R. L. DEAN.

SYSTEM OF TELEGRAPHY.

APPLICATION FILED FEB. 1, 1908.

982,659.

Patented Jan. 24, 1911.

10 SHEETS—SHEET 1.

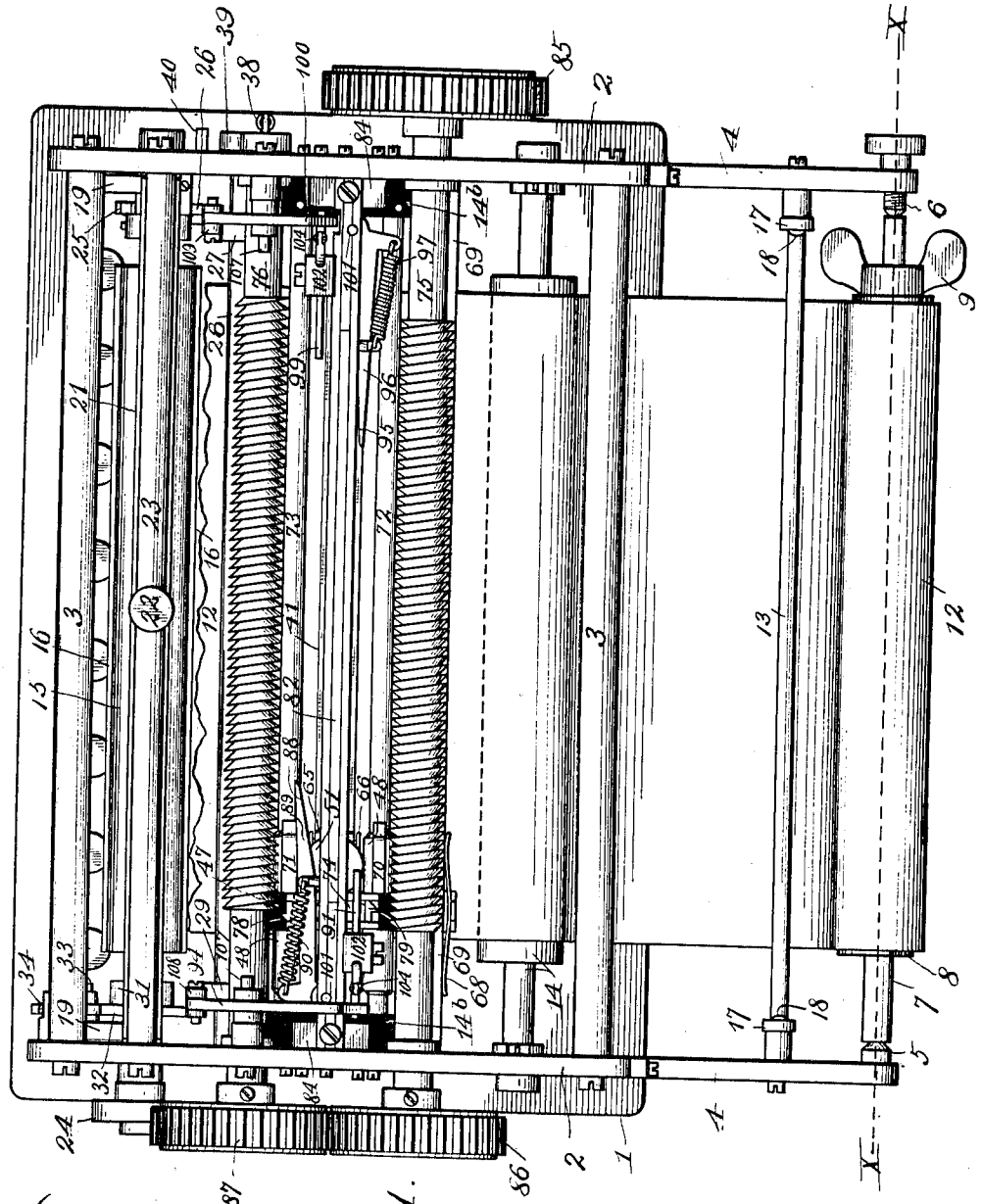

Fig. 1.

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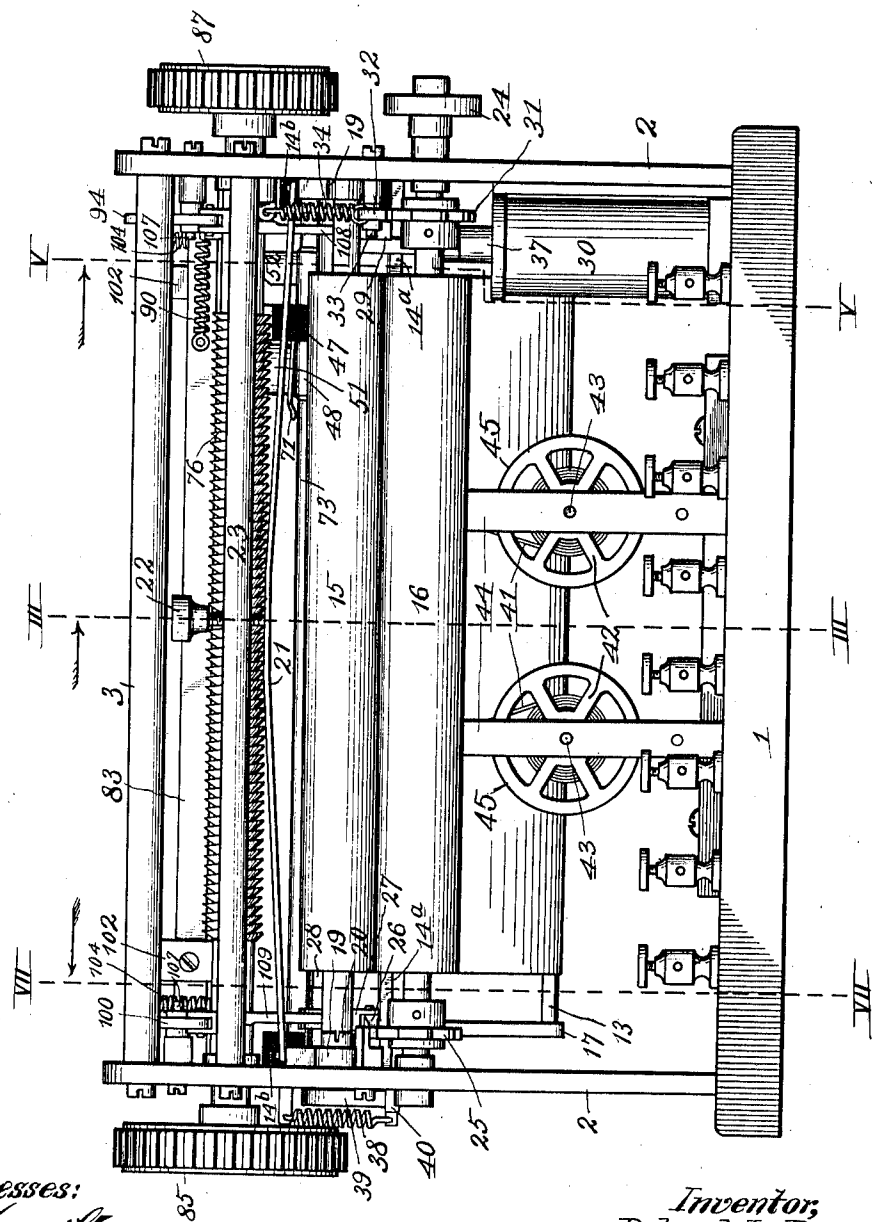
10 SHEETS—SHEET 2.

Fig. 2.



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10 SHEETS—SHEET 3.

Fig. 3.

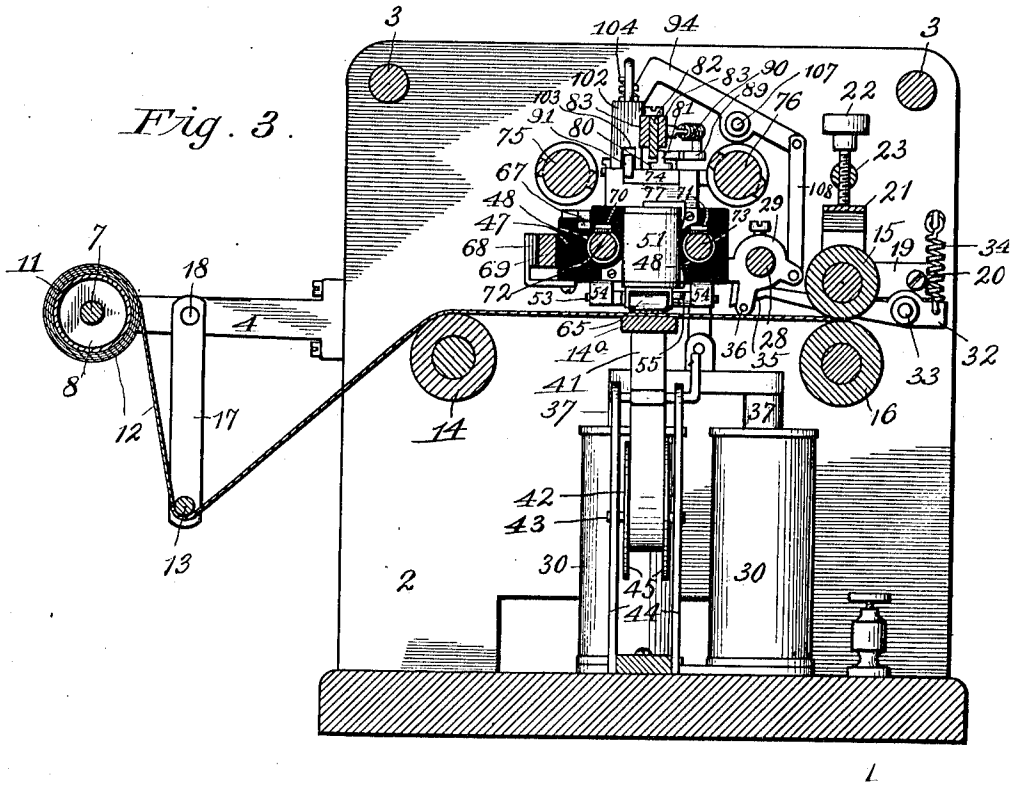
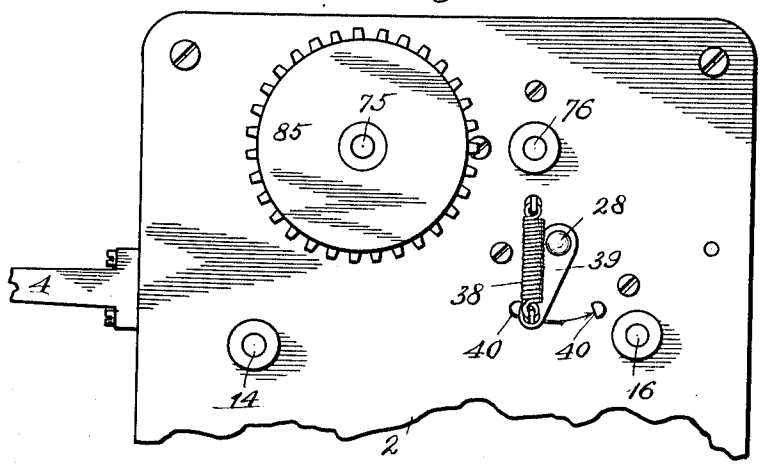


Fig. 4.



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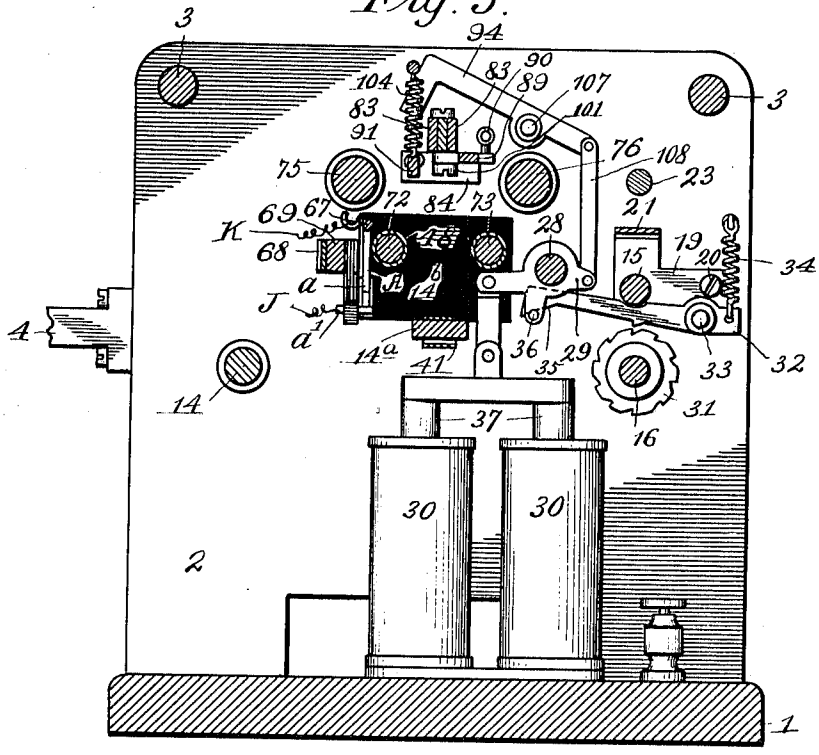
10 SHEETS—SHEET 4.

Fig. 5.



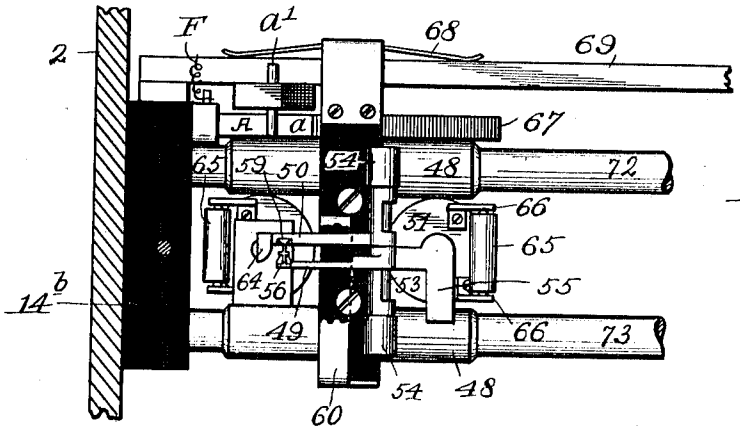
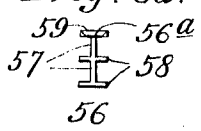


Fig. 6.

Fig. 6a.



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10 SHEETS—SHEET 5.

Fig. 7.

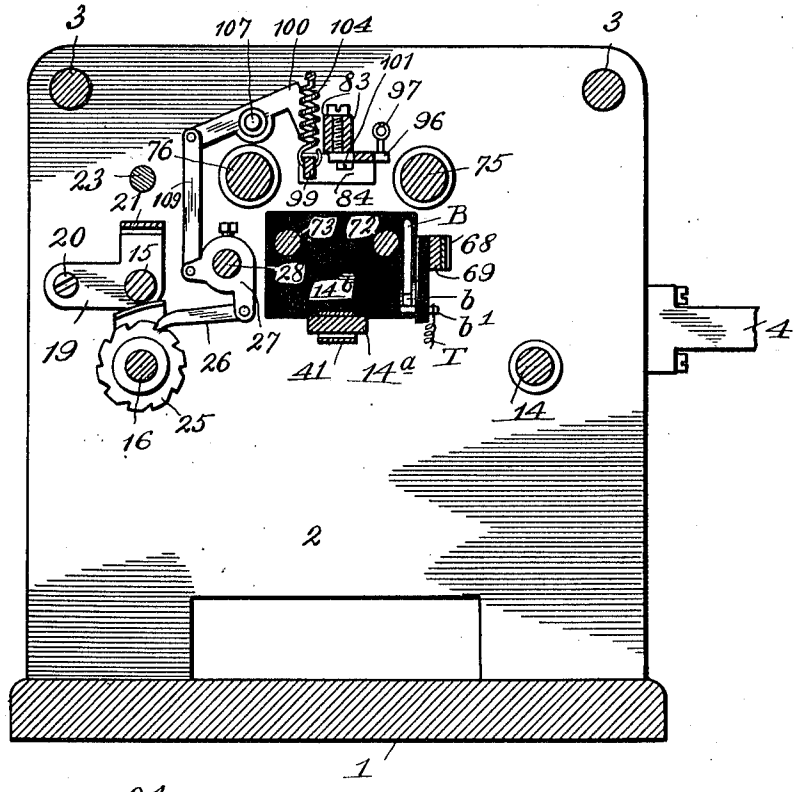
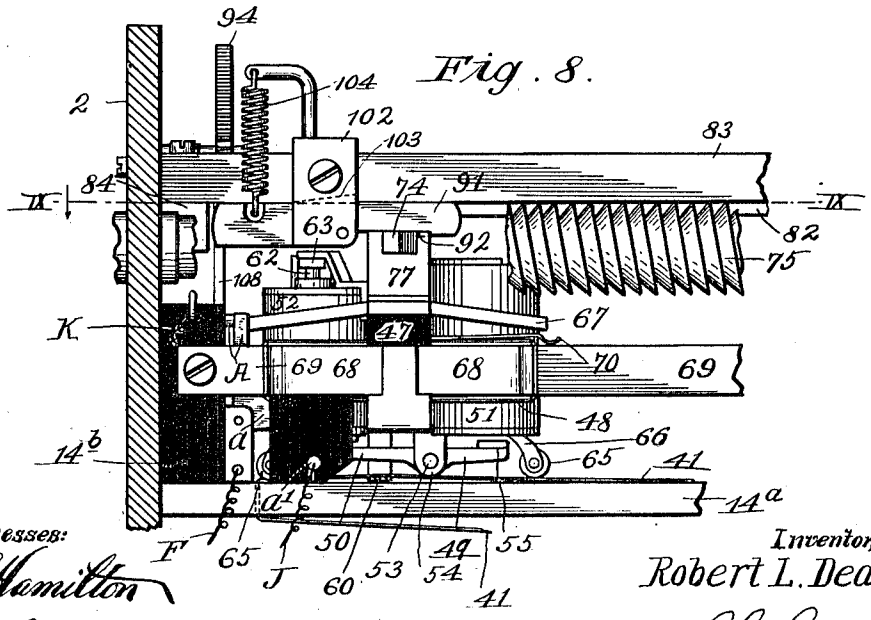


Fig. 8.



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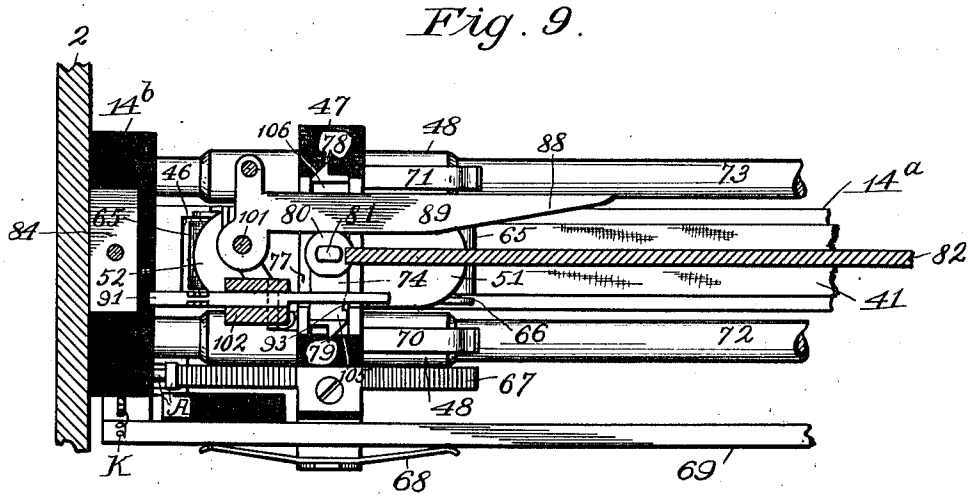
10 SHEETS—SHEET 6.

Fig. 9.



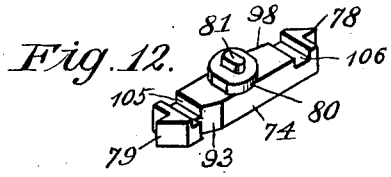


Fig. 12.

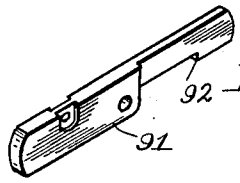


Fig. 13.

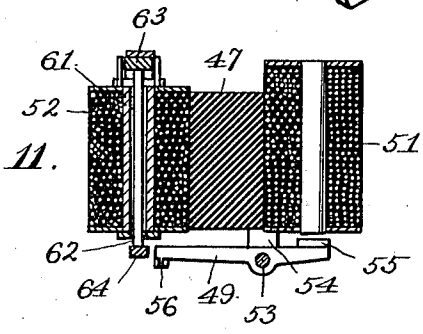


Fig. 11.

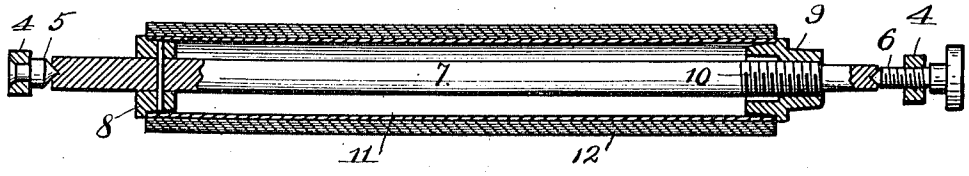


Fig. 10.

Witnesses:

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10 SHEETS—SHEET 7.

Fig. 14.

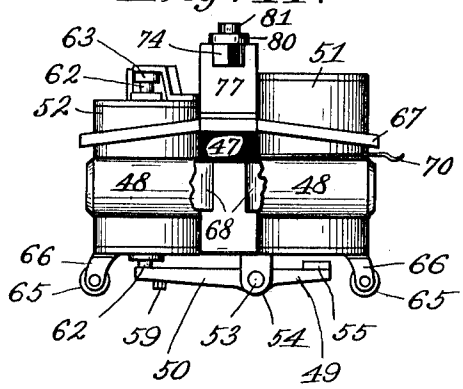


Fig. 18.

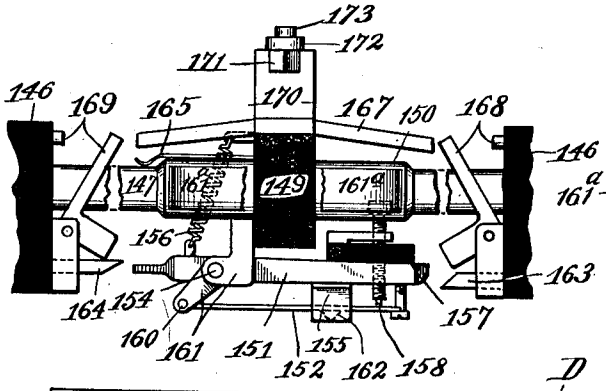
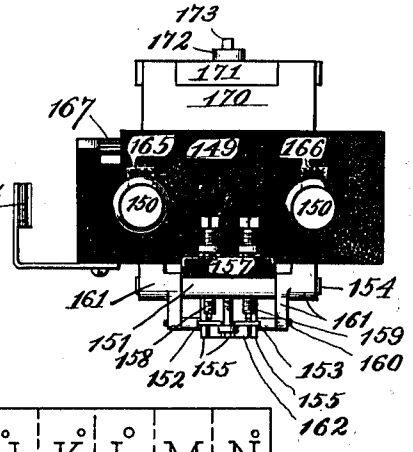


Fig. 19.



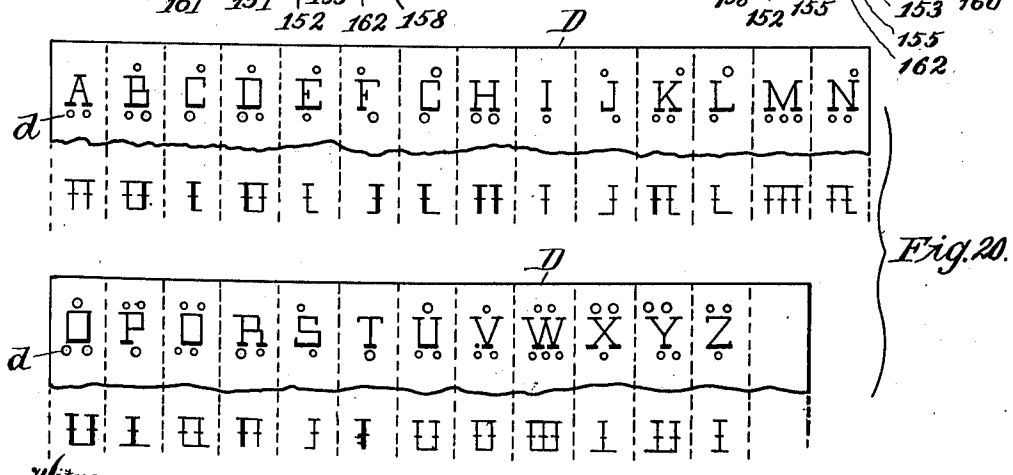


Fig. 20.

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SYSTEM OF TELEGRAPHY.

APPLICATION FILED FEB. 1, 1908.

982,659.

Patented Jan. 24, 1911.

10 SHEETS—SHEET 8.

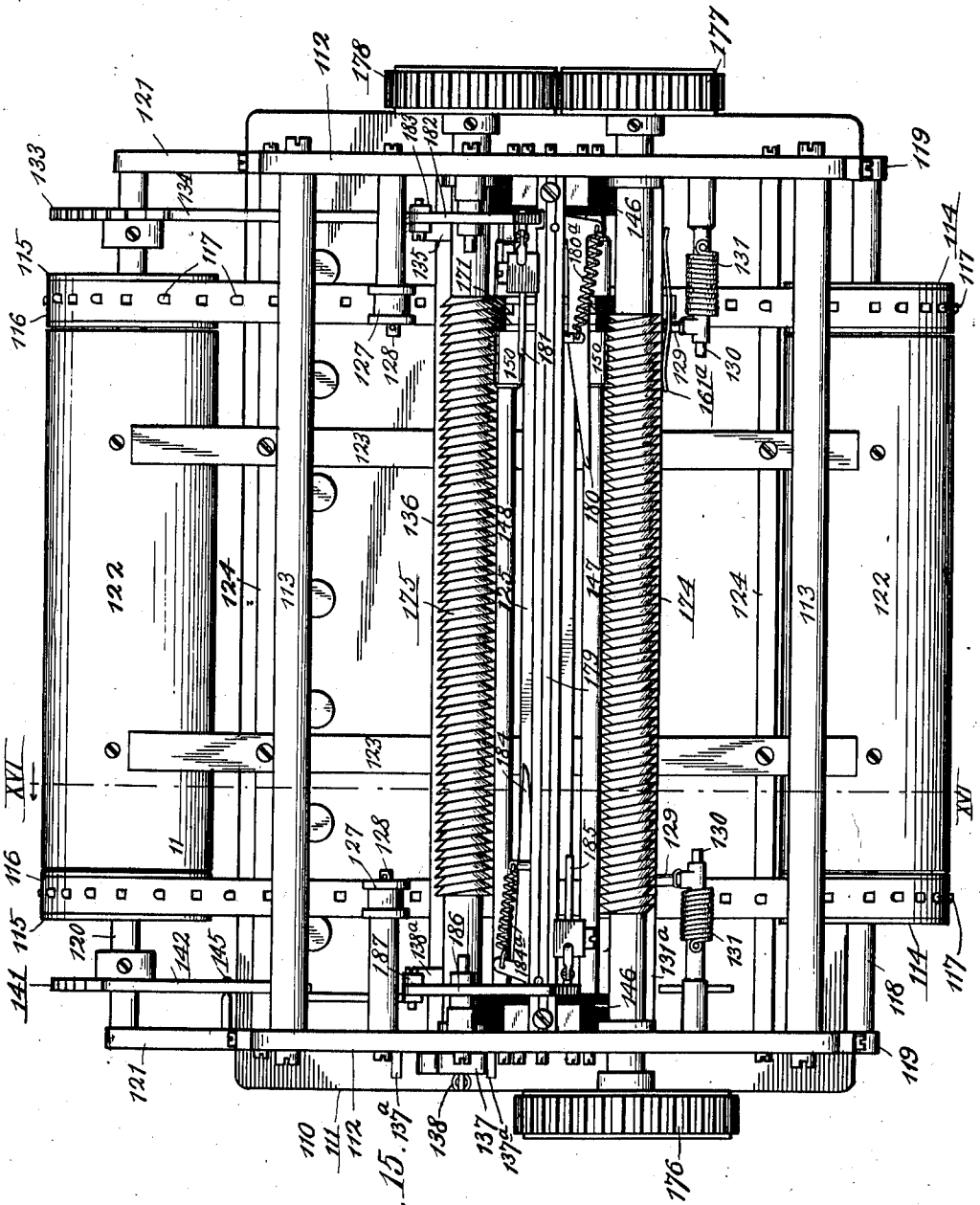

Fig. 15.

Witnesses:

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SYSTEM OF TELEGRAPHY.

APPLICATION FILED FEB. 1, 1908.

982,659. **Patented Jan. 24, 1911.**

10 SHEETS—SHEET 9.

Fig. 16.

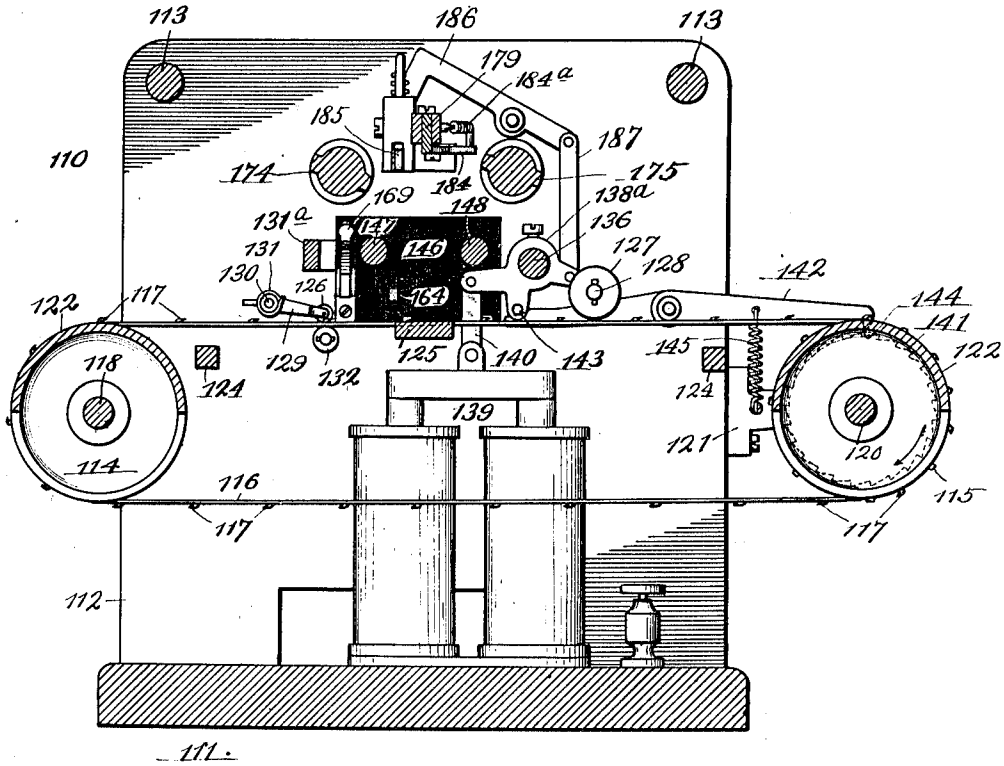
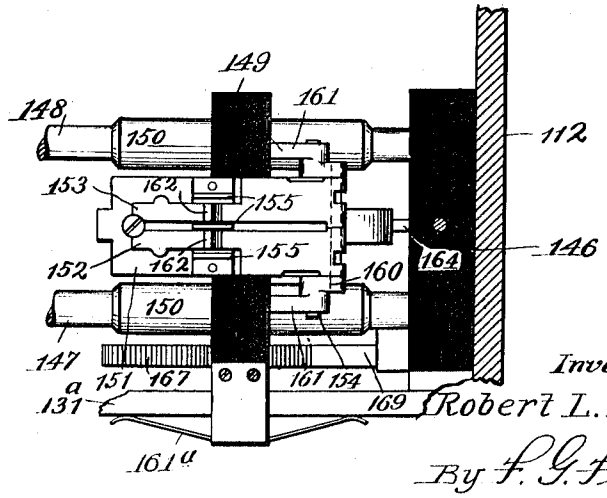


Fig. 17.



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10 SHEETS—SHEET 10.

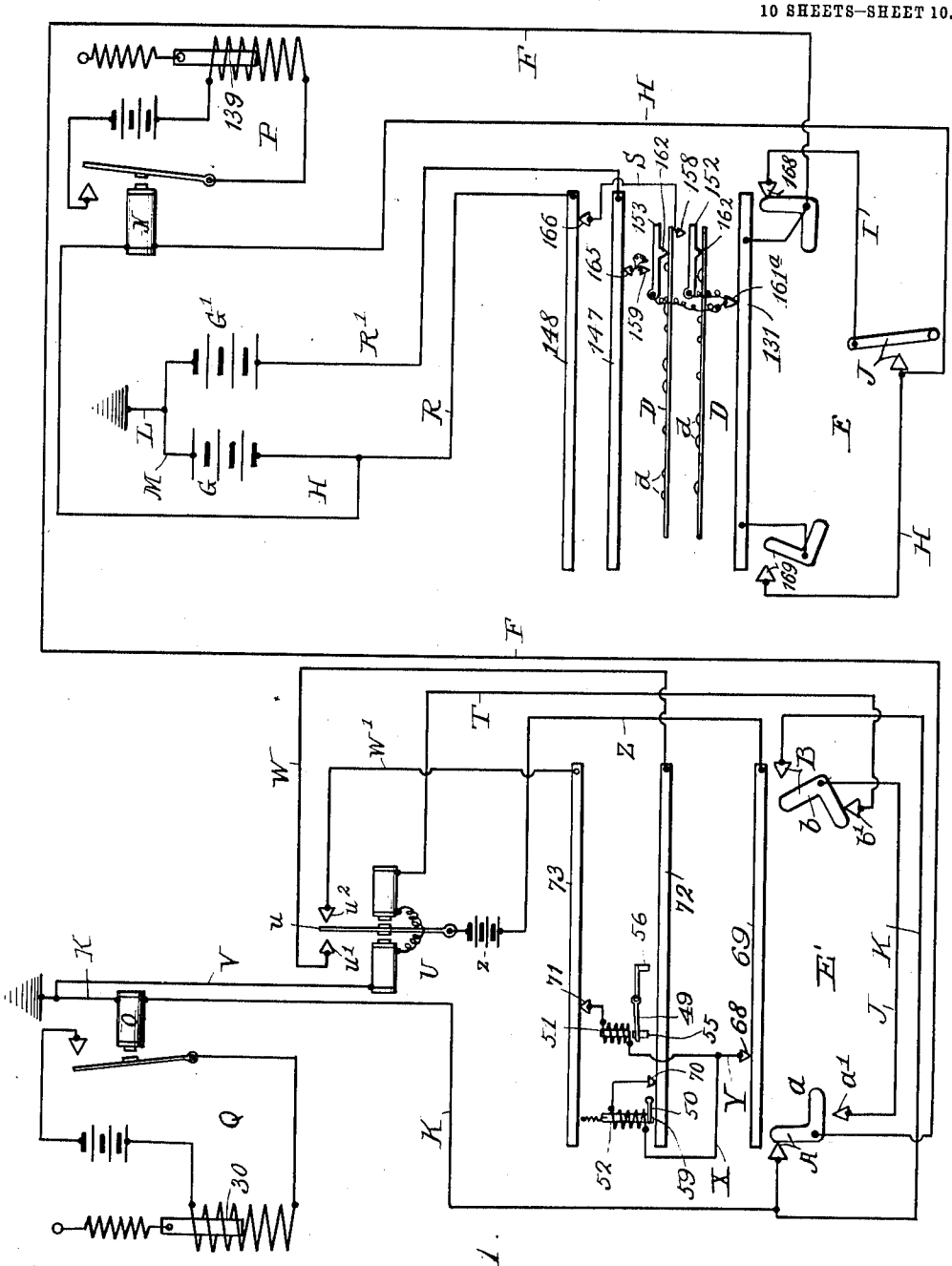

Fig. 21.

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UNITED STATES PATENT OFFICE.

ROBERT L. DEAN, OF KANSAS CITY, MISSOURI, ASSIGNOR TO DEAN RAPID TELEGRAPH CO., A CORPORATION OF ARIZONA TERRITORY.

SYSTEM OF TELEGRAPHY.

982,659. Specification of Letters Patent. Patented Jan. 24, 1911.

Application filed February 1, 1908. Serial No. 413,790.

To all whom it may concern:

Be it known that I, ROBERT L. DEAN, a citizen of the United States, residing at Kansas City, in the county of Jackson and State of Missouri, have invented certain new and useful Improvements in Systems of Telegraphy, of which the following is a specification.

This invention relates to a system of telegraphic transmission wherein positive and negative impulses transmitted from batteries of opposite polarity are employed in the transmission of messages, the impulses being controlled through the aid of embossed message-sheets and contact devices which latter are drawn to and fro over the successive rows of embossments upon said message-sheets.

The invention further embraces character-bearing members which are actuated by two electromagnets, one of which responds to positive impulses while the other responds to negative impulses, and a polarized relay which directs said positive and negative impulses to their respective magnets.

Referring now to the accompanying drawings, which illustrate the invention:—Figure 1 represents a plan view of the receiver. Fig. 2 represents a rear elevation of the same. Fig. 3 is a central section on line III—III of Fig. 2. Fig. 4 is a broken end view of the receiver. Fig. 5 is a cross section on line V—V of Fig. 2. Fig. 6 is an inverted plan view of the recorder and parts of the receiver. Fig. 6ª is an inverted plan view of the printing-characters of the recorder. Fig. 7 is a cross section on line VII—VII of Fig. 2. Fig. 8 is a side elevation of a recorder and parts of the receiver. Fig. 9 is a section on line IX—IX of Fig. 8, with the worms removed. Fig. 10 is a longitudinal section of a paper-carrying roller, forming part of the invention. Fig. 11 is a vertical section of the recorder. Fig. 12 is a detailed perspective view of a shifting-nut for carrying the recorder to and fro over the paper. Fig. 13 is a perspective view of a latch for holding the shifting-nut in a neutral position, between the worms. Fig. 14 is a side elevation of the recorder. Fig. 15 is a plan view of the transmitter. Fig. 16 is a cross section of the transmitter on line XVI—XVI of Fig. 15. Fig. 17 is an inverted plan view of a carriage forming part of the transmitter. Figs. 18 and 19 are side and front elevations, respectively, of said carriage. Fig. 20 represents my alphabet. Fig. 21 shows a diagram of the circuits.

In constructing the receiver I employ a frame comprising a base plate 1, end plates 2, and tie rods 3.

4 designates a pair of brackets extending forwardly from the end plates and provided with cone bearings 5 and 6, upon which is mounted a paper-carrying roller comprising a shaft 7, a shouldered disk 8, and a shouldered clamping-nut 9, which latter engages threads 10 of the shaft.

11 designates a tubular core which is removably mounted upon the shoulders of disk 8 and the clamping-nut 9.

12 designates a roll of paper which is carried by the core to receive the messages to be printed. After one roll of paper has been used its empty core is removed from the paper-carrying roller and one containing another roll is substituted therefor. The free end of the paper is drawn beneath a tension rod 13, over a guide-roller 14, across a platen 14ª, and between two feed-rollers 15 16, Figs. 1 and 3. Tension rod 13 is carried by a pair of arms 17 secured to brackets 4 by pivots 18. Roller 14 is journaled in the end plates 2, and platen 14ª is secured to the under side of two insulating blocks 14ᵇ, secured to the inner sides of the end plates 2. Roller 15 is journaled in a pair of bearings 19, pivotally secured to the end plates by screws 20, so that the roller may be forced downwardly upon the paper by a bow-spring 21, resting upon the upturned ends of bearings 19. The tension of said spring is regulated by a screw 22 adjustably engaging a rod 23 secured to the end plates, Figs. 2, 3 and 5. Roller 16 is journaled in the end plates and provided with a hand-wheel 24, Fig. 2, whereby it may be rotated when it is desired to start the paper between the feed-rollers. The paper is fed through the receiver step by step by a feeding mechanism comprising rollers 15 16, a ratchet-wheel 25 fixed to one end of roller 16, a pawl 26 for actuating said ratchet-wheel, a bell-crank lever 27 pivotally carrying the pawl, a rocker-shaft 28 for actuating the

bell-crank lever, a multi-arm lever 29 for rocking shaft 28, and a solenoid 30 for actuating lever 29, Figs. 5 and 7. The steps of the feeding mechanism are equalized in length by a spacing mechanism at the opposite end of the receiver comprising an escape-wheel 31 fixed to roller 16, and a detent 32 pivotally mounted upon a stub-shaft 33 and adapted to be thrown into engagement with the escape-wheel by a retractile-spring 34. The enlarged forward end of the detent has a beveled underside 35 adapted to be engaged by a pin 36, projecting from lever 29, which normally holds the detent out of engagement with the escape-wheel, see Fig. 5. When the solenoid is energized it draws its plungers 37 downwardly, rocking shaft 28 and causing pawl 26 to turn the ratchet-wheel 25, at the same time rocking lever 29 so that its pin 36 will be carried out of engagement with the detent and permit the latter to engage the succeeding tooth of the escape-wheel, and thus check further action of the feeding mechanism. When the solenoid is deënergized the feeding-mechanism is restored to normal by a retractile-spring 38 and a crank-arm 39, which latter is fixed to one end of shaft 28. The sweep of said crank-arm is limited by stops 40 projecting from the adjacent end of plate 2, Fig. 4. As the paper moves forward tension-rod 13 is swung upwardly thereby and allows sufficient slack paper for the forward step, after which it swings downward and unwinds enough paper from the roll for the next step. This arrangement prevents the roll from turning too fast and allowing too much slack paper to accumulate between the paper-roll and the feed-rollers.

41 designates an ink-containing ribbon arranged to be alternately wound upon a pair of drums 42, mounted upon shafts 43, journaled in standards 44, said drums being provided with flanges 45 whereby either drum may be turned to wind the ribbon thereon, see Figs. 2 and 3. Said ribbon passes upwardly through openings 46 (Figs. 8 and 9) in the ends of the platen and thence over the paper, so that when it is struck by the characters of the recorder, impressions of said characters will be printed upon the paper.

In constructing the recording device I employ a carriage of insulating material 47 provided with a pair of sleeves 48, two character-bearing levers 49 50, and two electromagnets 51 52 adapted to actuate the levers 49 50, respectively. Said levers are pivotally mounted upon a pin 53 carried by lugs 54 depending from the carriage, see Figs. 6, 8 and 14. Lever 49 is provided at one end with an armature 55, and at its opposite end with a character 56, which latter is adapted to print the letters A, H, I, M, R, and T, of my alphabet. Said character comprises a bar 57, for printing all of the vertical elements of the letters, and transverse bars 58 for printing a portion of the transverse elements of the letters. Lever 50 is provided at its free end with a character 59 which is insulated from character 56 by a nonconductor 56^a, and coöperates with said character in printing the transverse elements of certain of the letters of the alphabet. As the levers are carried to and fro with the carriage the characters ride upon the ribbon, a portion of which is raised above the paper by a yoke 60 depending from the carriage, so that said characters will not form lines upon the paper as they travel from side to side thereof. When magnet 51 is energized it will attract armature 55 and depress the character end of lever 49, causing character 56 to force the ribbon down upon the paper so that an impression of said character will be formed thereon. Magnet 52 has a hollow core 61 through which a plunger 62 extends, see Fig. 11. The upper end of said plunger is provided with an armature 63 which is attracted toward magnet 52 when the latter is energized, and the lower end of said plunger rests upon an armature 64 of lever 50, so that character 59 will be forced downwardly upon the ribbon and depress the latter against the paper, causing an impression to be formed thereon each time the magnet is energized.

65 designates a pair of inking-rollers journaled in a pair of arms 66 for the purpose of depressing the ribbon at opposite sides of yoke 60, and thus keeping that portion supporting the character-bearing ends of the levers taut. Arms 66 are secured to the undersides of the magnets 51 52.

67 designates a push-bar secured to the carriage for alternately closing a pair of circuit-breakers hereinafter described.

68 designates a brush slidably engaging a conductor 69, and 70 71 designate a pair of brushes slidably engaging a pair of conductors 72 73, respectively, secured at their ends to blocks 14^b. All of the brushes are secured to the carriage, see Fig. 9.

The carriage is reciprocably mounted upon conductors 72 73 which its sleeves 48 slidably embrace, and is carried to and fro over the paper by a shifting-nut 74 and a pair of worms 75 76, the threaded portions of which terminate out of alinement, (Fig. 1) so that the nut will pass out of engagement with one worm before engaging the other. Nut 74 is slidably mounted in a frame 77 secured to the top of the carriage. Said nut is provided with pointed terminals 78 79 adapted, respectively, to engage the worms 75 76, and it has a centrally-disposed shoulder 80, carrying a centrally-disposed lug 81 which alternately travels along the opposite sides of a rail 82 (Fig. 9) that holds the nut in engagement with the worm

threads. Rail 82 is supported by a pair of bars 83 secured to the top of two blocks 84 on the end plates. The worms are journaled in the end plates, and worm 75 is provided at its ends with cog-wheels 85 86, the former of which is adapted to be driven by a motor (not shown), while the latter intermeshes with a cog-wheel 87 which drives worm 76 reversely to worm 75. Nut 74 is carried to the left end of the machine by worm 76 and as it approaches said end it engages the beveled side 88 of a shifting-lever 89 (Figs. 1 and 9) and pushes the same outwardly against the action of a retractile-spring 90, so that when lug 81 reaches the left end of rail 82, lever 89 will shift the nut longitudinally until its terminal 79 engages worm 75 which carries it to the right end of the machine. The nut, however, is arrested midway of its longitudinal movement by a latch 91 provided with a shoulder 92 (Figs. 8 and 13) which engages a beveled portion 93 of the nut and forces the latter with the carriage to the left until push-bar 67 contacts with and closes a circuit-breaker A, Figs. 8, 9 and 21. The parts remain in this position until the circuit containing the synchronizing mechanism is closed and energizes the solenoid 30, which then actuates a hammer 94, causing it to strike the rear end of the latch and raise the latter out of engagement with the beveled portion 93 of the nut. Lever 89 then completes its operation of forcing the nut into engagement with worm 75, which carries it to the right end of the receiver. As the nut approaches said right end it will engage the beveled side 95 of a shifting-lever 96 and push the latter backwardly against the action of a retractile-spring 97, so that when nut 74 reaches the right end of rail 82 the nut will be shifted longitudinally until its beveled portion 98 engages a latch 99, which arrests its longitudinal movement and forces it with the carriage to the right until push-bar 67 contacts with and closes a circuit-breaker B (Figs. 7 and 21), forming part of the synchronizing mechanism. When the circuit containing the synchronizing mechanism has been closed solenoid 30 will again be energized and operate a hammer 100 (Figs. 1 and 7) which releases latch 99 from the nut and permits lever 96 to force the same into engagement with worm 76. Levers 89 96 are duplicates and fulcrumed upon screws 101, engaging the bars 83. Latches 91 99 are also duplicates and pivotally mounted in the bifurcated portions of a pair of lugs 102 secured to the cross-bars, see Figs. 1 and 8. The rear portions of said latches are normally held in engagement with the upper surface 103 of the bifurcated portions, by retractile-springs 104 to prevent their forward ends from being depressed below recesses 105 106 at opposite ends of the nut. Recess 105 is in alinement with latch 91 when the nut moves to the left, and recess 106 is in alinement with latch 99 when the nut moves to the right, so that said nut will not contact with either of the latches until it is shifted longitudinally, as above described. The hammers 94 100 are also duplicates and pivotally mounted upon stub-shafts 107. Hammer 94 is connected to lever 29 by a connecting-bar 108, and hammer 100 is connected to lever 27 by a connecting-bar 109, see Figs. 5 and 7.

Referring now to the transmitter, which in many respects is similar in construction and operation to the receiver; 110 designates a frame consisting of a base plate 111, end plates 112, and tie-rods 113. The feeding mechanism, whereby the message-sheets D are fed through the transmitter, consists of a pair of grooved pulleys 114, a pair of sprocket-wheels 115, and two perforated endless metallic-belts 116 which travel around the pulleys and the sprocket-wheels, and are provided with hooks 117 to which the message-sheets are attached preparatory to being carried through the transmitter, see Figs. 15 and 16. Pulleys 114 are fixed upon a shaft 118 journaled in bearings 119 at the front sides of the end plates, and sprocket-wheels 115 are fixed to a shaft 120 journaled in bearings 121 at the rear sides of the end plates. The messagé-sheets are prevented from sagging between the belts by a table consisting of semicylindrical end members 122, fitting over shafts 118 120, and two parallel members 123 which support the end members and in turn are supported by two bars 124, secured to the end plates. Each message-sheet is prepared on a typewriter containing studs of different diameters and spaced unequal distances apart for making embossments *d* which are formed thereon in horizontal rows arranged in pairs with the embossments of one row out of vertical alinement with those in the companion row, so that they will not raise contact-levers hereinafter referred to simultaneously into engagement with their stops and short-circuit the line impulses. The embossments of one row are arranged in proper relation to the embossments of its companion row to represent the characters and words to be transmitted. The diagram, Fig. 20, shows my code, the embossments arranged to represent the letters thereof, and a translation of the same in the English alphabet. The upper strands of belts 116 are held in contact with a platen 125 by depression-rollers 126 127, the latter of which are journaled upon stub-shafts 128 projecting inwardly from the end plates. Depression-rollers 126 are carried by arms 129 pivotally secured to stub-shafts 130, projecting inwardly from the end plates. The roller-carrying ends of

arms 129 are depressed by coil springs 131, and in order to prevent rollers 126 from depressing the upper strands below a horizontal plane, I support said strands by idlers 132 placed immediately beneath rollers 126, see Fig. 16.

133 designates a ratchet-wheel fixed to shaft 120 and engaged by one end of a pawl 134, pivotally secured at its opposite end to a bell-crank lever 135, fixed upon a rocker-shaft 136, provided at one end with a crank-arm 137, to which a spring 138 is connected, which restores the parts to normal as ratchet-wheel 133 turns one step. The sweep of crank-arm 137 is limited by stops 137^a projecting from the adjacent end plate, see Fig. 15. Ratchet-wheel 133, pawl 134, bell-crank lever 135, rocker-shaft 136, crank-arm 137, spring 138, and stops 137^a are duplicates of the parts 25, 26, 27, 28, 38, 39, and 40 shown in Figs. 4 and 7, with the exception that ratchet-wheel 133 is larger than ratchet-wheel 25, and pawl 134 is larger than pawl 26. Rocker-shaft 136 is provided with a multi-arm lever 138^a, which is connected to a solenoid 139 by a connecting-bar 140, so that every time said solenoid is energized, ratchet-wheel 133 will be turned one step through the instrumentality of the connecting parts. The length of the steps is limited to the distance between each pair of embossment rows by a ratchet-wheel 141, a detent 142, and a pin 143 carried by lever 138^a. Said pin normally engages the rear end of detent 142 and holds its forward hooked end 144 out of engagement with ratchet-wheel 141. Every time the solenoid is energized the pin is swung upward and permits a retractile spring 145 to draw the hooked end of the detent into engagement with the ratchet-wheel to arrest further movement.

Platen 125 is secured to the undersides of a pair of insulating blocks 146, secured to the end plates and carrying a pair of conductors 147 148, upon which the contact device is reciprocably mounted, see Figs. 17, 18, and 19. Said contact device consists of a carriage 149 of insulating material having a pair of sleeves 150 slidably embracing conductors 147 148, an arm 151, and a pair of contact levers 152 153. Arm 151 is pivotally-mounted near one end upon a pin 154, and provided at its underside with runners 155, which travel above platen 125 and press the message-sheets thereon, said runners being held in contact with the upper surface of the message-sheets by a retractile-spring 156.

157 designates an insulation block secured to the free end of arm 151, and carrying a pair of threaded contact-stops 158 159, against which the free ends of levers 152 153, respectively, contact when they are raised by the embossments on the message-sheets. The contact levers are pivotally-mounted upon a pin 160, which together with pin 154 are carried by brackets 161 secured to the carriage. Said levers are provided near their free ends with contact points 162, which engage and travel over the embossments. When the carriage reaches the end of its movement to the right the free end of arm 151 engages and is raised by a pointed pin 163, and when it reaches the end of its opposite movement it engages a pointed pin 164, which also causes its free end to swing upwardly and raise the runners above the message-sheets so as not to impede the forward movements thereof. Pins 163 164 project from the blocks 146.

165 166 designate two brushes secured to the carriage and engaging the conductors 147 148, respectively. 161^a designates a brush also secured to the carriage and slidably engaging a conductor 131^a, see Figs. 15, 16, and 18.

167 designates a push-bar projecting in opposite directions from the carriage and adapted to alternately close a pair of circuit-breakers 168 169, secured to the blocks 146.

170 designates a guide frame secured to the top of carriage 149 and provided with a shifting-nut 171, having a shoulder 172, and a lug 173. Nut 171, together with the carriage, is carried to and fro from one end of the transmitter to the other by a pair of reversely-driven worms 174 175, which are journaled in the end plates. Worm 174 is provided at its ends with cog-wheels 176 177, which latter intermeshes with and drives a cog-wheel 178 on one end of worm 175. Cog-wheel 176, like cog-wheel 85 is geared to a suitable motor, not shown, whereby it is driven. Nut 171 is alternately held in engagement with the worms by a rail 179 and lug 173, which latter, like lug 81, first travels along one side of the rail and then the other. The nut, together with the carriage, is carried to the right by worm 174 and when the nut reaches one end of the rail it is moved to a neutral position between the worms (Fig. 15), by a shifting-lever 180 controlled by a retractile-spring 180^a and adapted to move the nut longitudinally into engagement with worm 175. The nut, however, is arrested on reaching the neutral position, above referred to, by a latch 181, which is released from the nut at the proper time by a hammer 182, connected to lever 135 by a connecting-bar 183. The parts being so arranged that the message-sheet will be moved forward one step while the nut is at rest. After being released from the latch the nut is pushed into engagement with worm 175 which carries it to the opposite end of the rail, where it is shifted longitudinally toward worm 174 by a shifting-lever 184 controlled by a retractile-spring 184^a. The nut, however, is again arrested midway between the worms by an-

other latch 185, which in due time is disengaged from the nut by a hammer 186, connected to lever 138 by a connecting-bar 187.

From the above description, and reference to Figs. 1 and 15, it will be understood that the nut, the worms, and the mechanism for alternately shifting the nut into engagement with said worms, are duplicates of those shown on the receiver, hence further description or illustration thereof is considered unnecessary.

For convenience in describing the circuits, I have shown in the diagram, Fig. 21, two stations designated E and E¹, equipped with a transmitter and a receiver, respectively. When the operator at station E desires to forward a message to station E' he places a message-sheet in the transmitter and establishes a circuit over the main line F, by closing a key J. As the circuit-breakers A and 168 are normally held closed by the push-bars, current from the main battery G will pass through a circuit-wire H, key J, a circuit wire I, circuit-breaker 168, the line-wire F, bell-crank lever *a*, a circuit-wire K, to ground, thence to a wire L, and back to battery G through a branch-wire M. The current flowing through the main line will energize two relays N O located at stations E E¹, respectively, and cause them to close two local circuits P Q containing the solenoids 139 30, respectively, which are thus energized and turn the respective feed-rollers of the transmitter and the receiver one step. This action of the transmitter feed-rollers will move the message-sheet forward and bring its initial pair of embossed rows beneath the contact levers 152 153 and platen 125. The solenoids also, through the intervening parts, release the latches from nuts 81 173, so that the shifting-levers will move said nuts into engagement with worms 75 175, respectively. Then as the carriages travel toward each other, they will draw their push-bars away from circuit-breakers 168 and A, which immediately interrupt the local circuits P Q. When contact lever 152 passes over an embossment it is raised thereby into engagement with contact-stop 158, so that a positive impulse will be transmitted from battery G through wire H, a circuit-wire R, conductor 148, brush 166, a wire S, brush 158, lever 152, brush 161ª, conductor 131, line-wire F, lever *a*, contact-point a^1, wire J, lever *b*, contact-point b^1, a circuit-wire T, a polarized relay U, a wire V, wire K, and return to battery G through the ground circuit and wires L and M. As the positive impulse passes through relay U it energizes the same and causes it to draw its tongue *u* against a contact-point u^2 and close a local circuit comprising a circuit-wire W^1, conductor 73, brush 71, magnet 51, a circuit-wire Y, brush 68, conductor 69, a circuit-wire Z, and a battery *z*. When magnet 51 is energized it will attract armature 55 and depress the character-end of lever 49 so that an impression of character 56 will be printed upon the paper 12. After lever 152 has passed over the embossment it will drop out of engagement with stop 158 and interrupt the circuit over the line-wire. The polarized relay is then deënergized and interrupts the local circuit in which magnet 51 is arranged. When contact lever 153 is raised into engagement with contact-stop 159 a negative impulse will be transmitted from a battery G^1 through a circuit-wire R^1, conductor 147, brush 165, contact-stop 159, lever 153, brush 161ª, conductor 131, line-wire F, and then follow the course to branch-wire M pursued by the positive impulse, above referred to. When the negative impulse energizes relay U it will draw its tongue into engagement with a contact-point u^1 and close a local circuit consisting of a wire W, conductor 72, brush 70, magnet 52, wire X, brush 68, conductor 69, wire Z, and battery *z*. After the message has been printed key J is thrown open, and should this operation occur while the contact and recording devices are moved to the left and to the right, respectively, the main line and local circuits will be established when the circuit-breakers 169 and B are closed by the push-bars, hence the shifting-nuts will be thrown into engagement with worms 174 76 and returned thereby to the right end of the transmitter and the left end of the receiver, respectively. Upon reaching these positions, the push-bars will close circuit-breakers 168 A, but as communication has been broken between relays N O and circuit-breakers 168 and A, by opening the key, said relays will not be energized, hence the circuits will remain broken and the contact and recording devices will remain in the last-mentioned positions until the key is again closed, thus said devices will be ready to transmit and receive another message.

By referring to Fig. 20 it will be noted that the letters A and R are distinguished only by the heavy stem forming one of the vertical elements of R. This is accomplished by making the corresponding embossment larger than its companion, so that a long impulse will be transmitted to electromagnet 51 and cause it to hold character 56 depressed a corresponding period of time. The heavy stems of the other letters are formed in a like manner.

Having thus described my invention, what I claim is:—

1. In a system of telegraphy, reciprocably mounted character-bearing levers for printing upon paper, an ink-ribbon between said levers and the paper, and electrically-controlled means for actuating said levers.

2. In a system of telegraphy, a sheet of

paper having rows of embossments, said horizontal rows being in pairs and the embossments of different sizes and so arranged that those in one row will not be in vertical alinement with those in the companion row, a pair of contact levers arranged to travel to and fro over the embossments and be caused thereby to intermittently close a circuit, two electromagnets which are energized one at a time when the circuit is closed, and two character-bearing levers which are actuated by said electromagnets.

3. In a system of telegraphy, a line wire, a battery for supplying positive impulses to said wire, another battery for supplying negative impulses to the wire, contact levers for controlling the duration of said impulses, reciprocable character-bearing members for printing paper, means for moving said paper forward step by step, electromagnets for actuating the same, and a polarized relay in circuit with said electromagnets to control the same, said polarized relay being controlled by the positive and negative impulses.

4. In a system of telegraphy, a line wire, a battery for supplying positive impulses to said wire, another battery for supplying negative impulses to the wire, reciprocably mounted contact levers for controlling the duration of said impulses, reciprocably mounted character-bearing members, means for synchronizing the reciprocable movements of the contact levers and the character-bearing members, electromagnets for actuating said character-bearing members, and a polarized relay in circuit with said electromagnets to control the same, said polarized relay being controlled by the positive and negative impulses.

5. In a system of telegraphy, a line wire, sources for supplying the same with positive and negative impulses, contact levers for controlling the duration of said impulses, embossed material for actuating said contact levers, reciprocable character-bearing members, electromagnets for actuating the same, and a polarized relay in circuit with said electromagnets to control the same, said polarized relay being controlled by the positive and negative impulses.

6. In a system of telegraphy, a line wire, sources for supplying the same with positive and negative impulses, reciprocably mounted contact members for controlling the duration of said impulses, embossed material for actuating said members, means for moving said material step by step, reciprocably mounted character-bearing members for printing upon paper, means for moving said paper step by step, electromagnets for actuating the character-bearing members, a polarized relay in circuit with said electromagnets to control the same, said polarized relay being controlled by the positive and negative impulses, and means for synchronizing the reciprocable movements of the contact members and for synchronizing the steps of the embossed material and the paper.

7. In a system of telegraphy, a transmitter provided with a reciprocably mounted carriage, a receiver provided with a reciprocably mounted carriage, a line wire connecting the transmitter and the receiver, sources for supplying said wire with positive and negative impulses, contact members carried by the transmitter carriage for controlling the duration of the impulses, a message-sheet for actuating the contact members, electromagnets carried by the receiver carriage, character-bearing members which are actuated by said magnets and adapted to print on paper, a relay in circuit with said electromagnets to control the same, said relay being controlled by the positive and negative impulses, mechanisms for feeding the message-sheet and the paper step by step, solenoids for actuating said mechanisms, local circuits containing the solenoids, circuit-breakers adapted to establish communication between the line wire and said local circuits, and devices carried by the carriages for closing said circuit-breakers.

8. In a system of telegraphy, a carriage, two electromagnets carried thereby, two armature levers adapted to be actuated by said magnets, a character on one of said levers adapted to print certain letters of an alphabet and a portion of the remaining letters of said alphabet, and a character on the other lever for printing the remainder of the incompleted letters.

9. In a system of telegraphy, a carriage, means carried thereby for printing the letters of an alphabet, a nut adjustably mounted upon said carriage and adapted to move the same to and fro, a pair of reversely-driven worms for moving the nut to and fro, means for alternately shifting the nut into engagement with the worms, and a rail for alternately holding the nut in engagement with the worms.

10. In a system of telegraphy, a carriage, printing means carried thereby, a nut adjustably mounted upon said carriage and adapted to move the same to and fro, a pair of reversely-driven worms for moving the nut to and fro, a lever for shifting the nut into engagement with one of said worms, and another lever for shifting the nut into engagement with the other worm.

11. In a system of telegraphy, a carriage, printing means carried thereby, a nut adjustably mounted upon said carriage and adapted to move the same to and fro, a pair of reversely-driven worms for moving the nut to and fro, a lever for shifting the nut into engagement with one of said worms, another lever for shifting the nut into en-

gagement with the other worm, latches at the ends of the worms for arresting the shifting movements of the nut and holding the same in a neutral position between the worms, and means for disengaging the latches from the nut.

12. In a system of telegraphy, a carriage, printing means carried thereby, a nut adjustably mounted upon said carriage and adapted to move the same to and fro, a pair of reversely-driven worms for moving the nut to and fro, means for alternately shifting the nut into engagement with the worms, a latch at each end of the worms for arresting the shifting movements of the nut and holding the same in a neutral position between the worms, hammers for disengaging the latches from the nuts, and means for operating said hammers.

13. In a system of telegraphy, a roll of paper, a carriage, means carried thereby for printing upon the paper, a nut adjustably mounted upon the carriage for moving the same to and fro over the paper, reversely-driven worms for moving the nut to and fro, means for alternately shifting the nut into engagement with the worms, latches at the ends of the worms for arresting the shifting movements of the nut and holding the same in a neutral position between said worms, and means for moving the paper step by step and disengaging the latches from the nut.

14. In a system of telegraphy, reciprocably-mounted character-bearing members, electrically-controlled means for actuating said members, a relay in circuit with said means to control the same, contact-levers in circuit with said relay to control the same, and a sheet containing means for controlling said contact-levers.

15. In a system of telegraphy, character-bearing levers arranged to travel to and fro, electrically-controlled means for actuating said levers, a relay in circuit with said means to control the same, contact-levers in circuit with said relay to control the same and arranged to travel to and fro, a sheet containing embossments for actuating said contact-levers one at a time to temporarily close the circuit in which they are arranged, and means for simultaneously starting the character-bearing levers and the contact-levers on their to and fro movements.

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

ROBERT L. DEAN.

Witnesses:
F. G. FISCHER,
M. COX.