R. L. DEAN.

TELEGRAPH APPARATUS.

APPLICATION FILED FEB. 12, 1906.

963,213.

Patented July 5, 1910.

6 SHEETS—SHEET 1.

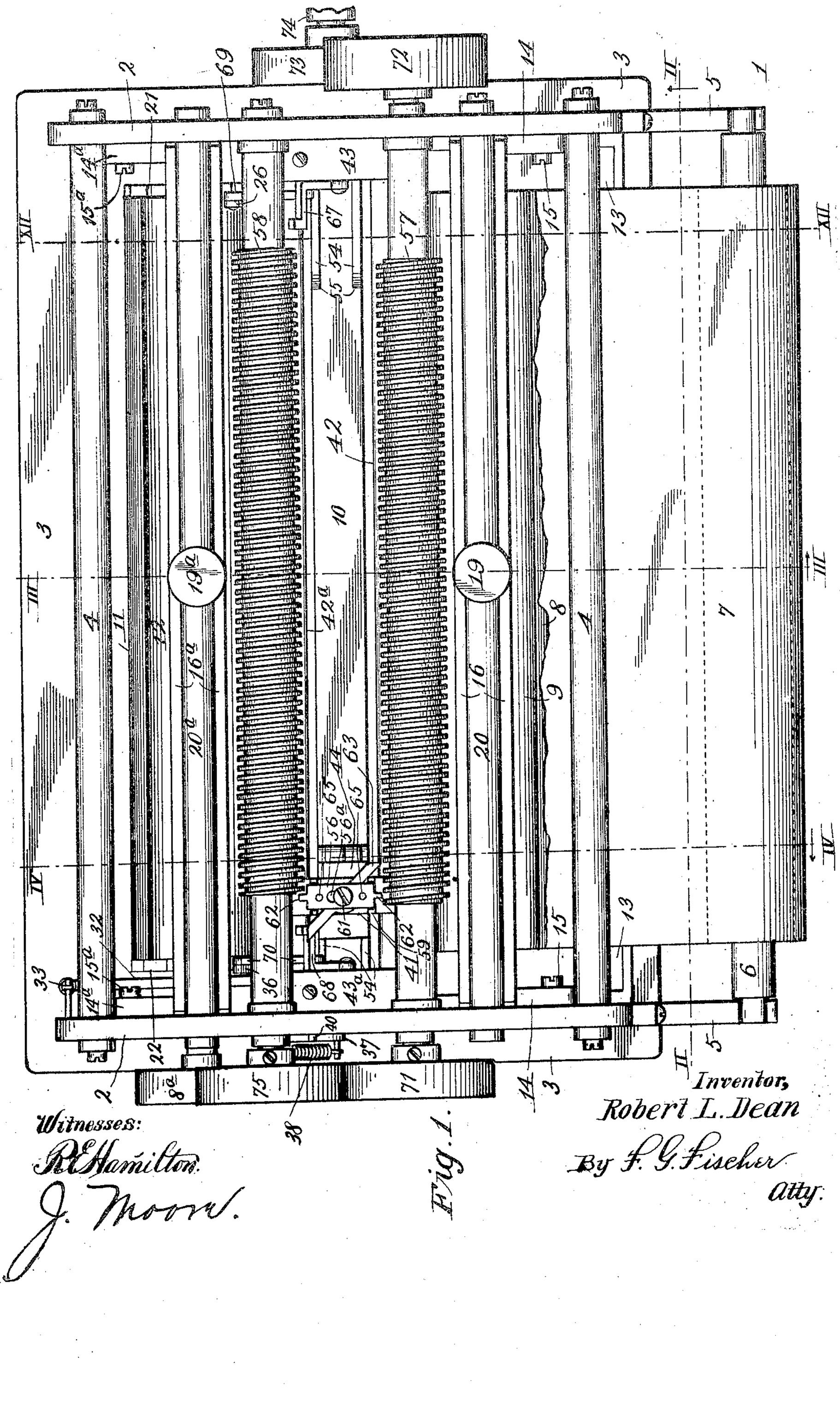

Fig. 1.

Witnesses:

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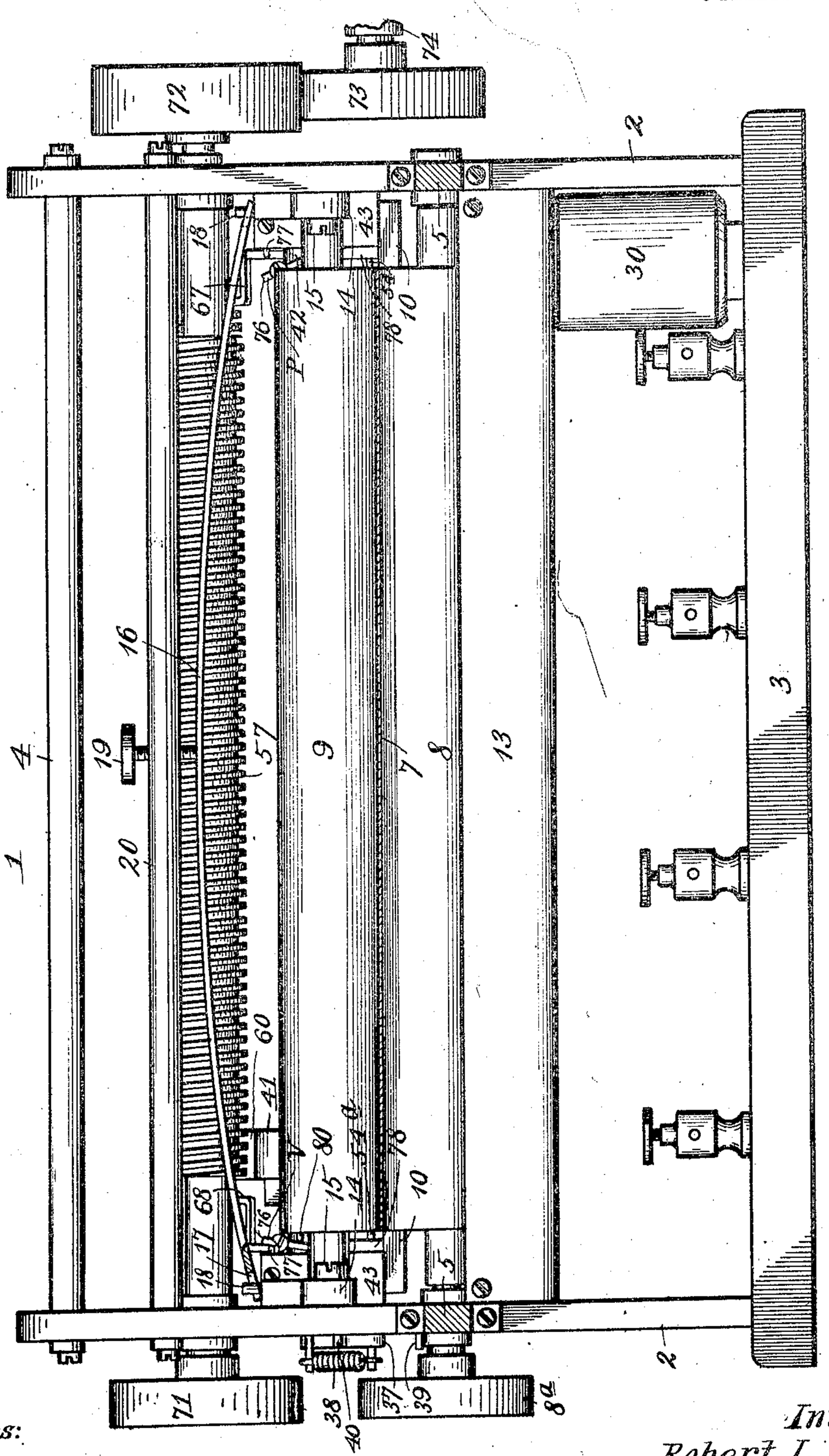
6 SHEETS—SHEET 2.

Fig. 2.



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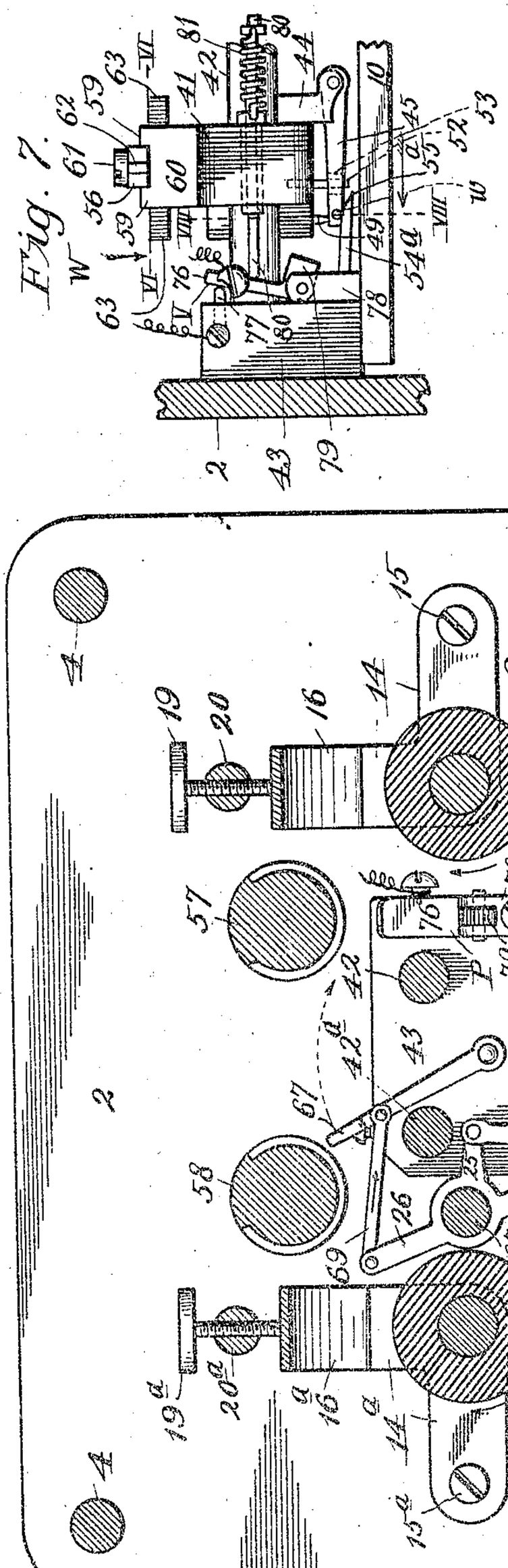

Fig. 7.

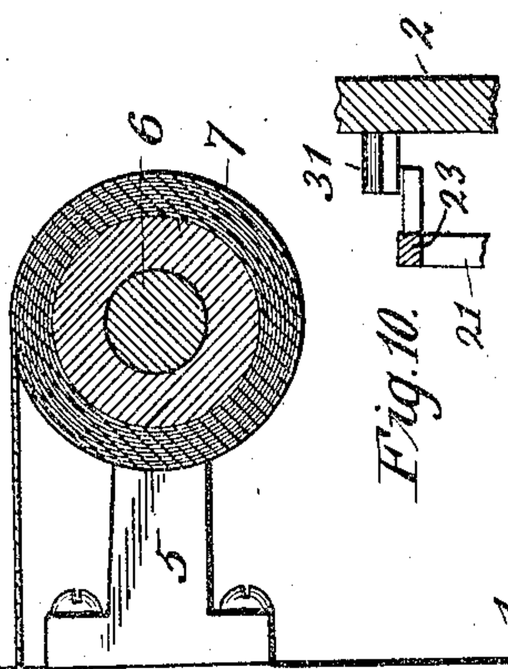

Fig. 10.

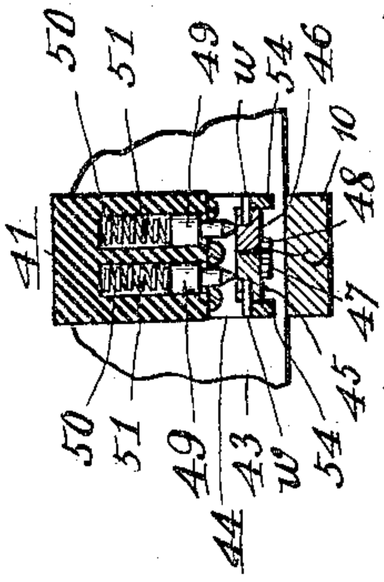

Fig. 8.

Fig. 3.

Witnesses:

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6 SHEETS—SHEET 4.

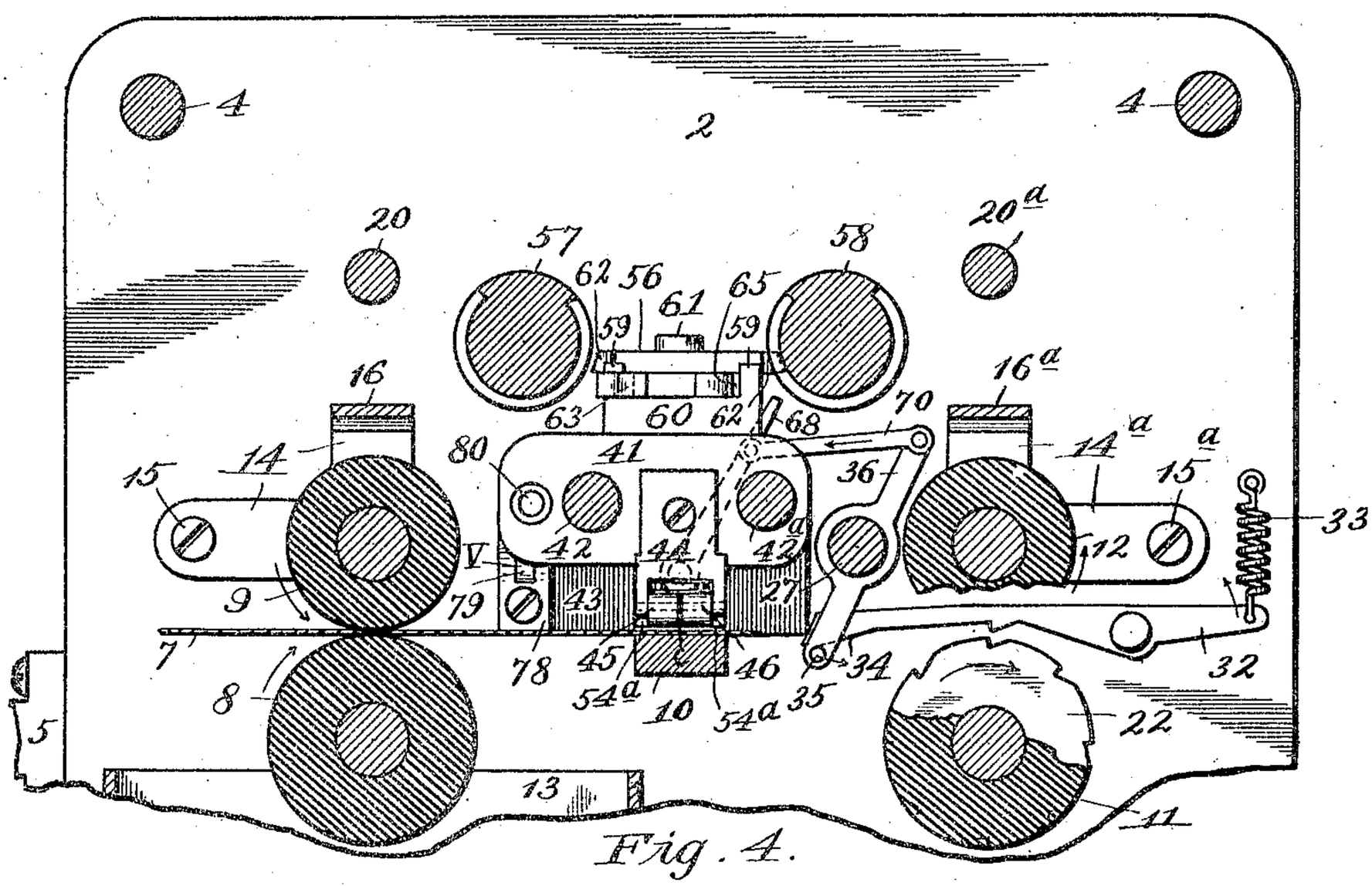
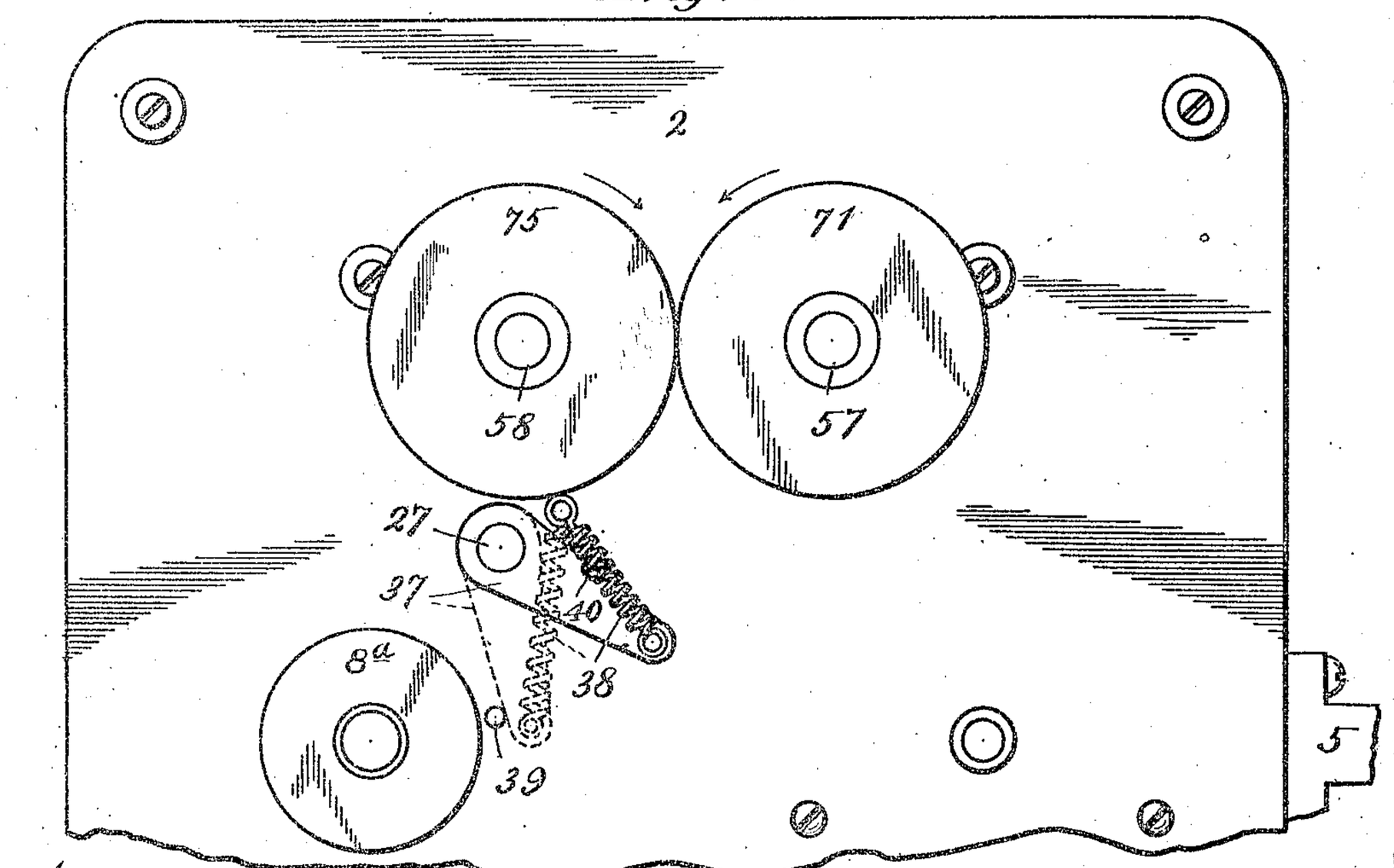


Fig. 4.

Fig. 5.



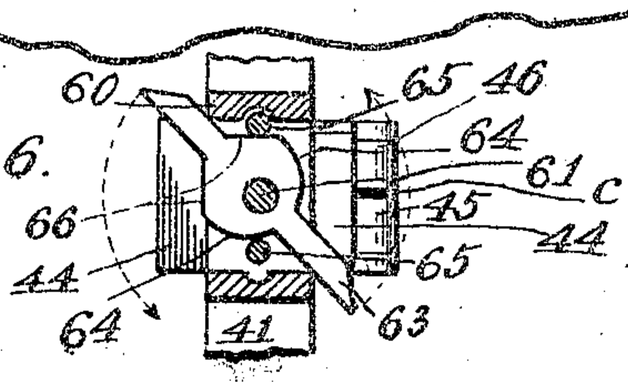


Fig. 6.

Witnesses:

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6 SHEETS—SHEET 5.

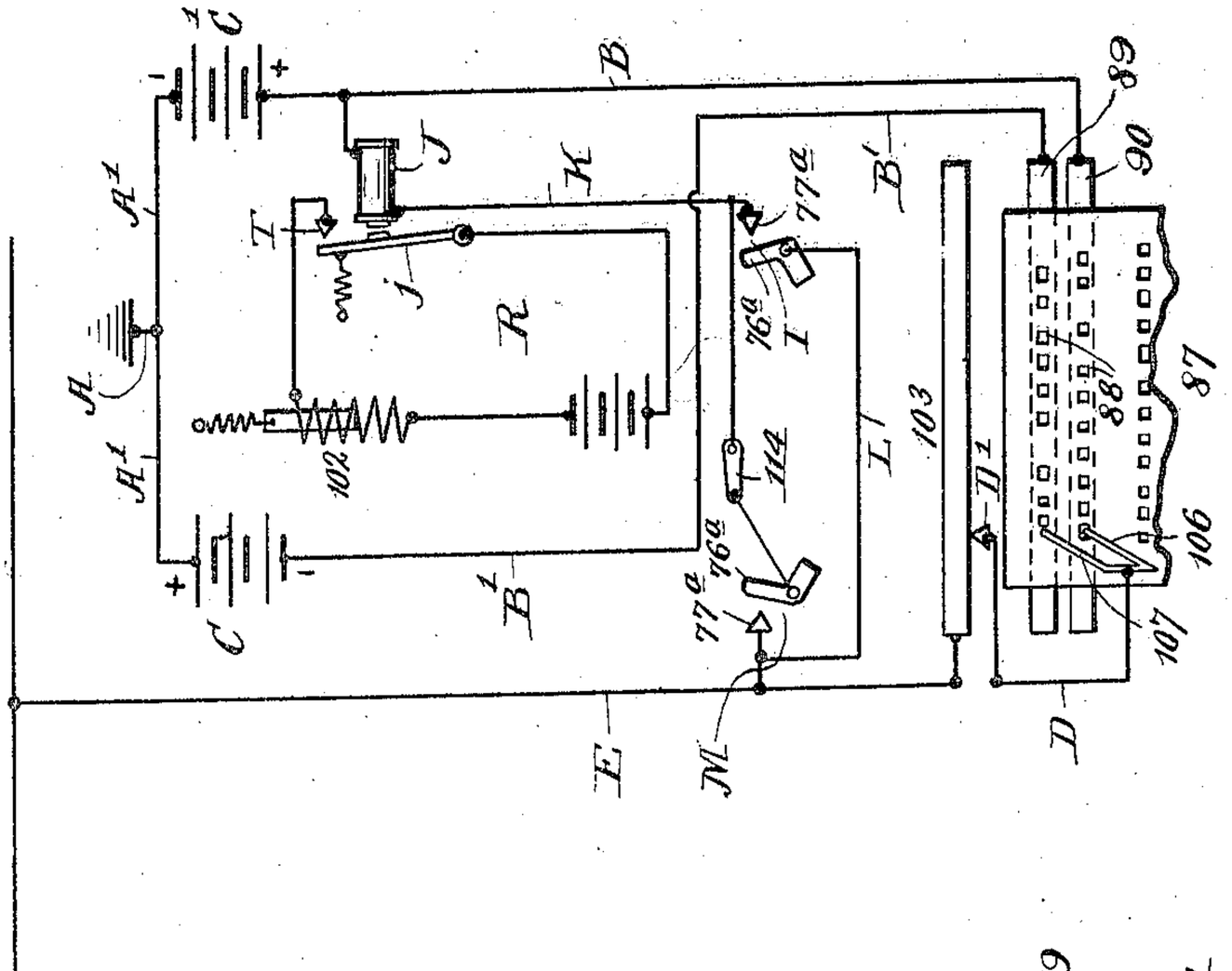


Fig. 11.

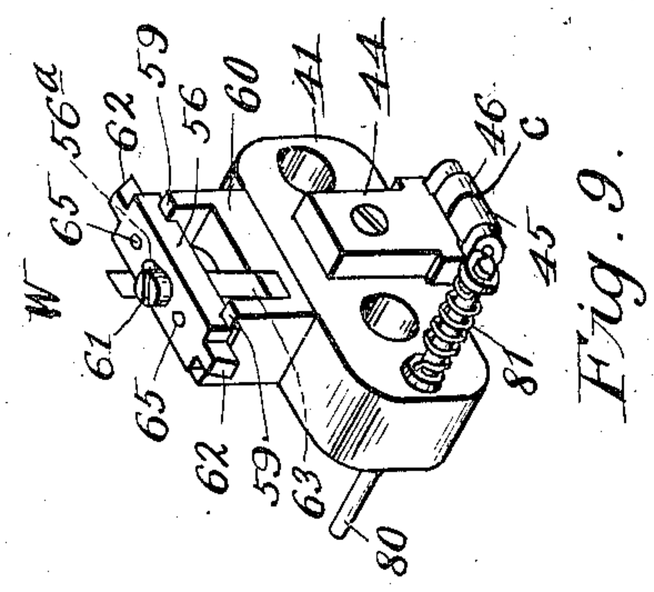
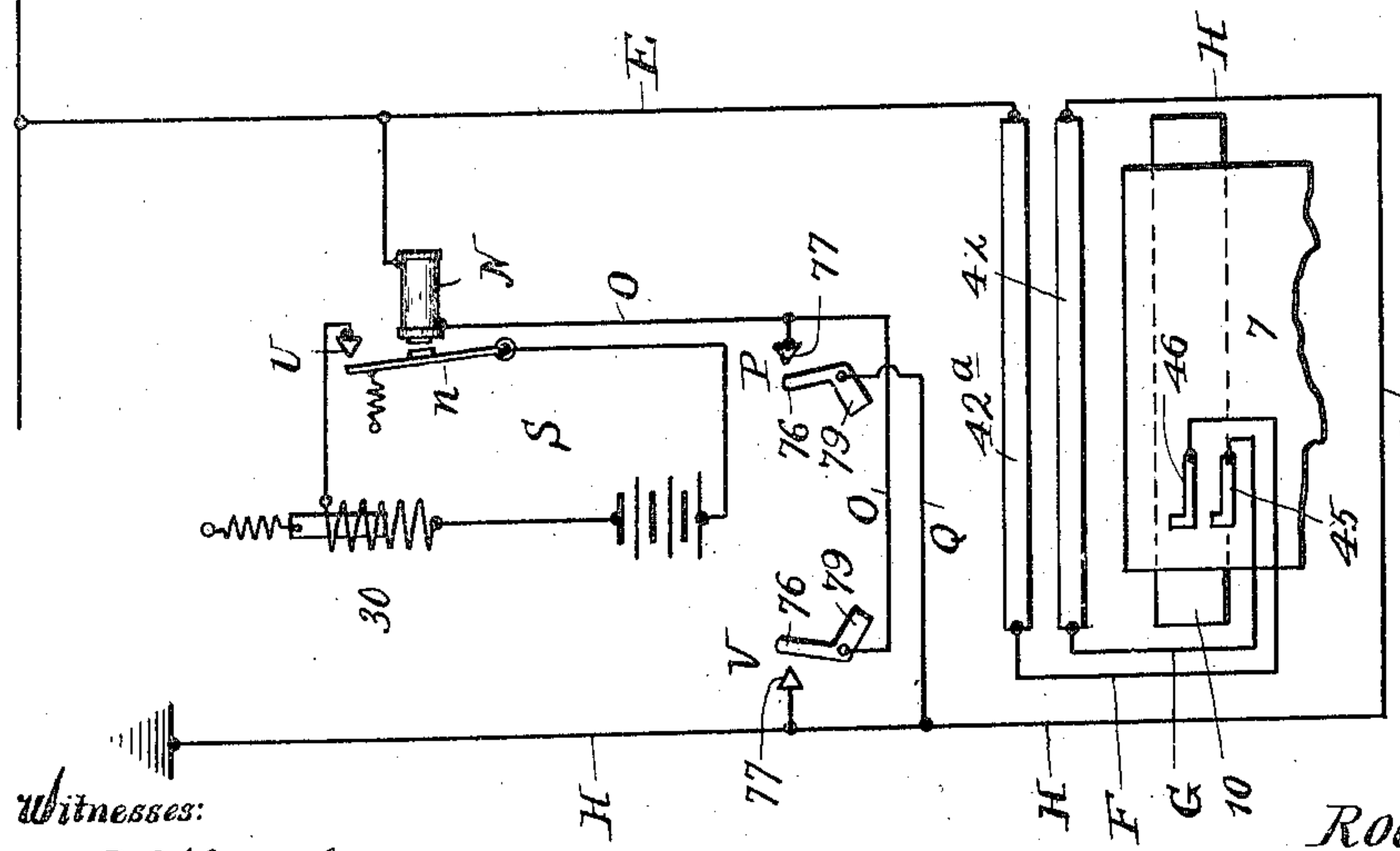


Fig. 9.



Witnesses:

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TELEGRAPH APPARATUS.

APPLICATION FILED FEB. 12, 1906.

963,213.

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6 SHEETS—SHEET 6.

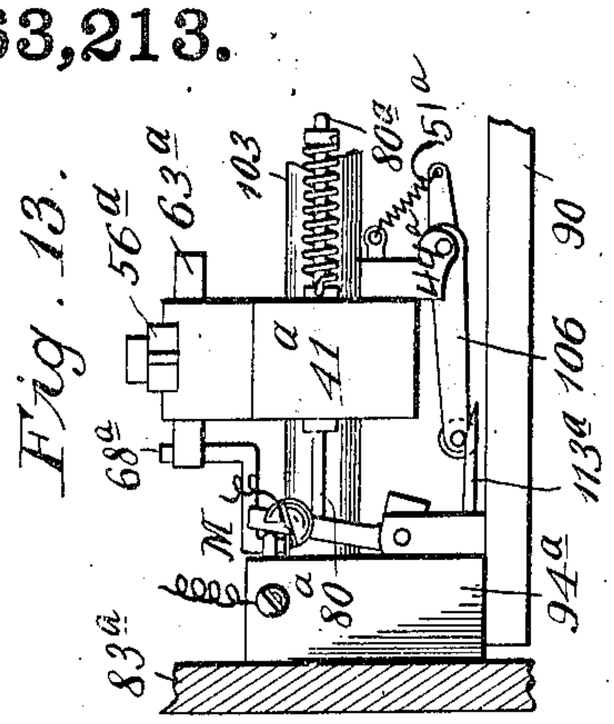

Fig. 13.

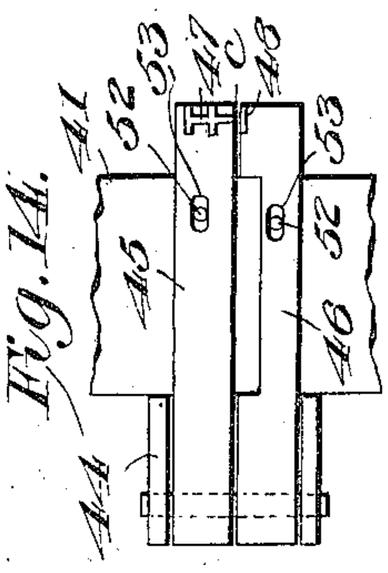

Fig. 14.

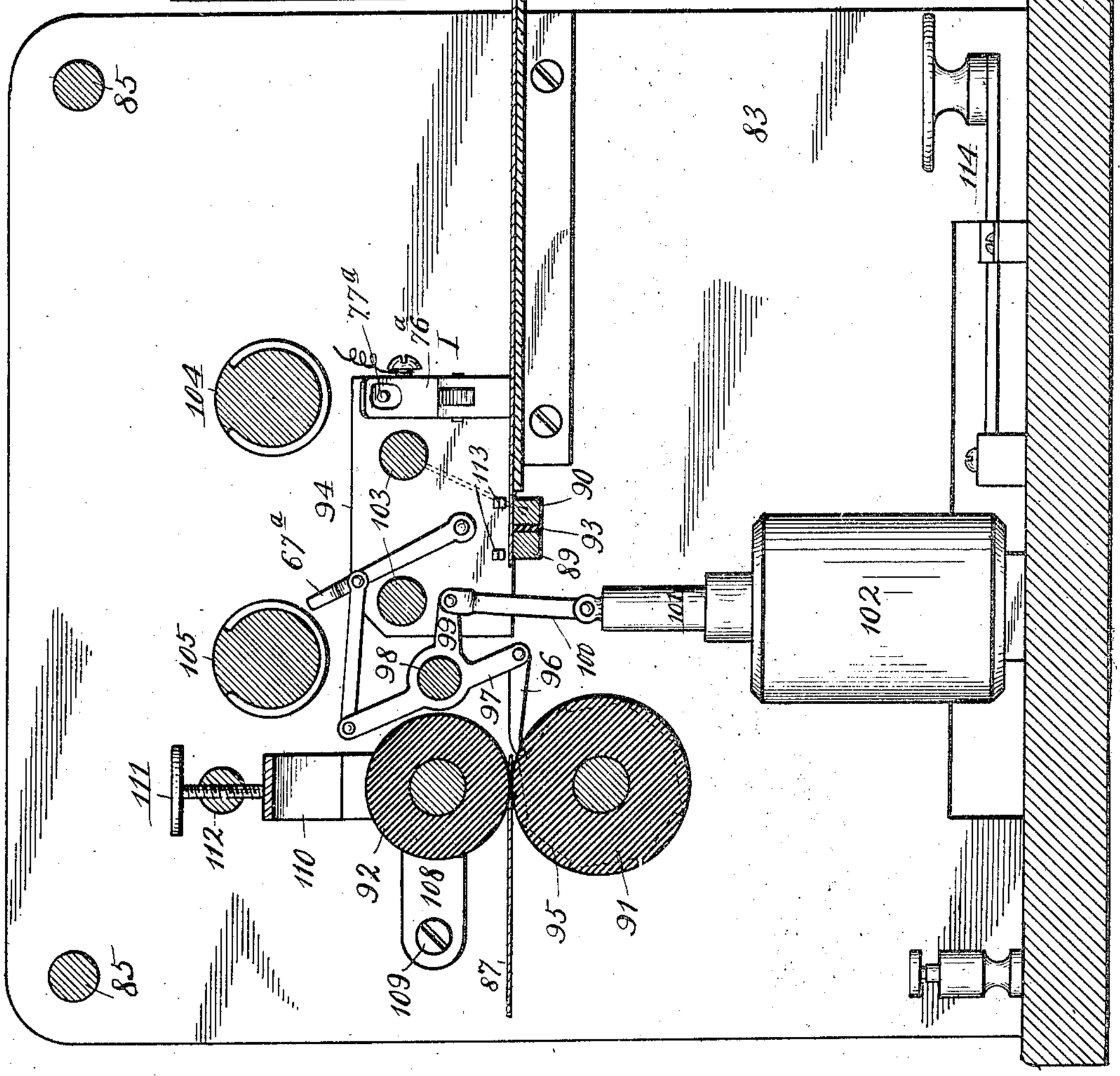

Fig. 12.

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UNITED STATES PATENT OFFICE.

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

TELEGRAPH APPARATUS.

963,213. Specification of Letters Patent. Patented July 5, 1910.

Application filed February 12, 1906. Serial No. 300,568.

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 Telegraph Apparatus, of which the following is a specification.

My invention relates to improvements in apparatus for transmitting, receiving and recording telegrams; and my object is to provide apparatus whereby messages may be transmitted over a single line-wire and automatically printed in page-form.

Figure 1 represents a plan view of the receiving and recording instrument forming part of the apparatus. Fig. 2 is a front elevation of same, partly in section, the section being taken on line II—II of Fig. 1. Fig. 3 is a vertical transverse section taken on line III—III of Fig. 1. Fig. 4 is a broken transverse section taken on line IV—IV of Fig. 1. Fig. 5 is a broken side view of said receiving and recording instrument. Fig. 6 is a cross-section taken on line VI—VI of Fig. 7, showing a shifting-lever forming part of the invention. Fig. 7 is a side elevation of a stylus and a circuit-breaker employed in carrying out the invention. Fig. 8 is a vertical section of the stylus taken on line VIII—VIII of Fig. 7. Fig. 9 is a detail perspective view of the stylus. Fig. 10 is a cross-section taken on line X of Fig. 3. Fig. 11 is a diagram of the circuit connecting the transmitter and the receiving and recording instrument. Fig. 12 is a vertical transverse section of the transmitter, taken on a line corresponding to XII—XII of Fig. 1. Fig. 13 is a side elevation of a contact device and one of the circuit-breakers employed on the transmitter. Fig. 14 is an enlarged broken inverted plan view of the stylus.

Referring first to the receiving and recording instrument which, for convenience, I will hereinafter refer to as the receiver, 1 designates a frame consisting of side-plates 2, a base 3 upon which said plates are mounted, and tie-rods 4 connecting the upper portions of said side-plates.

5 designates a pair of brackets secured to the forward edges of said side-plates for the reception of a shaft 6 carrying a roll of paper 7 upon which the telegrams are to be printed. The free end of said paper is passed between a pair of distributing rollers 8 9, thence over a platen 10 and between a pair of feed-rollers 11 12. Roller 8 is journaled in side-plates 2 and its lower portion is submerged in a chemical solution contained in a receptacle 13 so that when said roller is rotated by the paper it will carry a portion of the solution upwardly and saturate the paper therewith. Roller 8 is turned, in order to start the paper between it and roller 9, by means of a hand-wheel 8ª fixed to one end of the shaft carrying said roller 8. The solution is evenly distributed throughout the paper, as the latter moves forwardly, by roller 8 and roller 9, which latter is journaled in a pair of bell-crank bearings 14 pivotally secured to the side-plates by screws 15.

16 designates a bow-spring the ends of which rest upon bearings 14 and are provided with notches 17 engaging studs 18 projecting upwardly from the bearings for the purpose of retaining the ends of the spring thereon. The tension of spring 16 is regulated by a thumb-screw 19 extending downwardly through a threaded aperture in a rod 20 and bearing against the central portion of the spring. By adjusting said thumb-screw upwardly or downwardly it is obvious that the pressure of roller 9 upon the paper may be regulated as desired.

Roller 11 is provided at its ends with reversely-disposed ratchet-wheels 21 22, the former of which is engaged by a pawl 23 pivotally secured to the lower arm 24 of an irregular-shaped lever consisting of said arm 24 and arms 25 26—said lever being fixed upon a rock-shaft 27. Arm 25 is pivotally secured to the upper end of a connecting-rod 28, pivotally secured at its lower end to the plunger 29 of a solenoid 30 so that when the latter is energized by electrical impulses, as hereinafter described, said plunger will be drawn downwardly, and through the instrumentality of the irregular-shaped lever and pawl 23 turn ratchet-wheel 21 and roller 11 step by step, thus intermittently feeding the paper as each line of the telegram is printed thereon. The free end of pawl 23 is prevented from disengaging the teeth of ratchet-wheel 21 as it rotates the latter by a segmental guide 31. Roller 11 is prevented from moving more than one step at a time by means of ratchet-wheel 22 and a detent 32 which latter is drawn downwardly into engagement with said ratchet-

wheel, to engage its following tooth, by means of a retractile spring 33. Detent 32 is normally held out of engagement with ratchet-wheel 22 by means of its enlarged forward end 34 and a pin 35 normally supporting said enlarged end. Pin 35 projects from the lower end of a trip-lever 36 fixed upon shaft 27 through which said lever is actuated and caused to throw pin 35 downwardly out of engagement with the detent. Thus the feed-rollers 11 12, ratchet-wheels 21 22, pawl 23 and detent 32 constitute feeding mechanism for moving the paper forwardly step by step each time the solenoid is energized.

When the solenoid is deënergized its plunger and certain parts of the feeding mechanism are restored to normal by means of a crank-arm 37, fixed to one end of shaft 27, and a retractile-spring 38 which latter is expanded (see dotted lines Fig. 5) at each downward movement of the plunger. The movement of crank-arm 37 is limited by stop-pins 39 40 projecting from the adjacent side-plate 2.

Roller 12 is journaled in a pair of bell-crank bearings 14^a pivoted to the side plates by screws 15^a and, like bearings 14, are pressed downwardly to hold roller 12 in frictional contact with the paper by means of a bow-spring 16^a, the tension of which is regulated by a thumb-screw 19^a extending through the threaded aperture of a rod 20^a.

Having thus described the means for saturating the paper and mechanism for feeding the same step by step, I will now proceed to describe the mechanism for printing telegrams thereon in page form.

W designates a stylus consisting of a cross-head 41, a bracket 44 secured to said cross-head, a pair of type-arms 45 46 pivoted to said bracket, and pins 49 and springs 50 for normally pressing the character-bearing terminals of the type-arms toward the paper. Said arms are provided at the underside of their free terminals with characters 47 48. Pins 49 and springs 50 are arranged in counterbores 51 in the cross-head, as shown in Fig. 8. Cross-head 41 consists of nonconducting material arranged to slide to and fro upon a pair of guide-rods 42 42^a, secured at their ends to blocks of nonconducting material 43, fixed to the inner surface of the side plates and carrying at their undersides platen 10. Arms 45 46, which are separated by insulating material *c*, are held from lateral movement by guide-pins 52 depending from the underside of the cross-head and extending through openings 53 in said arms. The character-bearing ends of arms 45 46 are raised from the paper after each line has been printed, so that said paper may move forward the distance of another line, by means of inclined arms 54 54^a projecting from blocks 43 and provided with pointed ends 55 55^a which engage the underside of pins *w* and raise the latter with the arms, as shown in Fig. 7. Cross-head 41 is moved to and fro from one side of the paper to the other by means of a shifting-nut 56 and a pair of worms 57 58. Nut 56 is slidably arranged between stops 59 projecting upwardly from a plate 60 secured to the upper side of the cross-head, the movements of said nut being limited by its slot 56^a and a screw 61, which latter extends downwardly into plate 60 and holds the nut in position thereon. Nut 56 is provided at its ends with lugs 62 which are alternately thrown in and out of engagement with the worms by a shifting-lever 63, fulcrumed upon screw 61 and provided with eccentric-shoulders 64 that alternately engage two pins 65 depending from nut 56 and thus shift the latter so that its lugs will alternately engage the worms as above-mentioned. After the nut has been shifted into engagement with one of the worms it is reliably held in engagement therewith, until it reaches the opposite end of the worm thread, by one of the shoulders 66 engaging one of the pins 65 (see Fig. 6). Shifting-lever 63 is alternately actuated by arms 67 68 pivotally secured to blocks 43. Arm 67 is actuated by the irregular-shaped lever through the instrumentality of a connecting-bar 69, and arm 68 is actuated by trip-lever 36 through the instrumentality of a connecting-bar 70. After the stylus has been moved across the paper to print a line thereon the nut will be shifted into engagement with the opposite worm-thread preparatory to carrying the stylus back after said paper has been moved forwardly one step.

From the foregoing description it will be understood that both the paper feeding mechanism and the nut shifting mechanism are simultaneously operated by solenoid 30, rocker-shaft 27, and the parts connected thereto, although the parts are so disposed that the paper will come to rest before the stylus starts to move across the same.

Worms 57 and 58 are journaled in the side-plates, and worm 57 is provided at its ends with fixed friction-wheels 71 72 which latter is driven by a friction-wheel 73 fixed upon a motor shaft 74. Friction-wheel 71 engages and drives a friction-wheel 75 fixed upon one end of worm 58, thus the worms will be constantly driven in opposite directions through the instrumentality of a suitable motor, not shown, and in order that the shifting-nut will disengage one of said worms before engaging the other the ends of their threads are alternately arranged as shown in Fig. 1.

The electrical impulses for energizing the solenoid are timed by circuit-breakers V, P, M, and I, carried by both the receiver and the transmitter, and push-bars, hereinafter

described. Circuit-breakers V, P, are secured to end plates 2, and consist of bell-crank levers 76 and contact terminals 77 which latter project from blocks 43. Bell-crank levers 76 are pivoted in lugs 78 and their lower ends have counterweights 79 for normally holding their upper terminals away from contact terminals 77 (see diagram Fig. 11). Circuit-breakers V, P, are alternately closed by a push-bar 80 extending through the cross-head to which it is yieldingly secured by a coil-spring 81 secured at its ends to the cross-head and the push-bar. Thus when said push-bar closes one of the circuit-breakers the cross-head may continue to move toward the latter until the nut reaches the end of the actuating worm.

Referring now to the transmitter shown in Figs. 11 12 and 13, 82 designates a frame consisting of side plates 83 83ª, a base 84 upon which said side plates are mounted, and tie-rods 85 uniting the upper portion of the side plates.

86 designates a feed-table secured to the side plates for supporting a sheet of paper 87 having transverse rows of perforations 88 arranged in pairs, each pair being spaced to register with two conductors 89 90 as said sheet is drawn across the same by two feed-rollers 91 92. Conductors 89 90 are separated throughout their length by a strip of nonconducting material 93 and secured to the underside of blocks 94 94ª consisting of nonconducting material fixed to the side plates. Roller 91 is journaled in the side plates and rotated step by step by means of a ratchet-wheel 95 and a pawl 96. Ratchet-wheel 95 is fixed to the roller while pawl 96 is pivotally secured to the arm 97 of an irregular-shaped lever fixed upon a shaft 98 journaled in the side plates. Lever 97 is provided with an arm 99 secured by a connecting-bar 100 to the plunger 101 of a solenoid 102, which is synchronously energized with solenoid 30 so that the paper 6 and sheet 87 will be simultaneously moved forwardly step by step.

103 designates a pair of guide-rods secured to blocks 94 for the purpose of carrying a cross-head 41ª reciprocably mounted thereon. Said cross-head is provided with a shifting-nut 56ª adapted to alternately engage a pair of reversely driven-worms 104 105 journaled in the side plates for the purpose of moving the cross-head to and fro over sheet 87. After nut 56ª reaches the end of one worm it is thrown into engagement with the opposing worm by a shifting lever 63ª which is alternately thrown in opposite directions by arms 67ª 68ª pivoted to blocks 94 94ª, respectively. Said arms are indirectly connected to solenoid 102 so that the movement of feed-rollers 91 92 and cross-head 41ª will be so timed that sheet 87 will be moved forwardly one step as the cross-head momentarily pauses at the end of each worm.

106 107 designate a pair of contact-devices pivoted to a bracket 44ª secured to the cross-head. The free ends of said contact-devices are provided with antifriction rollers 107ª normally held upon sheet 87 by a spring 51ª, so that said rollers will pass through the alternately arranged perforations 88 and contact with conductors 89 90 as the cross-head moves to and fro over said sheet 87.

Roller 92 is mounted in a pair of bell-crank bearings 108 pivotally secured to the side plates by screws 109. The free ends of bearings 108 are pressed downwardly, in order to hold roller 92 firmly in contact with sheet 87, by means of a bow-spring 110 the tension of which is regulated by a thumb-screw 111 extending through the threaded aperture of a rod 112.

Worms 104 105 are driven by a motor, not shown, so that they, together, with cross-head 41ª will move in synchronism, or substantially so, with the corresponding parts of the receiver, and as the construction and operation of the transmitter is substantially the same as that of the receiver further detailed description thereof is deemed unnecessary.

Referring now to the diagram Fig. 11, which shows two stations, one containing the transmitter, the other the receiving apparatus:—A designates a circuit-wire one end of which is grounded while the other leads to a branch-wire A′ connected at its terminals to the positive pole of a battery C and the negative pole of a battery C′. B designates a circuit-wire leading from the positive pole of battery C′ to conductor 90 over which the perforated sheet 87 passes. The perforations are of variable lengths and those in one row are alternately arranged with reference to the perforations in the adjacent row so that when contact 106 is passing through a perforation in one of said rows contact 107 will enter one of the perforations in the adjacent row just as contact 106 is leaving its respective perforation, and vice versa. When contact 106 is in contact with conductor 90, as shown, an impulse corresponding in duration to the length of the perforation through which said terminal is passing will be transmitted from battery C′ to type-arm 46 through wire B, conductor 90, contact 106, a circuit-wire D, a contact terminal D′ carried by cross-head 41ª, guide-bar 103, a line-wire E, thence to guide-bar 42ª and to said arm 46 through a circuit-wire F, causing said type-arm to print the proper character upon paper 7. The current then returns to battery C′ through platen 10, type-arm 45, a circuit-wire G, guide-bar 42, a circuit-wire H to ground, and thence through circuit-wires A

and A'. As contact 106 passes out of a perforation and contact 107 enters one, the direction of the current will be reversed and an impulse corresponding in duration to the length of the perforation last referred to will be transmitted to arm 45 from battery C over circuit-wires A' and A to ground, thence to circuit-wire H, guide-bar 42, and to type-arm 45 through circuit-wire G, causing said type-arm 45 to print a character upon the paper. The current then returns to battery C through platen 10, type-arm 46, circuit-wire F, guide-bar 42ª, line-wire E, guide-bar 103, contact terminal D', circuit-wire D, contact 107, conductor 89, and circuit-wire B'. When contacts 106 107 reach the right hand side of sheet 87 they will be raised above said sheet by a pair of inclined arms 113 so that said sheet may be moved forwardly one step in order to bring the two succeeding rows of perforations in coincidence with conductors 89 and 90. As cross-head 41ª approaches the right-hand side of sheet 87 push-bar 80ª will contact with and close circuit-breaker I, consisting of a bell-crank lever 76ª and a contact terminal 77ª. The cross-head, however, will continue to move to the right until nut 56ª passes out of engagement with worm 104. When this occurs cross-head 41ª will remain stationary if it has traveled more rapidly than cross-head 41, until push-bar 43 closes circuit-breaker P. The closing of circuit-breakers I and P will establish a circuit through a relay J, circuit-wire K, circuit-breaker I, circuit-wire L, line-wire E, a relay N, a circuit-wire O, circuit-breaker P, a circuit-wire Q, and circuit-wire H to ground. It will then return to battery C' through circuit wires A A'. By establishing the circuit just described relays J and N will be energized and draw their armatures *j* and *n* against contact terminals, T and U, respectively, and thus close two local circuits R and S. The closing of said circuits will energize solenoids 30 102 and cause them to operate simultaneously, through the instrumentality of the intervening parts, the feed-rollers of the transmitter and the receiver, and also through the instrumentality of arms 67 67ª actuate levers 63 63ª and cause them to throw shifting-nuts 56 56ª into engagement with worms 58 105, respectively, which will return them and their crossheads to the left-hand side of paper 7 and sheet 87. As the parts return to said left-hand side the operation of printing upon paper 7 will proceed in the manner above described, consequently no time will be lost by said return movement. As contacts 106 107 and type-bars 45 46 approach the left side of sheet 87 and paper 7, respectively, they will be raised out of contact therewith by inclined arms 113ª and 54ª so that said sheet and paper may move forward another step. The push-bars will also close circuit-breakers M and V and thus close the local circuits so that the solenoids will be energized and again operate the feed mechanisms.

Communication between the transmitter and the receiver may be discontinued at any time by opening a switch 114 in circuit with wire K.

Having thus described my invention, what I claim and desire to secure by Letters-Patent, is:—

1. In a telegraph apparatus, a receiving and recording instrument consisting of mechanism for feeding paper step by step, a stylus, mechanism for propelling said stylus, shifting mechanism carried by the stylus for alternately engaging the adjacent sides of the propelling mechanism so that the stylus will be carried back and forth upon the paper, and means common to the feeding and shifting mechanisms for actuating the same.

2. In a telegraph apparatus, a receiving and recording instrument consisting of mechanism for feeding paper step by step, a stylus, mechanism for propelling said stylus, shifting mechanism carried by the stylus for alternately engaging the adjacent sides of the propelling mechanism so that the stylus will be carried back and forth upon the paper, means for raising the stylus from the paper as it approaches the end of each movement, and means for actuating the feeding and shifting mechanisms.

3. In a telegraph apparatus, a receiving and recording instrument consisting of mechanism for feeding paper step by step, a stylus, mechanism for propelling said stylus, shifting mechanism carried by the stylus for alternately engaging the adjacent sides of the propelling mechanism so that the stylus will be carried back and forth upon the paper, and electrically-controlled means common to the feeding and shifting mechanisms for actuating the same.

4. In a telegraph apparatus, a receiving and recording instrument consisting of mechanism for feeding paper step by step, a platen arranged beneath said paper, a stylus, mechanism for propelling said stylus, shifting mechanism carried by the stylus for alternately engaging the adjacent sides of the propelling mechanism so that the stylus will be carried back and forth upon the paper, and means for simultaneously actuating the feeding and shifting mechanisms.

5. In a telegraph apparatus, a receiving and recording instrument consisting of spacing mechanism, suitably prepared paper adapted to be fed step by step by said spacing mechanism, a stylus, means for transmitting electrical impulses to said stylus, mechanism for propelling said stylus, shifting mechanism carried by the stylus for al-

ternately engaging the adjacent sides of the propelling mechanism so that the stylus will be carried back and forth upon the paper, and means for simultaneously actuating the spacing and shifting mechanisms.

6. In a telegraph apparatus, a receiving and recording instrument consisting of a stylus including one or more type-arms, resilient means for forcing the type into contact with the paper to be printed upon, warms for propelling said stylus, shifting mechanism carried by the stylus for alternately engaging the adjacent sides of said worms, and means for actuating said shifting mechanism.

7. In a telegraph apparatus, a receiving and recording instrument consisting of a stylus, worms for propelling said stylus, shifting mechanism carried by the stylus for alternately engaging the adjacent side of said worms, and electrically-controlled means for actuating said shifting mechanism.

8. In a telegraph apparatus, a receiving and recording instrument consisting of a stylus including one or more type-arms, resilient means for forcing the type into contact with the paper to be printed upon, worms for propelling said stylus, a shifting-nut carried by the stylus for alternately engaging the adjacent side of said worms, and means for actuating said shifting-nut.

9. In a telegraph apparatus, a receiving and recording instrument consisting of a stylus, worms for propelling said stylus, a shifting device carried by the stylus for alternately engaging the adjacent sides of said worms, a shifting lever, eccentric shoulders thereon for operating the shifting device, shoulders 66 also on the shifting lever for holding the shifting device from accidental movement, and means for actuating said shifting lever.

10. In a telegraph apparatus, a stylus consisting of a cross-head slidably mounted, type-arms pivoted to said cross-head, and shifting mechanism carried by the cross-head, in combination with propelling mechanism adapted to be engaged by said shifting mechanism.

11. In a telegraph apparatus, a receiving and recording instrument consisting of mechanism for feeding paper step by step, a stylus, type-arms forming part of said stylus and adapted to rest upon the paper, propelling mechanism for carrying the stylus back and forth over the paper, and arms for raising the type-arms from the paper as the latter moves forwardly.

12. In a telegraph apparatus, a receiving and recording instrument consisting of a stylus including one or more type-arms, resilient means for forcing the type into contact with the paper to be printed upon, means for propelling said stylus, shifting mechanism carried by the stylus for reversing the movements thereof, means for actuating said shifting mechanism, and a relay controlling said actuating means.

13. In a telegraph apparatus, a receiving and recording instrument consisting of mechanism for feeding paper step by step, a stylus, type-arms forming part of said stylus, adapted to rest upon the paper, propelling mechanism for carrying the stylus back and forth over the paper, in combination with a relay in circuit with the paper feeding mechanism, circuit-breakers in circuit with said relay, and means carried by the stylus for alternately closing said circuit-breakers.

14. In a telegraph apparatus, a receiving and recording instrument consisting of a stylus, means for propelling said stylus, shifting mechanism for reversing the movements of the stylus, means for actuating said shifting mechanism, circuit-breakers in circuit with said means and a push-bar carried by the stylus for alternately closing said circuit-breakers.

15. In a telegraph apparatus, a feeding mechanism for feeding paper step by step consisting of a pair of rollers forming part of said feeding mechanism, reversely-disposed ratchet-wheels fixed to one of said rollers, a pawl engaging one of said ratchet-wheels, a lever carrying said pawl, a solenoid for actuating said lever, means for energizing said solenoid, and a detent for engaging the other ratchet-wheel.

16. In a telegraph apparatus, a transmitter consisting of mechanism for feeding a perforated sheet forwardly step by step, conductors over which said sheet is drawn, a cross-head, means for propelling said cross-head, shifting mechanism for reversing the movements of said cross-head, and contact devices carried by the cross-head, adapted to pass through the perforations and alternately close a main circuit by contacting with said conductors, in combination with chemically treated paper, a stylus in circuit with the contact devices, means for propelling the stylus over said paper, shifting mechanism for reversing the movements of the stylus, solenoids for actuating the shifting mechanisms, local circuits in which said solenoids are arranged, relays for closing said local circuits, circuit-breakers in circuit with said relays, and push-bars carried by the cross-head and the stylus for alternately closing said circuit-breakers.

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

ROBERT L. DEAN.

Witnesses:
G. E. GLEASON,
LESLIE E. BAIRD.