No. 705.227. Patented July 22, 1902.

T. M. FOOTE.

PRINTING TELEGRAPH.

(Application filed Mar. 11, 1901.)

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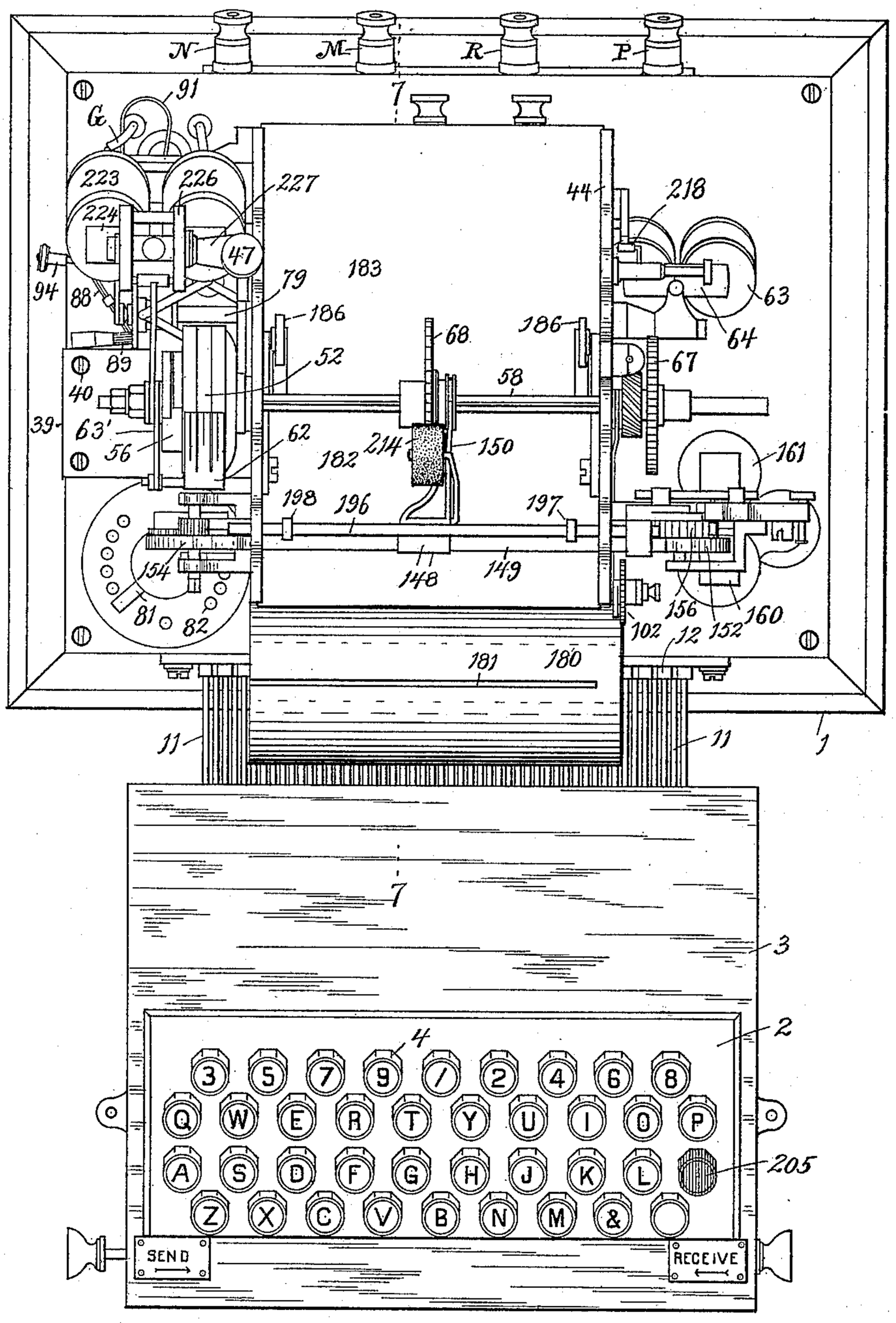

Fig. 1.

Witnesses.
C. N. Keeney.
Anna C. Faust.

Inventor.
Theodore M. Foote
By Benedict, Thorsell
Attorneys.

No. 705,227. Patented July 22, 1902.

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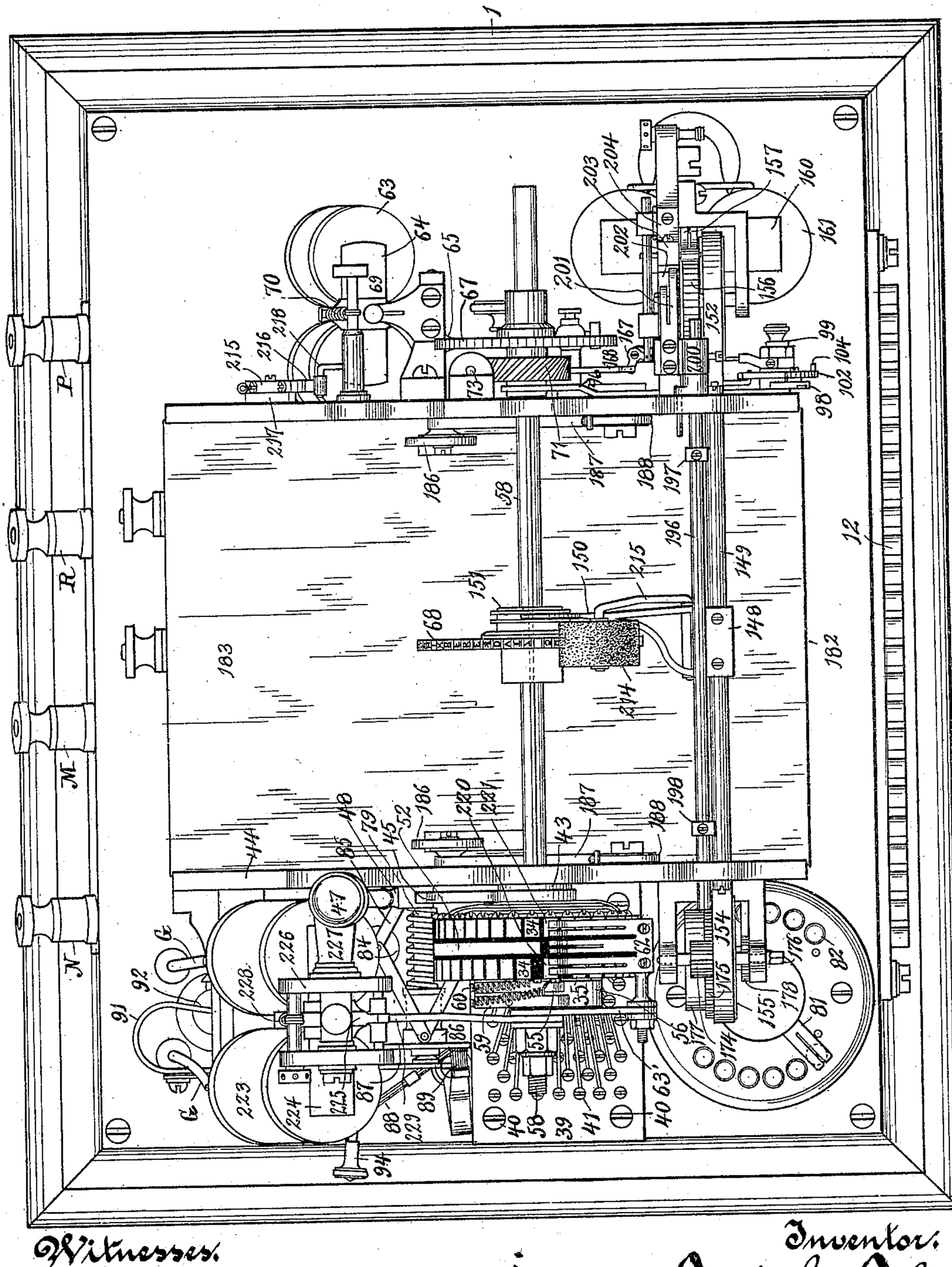

Witnesses:
A. F. Keeney.
Anna C. Faust.

Fig. 2.

Inventor:
Theodore M. Foote
By Benedict & Morsell
Attorneys.

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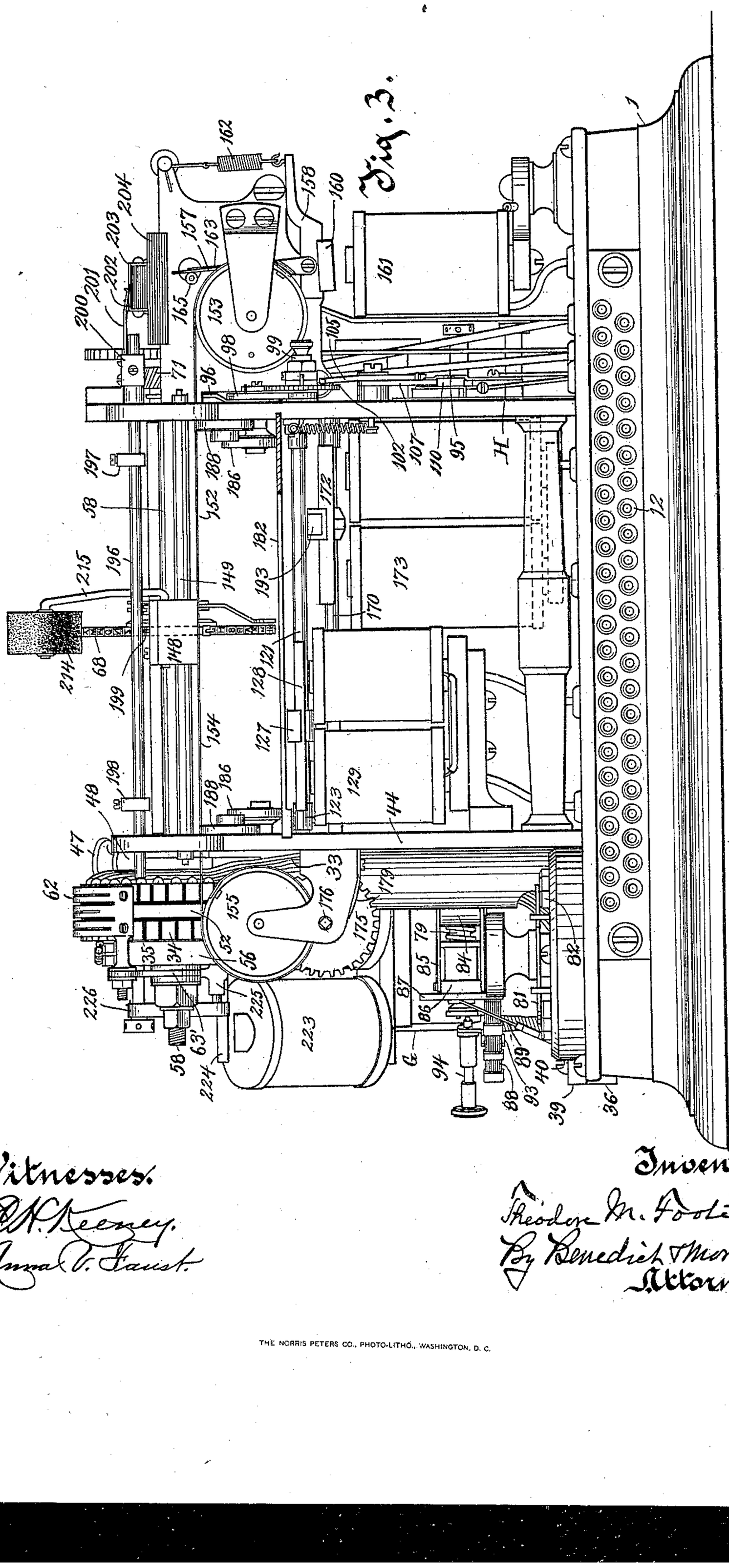
(Application filed Mar. 11, 1901.)

(No Model.) 14 Sheets—Sheet 3.



Witnesses.
A. F. Keeney.
Anna V. Faust.

Inventor.
Theodore M. Foote
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No. 705,227. Patented July 22, 1902.

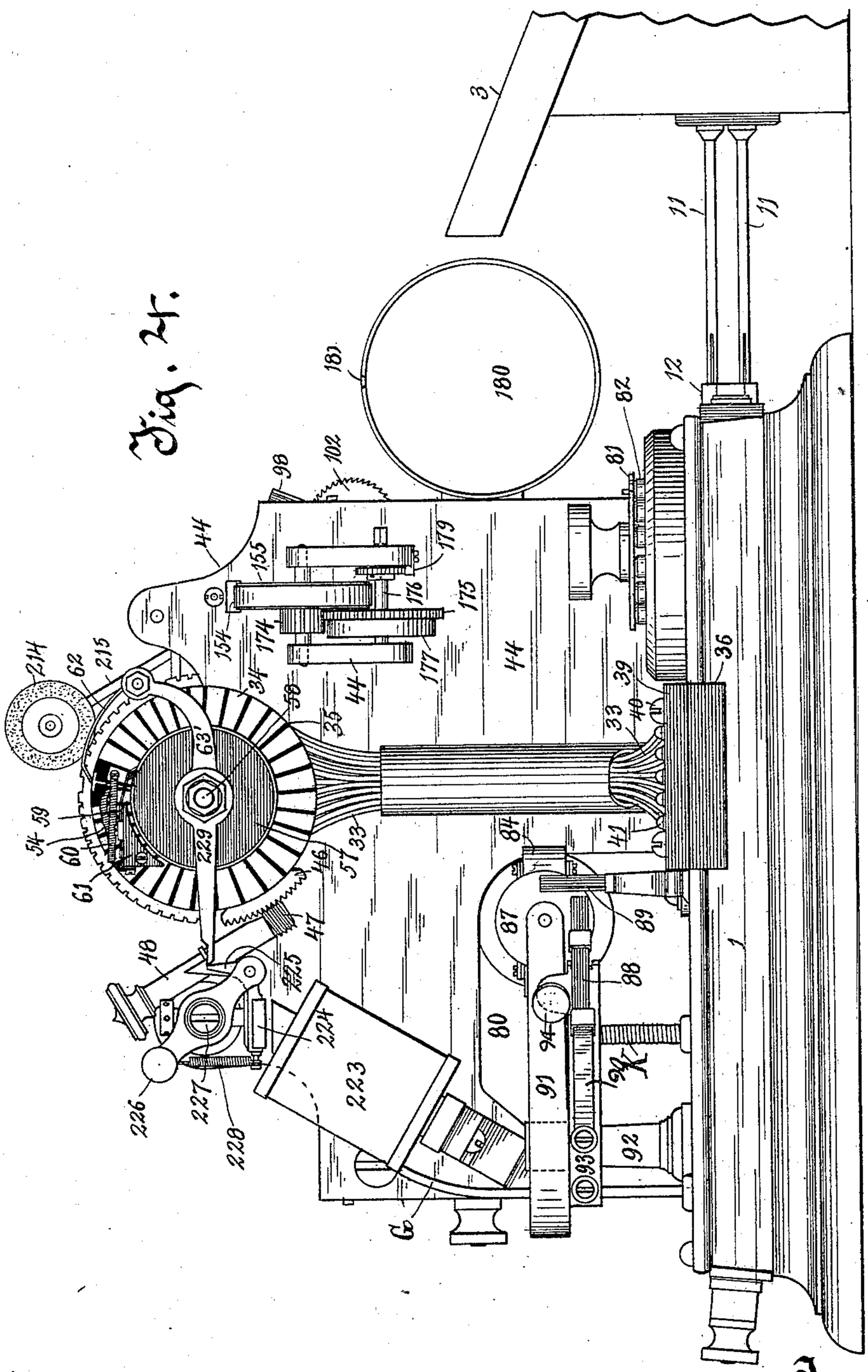
T. M. FOOTE.

PRINTING TELEGRAPH.

(Application filed Mar. 11, 1901.)

(No Model.) 14 Sheets—Sheet 4.

Fig. 2.



Witnesses.
O. K. Keeney.
Anna C. Faust.

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No. 705,227. Patented July 22, 1902.

T. M. FOOTE.

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(Application filed Mar. 11, 1901.)

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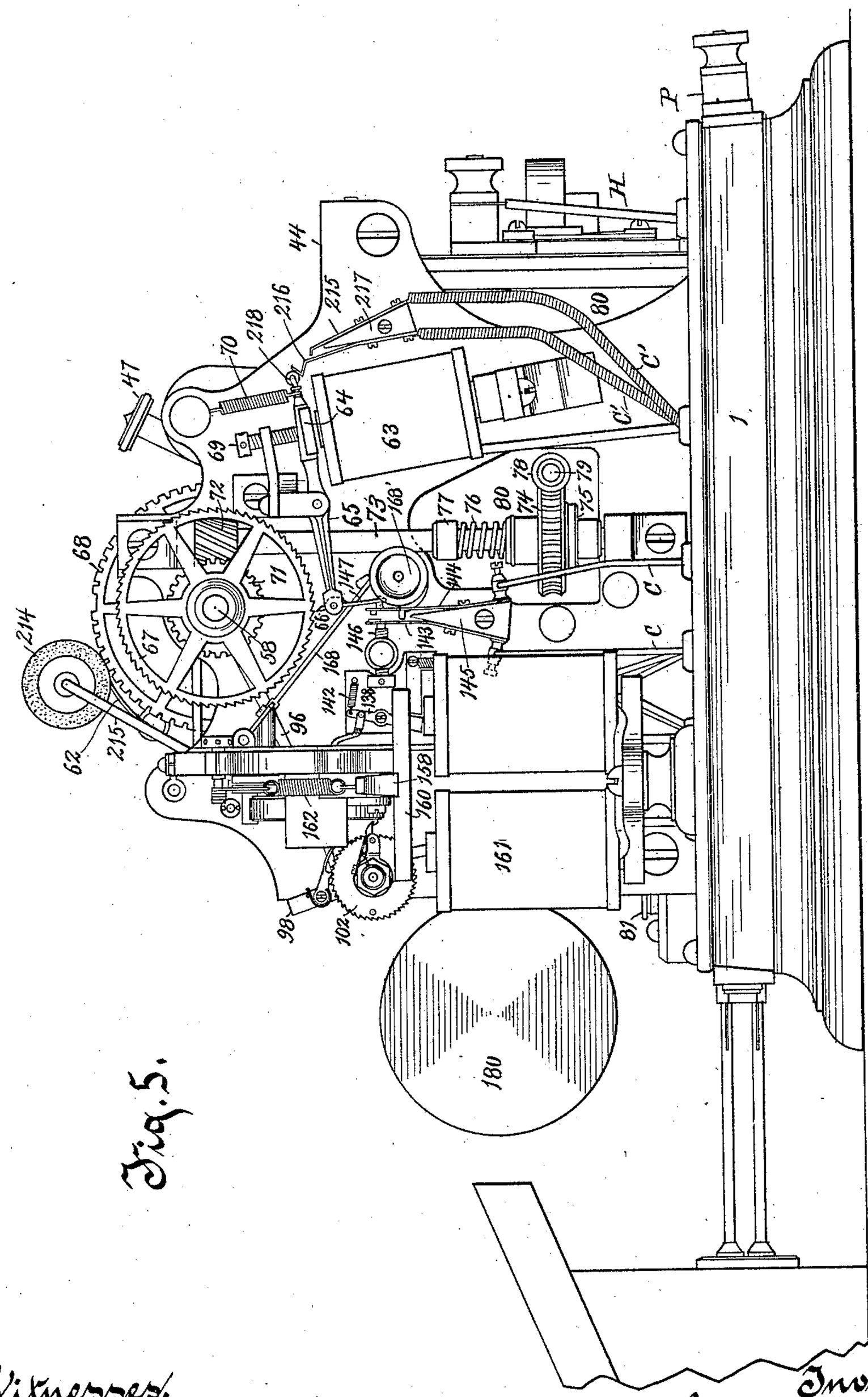

Fig. 5.

Witnesses:
C. F. Keeney.
Anna V. Faust.

Inventor.
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No. 705,227. Patented July 22, 1902.

T. M. FOOTE.

PRINTING TELEGRAPH.

(Application filed Mar. 11, 1901.)

(No Model.) 14 Sheets—Sheet 6.

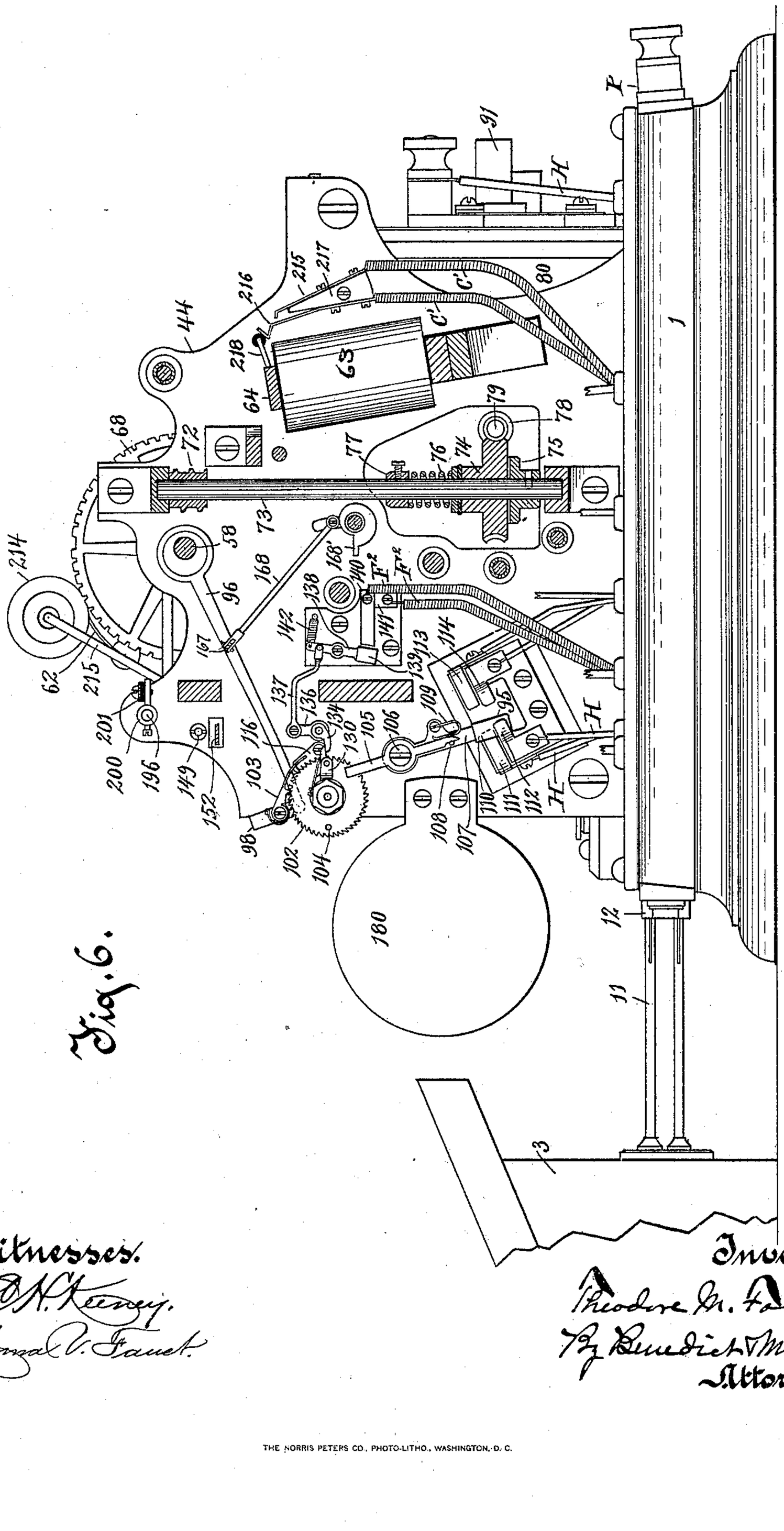

Fig. 6.

Witnesses.
C. N. Kenney.
Arnal V. Faust.

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No. 705,227. Patented July 22, 1902.

T. M. FOOTE.

PRINTING TELEGRAPH.

(Application filed Mar. 11, 1901.)

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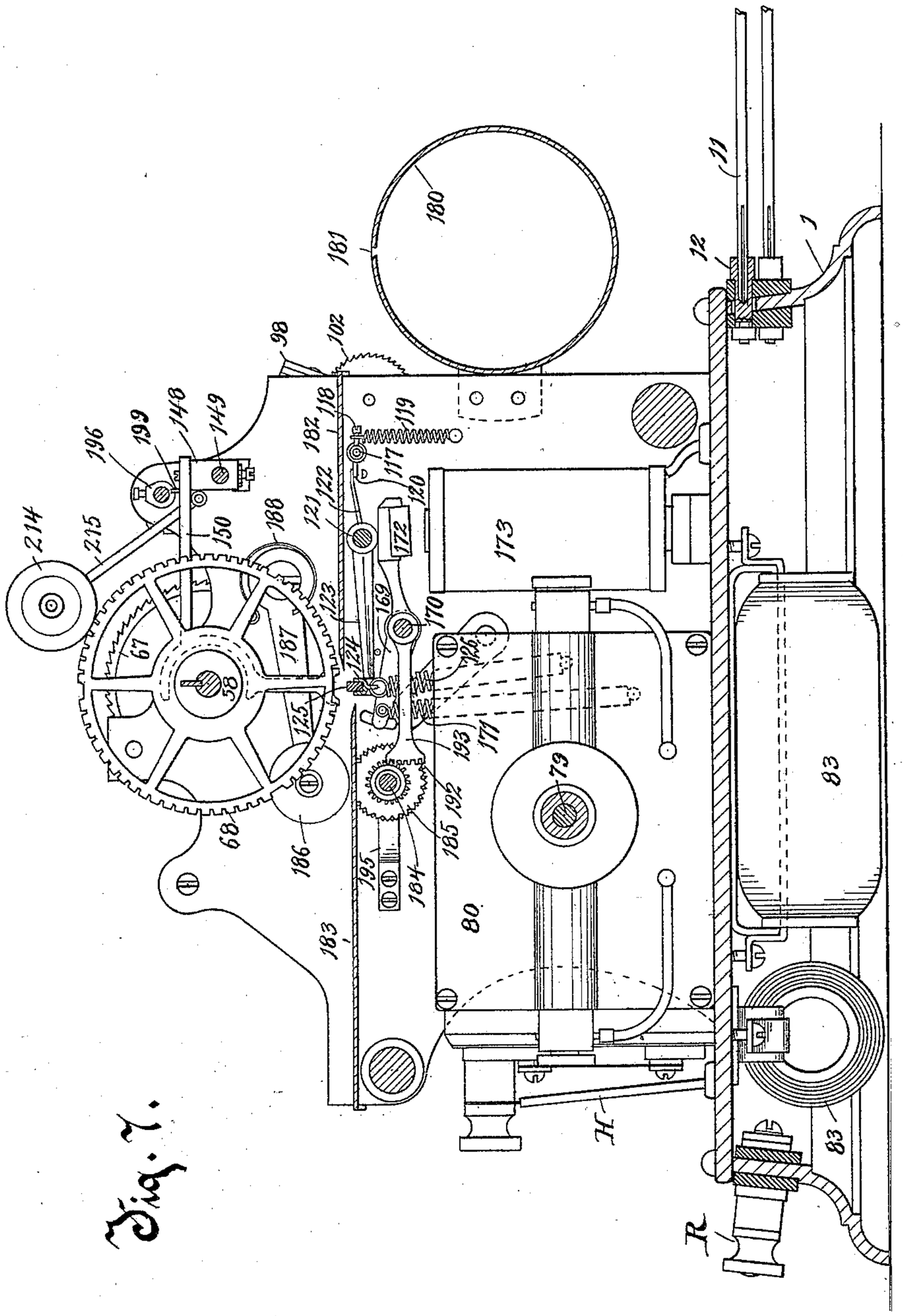

Fig. 7.

Witnesses.
C. F. Keenan,
Anna C. Faust.

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No. 705,227. Patented July 22, 1902.

T. M. FOOTE.

PRINTING TELEGRAPH.

(Application filed Mar. 11, 1901.)

(No Model.)

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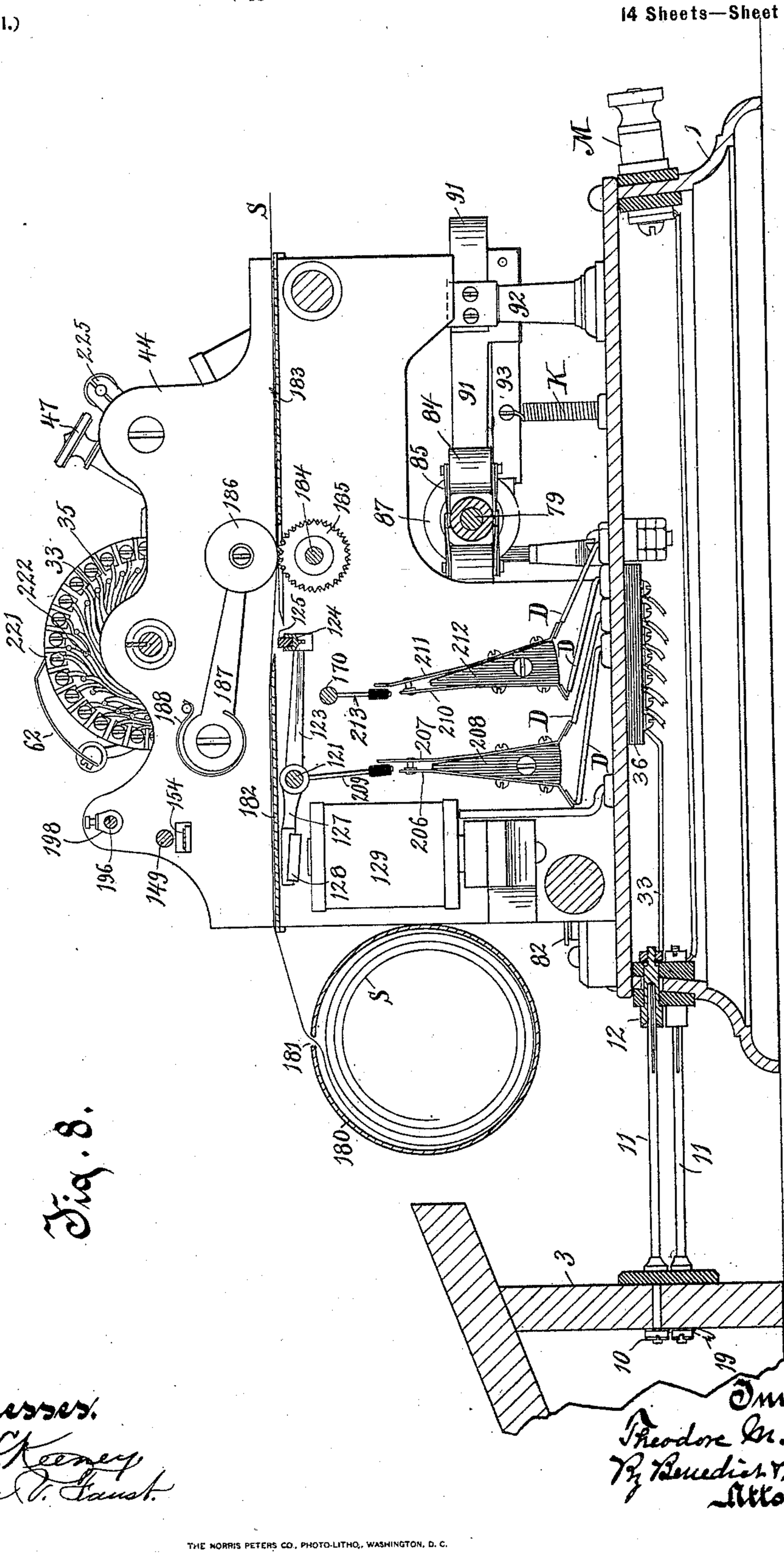

Fig. 8.

Witnesses:
C. F. Keeney
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No. 705,227. Patented July 22, 1902.

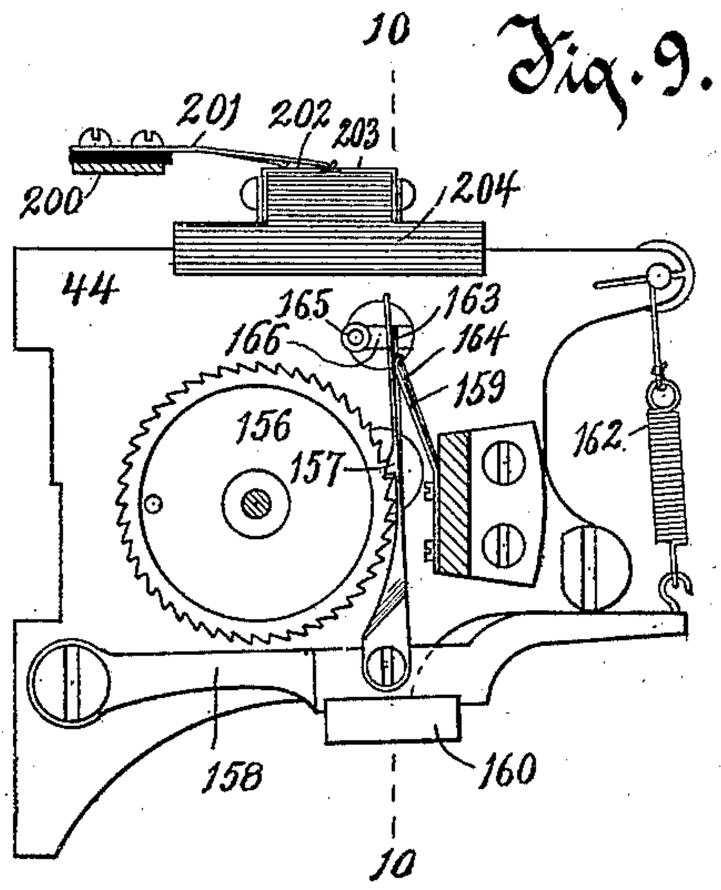
T. M. FOOTE.

PRINTING TELEGRAPH.

(Application filed Mar. 11, 1901.)

(No Model.) 14 Sheets—Sheet 9.

Fig. 9.



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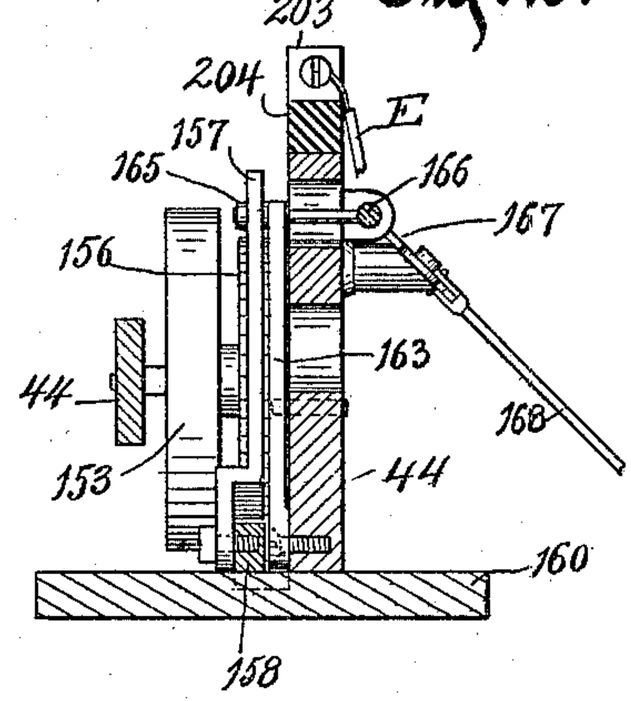


Fig. 11.

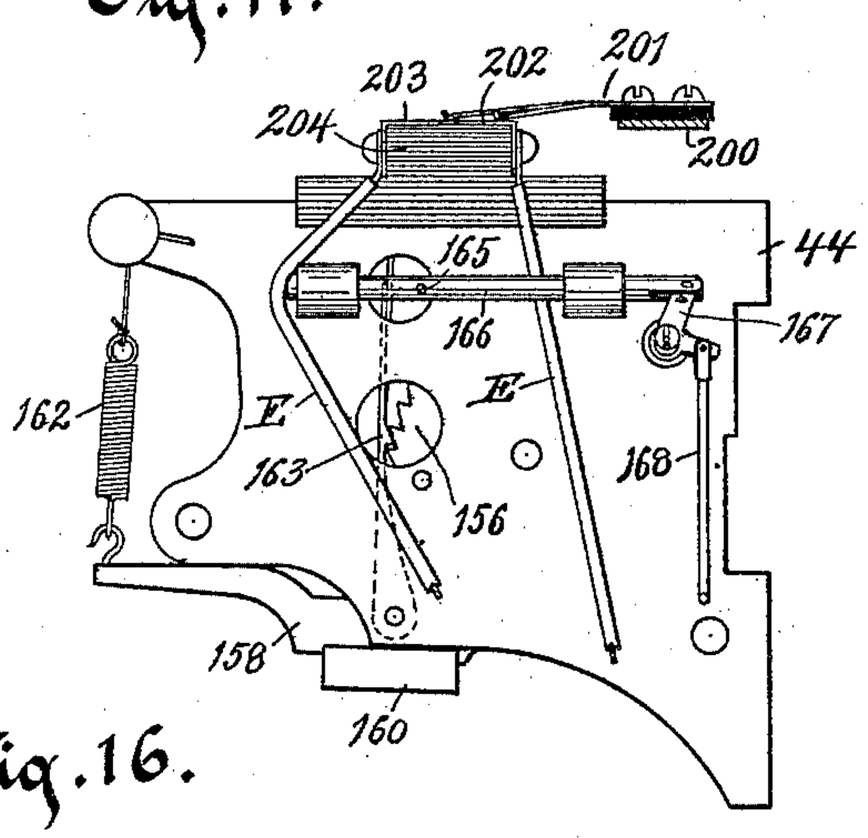


Fig. 12.

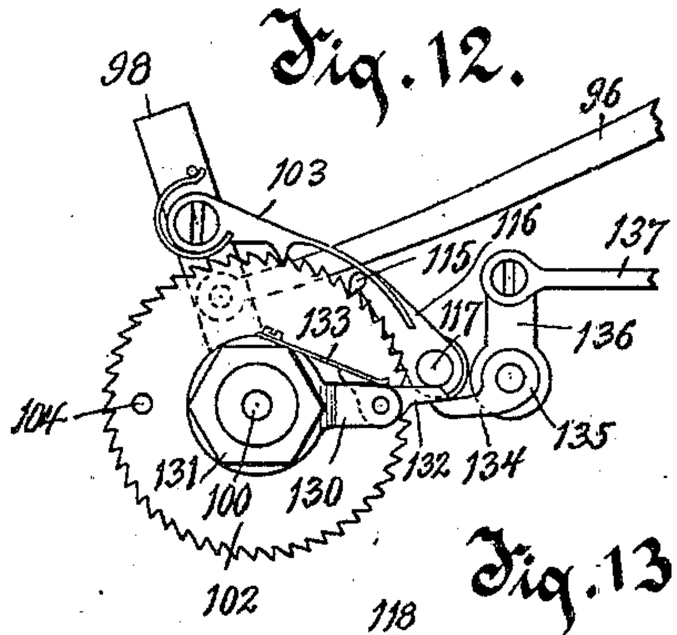


Fig. 13.

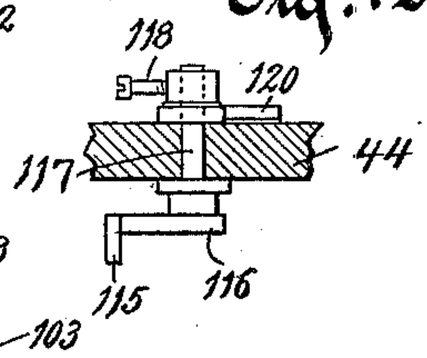
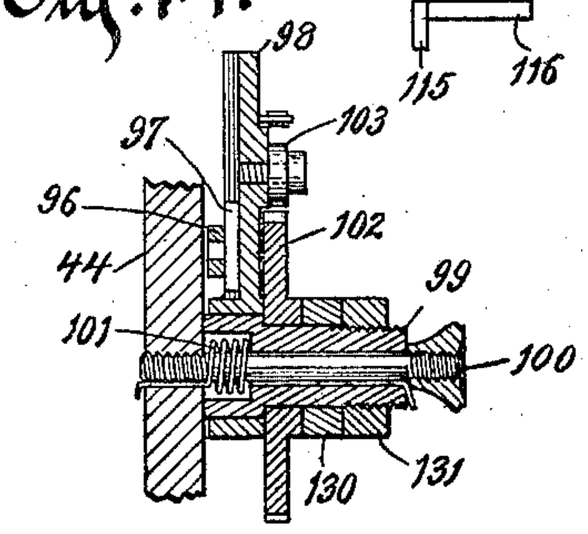


Fig. 14.



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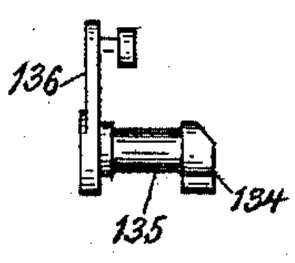

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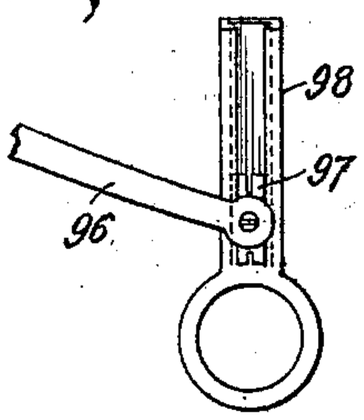

Witnesses:
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No. 705,227. Patented July 22, 1902.

T. M. FOOTE.

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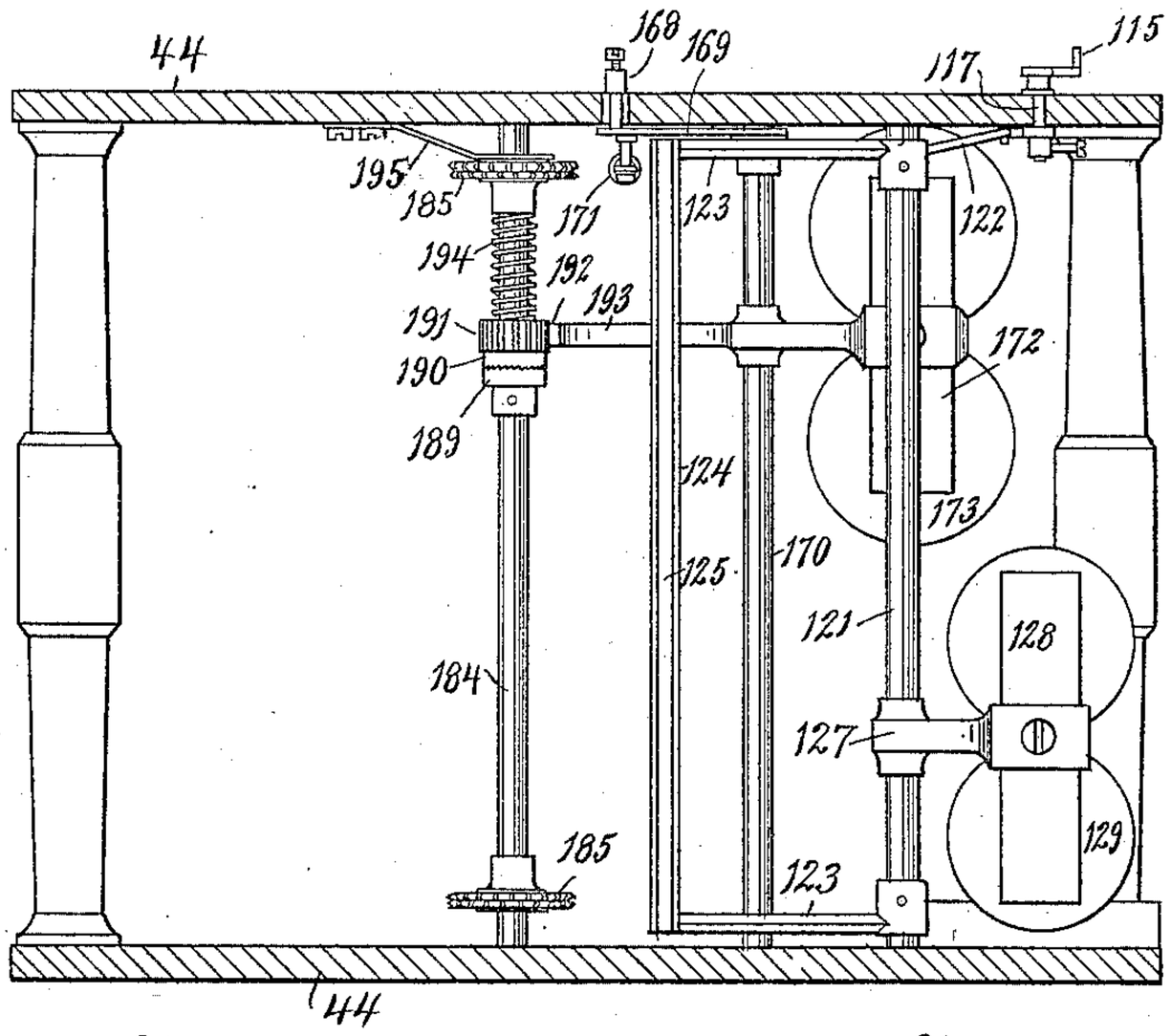
(Application filed Mar. 11, 1901.)

(No Model.) 14 Sheets—Sheet 10.

Fig. 17.



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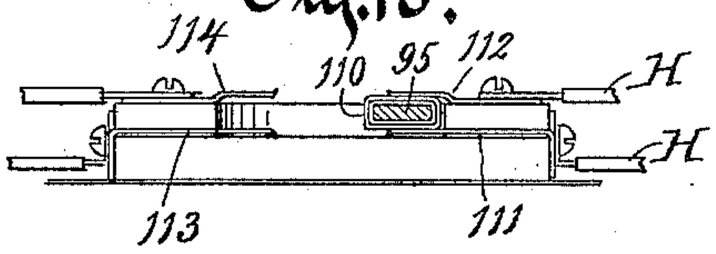

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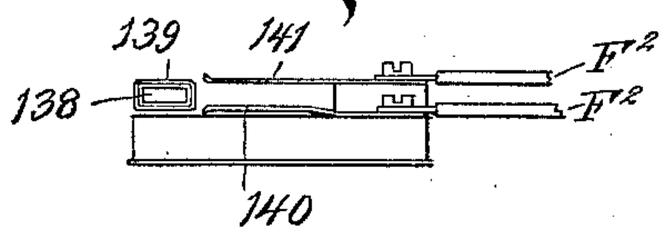

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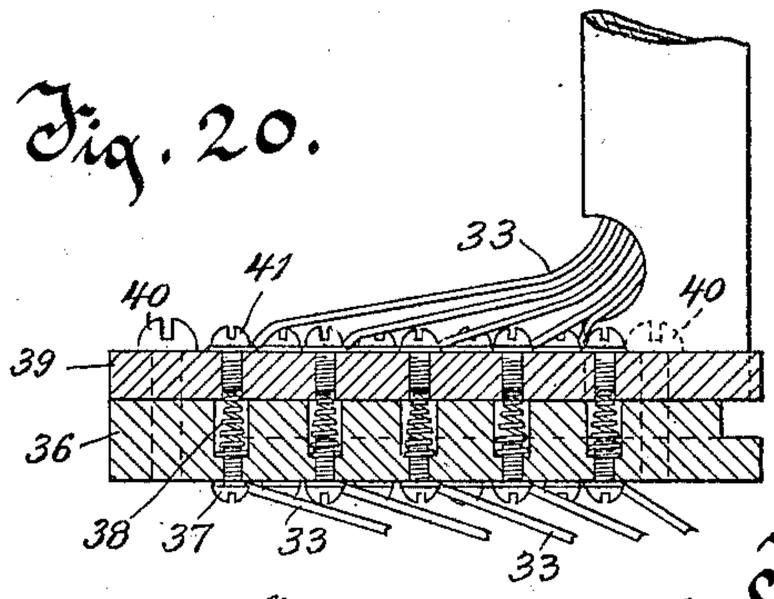

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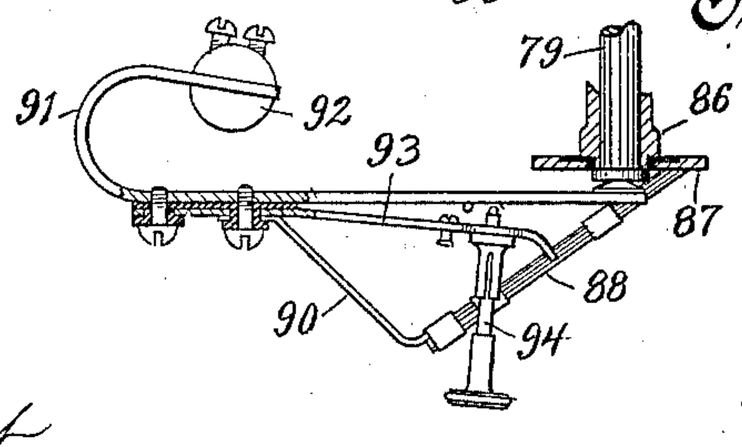

Witnesses.
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No. 705,227. Patented July 22, 1902.

T. M. FOOTE.

PRINTING TELEGRAPH.

(Application filed Mar. 11, 1901.)

(No Model.) 14 Sheets—Sheet II.

Fig. 22.

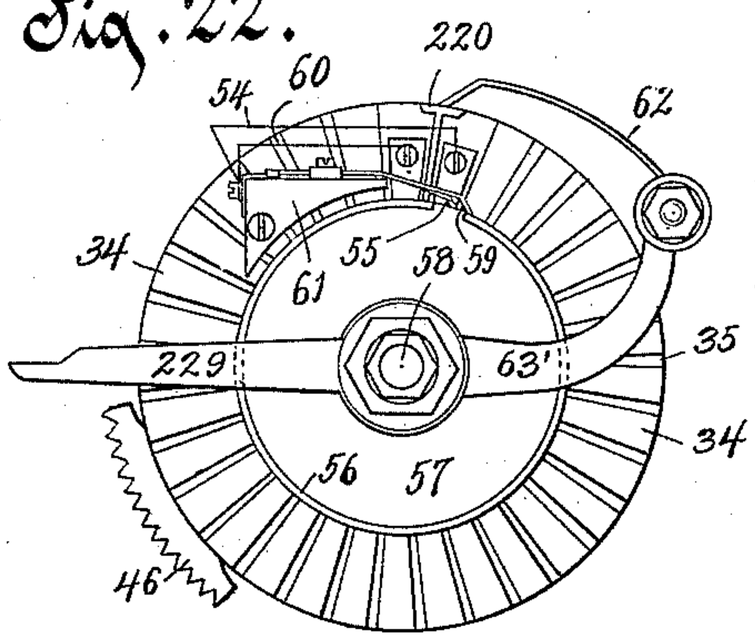


Fig. 23.

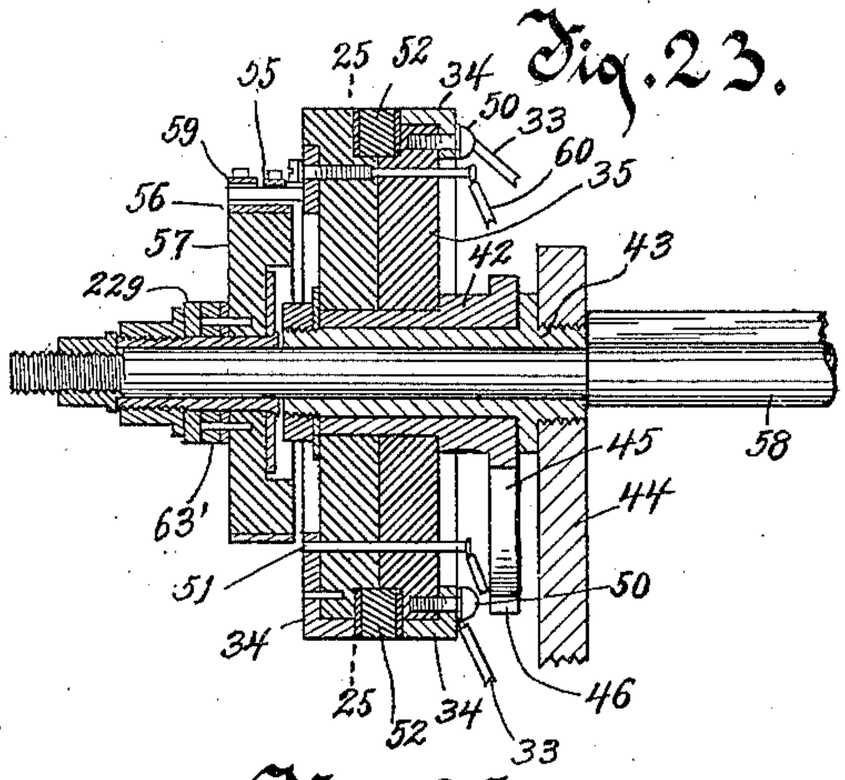
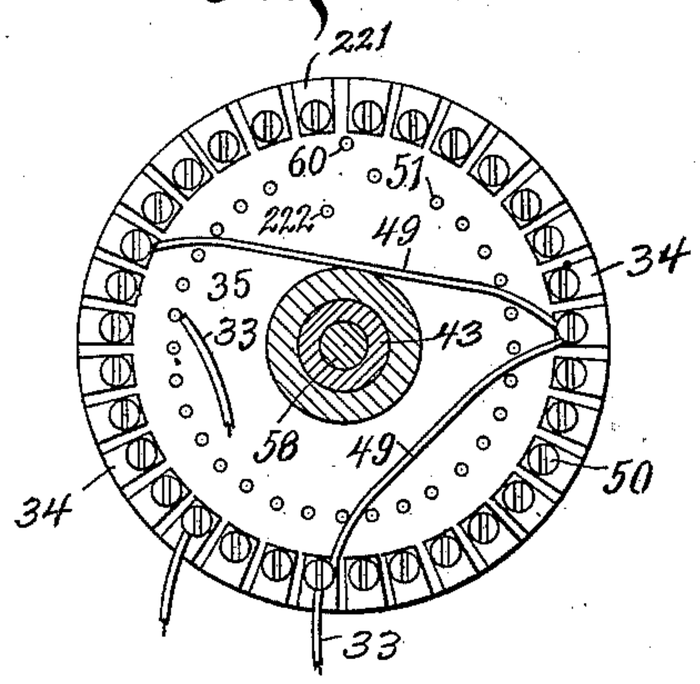


Fig. 24.



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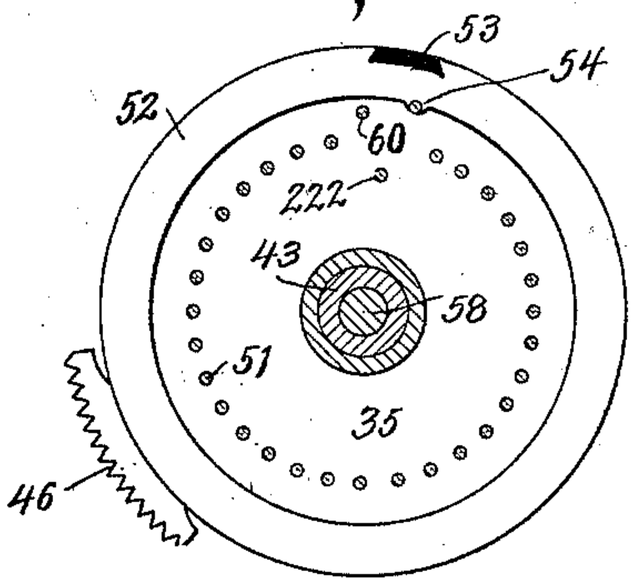

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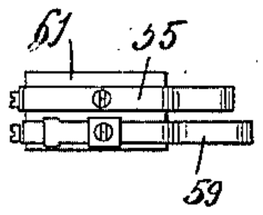


Fig. 26.

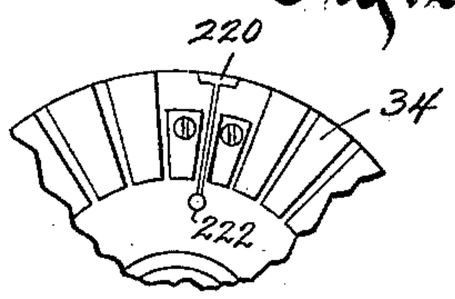


Fig. 28.

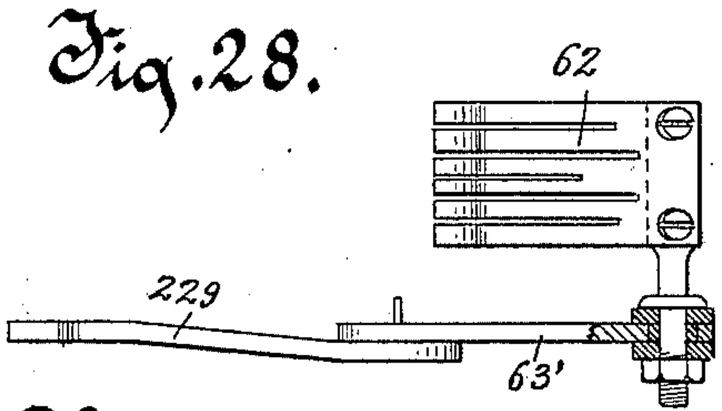
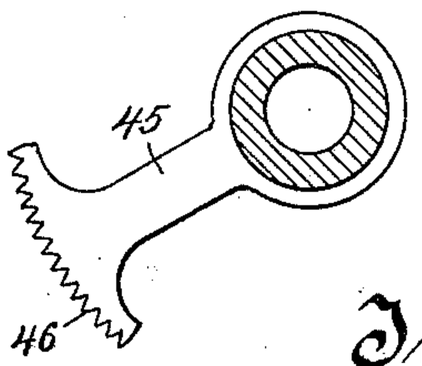


Fig. 27.



Witnesses:
C. N. Keeney.
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Inventor.
Theodore M. Foote
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Attorneys.

No. 705,227. Patented July 22, 1902.

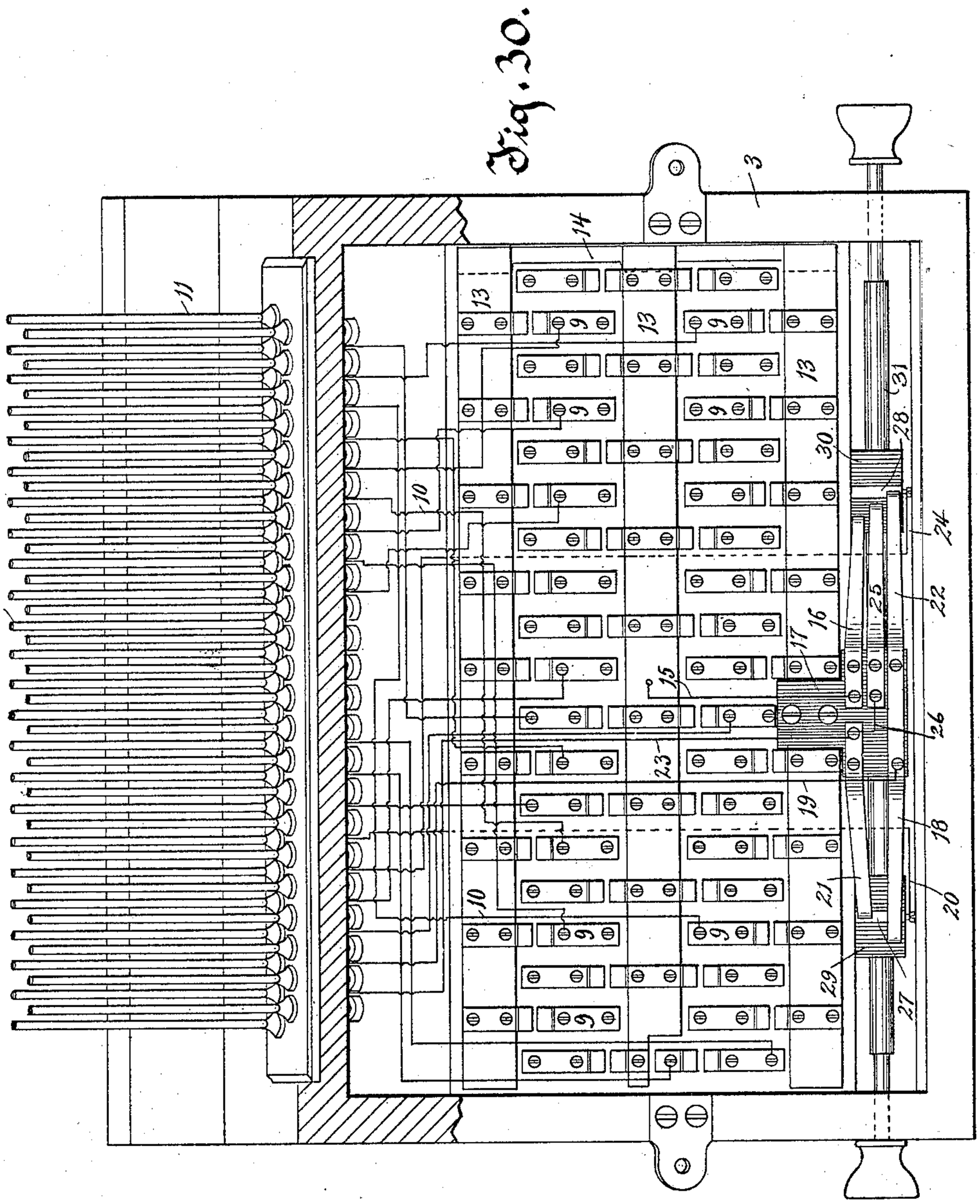
T. M. FOOTE.

PRINTING TELEGRAPH.

(Application filed Mar. 11, 1901.)

(No Model.) 14 Sheets—Sheet 12.

Fig. 30.



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T. M. FOOTE.

PRINTING TELEGRAPH.

(Application filed Mar. 11, 1901.)

(No Model.) 14 Sheets—Sheet 13.

Fig. 31.

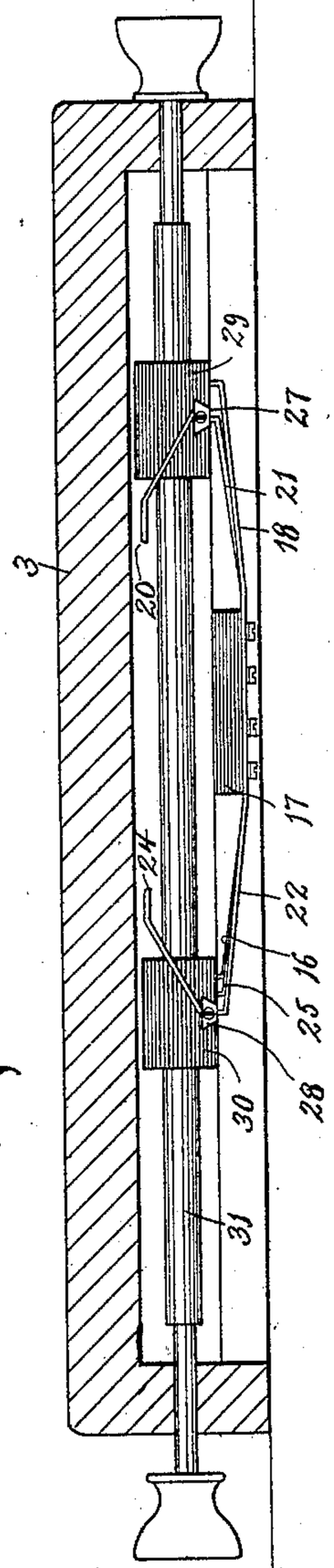


Fig. 32.

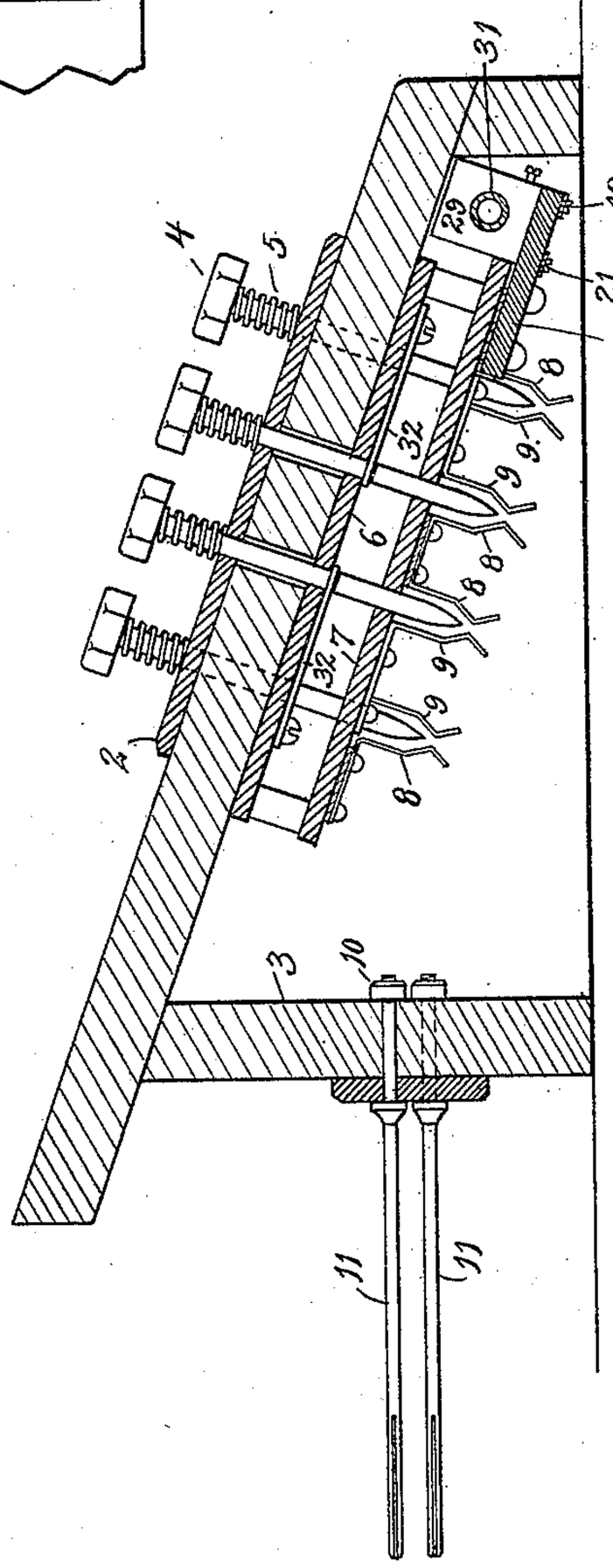
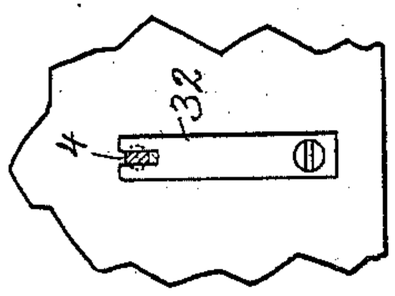


Fig. 33.



Witnesses:
C. H. Keeney.
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Inventor.
Theodore M. Foote
By Benedict & Morsell
Attorneys.

No. 705,227. Patented July 22, 1902.

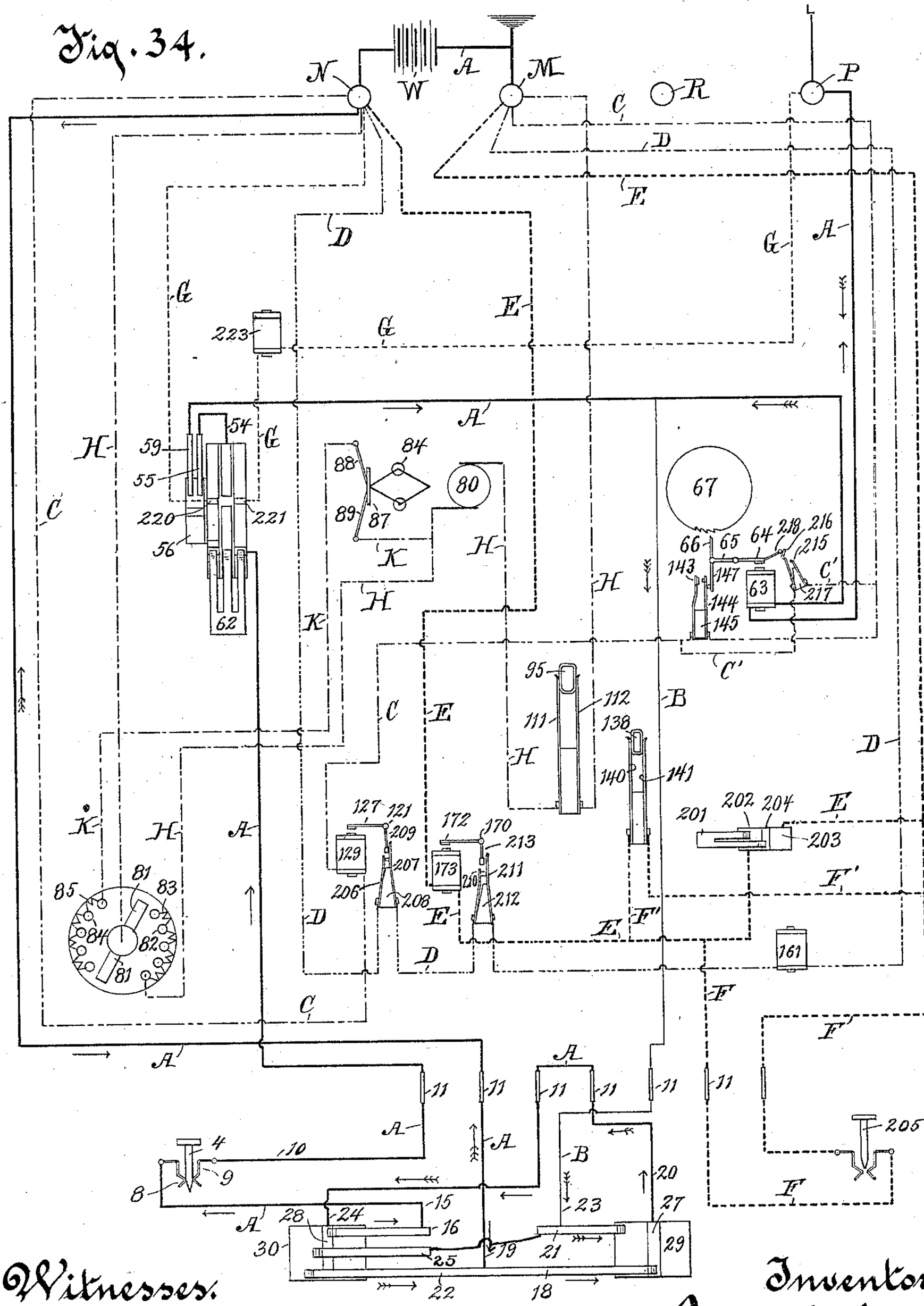
T. M. FOOTE.

PRINTING TELEGRAPH.

(Application filed Mar. 11, 1901.)

(No Model.) 14 Sheets—Sheet 14.

Fig. 34.



Witnesses.
C. K. Keeney.
Anna V. Faust.

Inventor.
Theodore M. Foote
By Benedict Howell
Attorneys.

UNITED STATES PATENT OFFICE.

THEODORE M. FOOTE, OF BROOKLYN, NEW YORK, ASSIGNOR TO WESTERN TELEGRAPH TYPEWRITING MACHINE COMPANY, A CORPORATION OF NEW JERSEY.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 705,227, dated July 22, 1902.

Application filed March 11, 1901. Serial No. 50,648. (No model.)

To all whom it may concern:

Be it known that I, THEODORE M. FOOTE, residing at Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Printing-Telegraphs, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention relates to improvements in machines adapted for transmitting messages electrically between distant points and for receiving and printing such transmitted messages in words or characters.

The invention includes improved means both for transmitting messages by or through a suitable electric conductor, as a wire, and for receiving such transmitted messages and printing them on paper or suitable material.

The invention consists of the novel machine and apparatus and the parts and combinations thereof, as herein described and claimed, and the equivalents thereof.

In the drawings, Figure 1 is a top plan view of my improved machine, the features being shown in a general way, details and small parts being omitted or merely indicated in outline. Fig. 2 is a top plan view, on larger scale, of my improved machine other than the paper-holder and the keyboard and parts directly connected with the keyboard. Fig. 3 is an elevation of that portion of my improved machine shown in plan in Fig. 2, the view being of that side of the machine which is at the front in Fig. 2. Fig. 4 is an elevation at the left of that portion of the machine shown in plan in Fig. 2, including also the paper-holder and a fragment of the keyboard frame or case and related parts. Fig. 5 is an elevation at the right of Fig. 2, showing substantially the other end of the machine from that shown in Fig. 4. Fig. 6 is an elevation at the right of Fig 2, being a view substantially the same as Fig. 4; but in this view the electromagnets at the front in Fig. 5 are omitted and the mechanism immediately behind the electromagnets is illustrated instead. Fig. 7 is a vertical section on line 7 7 of Fig. 1 toward the right. Fig. 8 is a vertical section on line 7 7 of Fig. 1 toward the left. Fig. 9 is a side view of mechanism shown at the right and near the front in Fig. 2 and is chiefly mechanism employed in and about the feed of the paper and the shifting of the type-wheel. Fig. 10 is a section on line 10 10 of Fig. 9. Fig. 11 is a view of the construction on the other side of the mechanism shown in Fig. 9 and of related parts. Fig. 12 is a view of a device shown at the right and in front on Fig. 2 employed in the control of the motor electric circuit and in the shifting of the type-wheel. Figs. 13, 14, 15, and 16 are details of the device or mechanism shown combined in Fig. 12. Fig. 17 is a horizontal section looking downwardly from just below the paper-supporting table, Figs. 7 and 8, the electric motor being omitted from the view. Figs. 18 and 19 are details of an electric switch located adjacent to and operated by the device of Fig. 12 for opening and closing the motor-circuit. Fig. 20 shows, partly in section, a connecting or binding device (seen in Fig. 4) for connecting the electric wires leading from the keyboard to the insulating-disk. Fig. 21 is a detail, partly in section, of a device employed in the motor electric circuit for maintaining the circuit under conditions that would otherwise break the circuit. The device is employed in connection with a governor on the motor-shaft for breaking the motor electric circuit. Fig. 22 is a side view of the insulating-disk with some related mechanism. Fig. 23 is a central section of the insulating-disk shown in Fig. 22 and of related mechanism. Fig. 24 is a view of the reverse side of the insulating-disk shown in Fig. 22. Fig. 25 is a transverse section of the insulating-disk on lines of separation of parts, as indicated at 25 25 on Fig. 23. Fig. 26 shows a fragment of the insulating-disk and partly devices employed inclosing the electric circuit to the electric ring set in the insulating-disk and a unison device. Fig. 27 shows a segmental rack secured to and adapted for the adjustment of the insulating-disk. Fig. 28 is a detail of the brush circuit-closer that sweeps the periphery of the insulating-disk, including the electric contact-pieces and electric ring mounted therein, with the means by which the brush is supported. Fig. 29 is a detail of a circuit-closing device mounted on the insulating-disk.

The relation of this device to the disk is shown in Figs. 4 and 22. In some of the drawings the insulating material is shown light, because the amount thereof being great if shown in black or even in heavy shade-lines the drawings would be too black for clear illustration or for suitable reproduction as required by the Patent Office. Fig. 30 is a view of the under side of the keyboard and related parts. Fig. 31 is a detail of the combination-switch employed with the electric wires of the keyboard, the frame of the keyboard being in section. Fig. 32 is a transverse section of the keyboard and its frame, showing also details of the keys and circuit-closers and coupling-up devices. Fig. 33 is a detail of a device for obviating the improper turning of the keys, and Fig. 34 is a diagram of the electric system employed with and forming a part of my invention.

The construction and operation of my improved machine are such that one machine may be located at one station on an electric line or telegraph wire and another machine or machines may be located at another or other stations on the line distant from the first station, and each machine is adapted for transmitting a message electrically over the line to the other station or stations, to be there received and printed by the duplicate machine. In use the several machines on the line are so connected up to the line electrically as to be in position for receiving and printing a message, and any one desiring to send a message over the line by means of these instruments has merely to shift a switch at the transmitting-station, putting the machine at that station in condition for transmitting a message, and thereupon by successively depressing the keys representing the characters desired to be transmitted to and printed at the distance station substantially in the manner of depressing keys on type-writing or similar machines puts the machine at the transmitting-station and the one at the receiving-station into operation and transmits the message to the receiving-station, which is there printed on paper or other suitable material without the presence of any person at the receiving-station. On finishing the transmission of the message the switch is again shifted, putting the machine at the transmitting-station into condition for receiving a message, so that, as before, all the machines on the line are normally in condition for receiving a message.

Referring now to the electric system forming a part of my invention and shown in diagram in Fig. 34, A represents the transmitting-circuit, which leads from the ground through a battery W to the line-wire, the line being shown as closed and the direction of the circuit through the machine being indicated by arrows with single barbs.

B indicates a shunt or branch of circuit A employed in receiving messages, the direction of the circuit through this shunt being indicated by arrows with a feather.

C indicates the printing-circuit, which is auxiliary to the circuit A and is employed for actuating the printing devices. It is connected to the circuit A through binding-posts M and N.

C′ is a shunt of circuit C.

D is the type-wheel-shifting circuit. This also is connected to the circuit A through the binding-posts M and N.

E is a paper-feed circuit connected to the circuit A through binding-posts M and N.

F is a shunt or branch circuit of the paper-feed circuit E.

F′ is a second shunt of the circuit E.

G indicates the synchronizing-circuit, connected to the circuit A through the binding-posts N and P.

H indicates the motor-circuit and is connected to the circuit A through the binding-posts M and N.

K is a shunt-circuit of the motor-circuit H.

R is a binding-post shown on the machine, but not necessarily required, being convenient for use in case of emergency in place of or for similar use as post P, M, or N.

The several electric circuits as thus described include therein operative parts of the machine, which will be described in detail hereinafter.

In the drawings, 1 is a base on which the principal members of the machine, and especially all those parts of the machine that relate to receiving a message and printing it, are supported.

2 is the keyboard, which is provided with a suitable frame or base 3 and is represented as located adjacent to the base 1, the construction being such that the keyboard, including its frame, can readily be separated from the principal machine and its base. This construction, by which the keyboard is made detachable from the principal machine, is not a necessary construction, but is preferred for convenience. The keyboard is, however, to be considered as an essential portion of the machine as a whole. The keyboard is provided with any desired number of keys 4, representing advisably the several letters of the alphabet, the numerals, and such other characters as are most usually employed in printing, though the keys may, if preferred, be made to represent stenographic or other characters.

In the drawings, Fig. 1, the letters or characters represented by the keys there shown are for convenience placed on the finger-pieces of the keys. The keys are advisably mounted to move endwise in the keyboard, as shown in Fig. 32, being in such form held in their initial positions by means of springs 5. The stems of the keys are of metal suitably insulated, preferably, in and by their mountings, which may consist of the hard-rubber keyboard 2 and plates 6 and 7, secured to the

frame. The keys are prevented from rotation in their bearings by insulated plates 32, secured to the frame 3, which plates are provided with recesses forming furcate ends that straddle and bear against flattened sides of the stems of the keys, and thus prevent them from turning in their bearings. Each key is adapted when depressed to contact as a plug with a metal electric terminal 8 and with an adjacent metal electric terminal 9, forming an electric contact and circuit closer from one terminal to the other. Each of these terminals 9, preferably of copper, Figs. 30, 32, is connected electrically to a wire 10, leading to a metal coupling-pin 11, the wires and pins forming a part of the electric circuit A. These wires and pins are mounted on the keyboard-frame 3, the pins being adapted to enter detachably and to contact electrically with socketed terminals 12, Figs. 1, 3, 8, fixed in the base 1. The wires 10, the pins 11, and the terminals 12 are suitably insulated in their supports. The pins 11 are preferably split at their free ends, and the furcate parts are sprung apart slightly, whereby they are adapted when inserted in the terminals 12 to insure electric contact therewith. In the drawings, Fig. 30, a few of the terminals 9 are shown as connected by wires 10 to the pins 11, the wires for the remaining terminals being omitted to avoid confusion in illustration. The pins 11 and the socketed terminals 12 are the means provided for making detachable electric connections between the keyboard devices and those on the base 1 and are employed for this purpose with all the electric connections between these two parts of the machine.

Each of the metal terminals 8, Figs. 30, 32, is in contact electrically with one or the other of the metal (copper) strips 13, which are secured to the frame 3 of the keyboard and are connected together electrically by a metal strip 14, forming a common electric conductor. The strips 13 and 14 are insulated on the frame 3, conveniently by being secured to the insulating-plate 7. This common conductor is connected electrically by a wire 15 to a metal electric-circuit closer 16, fixed on an insulating-block 17, which block is secured to the frame 3. Another metal electric-circuit closer 18, also secured to the block 17, projects in a reverse direction therefrom. This circuit-closer 18 is connected electrically by a wire 19 to a pin 11, the circuit-closer, the wire, and pin forming a part of electric circuit A, leading to the battery and ground.

The circuit-closers 16 and 18, Figs. 30, 31, 34, are employed actively in sending messages. Two other metal electric-circuit closers 21 and 22, both mounted on the block 17, are employed in receiving messages. The circuit-closer 22 is also connected electrically to the wire 19, and therefore is preferably made integral with the circuit-closer 18. The circuit-closer 21 is connected electrically to the wire 23, leading to a pin 11, which enters a socketed terminal 12, connected to a wire leading into the circuit A, the circuit-closer 21, the wires, the pin, and the socketed terminal forming a part of the electric circuit B. Another metal electric-circuit closer 25, also mounted on the block 17, is connected by a wire 26 to the circuit-closer 21. This circuit-closer 25 and its connections are a part of an electric starting-circuit hereinafter to be described.

The combination electric switch for opening and closing circuits to which the electric-circuit closers 16, 18, 21, 22, and 25 belong includes also the metal strips or electric terminals 27 and 28, respectively mounted in blocks 29 and 30 of insulating material, which blocks are mounted on a rod 31, slidable endwise in and through the keyboard-frame 3. This rod is preferably provided with terminal finger-knobs.

The electric-circuit closers 21 and 22 are so disposed as to contact electrically concurrently with the terminals 27 and 28, and the circuit-closers 16 and 18 contact concurrently with the terminals 27 and 28, but not synchronously with the contact of the circuit-closers 21 and 22 with the same terminals. The circuit-closer 25 contacts with terminal 28 for an instant during the shifting of the switch from its position for receiving a message (the position shown in Fig. 30) to the position for sending a message, Fig. 34, the contact occurring just previous to the circuit-closer 16 being brought into electric contact with the terminal 28. These electric terminals 27 and 28 are connected to and form a part of the circuit A, being immediately connected thereto by local wires 20 and 24, leading to coupling-pins 11, all forming a part of the circuit A.

The several socketed terminals 12, Figs. 3, 8, that are connected electrically through pins 11 and their connections to the character-keys on the keyboard, are also connected electrically to local wires 33, forming a part of the circuit A, which wires lead to metal segmental contact-pieces 34, Figs. 2, 3, 4, 8, 22, 24, disposed in radial series in a disk 35, composed of insulating material. A plurality of series of contact-pieces about the disk are preferably employed, thereby permitting of the use of a smaller disk than would be required if the entire number of the contact-pieces were mounted in a single series around the periphery of a disk. The contact-pieces 34 34 in the two series are preferably arranged to alternate and overlap circumferentially in the series for securing speed in transmission, the alternate overlapping disposition of these segments being adapted to permit of a more rapid transmission than could otherwise be obtained. To provide for readily removing the operative mechanism from the base 1, the wires 33, that are connected to the terminals 12 on the under side of the base, are run to a binding-

plate 36, Figs. 4, 8, 20, of insulating material, let into the base 1. The wires 33 are secured to the plate 36 by binding-screws 37, and these screws are in electrical contact with coiled springs 38 in sockets therefor in the plate. A complementary plate 39, also of insulating material, rests on the plate 36 and is secured thereto by screws 40. Metal screws 41, turning through the plate 39, contact electrically with the springs 38, and other portions of these wires 33 lead from the screws 41 direct to the contact-pieces 34, thus securing continuous electrical connection from the terminals 12 to the contact-pieces 34.

The disk 35 is for convenience preferably made in two parts, Fig. 23, and is fixed on a sleeve 42, revolubly loose on a tubular shaft-box 43, fixed in the frame 44. The frame is of suitable form and material and is secured detachably on the base 1. The sleeve 42 is provided with a radial arm 45, Figs. 4, 23, 27, having a terminal segmental rack 46, which is engaged by a screw 47, rotatable in a bearing 48 therefor fixed on the frame. By this construction the disk can be adjusted revolubly to proper position to related mechanism.

The contact-pieces 34 are advisably arranged in two series peripherally on and about the disk 35, the pieces being preferably in angular form to fit to the outer edges of the disk, and the outer ends of the pieces are curved, conforming to the curvature of the disk. The contact-pieces are let into the disk and are separated and thereby insulated from each other by the material of the disk. There must be as many contact-pieces as there are character-keys, and as some letters are used more frequently than others in printing the words of a message it is advisable to have a larger number of contact-pieces than there are keys. When a greater number of contact-pieces are employed, as shown in the drawings, than there are keys, two or more contact-pieces, preferably at a distance apart, are connected up electrically to one key, and this is best done by connecting two or more contact-pieces 35 together by an electric wire 49, as illustrated in Fig. 24. The resuit of this is that the brush (hereinafter described) will close an electric circuit for such key through one or the other of such connected contact-pieces without passing entirely around the disk. The contact-pieces 34 on one side of the disk are connected to electric wires 33 or 49 by binding-screws 50, and the contact-pieces on the other side of the disk are connected to similar wires by pins 51, extending through the disk. The disk 35 also carries a metal contact-ring 52, which is conveniently located and insulated in the material of the disk between the two series of the contact-pieces 34. The periphery of this ring is broken as an electric conductor at one point by the insertion therein, transversely thereof, of a block of insulating material 53. The ring 52 is connected electrically by a wire 54 to a metal brush 55, contacting with a divided metal band 56 on a wheel 57, of insulating material, tight on shaft 58, mounted in box 43. Another metal electric brush 59, contacting with band 56, is connected electrically by a wire 60, that leads to and forms a part of the electric circuit A. For convenience of construction the wire 60 is run back through the disk 35 and thence through the binding-plates 39 and 36 to the type-wheel-controlling electromagnet, hereinafter described. The brushes 55 and 59 are mounted on an insulating-block 61, Figs. 22, 23, 29, which block is secured to the disk 35. One of these brushes, 59, is preferably made in two parts overlapping each other and adjustable longitudinally, whereby the extent of the break in the electric circuit by the interterminal insulation in band 56 can be extended or minimized. The insulation in band 56 is disposed coactingly with unison-terminals in the disk 35.

For closing the electric circuit between the several contact-pieces 34 and the ring 52 on the disk 35 a metal brush 62, Figs. 1, 2, 3, 4, 8, 22, 28, is employed, which brush has fingers arranged as the brush is revolved about the disk to contact severally with the contact-pieces 34, and another finger that contacts substantially continuously with the ring 52. The brush 62 is mounted on an arm 63′ by an insulating connection, the arm 63′ being secured to and projecting radially from shaft 58, Figs. 22, 23, 28. Farther along in the electric circuit A there is an electromagnet 63, Figs. 1, 2, 5, 6, 34. The armature 64, actuated by this electromagnet, is mounted on a lever 65, pivoted medially on the frame 44. The lever 65 carries a thereto-pivoted pawl 66, adapted when the armature is drawn to the electromagnet closing the electric circuit to engage a ratchet-wheel 67, tight on shaft 58, whereby the rotation of the shaft and the type-wheel 68, splined thereon, is temporarily prevented while the type-wheel is employed from time to time in printing a character on paper, as hereinafter described. For convenience this ratchet-wheel 67 may be designated the "type-controlling" ratchet-wheel. An adjustable screw 69, turning in the frame, is adapted as a stop to limit the movement of the lever 65. The lever 65 is provided with a spring 70, adapted to hold the armature 64 yieldingly normally out of contact with the electromagnet 63.

The type-wheel 68, Figs. 1, 2, 3, 5, 6, 7, splined on shaft 58, is provided on its periphery with letters, numerals, characters, and spaces corresponding in number with the contact-pieces 34 on disk 35. These letters, numerals, characters, and spaces on the type-wheel correspond in number and arc value with the teeth on the ratchet-wheel 67.

For rotating the shaft and type-wheel a worm-wheel 71, fixed on the shaft, meshes with a worm 72 on a vertical shaft 73, footed and journaled in the frame. A worm-wheel 74, loose on shaft 73, is held thereto frictionally and so as to be capable of yielding rotatably

thereon under excess of strain by bearing at one side against a collar 75, fixed on the shaft, and by being held thereto by a spring 76, coiled about the shaft and bearing against the worm-wheel, the spring resisting against a collar 77, adjustable on the shaft. The worm-wheel 74 meshes with a worm 78, fixed on the shaft 79 of an electric motor 80. The motor is of a form in common use and is in the electric circuit H.

The electric circuit H, in which the motor 80 is located, is provided with a controller-switch consisting of an insulating swinging switch-arm 81 and a series of button-terminals 82, connected up by resistance-coils 83, Figs. 2, 3, 4, 7, 34, the arm being adapted to be put into electric contact with any one of the button-terminals for closing the circuit and regulating the current or to be swung free from the terminals breaking the circuit. A controller-switch in the shunt K of the motor-circuit H consists of the extension of the arm 81 in the opposite direction and button-terminals 84, connected up by resistance-coils 85, the relative arrangement of the button-terminals and the resistance-coils and their connections in the circuits H and K being such that when the switch is closed the resistance in each circuit will be correspondingly great or small. It will be seen that by the construction just described both the circuit H and the shunt-circuit K are closed by the same switch-arm 81, and this is the normal condition for driving the motor 80; but as the motor might be driven at too high a speed by the electric current through both these circuits, if uncontrolled, I provide an automatic cut-out switch or exothactic switch in the shunt-circuit K. In this automatic cut-out I employ a ball-governor comprising balls 84 at the joints of spring-extended toggle-arms 85, the toggle-arms being pivoted at their inner ends to a collar fixed on the motor-shaft 79 and at their outer ends to a collar 86, Figs. 2, 21, slidable on the motor-shaft. A metal disk 87 is fixed and insulated on the collar 86 and serves as the circuit-closer between the metal brush-terminals 88 and 89, Fig. 4, in shunt-circuit K. The brush 89 is spring-mounted on base 1 and contacts constantly with the revolving disk 87. The brush 88 is secured to an elastic metal finger 90, mounted by insulating connection on a spring-arm 91, fixed in a post 92, Figs. 4, 21, on the base 1. The brush 88 contacts normally electrically with disk 87. The free extremity of the spring-arm 91 bears against the end of the motor-shaft 79 and follows that shaft in such endwise vibrations or end play as is common in motor-shafts, the result being to maintain the brush 88 in constant position relative to the motor-shaft. A stop for the brush 88 consists of a finger 93, secured insulatingly to the spring-arm 91, the free end of which finger is disposed to engage the brush 88 and hold it back from contact with the disk 87 when that disk is withdrawn from the end of the motor-shaft by the action of the ball-governor under too-rapid rotation of the shaft. The finger 93 is provided with a set-screw 94, having a tip of insulating material which bears against the arm 91, and is adapted for adjusting the finger 93, so as to limit the movement of the brush 88 toward the disk 87, and thereby determine the point at which the brush shall break contact with the disk as the disk retreats from the end of the motor-shaft under the action of the governor. The result is to control the speed of the motor.

In electric circuit H, I also provide a cut-out or exothactic switch 95, Figs. 6, 18, 34, which is operated automatically by mechanism also employed for controlling the type-wheel-shifting circuit D. In this mechanism a connecting-rod 96 rides on an eccentric on type-wheel shaft 58 and is pivoted to a block 97, adjustable in a swinging arm 98, Figs. 6, 12, 13, 14, 15, which arm is pivoted on a hub 99, mounted oscillatingly on an axle-pin 100, rigid in frame 44. The pin is provided with a terminal hub-retaining nut. The adjustment of the block 97 in arm 98 determines the extent of the throw of the arm, causing the pawl 103 to pass one or more teeth on the ratchet-wheel 102 at each oscillation. A spring 101, coiled about the pin and secured to the frame and to the hub, is adapted to hold the hub in an initial position revolubly and to return it when rotated from its initial position, as hereinafter described. A ratchet-wheel 102 is fixed on the hub 99, and a spring-actuated click-pawl 103, pivoted on arm 98, engages the teeth of wheel 102. The reciprocation of the rod 96 oscillates arm 98 and through pawl 103 rotates the ratchet-wheel 102 intermittingly. A back-stop for the ratchet-wheel is hereinafter described. A pin 104 on wheel 102 is adapted by the oscillation of wheel 102 to engage a swinging lever 105. The lever 105 is pivoted medially on stud-pin 106, fixed in frame 44. A switch-arm 107 is pivoted on pin 106, and one arm of the lever 105 bears normally against a pin 108 in the switch-arm 107, the lever 105 bearing oppositely against a spring 109, mounted on arm 107. The switch-arm 107 is provided with a metal insulated band 110, which when in the position shown in Fig. 6 contacts electrically with the electric terminals 111 and 112 in electric circuit H, closing the circuit. The construction is such that when the lever 105 is swung from the position shown in Fig. 6 by the pin 104, moving around in its upper arc-path toward the right, it first compresses the spring 109 and then carries arm 107 with it, breaking the contact of the circuit-closer 110 with electric terminals 111 and 112, pushing the arm 107 and contact-piece 110 over to the electric terminals 113 and 114, which serve mechanically as stops to prevent the further swinging of the arms 107 and lever 105. The shifting of the arm 107 is accelerated when released from the terminals 111 and 112 by the action of spring 109. When the ratchet-wheel is returned to

its initial position by spring 101, the arm 105 is swung back to the position shown in Fig. 6 by the pin 104 on the ratchet-wheel, the pin being then against the lever 105 at the left in Fig. 6. The terminals 113 and 114 serve as back-stops to the arm 107.

In connection with the ratchet-wheel 102 I provide a releasable back-stop 115, Figs. 6, 12, 13, 17, adapted when in engagement with a tooth of the ratchet-wheel to prevent its rotation in one direction. This back-stop 115 is fixed on radial arm 116 on a rock-shaft 117, journaled in the frame 44. The rock-shaft is provided with a radially-projecting pin 118, Figs. 7, 13, to which a spring 119 is attached that serves to hold the back-stop 115 normally in engagement with the ratchet-wheel 102. An arm 120 projects radially from rock-shaft 117 above a pin-stop fixed in the frame. A rock-shaft 121, journaled in the frame 44, is provided with a radial arm 122, that bears against the arm 120 on that side opposite the stop. The rock-shaft 121 is provided with rearwardly-projecting arms 123, Figs. 7, 8, 17, and a transverse bar 124 unites the extremities of the arms 123 rigidly. A printing-pad 125, preferably of rubber, extending transversely of the machine, is secured in the bar 124, conveniently in a groove therefor. The bar 124 and arms 123 are held downwardly yieldingly by a spring 126. This rock-shaft 121 is provided with a radial arm 127, having thereon an armature 128, opposite to and actuated by the electromagnet 129 in electric circuit C.

A prolongation of the pawl 103, Fig. 12, rests on the back-stop 115, and whenever the armature 128 is drawn to the electromagnet 129 the back-stop 115 and the pawl 103 are lifted out of engagement with the ratchet-wheel 102, and the ratchet-wheel is returned to initial position by spring 101. This occurs every time a key in the keyboard is depressed.

In connection with the ratchet-wheel 102 a radial arm 130, Figs. 6, 12, 14, on hub 99 is secured rigidly to the ratchet-wheel by a nut 131 turning on the hub. This arm 130 is provided with a thereto-pivoted finger 132, capable of tilting in one direction only and held in extended position by a spring 133, which finger is adapted as the ratchet-wheel is rotated forwardly by its pawl 103 to engage a radial arm 134 on hollow rock-shaft 135, axled on a stud-pin fixed in the frame, Figs. 12, 16. When the ratchet-wheel is rotated in the other direction, the finger 132 strikes against the arm 134 and is tilted, permitting the arm 130 and the finger 132 to pass the arm 134, the finger being thereupon brought to radially-extended position by the spring 133. Another radial arm 136, fixed on rock-shaft 135, is connected by a rod 137 to one arm of a circuit-closing lever 138, pivoted medially on the frame and provided with a terminal insulated metal band 139, forming an electric circuit-closer between electric terminals 140 and 141 in shunt F′ of electric circuit E, Figs. 6, 19, 34. The lever 138 is held normally out of contact with terminals 140 141 by a spring 142.

For closing the circuit C, putting the electromagnet 129 into action, and thereby throwing the printing-pad 125 up against the type-wheel, Fig. 17, a circuit-closer is employed in circuit C, consisting of the metal elastic terminals 143 and 144, Figs. 5, 34, both mounted on a block 145 of insulating material. These terminals are normally separated, their distance from each other being adjusted by a screw 146, turning in the post on the frame and bearing by its tip of insulating material against the terminal 143, holding it toward terminal 144. A rearward extension 147 of pawl 146, Fig. 5, bears by an insulating-knob against terminal 144, the construction being such that when the pawl 66 engages ratchet-wheel 67 the pawl and its extension 147 are first tilted, thereby closing circuit C through terminals 143 and 144 and then hold the ratchet-wheel 67 and type-wheel 68 against rotation, while at the same instant the electric current through circuit C actuates electromagnet 129, throwing the pad 125 up against the paper or impression medium, forcing it against the type-wheel and printing the character thereon. The removal of the finger of the operator from the key opens the line electric circuit, and the machine at once assumes its normal conditions.

For shifting the type-wheel 68 along on the shaft 58 while it is being employed in printing a line of words across the paper and for returning it to its initial position the following mechanism is employed: A block 148 is slidable on a rod 149, fixed in the frame parallel with the shaft 58, Figs. 1, 2, 3. An arm 150, rigid on block 148, is provided with curved terminal fingers that ride in a circumferential groove therefor in hub 151 of the type-wheel. A shifting-strap 152, attached to the block 148, runs on a winding-up wheel 153, axled in the frame. A returning-strap 154, attached to block 148, runs in the other direction on a winding-up wheel 155. A ratchet-wheel 156 is rigid on the axle of wheel 153, Figs. 9 and 10. To rotate the wheel 153 intermittingly and correspondingly moving the type-wheel along on shaft 58, a pawl 157, adapted to engage the teeth of the ratchet-wheel, is pivoted on arm 158, hinged on the frame 44. The pawl is held up to the wheel yieldingly by spring 159. The arm 158 is provided with an armature 160, adapted to be actuated by electromagnet 161 in circuit D. The armature 160, Figs. 3, 34, is held in normal position away from the electromagnet 161 by a spring 162. A dog 163, pivoted on the frame, engages releasably the teeth of the ratchet-wheel and holds it against rotating backward. The dog 163 is held to its work by a spring 164, secured to the frame. For releasing the pawl 157 and the dog 163 a pin 165, Figs. 9, 10, 11, projecting laterally from a shiftable rod 166, is adapted to engage pawl

157 and dog 163 and against the action of their springs to force them temporarily out of engagement with the ratchet-wheel 156. The rod 166 is mounted on the frame and is connected to one arm of a bell-crank 167, pivoted on the frame, the other arm of which bell-crank is connected by a rod 168 to a crank-pin on radial arm 169, rigid on rock-shaft 170, journaled in the frame, Figs. 7, 17. The rock-shaft 170 is held in initial position by spring 171. The extent of movement of rod 168 and related mechanism is limited and regulated by a cam 168', Fig. 6, pivoted on the frame and on which the rod 168 rests. The rock-shaft 170 is provided with an armature 172, mounted on a radial arm, which armature is actuated by electromagnet 173 in electric circuit E.

For winding up the returning-strap 154, on wheel 155, Figs. 2, 3, 4, and thereby returning the type-wheel to its initial position, a pinion 174, fixed on the axle of wheel 155, meshes with a spur-wheel 175, loose on key-arbor 176. A barrel 177 on key-arbor 176 is provided with a helical spring (not shown) attached to the arbor and to wheel 175. A ratchet-wheel 178 on arbor 176 is engaged by a click-pawl 179, pivoted on the frame, whereby the arbor is held against backward rotation. The spring on arbor 176 is wound up by a key like an ordinary clock-movement. This clock mechanism does not in itself involve invention.

For holding and feeding the paper on which the type-wheel prints the words and characters of a transmitted message the following mechanism is employed: A paper-holder 180, Figs. 1, 4, 5, 6, 7, 8, consisting, preferably, of a hollow cylinder open at one end and having a slot 181 in its wall longitudinally thereof, is mounted on the frame 44 in front and centrally of the principal machine. This paper-holder is provided with a roll of paper S, which paper passing through the slot 181 is taken over and runs on a table conveniently constructed of sheet metal in two sections 182 and 183, supported on the frame by being inserted in horizontal grooves therefor in vertical walls of the frame, one section from the front and the other from the rear of the machine. The sections are slidable in the grooves. The two table-sections 182 and 183 are at their adjacent edges separated a little from each other, Figs. 7, 8, providing a space through which the printing-pad 125 passes upwardly, forcing the paper against the type-wheel above. The rear section 183 is advisably on a little lower plane than the section 182, so that the paper as it advances will be carried downwardly away from the type-wheel, as well as horizontally therefrom.

For feeding the paper intermittingly over the table and under the type-wheel a shaft 184, Figs. 7, 8, 17, journaled in the frame, is provided with spur-toothed wheels 185, one near each side of the table 183, which wheels project from below up through the table and slightly above its top surface and are adapted to engage the paper and as they rotate to draw it forward. These wheels are shown as and are preferably for convenience of construction made double or of two plates of metal each having spur-teeth, the teeth on one plate being arranged to alternate with those of the other plate. Directly above the toothed wheels 185 there are pressure-rolls 186, severally mounted on arms 187, pivoted on the frame and held to the toothed wheels 185 by springs 188. These pressure-rolls hold the interposed paper to the table and to the feed-wheels 185. The shaft 184 and the wheels 185 thereon are rotated intermittingly by means of a crown-toothed ratchet-wheel 189, fixed on the shaft, that engages in one direction a complementary crown-toothed ratchet-wheel 190, loose on the shaft, the wheel 190 being provided with a spur-toothed pinion 191, that meshes with a segmental rack 192 on the rear end of armature-arm 193, fixed medially on rock-shaft 170. The crown-toothed ratchet-wheel 190 is held to slipping engagement with its complementary wheel 189 by a spring 194, coiled about shaft 184 and resisting against wheel 185, fixed on the shaft. An elastic stop 195, secured to the frame, bears against wheel 185 and prevents backward rotation of the shaft 184.

The paper must be fed forward when a line of printing across the paper has been completed, and at the same time the type-wheel, by the mechanism hereinbefore described, must be returned to its initial position for beginning a line of printing of words. For automatically putting the electrical means into operation under certain conditions for feeding the paper and returning the type-wheel devices are provided, as follows: A rod 196, Figs. 1, 2, 3, slidable endwise in the frame 44, is provided with adjustable stops 197 198 thereon, which stops are adapted to be contacted by a pin 199, Fig. 3, on type-wheel block 148. The rod 196 is also provided with an adjustable sleeve 200, having a laterally-projecting wing, Figs. 2, 3, 9, 10, 11, on which a metal plate 201 is secured and insulated, the plate having two fingers of unequal length and bearing movably on block 204 and on metal terminal contact-pieces 202 and 203, fixed on the block and flush therewith on the bearing-surface, which block is of insulating material and is secured to the frame. The electric contact-pieces or terminals 202 and 203 are in the electric circuit E, and their adjacent ends are separated by an interposed portion of the insulating-block 204. The construction is such that normally one finger of plate 102 rests on the insulating material, as shown in Figs. 1, 9, 11, and 34, and the other on a contact-piece, thus leaving the electric circuit open; but as the rod 196 is moved endwise (toward the right in Fig. 2) by the advancing block 148 the plate 201 is, by its fingers, put in electric contact with both the terminal contact-pieces 202 and

203, thereby closing the circuit, putting electromagnet 173 into action and releasing pawl 157 and dog 163, permitting the clock mechanism to return the type-wheel to initial position and operating the paper-feed. As the type-wheel is returned to its initial position the pin 199 contacts with stop 198 on rod 196 and returns the rod to the initial position, (shown in Figs. 2, 3, 34,) by which the circuit E is again broken by a finger 201, resting on the block 204. The plate 201 is a circuit-closer.

It sometimes occurs that it is desirable to feed the paper ahead more than the ordinary distance between lines of printing thereon, and for this purpose the shunt F is put in the circuit E, and this shunt-circuit is provided with a key 205, Figs. 1, 34, which key and its mounting are substantially like the other keys 4 on the keyboard except that it is in an electric circuit of its own (F) and serves as a circuit-closer to close circuit E through its shunt F. By the opening and closing of this circuit E by manipulating key 205 the electromagnet 173 is put into activity and the paper is correspondingly fed forward, the type-wheel being incidentally returned to initial position (if not already there) by the first action of the electromagnet.

The means for moving the type-wheel 68 forward intermittingly on shaft 58 by the action of electromagnet 161 in electric circuit D has hereinbefore been described. This circuit is normally closed and the armature 160, Fig. 3, is put in motion reciprocally by breaking the circuit D momentarily, permitting the spring 162 to swing the armature away from the electromagnet until drawn thereto again by the renewed electrical activity of the magnet. For breaking the electric circuit D a cut-out is provided, consisting of the metal electric terminals 206 and 207, Figs. 8, 34, secured to a block 208 of insulating material fixed on the frame, the terminal 207 being elastic and provided with a metal point normally in electric contact with terminal 206. A radial arm 209, fixed in rock-shaft 121, is adapted by its terminal knob of insulating material to engage the terminal 207, and as the armature 128 is attracted to electromagnet 129 in electric circuit C pushes the terminal 207 away from terminal 206, breaking the circuit D.

The means for feeding the paper and returning the type-wheel through the action of electromagnet 173 in electric circuit E has also been described, and as it is important that electromagnet 161 should not be in action when the type-wheel is being returned to its initial position means are provided for breaking the circuit D while circuit E and electromagnet 173 are in action. For this purpose a cut-out in circuit D is employed, consisting of metal electric terminals 210 and 211, Figs. 8, 34, secured on block 212 of insulating material fixed on the frame, the terminal 211 being elastic and provided with a metal point normally in electric contact with terminal 210, and a radial arm 213, projecting from rock-shaft 170 by its terminal knob of insulating material, bears against the terminal 211 and when swung by the movement of armature 172 toward the electromagnet 173 pushes the terminal 211 away from 210, opening the circuit D.

For supplying the types on type-wheel 68 with ink a roller 214, Figs. 1, 2, 3, 7, advisably made of felt adapted to absorb and yield ink, is mounted revolubly loose on an arm 215, hinged on block 148, opposite the type-wheel on which it rests and by which it is rotated by contact therewith.

In electric circuit C a shunt C′ is provided by which the circuit may be closed past the circuit-closing terminals 143 and 144 without closing them. In the shunt-circuit C′, Fig. 34, there is a circuit-closer consisting of the metal terminals 215 and 216, mounted on block 217 of insulating material fixed on the frame, the terminal 216 being elastic and normally out of contact electrically with terminal 215. A finger 218, projecting rigidly from the armature-arm 65, is adapted when the armature 64 is drawn to the electromagnet 63 to contact with a projection on terminal 216 and push the terminal into contact with terminal 215, thus closing the shunt-circuit. The purpose of this shunt-circuit is to close the circuit of the press-electromagnet by sending a current over the line when the type-wheels are at rest, and thereby releasing ratchet-wheel 102, closing the circuit having the terminals 111 and 112, which closes the motor-circuit, and starting the machine.

When these machines are used in a telegraph-line, at least two machines are employed at points distant from each other in the line, and as many more machines may be in the line at intermediate stations as desired. The machines so in the line, at least the sending-machine and the receiving-machine when a message is sent from any one machine over the line to any other machine, must be in unison—that is, the receiving-machine must be so regulated or so in unison with the sending-machine that the letter or character indicated by the key depressed on the sending-machine will be the letter or character printed by the receiving-machine. To secure such unison of action in the sending and the receiving machines, the brushes 62 in the two machines must sweep over the corresponding contact-pieces 34 about the disks 35 in the two machines synchronously. To secure such synchronous movement, it is desirable, first, that the machines be duplicates of each other, and then being in the same electric circuit and operated by the same electric current they should and will run substantially in harmony; but for correcting any possible variation from complete unison special mechanism is employed, as follows: Two metal terminals 220 and 221 in electric circuit G, Fig. 34, are fixed in the periphery of insulat-

ing-disk 35 opposite each other, Fig. 2, and opposite the insulating-block 53, Figs. 2, 25, in the ring 52, Figs. 22, 24, 25, 26. The connections of these terminals in circuit G are shown and indicated in Figs. 8, 24, and 25, the wire in circuit G, that passes through the disk 35 to terminal 220, being indicated by numeral 222. The brush 62 when in contact with the two terminals 220 and 221 in the manner shown in Fig. 2 forms the electric bridge or circuit-closer in the circuit G, and this is the position which should exist at the starting of the machines in transmitting a message and is the position to which the two machines are brought in unison at each revolution of the brushes 62 about the disks 35 in the two machines in operation. An electromagnet 223, Figs. 2, 4, 34, in electric circuit G, is provided with an armature 224, fixed on one arm of a bell-crank 225, which bell-crank is pivoted in an ancillary frame 226, adjustable rotatively on a stud-pin 227, fixed in frame 44. The other arm of bell-crank 225 is provided with a catch adapted when in the position shown in Fig. 4, in which it is held by spring 228 when electric circuit G is open, to engage a radial arm 229, fixed on shaft 58, Fig. 23, and to be released therefrom by the tilting of the bell-crank when the armature is drawn to the electromagnet. Normally the bell-crank 225 is in the position shown in Fig. 4, and thereupon the two machines in the line-circuit being started by depressing a key the brushes 62 commence to revolve about the disk 35, and if a brush in one machine contacts with the terminals 220 and 221 before the brush 62 in the second machine comes to the corresponding terminals the brush in the first machine will be stopped on the terminals 220 221 by the catch on bell-crank 225 and held there until the brush in the second machine comes to the corresponding terminals, whereupon the circuit G being closed except at the electromagnet 223 the magnet will be put into activity, drawing the armature 224 thereto, tilting the bell-crank, and releasing arms 229, permitting the brushes 62 to revolve about disks 35 in unison in the two machines. As soon as the brushes 62 start on their revolution they escape from the terminals 220 221 and break circuit G, whereupon the catches on bell-cranks 224 are again put in the paths of arms 229 and the synchronizing operation just described is, if required, repeated at every revolution of the brushes.

What I claim as my invention is—

1. In a printing-telegraph, printing mechanism mounted on a frame, means with the printing mechanism for connecting it electrically to another similar machine at a distant station, and a keyboard provided with a plurality of circuit-closing keys and with electric severed but contacting wiring connecting the keyboard detachably with the printing mechanism.

2. In a printing-telegraph, a frame, printing mechanism mounted in the frame, and electric conductors leading from the printing mechanism and having disconnecting-terminals, in combination with a keyboard provided with a plurality of movable circuit-closing keys, wires secured to the keyboard and having terminals adapted to be connected electrically by the keys to another electric conductor, said wires having disconnecting-terminals adapted to be connected electrically to the wires from the printing mechanism by placing the keyboard in a predetermined position alongside the printing mechanism.

3. In a printing-telegraph, printing mechanism mounted on a frame, electric-wire terminals connected with the printing mechanism and provided with terminals having sockets arranged on and at one side of the frame, a detached keyboard-frame, electric wires on the keyboard-frame having pin-terminals projecting from the frame and disposed to register with and enter and contact electrically with the socketed terminals on the frame of the printing mechanism.

4. In combination in a printing-telegraph, a rotatable type-wheel, a shaft on which the type-wheel is splined, a worm-wheel tight on the shaft, a second shaft provided with a worm meshing with said worm-wheel, a worm-wheel loose on said second shaft, means for clutching the loose worm-wheel yieldingly, to the shaft, and a driven shaft provided with a worm meshing with said worm-wheel.

5. In combination in a printing-telegraph, an electric circuit for transmitting and receiving messages, a rotatable type-wheel splined on a shaft, a worm-wheel on said shaft, a second shaft geared by a worm to said worm-wheel on the type-wheel shaft, an electric motor, a shaft connected to and driven by said motor, said motor-driven shaft having a worm gearing with a worm-wheel on said second shaft, and a motor electric circuit leading from said message transmitting and receiving circuit through said motor.

6. In combination in a printing-telegraph, an electric circuit for transmitting and receiving messages, a rotatable type-wheel splined on a shaft, a worm-wheel on said shaft, a second shaft, an electric motor having a shaft driven thereby and geared through said second shaft to the worm-wheel on the type-wheel shaft, a motor electric circuit leading from said message transmitting and receiving circuit through said motor, a circuit-breaker in said motor-circuit, and a governor on said motor-driven shaft adapted by the too-rapid rotation of said motor-shaft to open said circuit-breaker in the motor-circuit.

7. In combination in a printing-telegraph, a type-wheel shaft, an electric-motor-driven shaft geared to said type-wheel shaft, an electric circuit including said motor, a shunt electric circuit leading from and into said motor-circuit, separable terminals in said shunt-circuit, a governor on said motor-shaft, and means connecting said governor mechanically

to one of said separable terminals whereby by the too-rapid rotation of the motor-shaft the shunt electric circuit is opened.

8. In combination in a printing-telegraph, a main message-transmitting electric line, a plurality of local electric lines in and forming part of said main line, a series of keys one in each local line adapted to close said line electrically, a series of local-line contact-pieces arranged alternately in series overlapping each other to which said local lines are severally connected, and a circuit-closer adapted to connect said contact-pieces severally with the main line.

9. In combination in a printing-telegraph, a main message-transmitting electric line, a plurality of local electric lines in and forming part of said main line, a series of keys one in each local line adapted to close said line electrically, two series of local-line contact-pieces arranged annularly the pieces alternating with and overlapping each other, a concentric adjacent electric ring connected electrically to the main line, and a circuit-closer adapted to revolve exteriorly about said local-line contact-pieces and said ring and to close the circuit between the ring and said local contact-pieces severally.

10. In a printing-telegraph a disk of insulating material, two series of insulated local-line contact-pieces arranged annularly alternately in and about the disk, a main-line contact-ring in and about the disk and a circuit-closer revoluble about the disk adapted to contact with said ring and severally with said local-line contact-pieces.

11. In a printing-telegraph, an insulating-disk, two series of local-line contact-pieces located alternately and overlapping circumferentially in the periphery of the disk concentrically, and in insulation, and a line contact-ring fixed in said disk also concentric and of equal diameter with said two series of local contact-pieces.

12. In combination in a printing-telegraph, a circular disk of insulating material, a series of electric contact-pieces arranged at a distance apart on the periphery of said disk, a second series of electric contact-pieces on the periphery of the disk alternating and overlapping circumferentially with the contact-pieces of the first series, an adjacent electric ring on and about said disk insulated from said contact-pieces and a circuit-closer revoluble about said disk so disposed as to contact with said ring and severally with said contact-pieces alternately in each series thereof.

13. In a printing-telegraph, a main message-transmitting electric line, a plurality of local lines in and forming a section of the main line, a series of local-line contact-pieces arranged annularly at a distance apart, an adjacent main-line contact-ring concentric with said annular contact-pieces and provided with an insulated section in its periphery, a circuit-closer adapted to revolve about the ring and said contact-pieces, the construction being such that at one point in its revolution the contact of the circuit-closer with the ring is broken by said ring-insulating section.

14. In combination in a printing-telegraph, a series of electric contact-pieces severally forming a part of an electric circuit, said contact-pieces being arranged in a fixed annular series, an adjacent electric ring of equal diameter with and separated from but in the electric circuit with said several contact-pieces, a rotatable shaft having a type-wheel thereon provided with a number of type equal in number to the said electric contact-pieces, said shaft and type-wheel being adapted to rotate continuously completely or through a movement equal to any portion of a complete revolution, and a circuit-closer revoluble exteriorly about the annularly-disposed contact-pieces and the contact-ring and adapted to close the electric circuit between said ring and a contact-piece.

15. In combination in a printing-telegraph, a series of fixed electric local contact-pieces arranged in two alternating overlapping annular series, a type-wheel provided with a number of type equal to the number of said contact-pieces, an electric-circuit closer fixed mechanically to and rotatable with said type-wheel about a common axis, said circuit-closer being adapted to contact peripherally and severally with said contact-pieces and connect each severally to the other section of said electric circuit, and a series of electric-circuit-closing keys in the local electric circuits leading from said fixed electric contact-pieces.

16. In combination in a printing-telegraph, a main electric message-transmitting line, a series of circuit-closing keys in local lines forming a section of said main line, electric contact-pieces of said local lines arranged annularly, an adjacent electric contact-ring, a circuit-closer revoluble about and in electric contact with said ring and said contact-pieces, means other than the main electric circuit for rotating the circuit-closer, a shunt-circuit, and means adapted to automatically close the main circuit and open the shunt-circuit and hold said circuit-closer against rotation.

17. In a printing-telegraph a main message-transmitting electric line, a plurality of local lines in and forming a section of the main line, a series of local-line contact-pieces on said local lines arranged annularly at a distance apart, a type-wheel on a shaft and having characters corresponding in number with said local-line contact-pieces, a circuit-closer on said shaft arranged to sweep over and contact intermittingly severally with said local contact-pieces, means other than the main electric circuit for rotating the circuit-closer, and a shunt unison electric line having terminals adapted to engage said circuit-closer in an interim of its contact with a local-line contact-piece.

18. In a printing-telegraph, a main message-

transmitting electric line, a series of local-line insulated contact-pieces arranged annularly, an adjacent concentric line-ring provided with an insulating-section in its periphery, a circuit-closer revoluble about the ring and local contact-pieces arranged to contact with the ring and severally with said local contact-pieces and intermittingly with the insulating-section in the ring thereby breaking the main-line circuit, means other than the main electric circuit for rotating the circuit-closer and a shunt synchronizing electric circuit having terminals adapted to contact with said circuit-closer when out of contact with said ring.

19. In a printing-telegraph a main message-transmitting electric line, a series of local-line insulated contact-pieces arranged annularly, an adjacent concentric line-ring provided with an insulating-section in its periphery, a circuit-closer revoluble about the ring and local contact-pieces arranged to contact with the ring and severally with said local contact-pieces and intermittingly with the insulating-section in the ring thereby breaking the main-line circuit, means other than the main electric circuit for rotating the circuit-closer, a shunt synchronizing electric circuit having terminals adapted to contact with said circuit-closer when out of contact with said ring, an electromagnet in the shunt-circuit, and means actuated mechanically thereby for releasing the circuit-closer revolubly.

20. In combination in a printing-telegraph, a main electric line, local electric lines forming a part of the main line, contact-pieces of the local lines arranged annularly at a distance apart, a concentric main-line ring contact-piece provided with a section of insulating material, a concentric shaft, a circuit-closer mounted on the shaft and sweeping over the contact-pieces and the ring, a unison shunt electric line having terminals in the arc of but insulated from the local contact-pieces, a divided metal band about a disk of insulating material on said shaft, terminals in the electric main line which terminals contact with said band and intermittingly with the insulating material in the break in the band concurrently with the contact of the revoluble circuit-closer with the unison line contact-pieces.

21. In combination in a printing-telegraph, a shaft, a circuit-closer mounted on a radial arm on the shaft, means for rotating the shaft, an electromagnet, a spring-held armature mounted on a bell-crank opposite said electromagnet, a catch on the bell-crank, and a second radial arm on said shaft, said catch being normally in the path of said second radial arm.

22. In a printing-telegraph, a main message-transmiting electric circuit, a revoluble type-wheel, a circuit-closer fixed to and revoluble with the type-wheel adapted to close the main circuit, shunt electric line provided with terminals and with an electromagnet, a printing-pad actuated by said electromagnet when the shunt-line is in action, an electromagnet in the main line, and means actuated by said last-enumerated electromagnet adapted to contact said terminals and close the shunt-line and to hold the type-wheel intermittently against revolution.

23. In a printing-telegraph, a main electric circuit, a rotatable type-wheel, an electromagnet in the main line, a movable printing-pad, an electric shunt-line provided with terminals and arranged to actuate the printing-pad, and a pivoted lever provided with an armature actuated by said electromagnet adapted to lock temporarily the rotation of the type-wheel and to close said shunt-line.

24. In a printing-telegraph, a main electric circuit, an electromagnet in said circuit, a revoluble type-wheel, an adjacent printing electric circuit, terminals in said printing-circuit, an armature opposite said electromagnet fixed on a tiltable arm, and means mounted on said arm for stopping the rotation of the type-wheel and for closing the printing-circuit.

25. In a printing-telegraph, a main electric circuit, a motor-circuit, a motor in said motor-circuit, a revoluble type-wheel connected to and rotated by said motor, terminals in said motor-circuit, a pivoted swinging lever provided with a terminal contactor and circuit-closer, a ratchet-wheel, provided with means for swinging said lever in one direction, and means actuated by the type-wheel shaft adapted to rotate the ratchet-wheel by intermitting movement.

26. In a printing-telegraph, a main electric circuit, a motor-circuit, a motor in said motor-circuit, a revoluble type-wheel connected to and rotated by said motor, means for automatically closing and opening said motor-circuit, comprising terminals in the motor-circuit, a swinging spring-actuated lever provided with a terminal contactor and circuit-closer, a ratchet-wheel provided with a device adapted by rotation of the wheel to engage and swing said lever, a swinging arm provided with a pawl engaging said ratchet-wheel, and a rod pivoted to the swinging arm and riding on an eccentric on the type-wheel shaft adapted to vibrate said arm and pawl.

27. In a printing-telegraph, a rotatable type-wheel, an electric motor connected to and adapted to rotate the type-wheel, a motor-driving electric circuit comprising a section in two lines, a controller-switch at the junction of the line with the two section-lines arranged to limit and control the electric current through the two-line section, a circuit-breaker in one of the section-lines, and a governor on the motor-shaft adapted automatically to open and close the circuit-breaker.

28. In a printing-telegraph, a main electric circuit, a revoluble type-wheel, type-wheel-shifting mechanism, an electric circuit adapted when closed to lock the type-wheel, an electromagnet in the latter circuit, a paper-feed electric circuit, an electromagnet in the pa-

per-feed circuit, and means actuated by the electromagnet in the paper-feed circuit for opening the type-wheel-locking circuit.

29. In a printing-telegraph, a main electric circuit, a revoluble type-wheel, means for revolving the type-wheel, type-wheel-shifting mechanism, a type-wheel-locking electric circuit, an electromagnet in the latter circuit, a paper-feed circuit, terminals in the paper-feed circuit, and means actuated by the revolving type-wheel for opening and closing the paper-feed circuit through said terminals.

30. In a printing-telegraph, a main electric circuit, a revoluble type-wheel, means for revolving the type-wheel, mechanism for shifting the type-wheel, a type-wheel-locking electric circuit, an electromagnet in the latter circuit, a paper-feed circuit, electric terminals in the paper-feed circuit, and means actuated by the means that shift the type-wheel for opening and closing the paper-feed circuit through said terminals.

31. In a printing-telegraph, a main electric circuit, a paper-feed electric circuit, devices actuated by the paper-feed circuit for feeding the paper, devices actuated by a motor for automatically closing the paper-feed circuit, said motor connected electrically to said last-enumerated devices, a shunt-circuit in the paper-feed circuit, and a key for closing the shunt paper-feed circuit.

32. In a printing-telegraph, a type-wheel shaft, a type-wheel splined thereon, an independent electric motor geared to and rotating said shaft, means for shifting the type-wheel intermittingly on its shaft comprising a shaft parallel with the type-wheel shaft, a shiftable block on said parallel shaft and connected to the type-wheel, a strap attached to the block, a winding-up wheel, a ratchet-wheel rigid to the winding-up wheel, a pawl engaging the ratchet-wheel, an armature-arm on which the pawl is pivoted, and means for actuating the armature-arm.

33. In a printing-telegraph, the combination with a type-wheel shaft, a type-wheel splined thereon, and an independent motor geared to and rotating with said shaft, of means for shifting the type-wheel comprising, a shiftable block connected to the type-wheel, a strap attached to the block, a winding-up wheel, a ratchet-wheel rigid to the winding-up wheel, a pawl engaging the ratchet-wheel, a dog engaging the ratchet-wheel in one direction, a slidable rod adapted to engage the pawl and the dog and disengage them from the ratchet-wheel, and means for automatically actuating the disengaging-rod.

34. In a printing-telegraph, the combination with a type-wheel shaft, a type-wheel splined thereon and an independent motor geared to and rotating said shaft, of means for shifting a type-wheel comprising, a shiftable block connected to the type-wheel, a strap attached to the block, a winding-up wheel means for actuating the winding-up wheel, a second strap attached to the block and running in the opposite direction, a winding-up wheel on which said second strap runs, and means for rotating the latter winding-up wheel.

35. In a printing-telegraph, the combination with a type-wheel shaft, a type-wheel splined thereon, and an independent motor geared to and rotating said shaft, of mechanical means for shifting the type-wheel intermittingly in one direction, an electric type-wheel-shifting circuit employed in shifting the type-wheel intermittingly, means for retrieving the type-wheel, and means for automatically opening the type-wheel-shifting circuit comprising terminals in the circuit, a circuit-closer mounted on a shiftable rod, stops on the rod, and means shifting with the type-wheel adapted to engage a stop on said rod and shift the circuit-closer closing the electric circuit and releasing the mechanism that shifts the type-wheel intermittingly.

36. In a printing-telegraph, a shiftable type-wheel, a strap connected to the type-wheel, a winding-up wheel provided with a ratchet-wheel, a pawl engaging the ratchet-wheel and pivoted on an armature-arm provided with an armature, an electromagnet in a normally closed electric circuit opposite said armature, means for opening and closing the circuit, and a spring holding the armature normally away from the electromagnet.

37. In a printing-telegraph, a main electric line, a shaft, a type-wheel on and rotatable with the shaft, an electric motor independent of the main electric line geared to and for rotating said shaft, a motor electric circuit provided with terminals, a swinging circuit-breaker in said motor-circuit, and means actuated mechanically by said type-wheel shaft for automatically swinging said circuit-breaker.

38. In a printing-telegraph, a shaft, a type-wheel on and rotatable with the shaft, an electric motor geared to and for rotating said shaft, a motor electric circuit, a circuit-breaker in said motor-circuit, and means for automatically opening said motor-circuit comprising a ratchet-wheel a swinging arm provided with a pawl engaging said ratchet-wheel, a rod riding on an eccentric on the type-wheel shaft and connected to said swinging arm, a circuit-closer mounted on a swinging arm, and means by which said ratchet-wheel actuates the circuit-closer and swinging arm and throws the circuit-closer out of contact with terminals in said motor electric circuit.

39. In combination in a printing-telegraph, means for automatically opening a motor-circuit comprising a ratchet-wheel, a pawl mounted on a swinging arm adapted to rotate said ratchet-wheel, means for actuating the pawl, a swinging arm disposed to be engaged and actuated by a pin on the ratchet-wheel, a switch-arm pivoted concentrically with said swinging arm, a pin and a spring on said

switch-arm holding the swinging arm thereto yieldingly, and a circuit-closer on the switch-arm contacting with terminals in the motor-circuit and adapted to be released therefrom breaking the circuit by the rotation of the ratchet-wheel in one direction.

40. In combination in a printing-telegraph, means for automatically opening and closing a motor-circuit comprising an oscillating ratchet-wheel a pawl mounted on a swinging arm adapted to rotate said ratchet-wheel in one direction, means for actuating the pawl, a spring secured to and adapted to retrieve the ratchet-wheel, a swinging arm disposed to be engaged and actuated by the ratchet-wheel, a switch-arm pivoted concentrically with said swinging arm, a pin and a spring on said switch-arm holding the swinging arm thereto yieldingly, and a circuit-closer on the switch-arm contacting with terminals in the motor-circuit and adapted to be released therefrom breaking the circuit by the rotation of the ratchet-wheel in one direction.

41. In a printing-telegraph, a revoluble ratchet-wheel, means including a reciprocating pawl for rotating the ratchet-wheel in one direction, a spring-actuated rock-shaft, a back-stop mounted on said rock-shaft and engaging said ratchet-wheel, a second rock-shaft provided with a radial arm engaging a radial arm on the first-enumerated rock-shaft, an armature mounted on a radial arm on said second rock-shaft, and an electromagnet in an electric circuit adapted when the circuit is closed to draw said armature thereto.

42. In a printing-telegraph, a type-wheel shaft, means rotating said shaft, a paper-feed electric circuit, a shunt in said circuit provided with normally open terminals, and means for automatically closing said shunt-circuit comprising a rotatable ratchet-wheel, means for rotating the ratchet-wheel, a radial arm fixed to the hub of the ratchet-wheel and provided with a finger tiltable in one direction only, a rock-shaft, an arm on the rock-shaft in the path of said finger, a spring-held circuit-closing lever, and a rod connecting the lever with a radial arm on said rock-shaft.

43. In a printing-telegraph, a paper-feed mechanism, comprising a rotatable shaft, spur-toothed wheels on said shaft, pressure-rolls opposite said spur-wheels, a fixed crown-toothed wheel on the shaft, a loose complementary crown-toothed wheel on the shaft and provided with a pinion, a swinging spring-actuated armature-arm provided with a segmental rack meshing with said pinion, an armature on the armature-arm, and an electromagnet in an electric circuit disposed to attract and hold said armature thereto against the pull of the spring when the electric circuit is closed through the electromagnet.

44. In a printing-telegraph, a main electric circuit, a paper-feed electric circuit, an electromagnet in the paper-feed circuit, an oscillating spring-held armature-arm provided with an armature adjacent to and actuated by said electromagnet and with a segmental rack, a shaft provided with spur-toothed paper-feed wheels, a pinion on said shaft in mesh with said segmental rack, and means connecting the pinion revolubly and slipably in one direction to said shaft.

45. In a printing-telegraph, a main electric circuit, a revoluble type-wheel, a motor connected mechanically to the type-wheel for rotating it, a motor electric circuit, a shunt electric circuit terminals in the shunt-circuit, a circuit-closer, and means on the motor-shaft adapted under rapid rotation of the motor-shaft to open the shunt-circuit.

46. In a printing-telegraph, a main electric circuit, a revoluble type-wheel, a motor connected mechanically to the type-wheel for rotating it, a motor electric circuit, terminals in the motor-circuit, a circuit-closer, a speed-actuated governor on the motor-shaft, a revoluble insulated metal disk fixed on a collar forming a part of and actuated by said governor and against which disk said terminals bear normally, and means for holding one of said terminals from following the disk when it is withdrawn by the governor, thus breaking the circuit.

47. In a printing-telegraph, an electric motor, a motor electric circuit, a speed-actuated governor on the motor-shaft, an insulated metal disk movable by said governor adapted to serve as an electric-circuit closer, terminals in said electric circuit, one of which terminals bears constantly against said disk, the other terminal being spring-held normally against said disk, and a finger adapted to serve as a stop to prevent said second terminal from following said disk when it is withdrawn from the governor thus breaking the electric circuit.

48. In a printing-telegraph, an electric motor, a motor electric circuit, a speed-actuated governor on the motor-shaft, an insulated metal disk movable by said governor adapted to serve as an electric-circuit closer, terminals in said electric circuit contacting normally with said disk and closing said circuit, a spring-arm bearing against the end of the motor-shaft and following its play and on which spring-arm one of said terminals is mounted elastically, a finger also mounted on said spring-arm adapted to engage the terminal and hold it back against the resiliency of its own spring, and means between said finger and said spring-arm for regulating the position of the finger relative thereto.

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

THEODORE M. FOOTE.

Witnesses:
C. T. BENEDICT,
ANNA V. FAUST.