No. 736,933. PATENTED AUG. 25, 1903.

C. L. BUCKINGHAM & E. GERMANN.

AUTOMATIC PRINTING TELEGRAPH.

APPLICATION FILED FEB. 1, 1900.

NO MODEL. 3 SHEETS—SHEET 1.

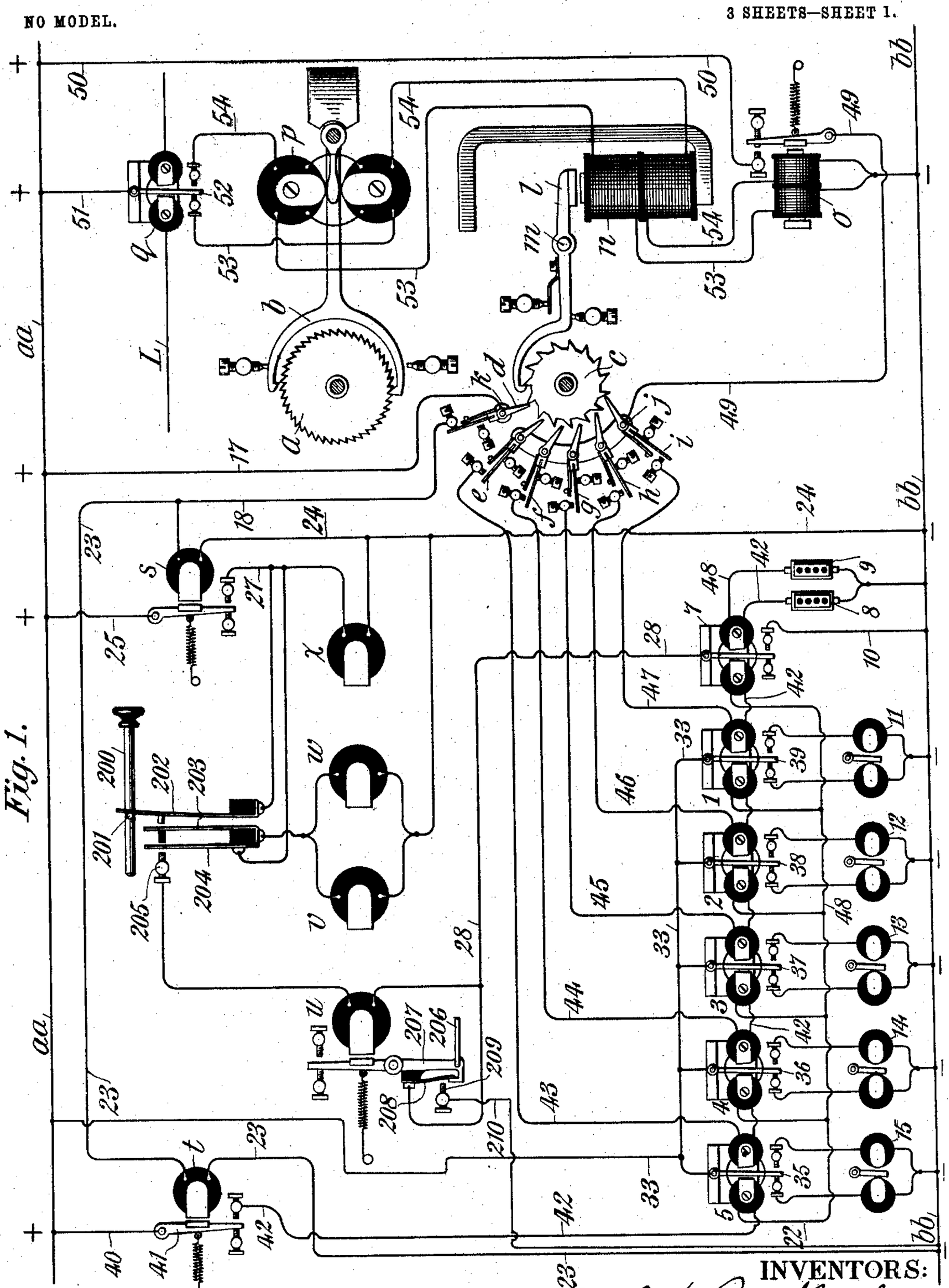

Fig. 1.

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NO MODEL. 3 SHEETS—SHEET 2.

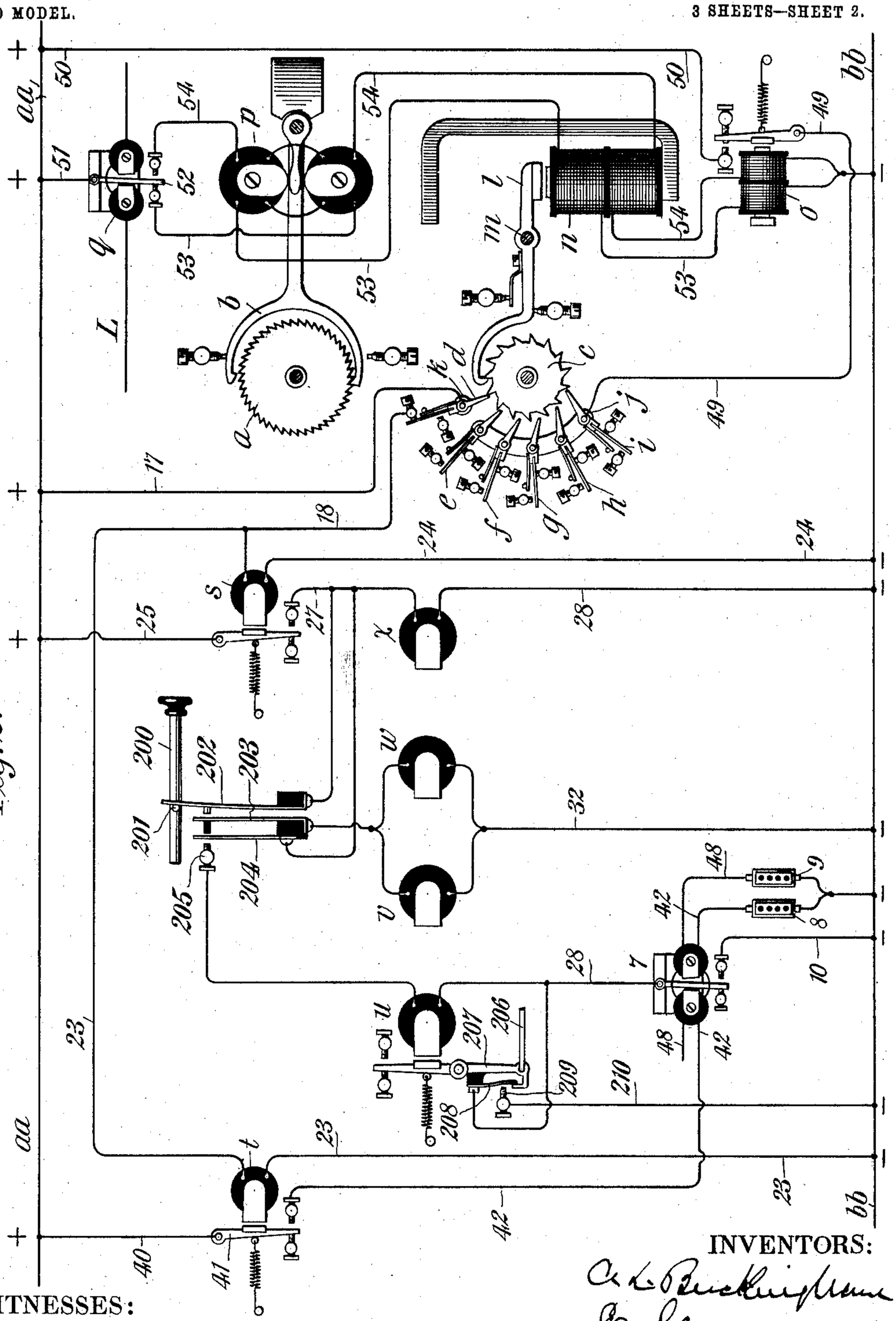

Fig. 2.

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NO MODEL. 3 SHEETS—SHEET 3.

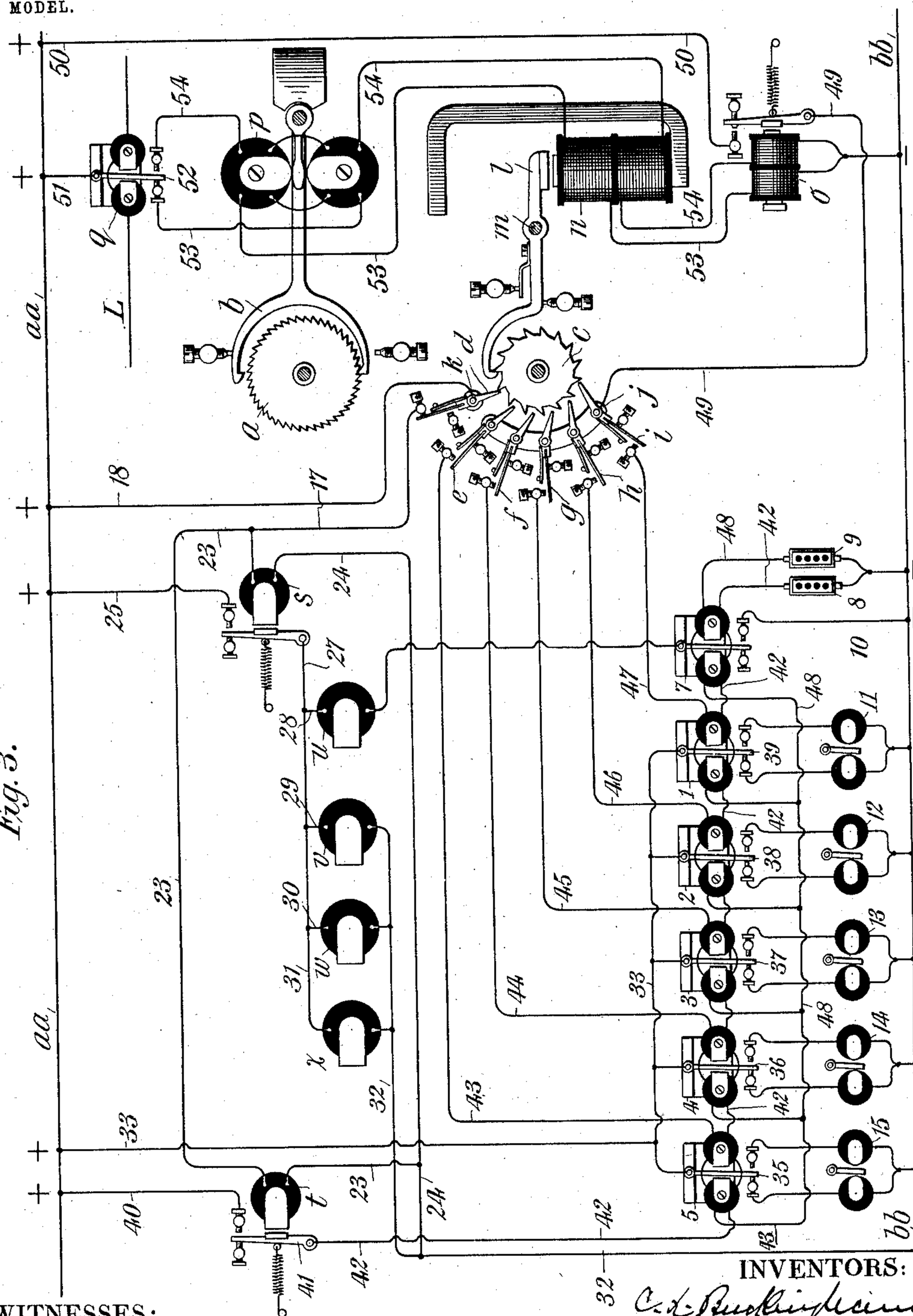

Fig. 3.

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No. 736,933. Patented August 25, 1903.

UNITED STATES PATENT OFFICE.

CHARLES L. BUCKINGHAM, OF NEW YORK, AND EMIL GERMANN, OF BROOKLYN, NEW YORK; SAID GERMANN ASSIGNOR TO SAID BUCKINGHAM.

AUTOMATIC PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 736,933, dated August 25, 1903.

Application filed February 1, 1900. Serial No. 3,611. (No model.)

To all whom it may concern:

Be it known that we, CHARLES L. BUCKINGHAM, of the city and county of New York, and EMIL GERMANN, of Brooklyn, county of Kings, State of New York, citizens of the United States of America, have made a new and useful Improvement in Automatic Printing-Telegraphs, of which the following is a specification.

In United States Letters Patent No. 544,348, granted to us August 13, 1895, is shown a system upon which the present invention is an improvement, in that it contemplates a means for preventing the operation of the press-hammer during the transmission of a space character—that is to say, when the paper sheet upon which the message is printed is fed to make spaces between words. During such a transmission no current reaches the setting-coils of the selecting-relays, but in the transmission of one of the printed characters some one or all of such setting-coils will be energized.

Referring to the drawings, Figure 1 is a diagram of circuits and some of the more essential parts of our printing-receiver. Fig. 2 is a diagram of circuits and parts of the printer to which the present invention more particularly relates. Fig. 3 represents a diagrammatic view showing a more general circuit arrangement of our printer system from which are omitted some of the details more specifically presented in Figs. 1 and 2.

In Figs. 1, 2, 3 are represented the sunflower arrangement of patent numbered 544,348, in which are employed a differentially-wound escapement-magnet *p*, an escapement-wheel *a*, and pallets *b*, under the action of which the sunflower-shaft is permitted to rotate step by step at each main-line reversal, while upon the same shaft is a wheel *c*, having one-third as many teeth as *a*, which serves both to put the sunflower at unison at the end of each word, as set forth in Patent No. 544,348, and to successively close the contact-arms *d e f g h i*. In the normal operation of the sunflower apparatus wheel *c* moves the space of one tooth for each letter transmitted, and this movement is accomplished by six main-line reversals of current or by three positive and three negative pulses. The long negative pulse which terminates each letter of the alphabet energizes the polarized unison-magnet *n* in such manner that arm *l*, pivoted at *m*, is lifted away from the teeth of wheel *c;* but under the action of a short negative pulse or a positive pulse, long or short, the hook of arm *l* remains in position to arrest the teeth of *c*. Some or all of the six reversals for each character may be prolonged, and whether it is one character or another that is transmitted is determined by the reversal or reversals that are prolonged. After arm *l* has been raised at the end of a character upon the first reversal of the following character wheel *c* actuates *e* to close contact with wire 43, while the following reversals cause arm *f* to close contact with wire 44, *g* with 45, *h* with 46, *i* with 47, and, finally, the sixth reversal causes arm *d* to close contact between wires 17 and 18 and to thereby form circuits through relays *s* and *t*, included, respectively, in branches 24 and 23. Relay *s* is known as the "sixth-pulse relay" and serves to establish circuits through magnets *x v w u*, which actuate the escapement-dog, feed-ribbon, and press apparatus of the printer, while the other relay *t* is employed as a resetting-relay for closing a circuit 40 42, by which the tongues of the relays 1 2 3 4 5 7 are thrown to their back positions at the end of each character transmitted. The setting-coils of relays 1 2 3 4 5 are respectively joined with wires 47 46 45 44 43, and these circuits are successively closed by the sunflower-arms *e f g h i* at each step of rotation. If only short reversals or pulses are sent over the main line, the movements of the tongue 52 of relay *q* are so rapid that the neutral differential relay *o* will not be sufficiently energized to move its armature, although wheel *a* at the time is allowed to rotate under the action of the differential polarized magnet *p* and escapement-anchor *h;* but upon the prolongation of a main-line pulse a current will flow through either 53 or 54 a sufficient length of time to enable *o* to attract its armature and close a circuit including wire 50 49 and bracket *j*, with which arms *e f g h i* are

electrically connected; but bracket *k*, upon which arm *d* is mounted, is insulated from *j*. Thus as *o* attracts its tongue a local circuit is closed from *aa* to *bb* through that one of the selecting-relays whose circuit is at the moment closed by arms *e*, *f*, *g*, *h*, or *i*, and thereby the tongue of such relay is moved to the right, breaking one contact and closing another in the operation of setting the type-wheel. The setting-magnets controlled by relays 1 to 5 are 11 12 13 14 15. From the foregoing it is obvious that during the first five reversals of current in transmitting a character some one or more or all of said magnets may be brought into action and that the operation of printing may be effected during the sixth—that is to say, each time a tooth of wheel *c* causes arm *d* to join wires 17 and 18.

In the arrangement shown in Figs. 1 and 3 a wire 33 leads from the positive pole *aa* of the local battery to the tongues 35 36 37 38 39 of the selecting-relays, thus establishing circuits through the setting or resetting sides of the adjusting-magnets, according to the position of said tongues, and thence to negative pole *bb*. At the end of each character transmitted relay *t* is brought into action, thereby closing tongue 41 to establish a circuit from *aa* by 40, 41, and 42 through the resetting-coils of selecting-relays 1 to 5, whereby such of the tongues of said relays as may have been moved to front position in the transmission of a character are reset to their back positions. The sixth relay, numbered 7, is in all respects like the five selecting-relays above described and is employed for preventing the operation of the press-hammer during the transmission of a space character—that is to say, when the paper sheet upon which the message is printed is fed to make spaces between words. During such a transmission no current reaches the setting-coils of the selecting-relays or the setting-coil of relay 7, but in the transmission of all other characters current will reach the setting-coil of relay 7 through some one or more of the setting-coils of the selecting-relays from the fact that the circuits of the setting-coils of the selecting-relays are united into one circuit, within which is placed the setting-coil of relay 7—that is to say, the multiple setting-coils of selecting-relays 1 to 5 are united into one conductor 48, within which is included the setting-coil of relay 7, while its resetting-coil is placed in series with those of the selecting-relays in conductor 42. Thus if a character to be printed were transmitted the current sent to the setting-coils of whatever selecting-relays might be called into operation would also pass through the setting-coil of 7, thereby causing the tongue of said relay to close the press-circuit, which is formed by wires 10 28 25 and the tongue of the sixth-pulse relay *s*, while at the end of the transmission the tongue of relay 7 is returned to its back position, thereby breaking the press-magnet circuit at that point. Thus the press-circuit is normally open at two points, and while relay *s* always closes, whether for a space or character transmission, the press-circuit is only closed at relay 7 upon the transmission of a character which is to be printed.

Referring to Fig. 3, it will be seen that relays *s* and *t* receive current simultaneously. In practice, however, relay *s* is made to respond somewhat more quickly than *t*, but notwithstanding this difference the throw-back circuit 40 42 is closed by the tongue of relay *t* only the merest instant after the press-circuit is closed by the tongue of *s*. Thus almost at the instant the press-circuit is closed by the tongue of relay *s* the closing of the throw-back circuit causes the tongue of relay 7 to break the press-circuit. Under these conditions obviously the press-magnet would be charged only for a very short interval, and without some auxiliary means for continuing a flow of current through the press-magnet the striking of the press-hammer would not be assured. To provide against this difficulty we have adopted an arrangement shown in Figs. 1 and 2, in which are shown auxiliary contacts and connections for maintaining a circuit through press-magnet *u* even after the tongue of relay 7 has been thrown to its back contact. In this arrangement the armature-lever 207 of the press-magnet is provided with an insulated spring 208 and a back contact 209, to which is connected a wire 210 leading to the negative pole of the local battery *bb*. 206 is the link leading from the armature-lever of the press-magnet to the press-hammer of the printer. Assuming now a circuit to have been momentarily closed by wire 25, tongue of relay *s*, wire 27, spring 204, contact 205, magnet *u*, wire 28, the tongue of relay 7, and wire 10, the armature of the press-magnet *u* will have been sufficiently attracted to cause spring 208 to come in contact with 209, thus establishing a branch circuit from wire 28 to spring 208, contact 209, and wire 210 to the negative battery-pole *bb*. By this means the press-magnet armature will be attracted to its front position even though the tongue of relay 7 is thrown to its back contact, and the press-armature will remain in such front position until the circuit is broken either at the sixth-pulse relay *s* or at contact 205.

In the upper portions of Figs. 1 and 2 is shown a horizontal pull-bar 200, having a right-angle horizontal pin 201, which when the bar 200 is pulled to the right causes spring 202 to separate from spring 203 and spring 203 in turn to separate from 204 and 204 from stop 205. Such horizontal pull-rod 200, springs, and connections are described and claimed in United States Letters Patent No. 544,346, August 13, 1895, and No. 568,513, September 29, 1896, and as described in said patents are employed to manually break the circuits to the press, dog, and ink-ribbon magnets, and as there described the rod 200 is used to disengage the escapement-pallets from the teeth

of the feed-wheel, whereby the sheet of paper upon which a message is being printed may at any point in line be rotated into position for commencing a second part of the message upon a new line. It will be seen that if the pull-rod were in its left position upon closing the tongue of relay *s* circuits would be formed through the press-magnet *u*, the ribbon and dog magnets *v w*, and the escapement-magnet *x* and that such circuits would remain closed as long as the tongue of relay *s* was held in its front position; but while the circuits through magnets *u v w* are all broken a continuous circuit is at the same time necessarily maintained through escapement-magnet *x*.

A further feature of our invention here shown is the arrangement of selecting-relays 1 2 3 4 5 and the non-print relay 7 in combination with rheostats 8 and 9. By the arrangement of circuits here shown a single rheostat for each of the two circuits 42 and 48 suffices to adjust and regulate to the required strength the current obtained from the ordinary incandescent-light circuit—that is to say, in place of employing a rheostat in each of the setting branches 43 44 45 46 47 of the relay system a single rheostat 9 is made to suffice.

We do not wish to limit our invention to the use of a relay *s*, as it is obvious that magnets *u v w x* might be worked directly from the sixth-pulse contact of the sunflower.

What we claim, and desire to secure by Letters Patent, is—

1. In a printing-telegraph system, the combination of a press-magnet, a circuit within which said press-magnet is included, a relay *s* for opening and closing said press-magnet circuit for each letter and space transmission and a second relay, 7, which closes said press-magnet circuit for all excepting space transmissions, as and for the purpose set forth.

2. In a printing-telegraph system, the combination of the press-magnet *u*, a contact for closing the circuit of said press-magnet during the sixth or last pulse of each character transmitted, an auxiliary relay 7, a series of circuits 43, 44, 45, 46, 47, and a sunflower for closing said circuits in succession, a series of selecting-relays 5, 4, 3, 2, 1, whose setting-coils are respectively included in said circuits, the latter being united into a single conductor within which is placed the setting-coil of an auxiliary relay, 7, for closing said press-magnet circuit, and a resetting-circuit within which are included the resetting-coils of said selecting-relays and of said auxiliary relay, 7, as and for the purpose set forth.

3. In a printing-telegraph system, the combination of a press-magnet, a relay-contact for closing the circuit of the same during the sixth pulse of each character transmitted, and an auxiliary relay, 7, for closing said circuit during the transmission of all characters except that of the space, as and for the purpose set forth.

4. In a printing-telegraph system, the combination of a press-magnet *u*, means for closing the circuit of said magnet during the sixth pulse of each character transmitted, an auxiliary relay, 7, for closing said circuit for all characters transmitted excepting spaces, and an auxiliary contact and circuit for maintaining a continuous circuit through the press-magnet after the press-circuit has been opened by said relay 7.

5. In a printing-telegraph system, a series of selecting-relays 1, 2, 3, 4, 5, each provided with a setting and a resetting coil, conductors 47, 46, 45, 44, 43, respectively including the setting-coils of said relays, said conductors being united into a single circuit, 48, within which is placed an adjustable rheostat, 9, a sunflower arrangement for successively closing said circuits 47 to 43, and a resetting-circuit, 42, for said selecting-relays within which is placed an adjustable rheostat, 8, and a relay, *t*, which is brought into action to close said resetting-circuit during the sixth pulse of each character transmitted.

6. In a printing-telegraph system, the combination of a series of selecting-relays 1, 2, 3, 4, 5, a series of circuits 47, 46, 45, 44, 43, including the setting-coils of said selecting-relays, a sunflower arrangement for closing and opening said circuits in succession, a non-print relay, 7, for closing a press-circuit in the transmission of all excepting space characters, a conductor, 48, connected with the setting-coils of the selecting-relays within which are placed the setting-coils of said non-print relay and an adjustable rheostat, 9, a resetting-circuit, 42, including the resetting-coils of all of said relays and an adjustable rheostat, 8, and means for closing said resetting-circuit during the sixth pulse of each character transmitted.

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