists of a spring of suitable metal, the tension of which is such as to bring it away from the electro-magnet whenever the latter ceases to
55 act by reason of a cessation of the current in the coils thereof. The armature may, however, be of any suitable and preferred kind provided with means for bringing it away from the electro-magnet by cessation of the
60 current through its coils, when the electro-magnet becomes inoperative as just set forth. The outer or free end of this armature carries a pen, H. This pen is intended, in practice, to comprise a tubular stem pointed or conical
65 at its lower end, which latter is arranged to rest upon the sheet material, H' , employed in the receiving part of the instrument; the hol-

low within said stem constituting an ink reservoir and the outlet from said hollow at the lower end of said stem being of such size 70 and character as to supply the ink in due quantity in the automatic writing of the message received, upon the sheet material, H' , placed and arranged to receive it. As the hollow pen separately considered is a device 75 well known in various telegraphic instruments in common use it requires no further or specific description here. Any suitable pen may, moreover, be used in such connection, without departing from my invention. 80

Extending from the saddle, E, in a direction opposite to that of the first mentioned armature, G, in other words, at the opposite side of the instrument is an arm, I, in the outer end of which is a suitable stylus or tracer, J. 85 This arm, I, is of vulcanite or other insulating material to secure the insulation of the stylus, J, from the pen, H. The stylus, J, has its lower end in such relation with the feed roll, C, adjacent thereto, that it rests upon the sur- 90 face of the sheet material, H'' —see Fig. 6—which as hereinafter more fully explained is carried by said feed roll and which has upon it, in suitable ink, the writing, characters, or graphic matter of the message to be trans- 95 mitted. It will be observed from the foregoing that the stylus relates to the transmitting, and the pen to the receiving functions of the apparatus.

Placed parallel with the screw, A, with its 100 ends supported in suitable guides, c , is a sliding bar, K. This bar has at one end a projecting stud or arm d . At the other end it has a like projecting stud or arm, l , and also a wedge-shaped projection or inclined plane, 105 f . It also has upon it adjustable stops, $c'c'$. The arch, c'' , of the saddle, E, is arranged to strike one of the stops, c' , as the saddle approaches the limit of its movement in one direction, and the other of said stops as it 110 approaches the limit of its said movement in the opposite direction. This, of course, transmits a longitudinal movement to the bar, K, as the saddle nears and reaches the limit of its movement in each direction. The reverse 115 motions of the saddle, that is to say, its movement alternately in opposite directions upon the screw, A, are provided by changing the currents which actuate the motor to reverse the same simultaneously with the limit of the 120 movements in each direction of the saddle upon the screw.

As before remarked, two apparatuses, duplicates of each other, and one placed at each end of the line over which a message is to be 125 transmitted are employed in the application of my invention to use. This arrangement of duplicate apparatuses is represented in Fig. 2. Further, each of said apparatuses has its own separate battery, and the one or the 130 other battery is thrown into operation according as the motor and its dependent screw, a , are to be turned in the one direction or the other. Therefore, in the use and operation of

the invention, the two batteries are thrown alternately into operation, so that when the current on the main line is from one battery, the motor, and consequently the screw, A, will rotate in one direction, and when from the other battery, the said motion of said parts will be reversed. If therefore, the main line is changed from one battery to the other, a corresponding change from the one current to the other is secured, with a consequent change or reversal in the rotatory motion of the motor and of the screw, A. To provide for this change from the one battery to the other, the main line is looped or extended to two separate circuit closing and breaking devices *g* and *h*, one at each end of the screw, A, as shown, for example, in Fig. 3. Each loop of the said main line wire is, of course, divided to connect with the parts of the adjacent circuit closing devices. The said devices as shown in the drawings each comprises a movable block, *g'*, preferably pivoted at one end, and a contact piece or part, *g''*, which may be stationary. The line wire being connected with the said two parts of the circuit closer, the circuit is of course closed for the transmission of the current, when a contact block, *g'*, is brought in contact with its adjacent contact piece, *g''*, and broken when said parts are separated. When the saddle and the parts carried thereby have so nearly reached the limit of movement in one direction that the arch of the saddle strikes the stop, *c'*, ahead of it, the bar, K, is moved in the same direction with the saddle, thereby bringing its stud, *d*, or, *e*, as the case may be, under or behind the movable contact block, *g'*, in front of it, against the corresponding contact piece *g''*, thereby closing the circuit through that loop of the main line or circuit wire. Simultaneously with this the other stud or arm, *d*, or *e*, as the case may be, is brought away from the movable contact block, *g'*, at the other end of the screw, A, thereby breaking or opening the circuit through that loop of the said line or wire connected with said last mentioned contact block, &c. As a result of this, the current from the battery which has produced the operation of the motor and its connected devices in one direction is shut off from the main line, and that from the other battery is turned on, and is thus caused to reverse the direction of motion of the motor, and, of course, the direction of motion of those parts which secure their movement from the said motor.

It will be seen that the saddle, E, with the parts carried thereby, reverses the movement of the motor and its connected or dependent devices, by changing from the current of the one battery to that of the other at the termination of each of its movements in either direction. The stylus, J, and the pen, H, are moving together and are both carried to and fro alternately in opposite directions, each moving parallel with the feed roll, C, and pressure rollers, D, adjacent thereto, and con-

sequently in contact with any sheet material placed upon, or carried by, said feed roll. Of course, if the feed-roll were stationary at all times, the track of the stylus, or of the pen, as the case may be, would be always on the same place upon the sheet material, and whatever was marked or traced on the latter in one traverse of the pen or stylus, as the case might be, would be covered or confused by whatever was traced or marked by a subsequent passage. It is therefore necessary to give an intermittent rotatory movement to the feed rolls to present a new surface to the stylus and the pen respectively, prior to each successive rectilinear movement thereof, in other words, prior to the transmission from one end of the main line, and reception at the other, of a succeeding line of an autographic message. To provide for this, each feed roll has at one end a ratchet wheel, *m*, more fully shown in Figs. 1 and 7, adjacent to which, pivoted as at, *c'*, to a suitable fixed support is a swinging bar, M. The two swinging bars, M, are connected by a transverse rod or bar, N, which is slotted as at *f'*, as shown more fully in Fig. 7, to permit the adjacent part of the sliding bar, K, to be passed through it with the opposing inclined planes, *f*, *f*, bearing against the ends of the slot as against opposing stops, so that when the bar, K, slides in one direction or the other it will communicate a transverse movement to the bar, N, in other words, a movement at right angles to that of the bar, K. Upon each of the pivoted bars, M, is placed a spring pawl, *r*, at that end of the bar, M, opposite that which carries the pawl, *s*, though the two pawls, *r*, and, *s*, of each of said swinging bars are placed at opposite arms of said bar, so as to act alternately upon the contiguous ratchet wheel, *m*, of the adjacent feed roll, C, according as the one or the other arm of the swinging bar is swung inward to transmit movement to the said roll. When the sliding bar, K, is moved in the one direction or the other to change the motor, &c., from the action of the one current to the other, as hereinbefore explained, the practically simultaneous movement transmitted from said sliding bar through the inclined planes to the bar, N, and swinging bars, M, and thereon to the pawls *r* and *s*, of the said swinging bars, causes the one or the other of said pawls on each swinging bar to partially turn or rotate the ratchet wheel, and consequently the feed roll to which said wheel is attached. This fractional rotatory movement of the feed roll is, of course, predetermined to afford a corresponding movement to the sheet material carried by or upon said roll. The object of this is, of course, to present a new line of travel upon said material to the stylus, or to the pen, as the case may be, of transmitting and receiving the autographic message as hereinafter more fully explained. The just described feed movements of the feed rolls of course alternate with the traveling movement,

hereinbefore described, of the stylus and pen parallel with the respective feed rolls and upon or in relation with the sheet material placed upon or carried by said rolls.

5 It is to be understood that the changes in the direction of the current, as hereinbefore set forth, relate, not to a reversal of a single current from one and the same battery, but to the changing from the positive current of
10 a battery at one end of the line to the positive current of another battery placed at the opposite end of the line and vice versa, the positive current from the one battery being in the direction opposite to that of the other,
15 the motor and the mechanism dependent thereon for movement being switched alternately from the current of the one battery to that of the other, in other words, from one to the other of two alternative currents
20 passing in opposite directions to operate the motor alternately in correspondingly opposite directions through one and the same line wire.

It will be observed that there are two distinct operations to be performed by the transmission of currents over the main line, R. One of them is the simultaneous and synchronous motion or activity of the two instruments at the opposite ends of said main line,
25 in order that the same conditions, in certain essential respects, which inhere in the transmission of the message may also inhere in the receiving thereof. To provide for this each instrument is provided with two batteries, f^x , and, h^x , one say, f^x , of which is negative and
35 the other, h^x , positive, the negative battery of the one instrument operating in conjunction with the positive battery of the other and vice versa.

40 The circuits for insuring the synchronous operation of the two instruments, one at each end of the main line, R, are indicated in the diagram Fig. 2. It will of course be understood that this synchronous operation of the
45 instruments is dependent upon the synchronous movement of the screws, A, thereof, and this movement of the screws is in its turn dependent upon the synchronous operation of the motors by which the said screws of the respective instruments are operated as hereinbefore explained. To open communication
50 between the two instruments, the operator, or sender, at the one instrument, for example or illustration, say, that indicated at the left hand part of the diagram Fig. 2, the attention
55 of the operator or receiver at the opposite instrument is signaled by the call bell or signal as above mentioned. Provided to the negative battery h^x of each instrument is a switch
60 D' arranged to, in the operation of the apparatus, connect with a wire which connects in its turn with the commutator of the adjacent motor and also with the adjacent positive battery, f^x . It is to be kept in mind however,
65 that this switch is not intended to connect the two batteries l^x and h^x of the same instrument inasmuch as this would result in short cir-

cuiting and prevent the operation of the apparatus. The switch, D' of each instrument is brought to connect with the positive battery thereof. If now we assume the circuit
70 from the positive battery f^x of one instrument, for example of the left hand to be unbroken through the apparatus to the negative battery of the other instrument, assumed to
75 start from and through the left hand instrument, said current will follow the electrical connections in the direction indicated by the solid arrows from the positive battery f^x of
80 the left hand instrument to the commutator of the motor of the said instrument, thence through the circuit making-and-breaking devices, thence to and along the main line
85 wire, R, to the opposite or right hand instrument, thence through the wire, 96, to the circuit making and breaking devices of said instrument, thence through the wire 94 to the
90 commutator of the motor of the said instrument and thence to the negative battery, h^x , of said instrument, thus, (the batteries being of course suitably grounded or otherwise provided with means for the return current,) completing the circuit and in so doing operating
95 simultaneously and substantially synchronously and in the same direction as the motors of the two instruments. While this is being done the circuit making-and-breaking devices are of course in such position as to provide conductivity to the current along the
100 conductors mentioned, and to destroy connection between the conductors which connect the positive battery, f^x , of the right hand instrument with the negative battery, h^x , of the left hand instrument. When,
105 however, by the means set forth in another part of this specification the continuity of the one current is broken that of the other is established, and the current from the positive battery of the right hand instrument then
110 passes in a direction the reverse of that of the current first just herein set forth, and passing from the positive battery, f^x , thereof, through the switch, C' , follows the wire 77, to the commutator of the adjacent motor, thence
115 through the wire 94, to the wire, 93, to the adjacent circuit making-and-breaking devices, and thence to the main line wire, R, through which it passes to the left hand instrument, thence to the wire, 92, through the circuit making-and-breaking devices, thence through the
120 wires 89 and 91 to the commutator of the motor of the left hand instrument, and thence to and through the switch, C' , of said instrument to the negative battery, h^x , thereof, thereby completing the circuit. As the current called
125 into play by the action of the circuit making-and-breaking devices is in a direction the opposite of that of the other current described it follows that it rotates the motors and consequently the screw, A, of the two instruments in opposite directions. In other words,
130 the mechanism being thrown alternately from one to the other of the two currents which are the opposites of each other, the operation

of the motors and of the parts dependent upon each motor, is alternately in opposite directions. As each current in its turn traverses both instruments, it follows that the two motors run in the same directions and synchronously or substantially so as just described, and that as a consequence the speed of the screw, A, the saddle, E, and the parts carried thereby and also the feed rolls of the one instrument correspond to the speed of the corresponding parts of the other, the reversals of motion in the motors, and of the parts dependent upon each for motion being, of course, correspondent, the purpose of which is fully explained in another part of this specification.

The other of said two distinct operations to be performed by currents over the main line as aforesaid comprises the operation of the stylus and of the pen in transmitting the message from the instrument at one end of the main line and receiving it at the other. The currents for these purposes are distinct from those which relate to the first of the operations just hereinbefore mentioned and are derived from separate and distinct batteries which are indicated by the reference letters, b^2 , and d^2 , as shown in the aforesaid Fig. 2 of the drawings, although the currents from these batteries like those of the others pass over the main line, R. Of these batteries, b^2 , d^2 , at each instrument one, say, b^2 , is negative and the other, d^2 , is positive. The negative battery, b^2 , of the one instrument operates in connection with the positive battery, d^2 , of the other and vice versa.

To provide for the changing of the current from one battery, f^x , h^x to the other at each instrument, there is provided adjacent to each instrument in the wire, R, a switch, C', by which the contacts and connections are so changed as to connect and disconnect the wire, R, with the one or the other battery as may be required.

Referring now to the second of the operations just hereinbefore indicated, there are, as hereinbefore explained, at each end of said line the two additional batteries, b^2 , d^2 , one negative and one positive, the positive battery say, d^2 , at one end of the main line connecting through the two apparatuses and the main line with the negative battery, b^2 , at the opposite end of the line, while, conversely, the positive battery, d^2 , of the just last mentioned battery end connects in like manner with the negative battery, b^2 , of the other. Thus the current from the battery, b^2 , of the instrument indicated at the left hand, is negative to the battery, d^2 , of the instrument indicated at the right hand of said figure, and may be termed a negative current as concerns the left hand instrument and a positive current as concerns the right hand instrument, while the current from the latter instrument being from its negative battery, b^2 , to the positive battery, d^2 , of the other, is a current of opposite character, that is to say, it may be

termed a positive current as concerns the left hand instrument, and a negative current as concerns the right hand instrument. When a message is to be transmitted from the one end of the main line to the other, the positive battery at the transmitting instrument is put in connection therewith and consequently with the main line. Simultaneous with this the corresponding negative battery of the apparatus at the opposite end of the line is connected or placed in circuit with said main line, and the positive battery at said opposite end of the line is disconnected. Suitable switches are provided the placement of which provides the requisite connections between other parts of the circuit wires. This, of course, is required to be done by the operator at said opposite end of the line. To provide for this purpose, as well as for that of adjusting the switches, D', for the starting of the instruments into operation as hereinbefore explained, the hereinbefore mentioned electric call is provided, the wires of which connect to each end of the main line to enable the operator at the one end of said line to signal the operator at the other. As such call signals are well known, no specific description of such an apparatus is necessary here.

Assuming that a message is to be transmitted from, say, the instrument shown at the left hand of the drawing, Fig. 2, the switch, C', of said instrument is placed to connect with the adjacent positive battery, d^2 , as shown in dotted outline in the figure and the wire, d^3 , of the receiving instrument is detached at one end in order that the current shall not be diverted from the adjacent magnet of said receiving instrument. The operator at the receiving instrument also places the switch, C', thereof in connection with the adjacent negative battery, b^2 . This establishes a current from the positive battery, d^2 , of the transmitting instrument through the adjacent switch, C', to the wire or conductor, 21, thence to the metallic post or part, n , which holds the metallic bearing, c , of the screw, A, of the transmitting instrument, thence through said screw to a wire, b^3 , thence through the wire, d^3 , to and through a metallic arm, a^3 , of the saddle to the stylus J carried by the said arm. From the stylus, under conditions hereinafter explained, it passes to an adjacent pressure roll, D, from which, through a suitable wire or conductor, 22, it passes upon the main line wire R. At the opposite end of the latter is a branch wire or conductor, 23, which connects with a pressure roll of the receiving instrument, thence through the stylus, thence through the helix of the magnet carried by the saddle. From this it passes to the screw, A, of said receiving instrument and thence through the part, n , thereof to the wire 24 to the adjacent switch, C', and negative battery b^2 , and, the batteries being duly grounded thus completes the circuit.

Of course in transmitting a message in the

reverse direction, as from the right hand to the left hand instrument as shown in the drawings, the operation is simply reversed, that which, in the one case is the transmitting instrument becoming, in the other the receiving instrument and vice versa. For such transmission of a message in the opposite direction, the switch, C', of the one system of batteries, d^2 , b^2 , is of course moved to break the current thereof, and the corresponding switch is placed to establish, in an opposite direction, the current of the other system, one or the other of said systems of batteries being put in action according as the message is to be transmitted in the one direction or the other. It is of course to be understood that the wire d^3 is always to be attached or connected as hereinbefore explained in the instrument which is to be used as a transmitter and detached to prevent short circuiting the current from the magnet in the instrument which is to be used as a receiver.

In the wire, d^3 , or in due connection therewith, is placed any suitable device or switch by means of which the circuit through said wire may be broken as hereinbefore explained when a current is passing through the apparatus to operate the pen as herein explained, the object of this being to prevent short circuiting during such operation of the pen. As such devices for breaking the continuity, on occasions, of a circuit wire are well known no special description of such is necessary here.

The operation of the apparatus is as follows: The message to be transmitted is written or otherwise provided upon the surface of a sheet of tin-foil or equivalent material—which is a conductor of electricity. This may be done with any suitable ink or liquid which, when dried or solidified upon the surface of the sheet, is practically a non-conductor of electricity. The sheet with the message or matter to be transmitted being thus provided, is placed upon that feed-roll which is adjacent to the stylus, J, with its message-bearing face toward and in contact with the said stylus and with the adjacent pressure roller or rollers bearing upon its said face. The positive current, provided as hereinbefore explained being turned on and the motor being set in motion by the current of the batteries provided for that purpose, as also hereinbefore explained, the stylus is carried longitudinally with the screw, the feed-roll and the said pressure-roller. So long as the conductivity between the point of the stylus and the adjacent pressure roller is intact, by the connection established by the contact of the stylus with the surface of the tin-foil, and of the tin-foil with the pressure roller, just so long will the current pass unbroken through the main line to the instrument at the opposite end of said line, the tin-foil, in such circumstance forming a part of the circuit and the current being unbroken through both instruments; but when

the contact of the stylus with the surface of the tin-foil is broken by the interposition of an ink mark or stroke forming part of the autographic message, in other words, by any portion of the message provided as aforesaid on the surface of said tin-foil, then the current through the main line and the two instruments is correspondingly broken and remains broken so long as the obstruction afforded by the insulating ink remains. Thus, in the operation of the invention, the current in the transmitting instrument is automatically broken and closed by the non-conducting characters constituting the message on the tin-foil sheet. This current being thus broken whenever the stylus passes over or in contact with the non-conducting material of the autographic message, it follows that the armature of the receiving instrument is depressed to bring the pen in contact with the receiving sheet upon the adjacent roll, D, so that whenever the stylus crosses a character or ink mark on the autographic message, the pen makes a mark on the receiving sheet corresponding in time and location to that part of the said message upon which in the transmitting instrument the stylus rests; and as the position of the receiving sheet in the receiving instrument corresponds to that of the autographic message sheet in the transmitting instrument, and the movements of the two instruments are synchronous, it follows that the contacts of the stylus of the transmitting instrument with the non-conducting characters of the message result, in the receiving instrument of correspondent ink-marking contacts of the pen with the receiving sheet in said receiving instrument. It is to be stated in this connection that the modification of the current by which the electro-magnet is brought into action to depress the armature and consequently the pen in the receiving instrument when the current is broken as described, is secured by the use of a relay which, for receiving purposes, is provided to each instrument. As the construction and operation of relays for causing an electro-magnet to be brought into action when a current is broken and rendered inactive when the current is restored, are well known in the art of telegraphy, and familiar in said art, specific description of such an apparatus is deemed unnecessary here.

Such being the principle upon which the apparatus works the *modus operandi* thereof is in detail as follows: The tin-foil sheet bearing the message in non-conducting characters and placed upon the feed-roll as described, is traversed by the point of the stylus as the saddle moves longitudinally with the feed-roll and its pressure roll or rolls. When the point of the stylus rests in contact with the conducting surface of the tin-foil, the current flows uninterruptedly; but, whenever the stylus passes upon the ink—a non-conductor—the circuit is interrupted and the current is broken. In the transmission of a written

message the current will thus be made and broken many times during a single longitudinal movement along the feed roll of the stylus, each interruption of the current corresponding to the contact of the stylus with the ink. While the operation just described occurs at the transmitting instrument, the pen in the receiving instrument is set into a corresponding movement, or series of movements, by the action of the electro-magnet which, actuating the armature which carries the pen brings the pen down upon a sheet of any suitable material placed upon the adjacent feed roll, D, and inasmuch as the interposition of the relay causes the closing of the current at the receiving instrument to coincide with the breaking of the current at the transmitting instrument, it follows that every breaking of the current in passing over the non-conducting characters of the tin-foil sheet of the transmitting instrument results in a closing of the current to bring the pen at the receiving instrument to make a mark on the receiving sheet corresponding to that which causes the breaking of the current in the first instance. It is, of course, to be kept in mind that the two instruments are maintained in synchronous movement so that the pen traverses lengthwise of the feed-roll which carries the receiving sheet at the same speed and to the same extent that the stylus traverses in the transmitting apparatus. As the stylus in a single passage across on the ink line traverses the whole length of such line, but only a minute fraction of the width of such line—as such lines are ordinarily proportioned in chirography, symbols, designs, &c.—it follows that a considerable number of passages to and fro of the stylus, each a little aside or apart from its immediate predecessor, are necessary to transmit the whole of a message. This is provided for by the means hereinbefore described, whereby at the end of each longitudinal movement of the saddle the feed-roll is actuated to move a minute part of a revolution, thereby feeding the sheet thereon to bring a fresh surface of the transmitting sheet to the contact of the stylus in transmitting, and a corresponding fresh surface to the action of the pen in receiving, this movement of the saddle being changed alternately from one direction to the other immediately succeeding the feeding of the sheets, as just explained. As each interruption of the current at the transmitting instrument produces a corresponding action in the electro-magnet of the receiving instrument, thereby actuating the armature of the latter to depress its pen to make a mark upon the paper placed in juxtaposition therewith, the length of this mark, of course, corresponds to the length of time during which the current through the stylus at the transmitting instrument is interrupted, and this, in its turn, depends upon the width of the non-conducting ink line traversed by the stylus. As the stylus at the transmitting instrument passes across the lines of the writ-

ten or graphic matter on the transmitting sheet in a definite path, it follows that there is placed upon the receiving sheet a transverse series of marks corresponding to the parts of the message which have broken the current at the transmitting instrument, as described. As a new line of such marks is made with each minute shifting of the transmitting sheet, with reference to the path of the stylus, and a like change in the position of the receiving sheet with reference to the pen is correspondingly made, it follows that a series of dots is formed upon the receiving sheet, each of which corresponds in position to that part of some one of the characters on the transmitting sheet which has broken the circuit, the characters or lines on the transmitting sheet being thus reproduced in dotted outline on the receiving sheet.

In order to render more certain the synchronous movements of the two motors and their dependent parts, I provide to each an escapement so adjusted that the two will run in equal time, and thereby, by giving to the screw, A, in each instrument the same ratio of motion as in the other insure that exactitude in the alternating movements in opposite directions of the two screws which is essential to the deposit upon the receiving sheet of the lines of dots made by the pen of the receiving instrument, in exact correspondence to the lines of non-conducting ink on the transmitting sheet of the transmitting instrument. The said escapement for each instrument is constructed and operates as follows: The shaft, *b*, of the motor is extended to receive an escapement wheel, T, which is fast on said shaft. A pallet, T', is arranged to work in conjunction with this wheel, T. The pallet is operated from an arm, which extends from the armature, *p*^x, of an electro-magnet, G', said arm being connected with the stem of the pallet by a rod, G''. The arm of the armature is a conductor and is pressed back against an adjustable conducting stud, H'', by a suitable spring. The current from a separate local battery at each end of the main line passes through suitable conducting wires, *n*³, *n*⁴, to and through the coils of the electro-magnet when the arm, *r*, rests against the said stud. This puts the electro-magnet in operation, the armature is drawn away from said stud and in its movements actuates the pallet to let escape one tooth of the escapement wheel to permit a corresponding movement of the motor. As this breaks the current the armature is in turn released by the electro-magnet, and being brought back to its place by the spring, *t*^x, affords another and reverse movement to the escapement wheel, to be followed by another movement of the armature when the current through the electro-magnet, G', is re-established by the renewed contact of the arm with the stud. As the escapement and its adjuncts are duplicated, one to each instrument at the end of the main line the current just mentioned of

said batteries insures a simultaneous and synchronous movement of the two escapements with a corresponding identity in the speed and motions of the motors. By adjusting the stud, H'', the swing of the pallet and the time afforded at each movement or vibration thereof may be readily regulated, and the escapement of the two motors—one at each end of the line, as hereinbefore explained—being adjusted to work in equal time, it follows that the synchronous operation of the motors and their dependent parts on the two apparatuses is secured.

What I claim as my invention is—

1. In an autographic telegraph apparatus, the combination of the following elements, to wit:—a feed-roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding or fractionally rotative movement, a screw revoluble in opposite directions and placed parallel or substantially so with said feed roll, a traveling nut placed upon and operated from said screw, a stylus carried by said nut, and an electric motor revoluble in opposite directions to communicate a like motion to the screw, substantially as and for the purpose herein set forth.

2. In an autographic telegraph apparatus, the combination of the following elements, to wit:—a feed-roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding or fractionally rotative movement, a screw revoluble in opposite directions and placed parallel or substantially so with said feed-roll, a traveling nut placed upon and operated from said screw, a stylus carried by said nut, and an electric motor placed with its axis of motion in the axial line of said screw and revoluble in opposite directions, and means for coupling the motor to the screw to transmit the movements of the one to the other in the same axial line, substantially as and for the purposes herein set forth.

3. In an autographic telegraph apparatus, the combination of the following elements, to wit:—a feed-roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding intermittent or fractionally rotative movement, a screw revoluble in opposite directions and placed parallel or substantially so with said roll, a traveling nut which meshes with the thread of said screw, a stylus carried by said nut, an electric motor provided to operate the said screw, duplicate batteries of opposite polarity adapted for electric connection with the motor to operate the same, and means for shifting the electrical connection of the motor alternately from one to the other of said batteries to reverse the direction of the rotary motion of the motor and consequently that of the screw and of the rectilinear movement of the nut and stylus, substantially as and for the purpose herein set forth.

4. In an autographic telegraph apparatus

the combination of the following elements; to wit:—a feed-roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding intermittent or fractionally rotative movement, a screw revoluble in opposite directions and placed parallel or substantially so with said roll, a traveling nut which meshes with the thread of said screw, a stylus carried by said nut, an electric motor provided to operate the said screw, duplicate batteries of opposite polarity adapted for electric connection with the motor to operate the same, and mechanism adapted to be operated by the nut at each limit of its rectilinear movement to shift the electrical connection of the motor alternately from one to the other of said batteries to reverse the direction of the rotary motion of the motor and the screw and of the rectilinear movements of the nut and stylus, substantially as and for the purpose herein set forth.

5. In an autographic telegraph apparatus, the combination of the following elements, to wit:—a feed-roll for carrying a receiving sheet, means for giving to said roll a feeding, intermittent or fractionally rotative movement, a screw revoluble in opposite directions, and placed parallel or substantially so with said feed-roll, a traveling nut which meshes with the thread of said screw an armature carried by said nut, an electric motor arranged to give motion to said screw, duplicate batteries of opposite polarity adapted for electrical connection with said motor to operate the same, means for shifting the electrical connection of the motor alternately from one to the other of said batteries to reverse the direction of motion of said motor, a pen carried by the armature, an electro-magnet carried by the nut and adapted to actuate the armature to bring the pen to the receiving sheet, and a battery adapted to form part of an electric circuit through said electro-magnet to operate the armature, substantially as and for the purpose herein set forth.

6. In an autographic telegraph apparatus, the combination of the following elements, to wit:—a feed-roll for carrying a receiving sheet, means for giving to said roll a feeding, intermittent or fractionally rotative movement, a screw revoluble in opposite directions and placed parallel or substantially so with said feed-roll, a traveling nut which meshes with the thread of said screw, an armature carried by said nut, an electric motor arranged to give motion to said screw, duplicate batteries of opposite polarity adapted for electrical connection with said motor to operate the same, mechanism adapted to be operated by the nut at each limit of its rectilinear movement to shift the electrical connection of the motor alternately from one to the other of said batteries to reverse the direction of motion of said motor, a pen carried by the armature, an electro-magnet carried by the nut and adapted to actuate the armature to bring the pen to the receiving sheet,

and a battery adapted to form part of an electric circuit through said electro-magnet to operate the armature, substantially as and for the purpose herein set forth.

5 7. In an autographic telegraph apparatus, the combination of the following elements, to wit:—a feed-roll for carrying a conducting transmitting sheet, a feed-roll for carrying a receiving sheet, means for giving to each of
10 said rolls a feeding intermittent or fractionally rotative movement, a screw revoluble in opposite directions and placed parallel or substantially so with the feed rolls, a traveling nut which meshes with the thread of the screw, a
15 stylus and a pen carried by said nut and adapted to move over or upon, respectively, the transmitting and receiving sheets, an armature connecting the pen with the nut and movable with respect to the latter, an electro-
20 magnet also carried by the said nut and adapted to actuate the armature to bring the pen to the receiving sheet, duplicate batteries of opposite polarity adapted the one for electrical connection with the main line
25 through the stylus the other for like connection through the electro-magnet, and means for making and breaking the connections of said batteries with the stylus and electro-
30 magnet according as the instrument is required for use in transmitting or receiving, substantially as and for the purpose herein set forth.

8. In an autographic telegraph apparatus, the combination of the following elements, to
35 wit:—a feed-roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding or fractionally rotative movement, rollers placed parallel with said feed-roll to retain the transmitting sheet
40 smoothly upon the same and arranged to move in unison with said rolls, a screw revoluble in opposite directions and placed parallel or substantially so with said feed roll, a traveling nut which meshes with the thread
45 of said screw, a stylus carried by said nut, an electric motor provided to operate the said screw, duplicate batteries of opposite polarity capable of electric connection with the motor to operate the same, and means for shifting
50 the electrical connection of the motor alternately from one to the other of said batteries to reverse the direction of the rotary motion of the motor and screw and of the rectilinear movement of the nut and stylus, substantially
55 as and for the purpose herein set forth.

9. In an autographic telegraph apparatus, the combination of the following elements, to
60 wit:—a feed-roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding intermittent or fractionally rotative movement, swinging arms arranged at or near the ends of said roll, and rollers journaled in said arms parallel with said roll and arranged to hold the transmitting sheet to said roll to move in unison
65 therewith, a screw revoluble in opposite directions and placed parallel or substantially

so with said roll, a traveling nut which meshes with the thread of said screw, a stylus carried by said nut, an electric motor provided to operate the said screw, duplicate
70 batteries of opposite polarity capable of electric connection with the motor to operate the same, and means for shifting the electrical connection of the motor alternately from one
75 to the other of said batteries to reverse the direction of the rotary motion of the motor and screw and of the rectilinear movement of the nut and stylus, substantially as and for the purpose herein set forth. 80

10. In an autographic telegraph apparatus, the combination of the following elements, to
85 wit:—a feed-roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding intermittent or fractionally rotative movement, rollers placed parallel with said feed roll to retain the transmitting sheet smoothly upon the same and
90 arranged to move in unison with said rolls, a screw revoluble in opposite directions and placed parallel or substantially so with said roll, a traveling nut which meshes with the thread of said screw, a stylus carried by said nut, an electric motor provided to operate the
95 said screw, duplicate batteries of opposite polarity capable of electric connection with the motor to operate the same, and mechanism adapted to be operated by the nut at each limit of its rectilinear movement to shift the
100 electrical connection of the motor alternately from one to the other of said batteries to reverse the direction of the rotary motion of the motor and the screw and of the rectilinear movements of the nut and stylus, substantially as and for the purpose herein set forth. 105

11. In an autographic telegraph apparatus, the combination of the following elements, to
110 wit:—a feed-roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding intermittent or fractionally rotative movement, swinging arms arranged at or near the ends of said roll, and rollers journaled in said arms parallel with
115 said roll and arranged to hold the transmitting sheet to said roll to move in unison therewith, a screw revoluble in opposite directions and placed parallel or substantially so with said roll, a traveling nut which meshes with the thread of said screw, a stylus carried by
120 said nut, an electric motor provided to operate the said screw, duplicate batteries of opposite polarity capable of electric connection with the motor to operate the same, and mechanism adapted to be operated by the nut at each limit of its rectilinear movement to
125 shift the electrical connection of the motor alternately from one to the other of said batteries to reverse the direction of the rotary motion of the motor and the screw and of the rectilinear movements of the nut and stylus, substantially
130 as and for the purpose herein set forth.

12. In an autographic telegraph apparatus, the combination of the following elements, to

wit:—a feed-roll for carrying a receiving sheet, means for giving to said roll a feeding, intermittent or fractionally rotative movement, rollers placed parallel with said feed roll to retain the transmitting sheet smoothly upon the same, and arranged to move in unison with said rolls, a screw revoluble in opposite directions, and placed parallel or substantially so with said feed roll, a traveling nut which meshes with the thread of said screw, an armature carried by said nut, an electric motor arranged to give motion to said screw, duplicate batteries of opposite polarity adapted for electrical connection with said motor to operate the same, and means for shifting the electrical connection of the motor alternately from one to the other of said batteries to reverse the direction of said motor, a pen carried by said armature, an electro-magnet carried by the nut and adapted to actuate the armature to bring the pen to the receiving sheet, and a battery adapted to form part of an electric circuit through said electro-magnet, substantially as and for the purpose herein set forth.

13. In an autographic telegraph apparatus, the combination of the following elements, to wit:—a feed-roll for carrying a receiving sheet, means for giving to said roll a feeding, intermittent or fractionally rotative movement, swinging arms arranged at or near the ends of said roll, and rollers journaled in said arms parallel with said roll and arranged to hold the transmitting sheet to said roll to move in unison therewith, a screw revoluble in opposite directions, and placed parallel or substantially so with said feed roll, a traveling nut which meshes with the thread of said screw, an armature carried by said nut, an electric motor arranged to give motion to said screw, duplicate batteries of opposite polarity adapted for electrical connection with said motor to operate the same, and means for shifting the electrical connection of the motor alternately from one to the other of said batteries to reverse the direction of motion of said motor, a pen carried by said armature, an electro-magnet carried by the nut and adapted to actuate the armature to bring the pen to the receiving sheet, and a battery adapted to form part of an electric circuit through said electro-magnet, substantially as and for the purpose herein set forth.

14. In an autographic telegraph apparatus, the combination of the following elements, to wit: a feed roll for carrying a receiving sheet, means for giving to said roll a feeding, intermittent or fractionally rotative movement, rollers placed parallel with said feed roll to retain the transmitting sheet smoothly upon the same, and arranged to move in unison with said rolls, a screw revoluble in opposite directions and placed parallel or substantially so with said feed roll, a traveling nut which meshes with the thread of said screw, an armature carried by said nut, an electric motor arranged to give motion to said screw, dupli-

cate batteries of opposite polarity adapted for electrical connection with said motor to operate the same, mechanism adapted to be operated by the nut at each limit of its rectilinear movement to shift the electrical connection of the motor alternately from one to the other of said batteries to reverse the direction of motion of said motor, a pen carried by said armature, an electro-magnet carried by the nut and adapted to actuate the armature to bring the pen to the receiving sheet, and a battery adapted to form part of an electric circuit through said electro-magnet, substantially as and for the purpose herein set forth.

15. In an autographic telegraph apparatus, the combination of the following elements, to wit: a feed-roll for carrying a transmitting sheet of the character described, a feed-roll for carrying a receiving sheet, means for giving to each of said rolls a feeding, intermittent or fractionally rotative movement, swinging arms arranged at or near the ends of said rolls, and rollers journaled in said arms parallel with said roll and arranged to hold the transmitting sheet to said roll to move in unison therewith, a screw revoluble in opposite directions and placed parallel or substantially so with the feed rolls, a traveling nut which meshes with the thread of the screw, a stylus and a pen carried by said nut and adapted to move over or upon, respectively, the transmitting and receiving sheets, an armature connecting the pen with the nut and movable with respect to the latter, an electro-magnet also carried by the said nut and adapted to, on occasion, actuate the armature to bring the pen to the receiving sheet, duplicate batteries of opposite polarity and adapted, the one for electrical connection with the main line through the stylus, the other for like connection through the electro-magnet, and means for making and breaking the connections of said batteries with the stylus and electro-magnet, according as the instrument is required for use in transmitting or receiving, substantially as and for the purpose herein set forth.

16. In an autographic telegraph apparatus, the combination of the following elements, to wit: a feed-roll for carrying a transmitting sheet of the character described, a feed-roll for carrying a receiving sheet, means for giving to each of said rolls a feeding, intermittent or fractionally rotative movement, rollers placed parallel with said feed roll to retain the transmitting sheet smoothly upon the same, and arranged to move in unison with said rolls, a screw revoluble in opposite directions and placed parallel or substantially so with the feed-rolls, a traveling nut which meshes with the thread of the screw, a stylus and a pen carried by said nut and adapted to move over or upon, respectively, the transmitting and receiving sheets, an armature connecting the pen with the nut and movable with respect to the latter, an electro-magnet

also carried by the said nut and adapted to actuate the armature to bring the pen to the receiving sheet, duplicate batteries of opposite polarity and adapted, the one for electrical connection with the main line through the stylus, the other for like connection through the electro-magnet, and means for making and breaking the connections of said batteries with the stylus and electro-magnet, according as the instrument is required for use in transmitting or receiving, substantially as and for the purpose herein set forth.

17. In an autographic telegraph apparatus, the combination of the feed screw, A, adapted to rotate in opposite directions without longitudinal movement of its own, means for affording such movement to said screw, feed rolls, C, placed at opposite sides of said screw, means for affording a fractional and intermittent rotative movement to said feed rolls, clamping rolls, D, placed parallel with the feed rolls and movable with reference thereto, the saddle E, constructed with a nut for the passage and operation of the feed-screw to give motion to the saddle, the electro-magnet, F, carried by the saddle, the armature, G, also carried by said saddle and adapted to be actuated from said electro-magnet, the pen, H, carried by the free end of the armature, the arm, I, also carried by said saddle and extended therefrom in a direction opposite that of the armature, the conducting stylus, J, carried by said arm and insulated from the pen, a source or sources of electric energy and connections for, on occasions, transmitting currents from such source to and through the stylus, and to and through the electro-magnet to actuate the pen, the whole arranged for use and operation, substantially as and for the purpose herein set forth.

18. In an autographic telegraph apparatus, the combination of the feed screw, A, adapted to rotate in opposite directions without longitudinal movement of its own, an electric motor constructed and arranged to rotate alternately in opposite directions, mechanism connecting the shaft of said motor with the said feeding screw to transmit corresponding motion thereto, feed rolls, C, placed at opposite sides of said screw, means for affording a fractional and intermittent rotative movement to said feed rolls, clamping rolls, D, placed parallel with the feed rolls and movable with reference thereto, the saddle, E, constructed with a nut for the passage and operation of the feed screw to give motion to the saddle, the electro-magnet, F, carried by the saddle, the armature, G, also carried by said saddle and adapted to be actuated from said electro-magnet, the pen, H, carried by the free end of the armature, the arm, I, also carried by said saddle and extended therefrom in a direction opposite that of the armature, the conducting stylus, J, carried by said arm and insulated from the pen, a source or sources of electric energy and connections for, on occasion, transmitting currents from such

source to and through the stylus, and to and through the electro-magnet to actuate the pen, the whole arranged for use and operation, substantially as and for the purpose herein set forth.

19. In an autographic telegraph apparatus, the combination of the feed screw, A, adapted to rotate in opposite directions without longitudinal movement of its own, an electric motor constructed and arranged to rotate alternately in opposite directions and with its shaft axially coincident with said screw, a coupling connecting said shaft with said screw, feed-rolls, C, placed at opposite sides of said screw, means for affording a fractional and intermittent rotative movement to said feed rolls, clamping rolls, D, placed parallel with the feed rolls and movable with reference thereto, the saddle, E, constructed with a nut for the passage and operation of the feed-screw to give motion to the saddle, batteries of opposite polarity for operating the motor and mechanism for automatically shifting the motor from the current of one battery to that of the other to reverse the motion of the latter as the saddle reaches the limit of its movement in each direction along the feed screw, the electro-magnet, F, carried by the saddle, the armature, G, also carried by said saddle and adapted to be actuated from said electro-magnet, the pen, H, carried by the free end of the armature, the arm, I, also carried by said saddle and extended therefrom in a direction opposite that of the armature, the conducting stylus, J, carried by said arm and insulated from the pen, a source or sources of electric energy and connections for, on occasion, transmitting currents from such source to and through the stylus, and to and through the electro-magnet to actuate the pen, the whole arranged for use and operation, substantially as and for the purpose herein set forth.

20. In an autographic telegraph apparatus, the combination of the feed screw, A, adapted to rotate alternately in opposite directions without longitudinal movement of its own, the feed rolls, C, and clamping rolls, D, placed parallel with said screw, the saddle, E, constructed with a nut for the passage and operation of the feed screw to give movement to the saddle, the electro-magnet, F, carried by the saddle, the armature, G, also carried by the saddle and adapted to be actuated from said electro-magnet, the pen, H, carried by the free end of the armature, the arm, I, also carried by the saddle and extended therefrom in a direction opposite that of the armature, the conducting stylus, J, carried by said arm and insulated from the pen, batteries of opposite polarity to operate said motor, two separate circuit closing and breaking devices, placed one at each end of the feeding screw, a main line looped or extended to said two devices, and mechanism for actuating said devices to open the one circuit and close the other simultaneously with the limit of motion in

either direction of the saddle and parts carried thereby along the feeding screw, the whole arranged for joint use and operation, substantially as herein set forth.

21. In an autographic telegraph apparatus, the combination of the feed screw, A, adapted to rotate alternately in opposite directions without longitudinal movement of its own, the feed rolls, C, and clamping rolls, D, placed parallel with said screw, the saddle, E, constructed with a nut for the passage and operation of the feed screw to give movement to the saddle, the electro-magnet, F, carried by the saddle, the armature, G, also carried by the saddle and adapted to be actuated from said electro-magnet, the pen, H, carried by the free end of the armature, the arm, I, also carried by the saddle and extended therefrom in a direction opposite that of the armature, the conducting stylus, J, carried by said arm and insulated from the pen, batteries of opposite polarity to operate said motor, two separate circuit closing and breaking devices placed one at each end of the feeding screw, contact blocks, g' , placed at opposite ends of the feeding screw, contact pieces, g'' , placed to cooperate with said contact blocks to open and close the circuits to operate the motor in the one direction and the other, a main line looped or extended to said contact blocks and contact pieces and devices actuated from the feeding screw to operate contact blocks as the saddle and the parts carried thereby approach or reach the limit of their movement in each direction along the screw, the whole arranged for joint use and operation, substantially as herein set forth.

22. In an autographic telegraph apparatus, the combination of the feed screw, A, adapted to rotate alternately in opposite directions without longitudinal movement of its own, the feed rolls, C, and clamping rolls, D, placed parallel with said screw, the saddle, E, constructed with a nut for the passage and operation of the feed screw to give movement to the saddle, the electro-magnet, F, carried by the saddle, the armature, G, also carried by the saddle and adapted to be actuated from said electro-magnet, the pen, H, carried by the free end of the armature, the arm I, also carried by the saddle and extended therefrom in a direction opposite that of the armature, the conducting stylus, J, carried by said arm and insulated from the pen, batteries of opposite polarity to operate said motor, two separate circuit closing and breaking devices placed one at each end of the feeding screw, contact blocks, g' , placed at opposite ends of the feeding screw, contact pieces, g'' , placed to cooperate with said contact blocks, the sliding bar, R, having studs, d and e , and adapted to alternately operate the contact blocks by its longitudinal movement in opposite directions and provided with stops, c' , arranged to receive the impact of the arch of the saddle as the latter with the parts carried thereby approaches or reaches the limit of its

movement in each direction along the screw, the whole arranged for joint use and operation, substantially as herein set forth.

23. In an autographic telegraph apparatus, the combination of a feeding screw, A, revoluble in opposite directions, means for thus operating the said screw, feed rolls, C, adapted to carry, respectively, a conducting transmitting sheet and a receiving sheet and each provided with a ratchet wheel, m , the pivoted swinging bars, M, carrying pawls, r , and s , at their opposite ends, the slotted transverse bar, N, connecting said swinging bars, the bar, R, extended through the slot of said bar, N, and constructed with opposing inclined planes, f , bearing against the ends of said slot, a traveling nut placed upon and actuated by the feeding screw, a stylus carried by said nut and adapted to traverse the surface of the transmitting sheet, a pen also carried by said nut and adapted to be brought into contact with the receiving sheet while passing over the same, and mechanism for transmitting motion from the feeding screw to the bar, R, when the nut approaches the limit of its movement in either direction upon said screw, the whole arranged for joint use and operation, substantially as herein set forth.

24. In an autographic telegraph apparatus, the combination of a feeding screw, A, revoluble in opposite directions, an electric motor constructed and arranged to rotate alternately in like opposite directions, means for transmitting the motion of the said motor to the said screw duplicate batteries of opposite polarity, means for shifting the said motor from the current of one of said batteries to that of the other to alternate the motion of the motor in opposite directions, feed rolls, C, adapted to carry respectively, a conducting transmitting sheet and a receiving sheet and each provided with a ratchet wheel, m , the pivoted swinging bars, M, carrying pawls, r , and s , at their opposite ends, the slotted transverse bar, N, connecting said swinging bars, the bar, R, extended through the slot of said bar, N, and constructed with opposing inclined planes, f , bearing against the ends of said slot, a traveling nut placed upon and actuated by the feeding screw, a stylus carried by said nut and adapted to traverse the surface of the transmitting sheet, a pen also carried by said nut and adapted to be brought into contact with the receiving sheet while passing over the same, and mechanism for transmitting motion from the feeding screw to the bar, R, when the nut approaches the limit of its movement in either direction upon said screw, the whole arranged for joint use and operation, substantially as herein set forth.

25. In an autographic telegraph apparatus, the combination of a feeding screw, A, revoluble in opposite directions, an electric motor constructed and arranged to rotate alternately in like opposite directions, means for transmitting the motion of the said motor to the said screw duplicate batteries of opposite

polarity, means for shifting the said motor from the current of one of said batteries to that of the other to alternate the motion of the motor in opposite directions, feed rolls, 5 C, adapted to carry, respectively, a conducting transmitting sheet and a receiving sheet and each provided with a ratchet wheel, *m*, the pivoted swinging bars, M, carrying pawls, *r*, and *s*, at their opposite ends, the slotted transverse bar, N, connecting said swinging bars, the bar, R, extended through the slot of said bar, N, and constructed with opposing inclined planes, *f*, bearing against the ends of said slot, a traveling nut placed upon and actuated by the feed- 15 ing screw, a stylus carried by said nut and adapted to traverse the surface of the transmitting sheet, a pen also carried by said nut and adapted to be brought into contact with the receiving sheet while passing over the same, 20 and mechanism for transmitting motion from the feeding screw to the bar, R, when the nut approaches the limit of its movement in either direction upon said screw, separate circuit closing and breaking devices placed at oppo- 25 site ends of the feeding screw, a main line looped or extended to said circuit closing devices, and mechanism for operating said devices alternately from the traveling nut as the latter reaches or approaches the limit in 30 either direction of its movement upon the screw, substantially as herein set forth.

26. In an autographic telegraph apparatus, the combination of a feed roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding or frac- 35 tional rotative movement, a screw revoluble in opposite directions and placed parallel or substantially so with said feed roll, a traveling nut placed upon and operative from said 40 screw, an electric motor revoluble in opposite directions, means for transmitting such alternating movements to the screw, a stylus carried by said nut and an escapement arranged in cooperative relation with the shaft of the 45 motor to synchronize the revolutions of the latter, substantially as and for the purpose herein set forth.

27. In an autographic telegraph apparatus, the combination of a feed roll for carrying a 50 conducting transmitting sheet, means for giving to said roll at intervals a feeding or fractional rotative movement, a screw revoluble in opposite directions and placed parallel or substantially so with said feed roll, a travel- 55 ing nut placed upon and operative from said screw, a stylus carried by said nut, an electric motor revoluble in opposite directions to operate the screw, duplicate batteries of opposite polarity, means for shifting the motor 60 alternately from the current of one battery to

that of the other to reverse the motion of the motor and consequently of the screw, and an escapement arranged in cooperative relation with the motor to synchronize the revolutions of the latter, substantially as and for the pur- 65 pose herein set forth.

28. In an autographic telegraph apparatus, the combination of a feed roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding or frac- 70 tional rotative movement, a screw revoluble in opposite directions and placed parallel or substantially so with said feed roll, a traveling nut placed upon and operative from said screw, an electric motor revoluble in opposite 75 directions, means for transmitting such alternating movements to the screw, a traveling nut placed upon and actuated from said screw, an escapement wheel, T, fast on the shaft of the motor, a pallet, T', having a stem *p*², and 80 arranged to cooperate with said wheel, an electro-magnet, G', an armature, *r*, having a conducting arm, *r*^x, a rod, G'', to connect the stem of the pallet with the arm of the armature, a conducting stud, H'', and a spring, *t*^x, 85 for throwing the armature from the electro-magnet, the whole arranged for joint use and operation, substantially as and for the purpose herein set forth.

29. In an autographic telegraph apparatus, 90 the combination of a feed roll for carrying a conducting transmitting sheet, means for giving to said roll at intervals a feeding or fractional rotative movement, a screw revoluble in opposite directions and placed parallel or 95 substantially so with said feed roll, a traveling nut placed upon and operative from said screw, a stylus carried by said nut, an electric motor revoluble in opposite directions to operate the screw, duplicate batteries of op- 100 posite polarity, means for shifting the motor alternately from the current of one battery to that of the other to reverse the motion of the motor and consequently of the screw, an es- 105 capement wheel, T, fast on the shaft of the motor, a pallet, T', having a stem, *p*², and arranged to cooperate with said wheel, an electro-magnet, G', an armature, *r*, having a con- 110 ducting arm, *r*^x, a rod, G'', to connect the stem of the pallet with the arm of the armature, a conducting stud, H'', and a spring, *t*^x, for throwing the armature from the electro-magnet, the whole arranged for joint use and operation, substantially as and for the purpose herein set forth.

JOHN O'NEIL.

Witnesses:

JNO. C. MCQUHAL,
AARON BECKER.