No. 865,470. PATENTED SEPT. 10, 1907.

J. E. WRIGHT.

PRINTING TELEGRAPH.

APPLICATION FILED MAY 6, 1904.

8 SHEETS—SHEET 1.

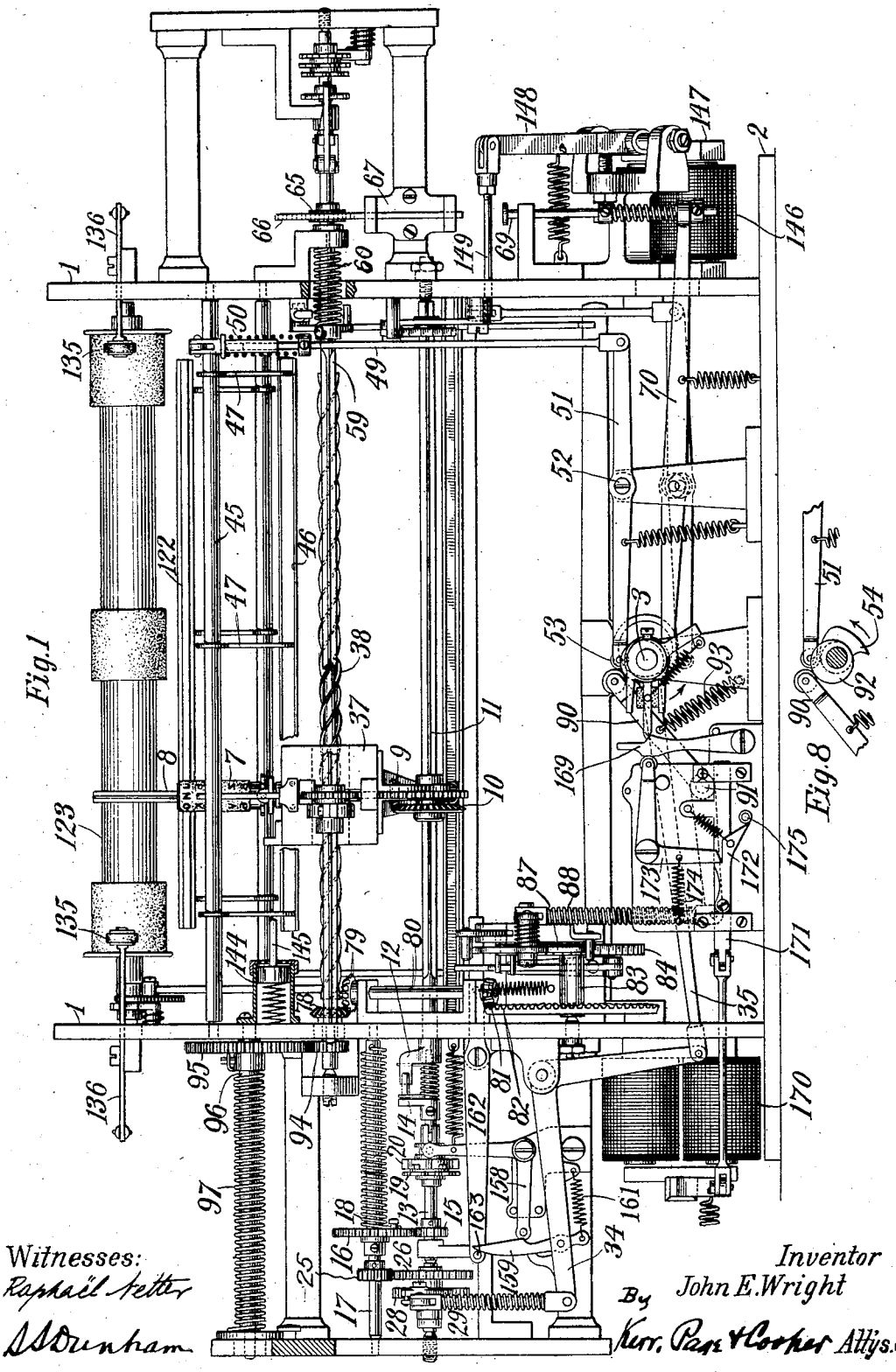

Fig. 1

Fig. 8

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8 SHEETS—SHEET 2.

Fig. 9

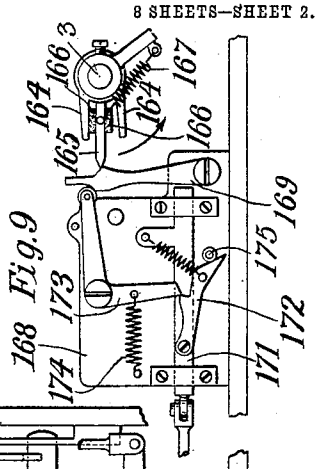
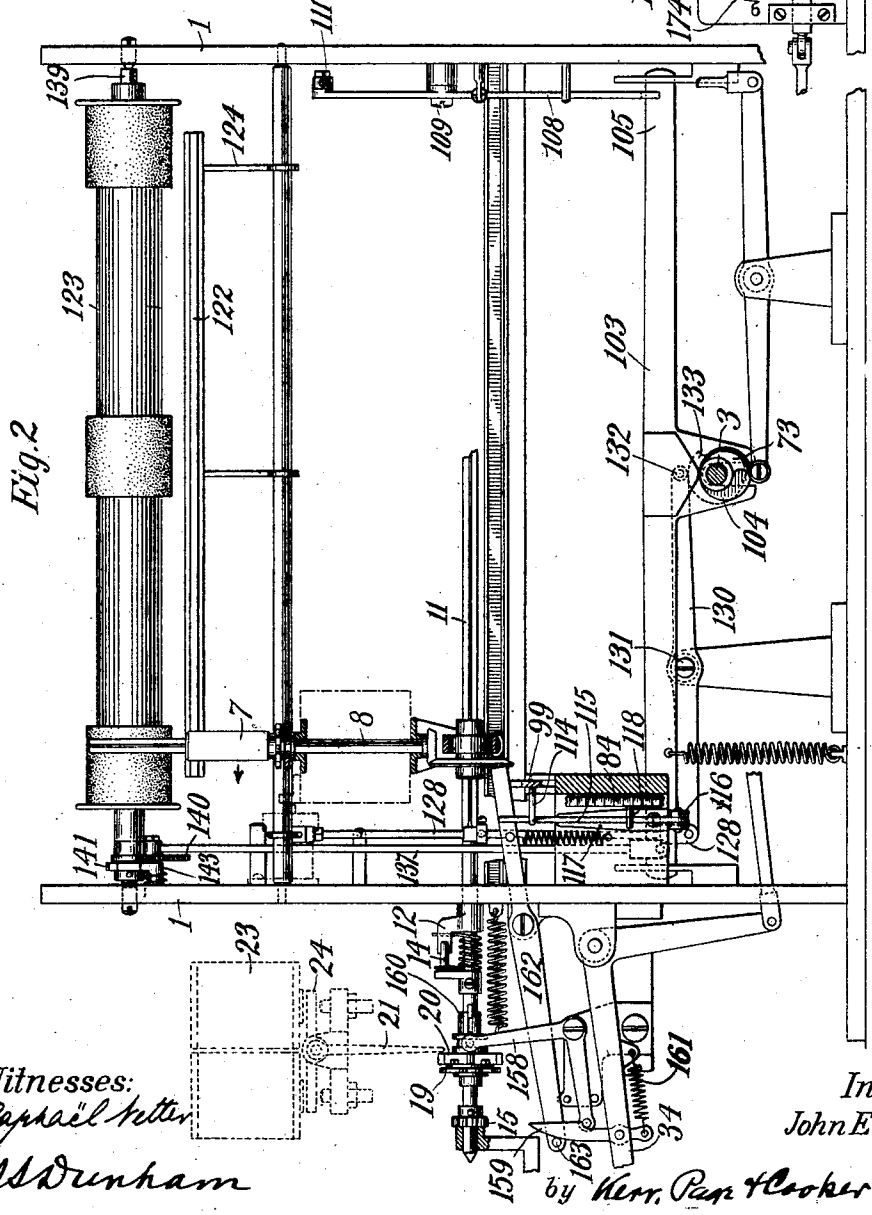


Fig. 2



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8 SHEETS—SHEET 3.

Fig.10

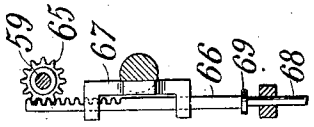
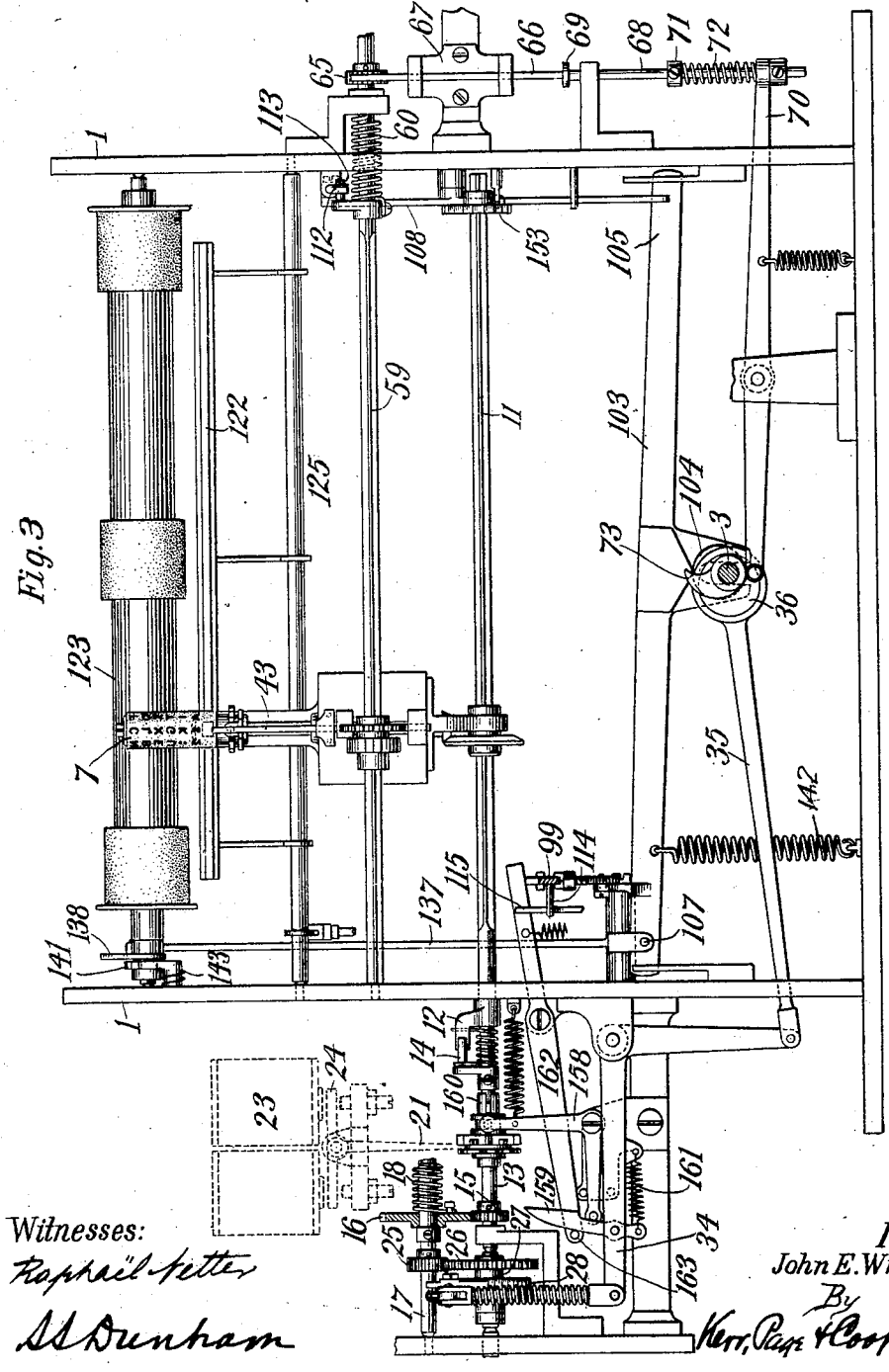


Fig.3



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8 SHEETS—SHEET 4.

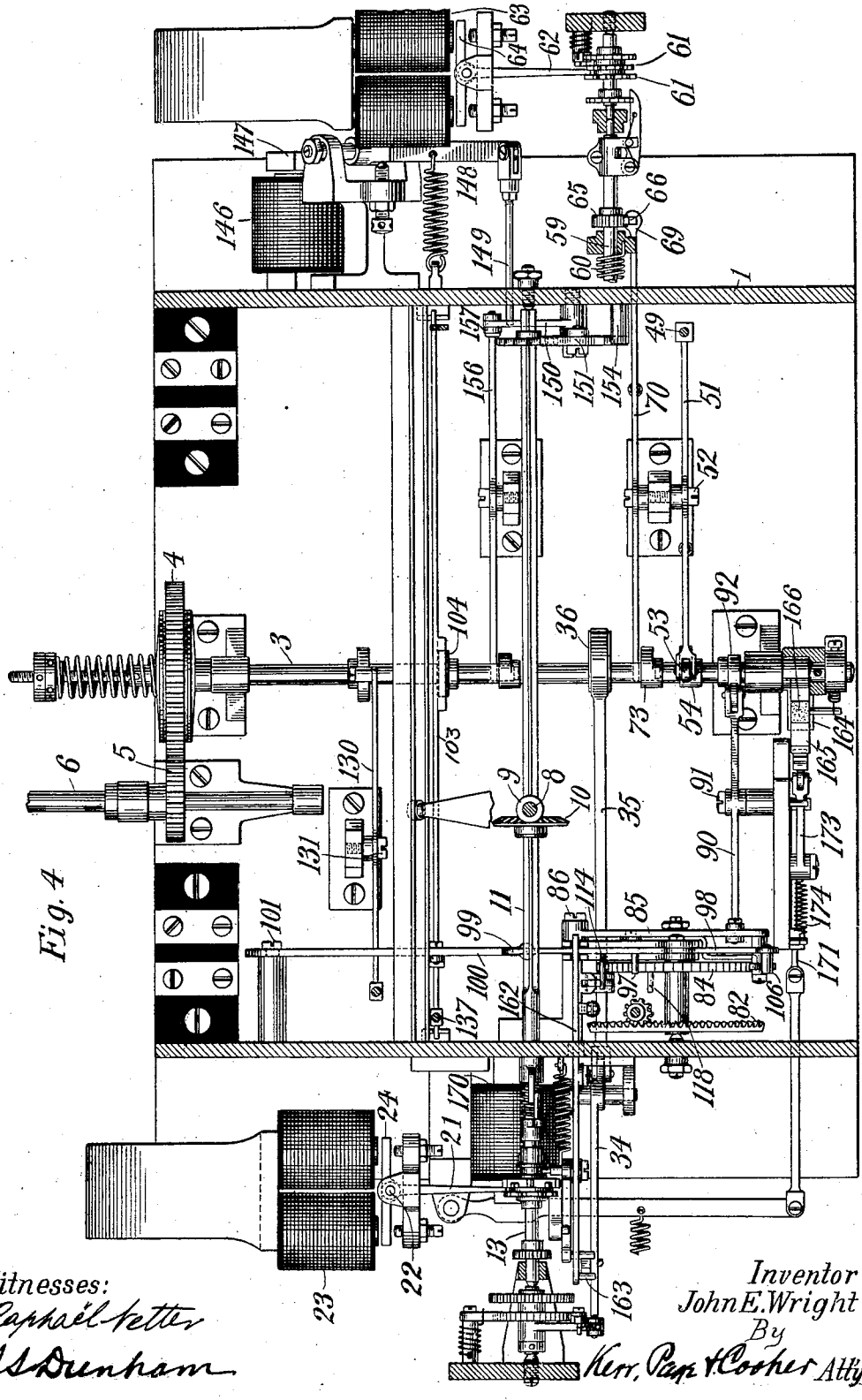

Fig. 4

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8 SHEETS—SHEET 5.

Fig.5

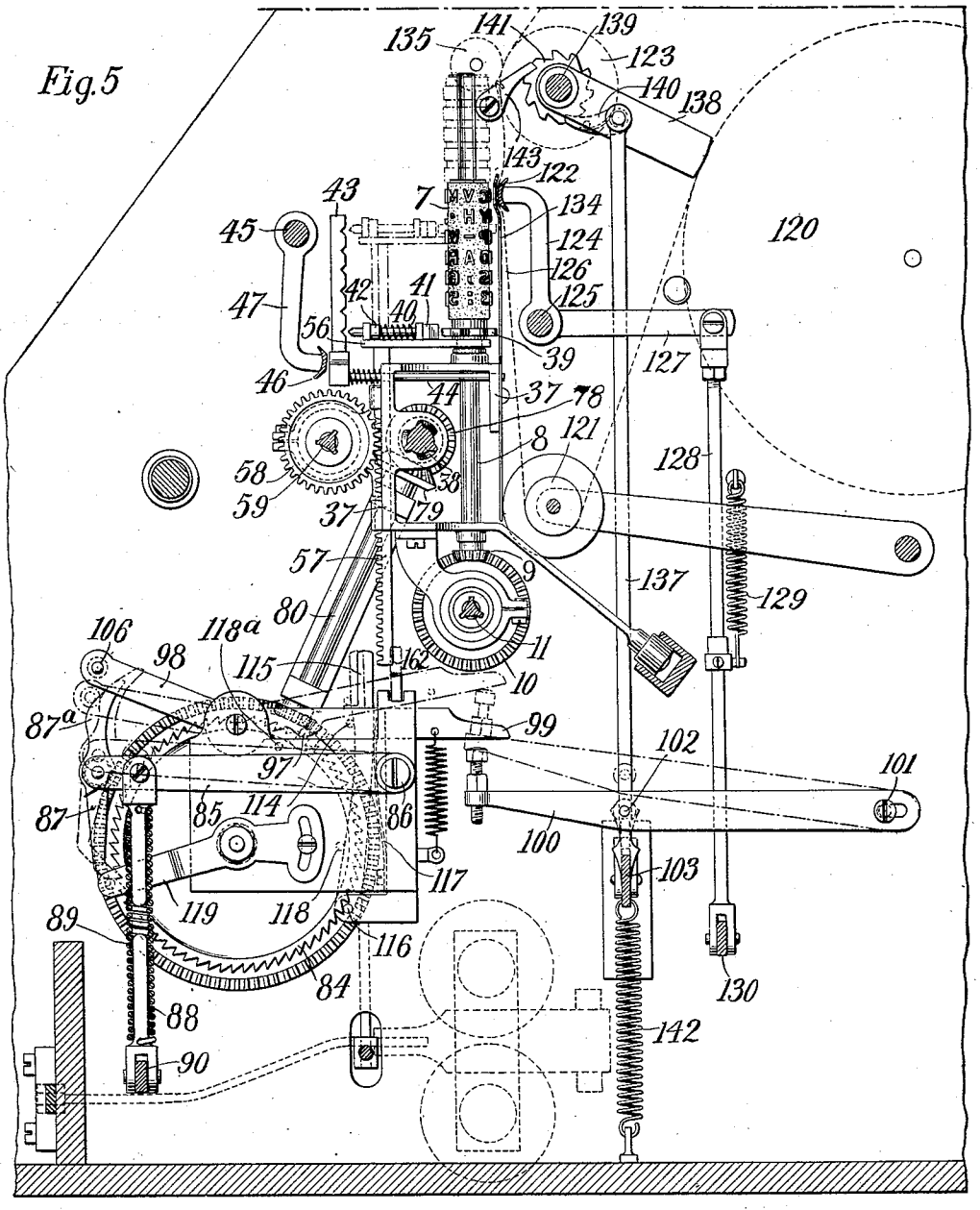
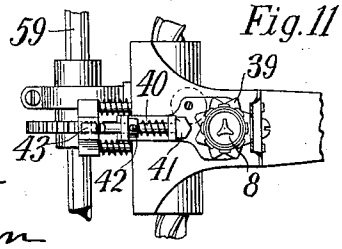


Fig.11



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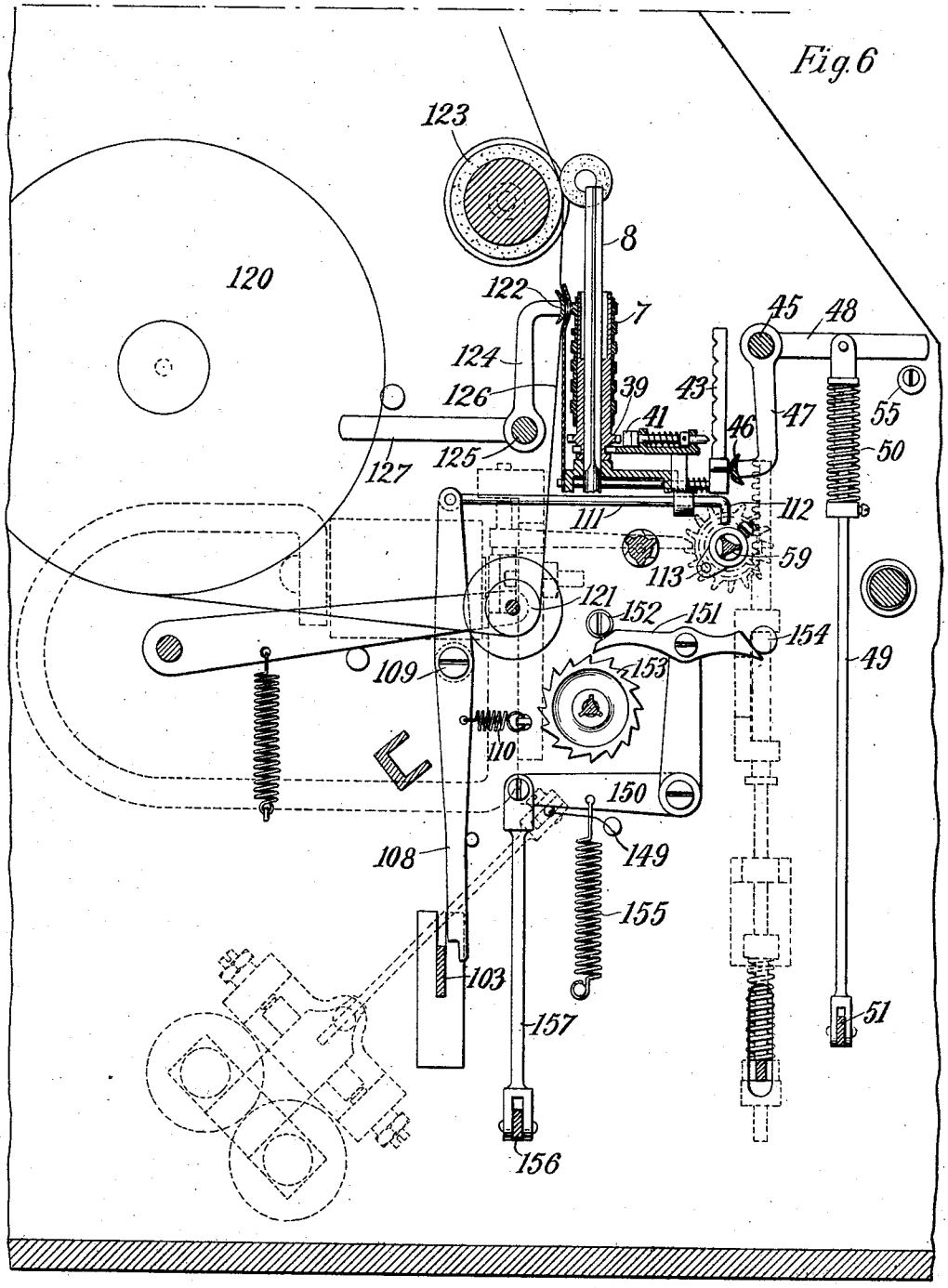
8 SHEETS—SHEET 6.

Fig. 6



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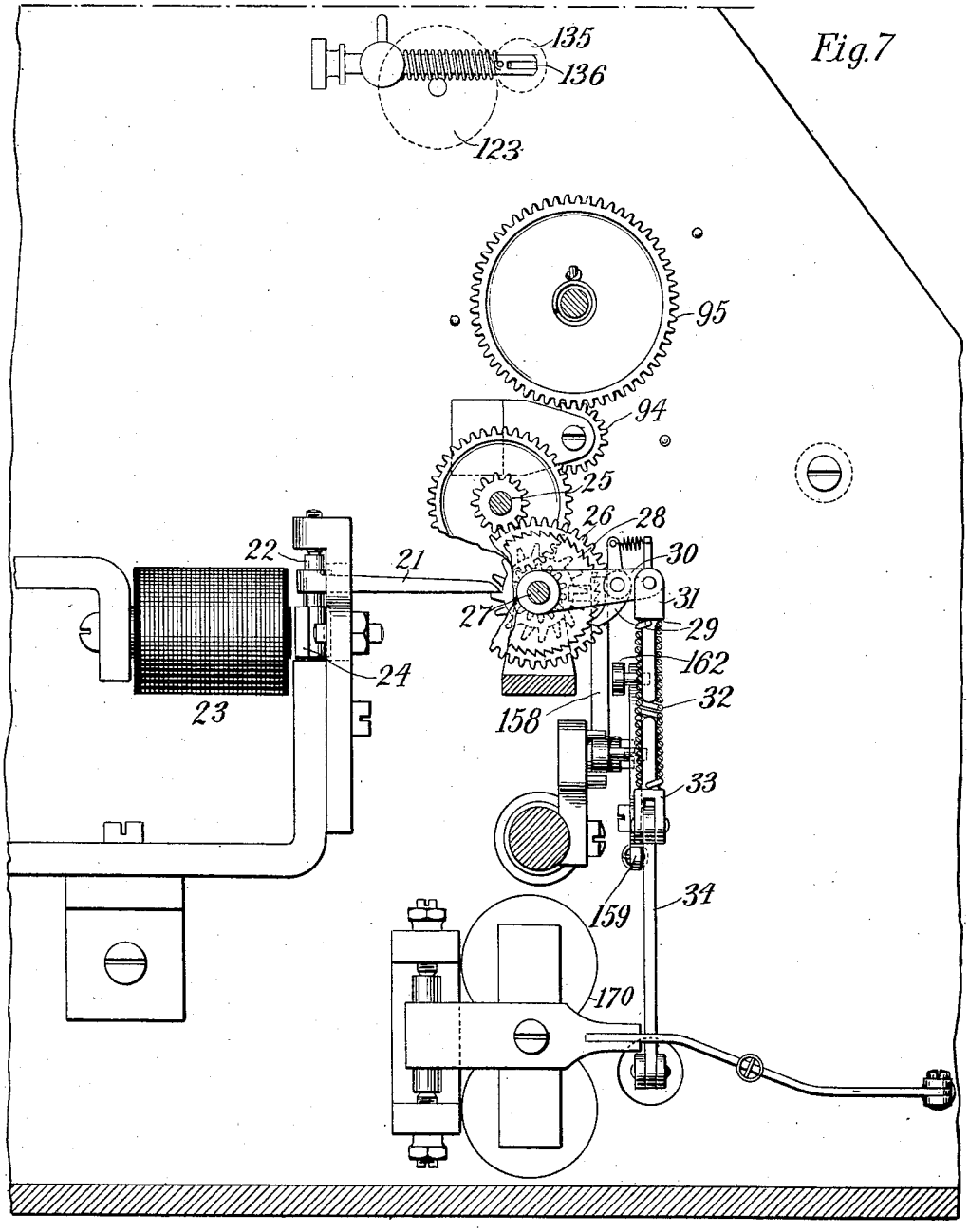
8 SHEETS—SHEET 7.

Fig.7



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APPLICATION FILED MAY 6, 1904.

8 SHEETS—SHEET 8.

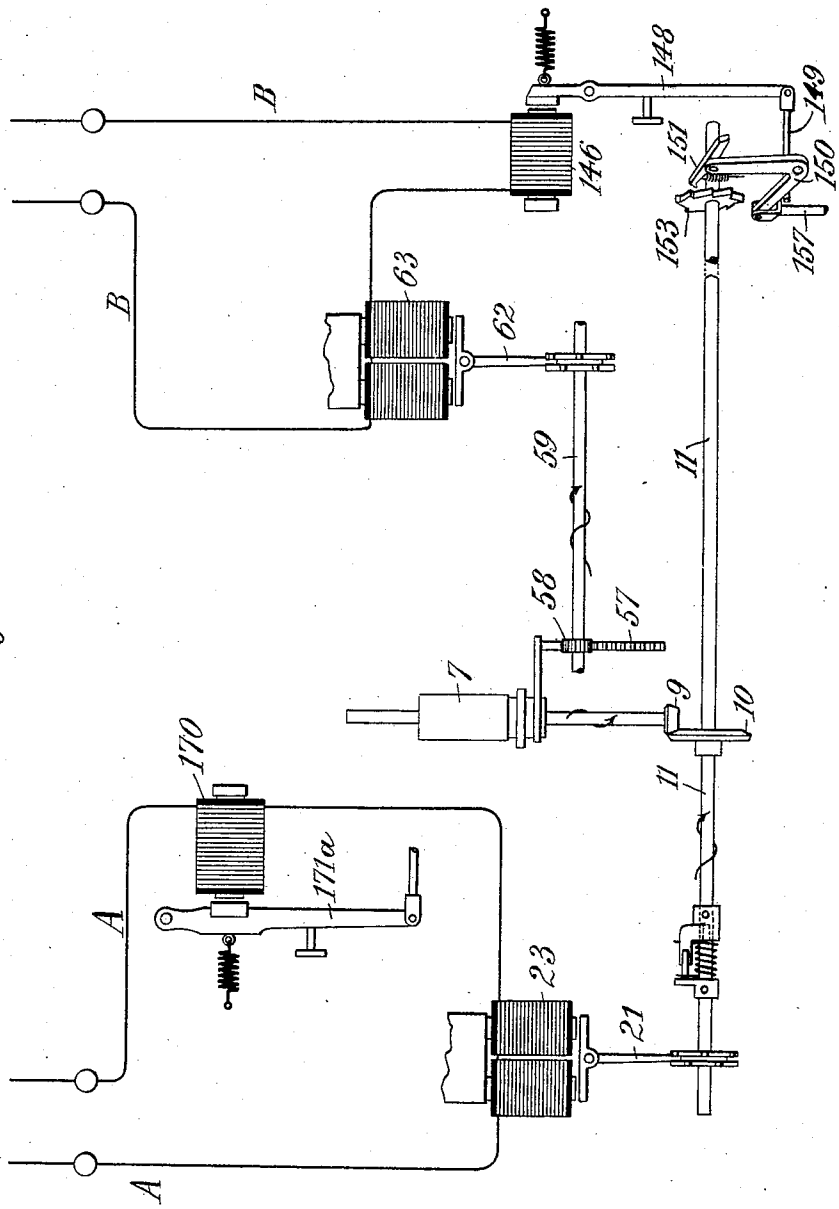

Fig. 12

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UNITED STATES PATENT OFFICE.

JOHN E. WRIGHT, OF NEW YORK, N. Y.

PRINTING-TELEGRAPH.

No. 865,470. Specification of Letters Patent. Patented Sept. 10, 1907.

Application filed May 6, 1904. Serial No. 206,638.

To all whom it may concern:

Be it known that I, JOHN E. WRIGHT, a citizen of the United States, residing at New York, in the county and State of New York, borough of Manhattan, have invented certain new and useful Improvements in Printing-Telegraphs, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

The invention, subject of my present application for patent, resides in improvements in that class of telegraphic instruments which are used as receivers, and which print in columns or successive rows the letters and characters corresponding to electrical impulses of definite number and character transmitted over the line.

The invention is, more especially, an improvement on the page printing telegraph apparatus of my former patent No. 466,858, of January 12, 1892, but involves features of novelty which are applicable to type printing mechanisms and printing telegraphs generally.

The object of the improvements is to obtain an increased speed in the operation of the several parts of the apparatus and a more rapid recording or printing of the characters and at the same time to simplify the construction of the apparatus as a whole and render its action more certain.

The general plan or principle of construction of the improved apparatus is the same as that set forth in my patent referred to, but the means which I have devised for carrying out the several operations of setting the type-wheel to present the proper letter or character for printing, of feeding the type-wheel forward and restoring it to its initial position and for effecting the feed of the paper and other operations necessary for accurate rapid work, are mainly of essentially novel character. The features of novelty which distinguish my present improvements, therefore, may be most readily comprehended by reference to the accompanying drawings, by the aid of which they are described.

Figure 1 is a front elevation of a machine embodying the present invention. Fig. 2 is a similar view, but stripped of some of its parts in order to show other parts more clearly. Fig. 3 is a view similar to Fig. 2, but showing certain parts in different operative positions. Fig. 4 is a horizontal section of the machine, taken on line IV—IV, of Fig. 1. Figs. 5, 6 and 7 are sections on lines V—V, VI—VI, and VII—VII, respectively, in Fig. 1, looking in the direction of the arrows. Figs. 8, 9, 10 and 11 are detail views of various elements. Fig. 12 is a diagram showing the wiring of the apparatus.

Following the usual plan of construction in instruments of this nature, the operative parts are mounted between two vertical side plates 1, 1, on a base 2, on which latter, in suitable bearings, there is mounted a counter shaft 3, in frictional engagement with a spur-wheel 4, which gears with a pinion 5, on a short shaft 6 constantly driven by a small motor of any suitable kind when the machine is in operation. From the counter shaft 3 is derived the power for effecting the operation of all of the several instrumentalities in the machine, the application of such power to any or all of the same being controlled by the number or character of the impulses transmitted over the two circuits, designated by A and B, Fig. 12, which the instrument requires for its operation, acting through suitable electro-magnets. Each of these instrumentalities will be described independently so far as clearness of illustration will permit.

The mechanism for rotating the type-wheel to bring to the proper printing position any type or character in a given circular row.—The type-wheel 7 is mounted to rotate with a vertical shaft 8, having a pinion 9 meshing with a gear 10 on the shaft 11. The type-wheel carriage, in which the shaft 8 is mounted, is laterally movable, and the gear 10 adapted to slide on the triangular knife edge shaft 11. Rotation of the latter will therefore rotate the type-wheel, whatever may be the position of the type-wheel carriage. The shaft 11 is actuated by the following instrumentalities: At one end it is provided with a rigidly mounted dog 12, into which latter extends a short shaft 13, carrying a dog 14 rigidly secured thereto. The dogs are held in yielding engagement with each other by means of a coiled spring, as shown in Fig. 1. The shaft 13 also carries a pinion 15, geared with a spur wheel 16 on a power shaft 17, which wheel is rotated by a coiled spring 180. It will now be seen that the spring 18 will cause the shaft 11 to rotate, and with it the type-wheel 7. The movement of these parts is made intermittent, or step-by-step, under the control of the operator, by means of an escapement, consisting of two toothed wheels 19, 20, with which engages a vibrating tongue 21. Each escapement wheel has eight teeth, and these are staggered with reference to each other, so a single movement of vibration of the tongue 21, on its vertical pivot 22, in either direction, will release the escapement shaft 13 and permit it to turn one step. By the proper proportioning of the gears intermediate to this shaft and that of the type-wheel one revolution of the former results in four revolutions of the latter, each step of the escapement wheel therefore resulting in a quarter revolution of the type-wheel, or through a space corresponding to two characters. Thus, by the vibration of the tongue 21 one of a pair of characters on the type-wheel will be brought to the printing position at each step-by-step motion of the escapement shaft. I have devised special means for moving the type-wheel, independently of the escapement mechanism, for throwing the other character of any given pair into the printing position when it, and not the character normally presented, is to be printed, and

this will be hereinafter more fully described. To actuate the tongue a polarized relay magnet 23 is provided, its armature 24 being rigidly fixed to the pivot 22.

The driving spring 18 is wound up at each step of the carriage across the paper or printing surface by an amount substantially equal to its unwinding in rotating the type-wheel, so that the spring is always under sufficient tension to perform its function with certainty. This operation is effected as follows: On the shaft 17 is a pinion 25, meshing with a gear 26 on an arbor 27. The latter is not connected with the escapement shaft 13, except that the end of the shaft 13 is utilized as a convenient bearing for the former. Rigidly connected with the gear 26 is a ratchet 28, which is engaged by a pawl 29, carried by an arm 30 which is loosely mounted on the arbor 27, (Fig. 7). The arm 30 is pivoted to a short link 31, yieldingly connected by means of a coiled spring 32 with another link 33. The latter is pivoted to a bell-crank lever 34, to the other arm of which is connected a link 35. The link is actuated by an eccentric 36 (Fig. 3) on the main power shaft 3. Rotation of the power shaft 3 will therefore rock the bell-crank lever 34, and cause the pawl to engage the ratchet 28, advance the same a predetermined extent, (dependent upon the relative proportions of the various parts) and then to be retracted to its initial position. As this motion of the ratchet actuates the shaft 17 in a direction opposite to the uncoiling of its spring 18 the latter will thereby be wound up. In case the spring should be wound to its full extent, or as far as the proper operation of the machine requires, the resistance thereof to further winding will be sufficient to overcome the tension of the spring 32 which connects the two links 31, 33, and the last mentioned spring will therefore yield, permitting the bell-crank lever 34 to rock idly without transmitting its motion to the pawl.

The energizing of the magnet 23, by which the armature 24 and tongue 21 are vibrated is effected by current impulses in opposite directions so that each reversal of current on the line will release the escapement and permit the shaft 11 and type-wheel 7 to rotate.

The type-wheel and its carriage.—The type-wheel proper, 7, is a light cylinder, having six circular rows of characters, generally made of rubber or other suitable yielding material. This cylinder is loosely mounted on the vertical knife edge shaft 8, which is rotated by the means described above. The carriage itself, 37, works on a worm or screw 38, so that rotation of the latter will cause the carriage to travel, as will be readily understood. There are eight characters in each row on the type-wheel, and at the bottom of the wheel is a toothed wheel 39, (Fig. 5), arranged with each notch corresponding to a vertical column of characters. Adjacent to the toothed wheel is a plunger 40, carrying a pointed head 41 which exactly fits the notches in the wheel 39. The plunger is normally retracted from the wheel by a spiral spring bearing against a stop 42. Adjacent to the outer end of the plunger is a standard 43, carried by rails 44 which slide in suitable bearings in the carriage 37. Springs on the rails normally hold the standard out of engagement with the plunger, as will be seen. When the standard is advanced against its spring it will push the plunger 40 forward, causing the pointed head of the same to enter the adjacent notch. If the wheel has not been correctly set by the rotation of the shaft 11, the head of the plunger will turn the notched wheel until the head and the notch fit exactly, whereupon the type or character will be in the exact printing position and firmly held there during the operation of printing. The devices just described are shown in detail in Fig. 11.

To actuate the standard 43 at each printing operation the following devices are provided: A rock shaft 45, suitably journaled, as in the side plates 1, 1, has a presser bar 46, carried adjacent to the base of the standard by arms 47. At one end of the shaft is an operating arm 48, (Fig. 6), to which is pivoted a link 49. The latter is made in two parts, yieldingly connected together by a spring 50. At the other end of the link is a lever, 51, pivoted at 52, (Fig. 1.), and bearing at 53 against a cam 54, (Fig. 8), on the main power shaft 3. It will now be seen that rotation of the power shaft will oscillate the lever 51, thereby drawing down the link 49, rocking the shaft 45 and causing the presser bar 46 to advance the standard against the justifying plunger 40. A stop 55 prevents the arm 48 from being depressed so far that the engagement of the justifying plunger with its notched wheel would lock the elements. When the arm strikes the stop the movement of the former ceases, while the link may continue to fall by reason of the yielding of the spring 50.

Since the type-wheel is vertically movable on the shaft 8 the standard 43 is made long enough to engage the plunger 40 whatever its position may be. If desired, the end of the plunger 40 may be pointed, and the standard 43 notched at the points of engagement therewith, as shown in Fig. 5.

Mechanism for raising and lowering the type-wheel to bring any row of characters to the printing position.—The type-wheel is mounted on a carrier 56, which latter is supported by a rack-bar 57 mounted in the type-wheel carriage 37. Meshing with the rack-bar is a pinion 58, carried by the type-wheel carriage and movable longitudinally on its triangular driving shaft 59. Hence in any position of the carriage rotation of the shaft 59 will actuate the gear and raise or lower the type-wheel.

The shaft 59 is rotated in the direction to raise the type-wheel by a coiled spring 60 (Figs. 1 and 3). The movement of the shaft is controlled and made intermittent by means of an escapement now to be described.

On the shaft are two ratchets or scape wheels 61, having any convenient number of teeth, the latter being staggered. The angular distance between a tooth on one wheel and the next tooth on the other is sufficient to permit the shaft to rotate far enough to raise the type-wheel one row of characters, so that actuation of the vibrating tongue 62 in either direction will release the escapement and permit the type-wheel to be raised a distance sufficient to bring the next row of characters to the printing position. The magnet 63 which actuates the armature 64 and tongue 62 is polarized and therefore causes the armature to oscillate in one direction or another according to the direction of the impulse which is sent to energize the magnet.

No provision is made for lowering the type-wheel one or more rows simply to bring to the printing position a row which may have been previously carried above such position. Instead, the wheel is lowered after each printing of a character, so that the wheel is always

raised from its initial position when it is desired to print a character not found in the row which is presented in such initial position. Simultaneously with the lowering of the type-wheel the spring 60 is wound up, the mechanism for performing these functions being the following. On the shaft 59, (Figs. 3, 4 and 10), is a pinion 65, engaged by a rack-bar 66 sliding in a bearing 67. Below the bar, and distinct therefrom, is a plunger 68 having a head 69 adapted to engage the lower end of the bar. The plunger passes through an opening in a lever 70, and has a stop 71, between which and the lever is a spring 72. Elevation of the lever will therefore raise the plunger and rack-bar, rotating the pinion and shaft and winding up the spring 60, at the same time lowering the type-wheel. When the latter has fallen far enough to rest on the carriage further movement of the rack-bar will be prevented, and if the movement of the lever 70 has not been completed the parts would be locked. This is prevented, however, by the spring 72, which will yield and permit the lever to rock idly if for any reason, as for example inaccuracy in construction or adjustment of the parts, the movement of the lever is not completed by the time the type-wheel has fallen to its initial position. For the purpose of rocking the lever 70 its other end is made to bear on a cam 73 fixed to the main power shaft 3, so that the plunger 68 will be raised at each rotation of the power shaft. Of course if the type-wheel has not previously been raised enough to lower the rack-bar into engagement with the plunger the latter will move a short distance before striking and raising the bar, as will be readily understood. As in the case of the spring which rotates the typewheel, previously described, the spring which raises the wheel is rewound at each printing operation the same amount as it had previously unwound.

The mechanism for moving the printing carriage across the printing surface.—As before stated, the carriage 37 is mounted on a screw or worm 38, so that rotation of the latter will cause the carriage to travel. Rotation of the worm in the forward direction, that is, to move the carriage from left to right, is effected by the following devices. On the worm is a bevel gear 78, meshing with another 79 on the shaft 80, on which is a gear 81 in mesh with another, 82, on a short shaft 83. The latter shaft has also a ratchet 84, so that actuation of the ratchet in its proper direction will rotate the worm 38 and cause the carriage to move from left to right. On an arm 85, (Fig. 5), pivoted at 86, is a pawl 87 engaging the ratchet 84. A link 88, constructed in two parts connected by a contractile spring 89, connects the arm 85 with a bell-crank lever 90, (Figs. 1 and 4), pivoted at 91 and bearing on a cam 92 on the main power shaft 3, with which it is held in positive engagement by a spring 93. Rotation of the power-shaft will therefore oscillate the arm 85 and pawl 87 once in each revolution of the shaft, causing the ratchet to be advanced and the worm to be rotated one space, a distance determined of course by the proportions of the operating parts.

The mechanism for returning the printing carriage to its initial position at the left of the machine.—The worm 38 is connected by a gear 94 to another, 95, on a shaft 96, which latter is actuated by a spring 97, to rotate the worm in a direction contrary to that effected by the ratchet mechanism before described, and therefore tends to bring the carriage back to the left of the machine. This is prevented, however, by a pawl tooth 97, (Figs. 4 and 5), carried by a pawl 98, and engaging the ratchet 84. The latter is therefore engaged by two pawls, 87 and 98, and consequently both must be disengaged before the reverse movement of the worm can occur. To disengage the latter, 98, the following devices are provided. Under the rear end, 99, of the pawl 98 projects a lever 100, pivoted at 101 to the side plate 1, and at 102 to a transverse lever 103 which passes over the main power shaft 3 to the other side plate. On the main power shaft 3, (Fig. 2) is a cam 104. The end 105 of the lever 103 being held against oscillation the rotation of the cam will raise the other end of the lever, and elevate the lever 100 against the pawl 98—99, thereby lifting the tooth 97 out of engagement with the ratchet. The latter, however, is still engaged by the pawl 87, which must also be released before reverse rotation of the ratchet can occur. This is effected by the stud 106, (Fig. 5), which engages the cam surface of the pawl extension 87^a, thereby lifting the pawl 87 whenever the lever 98 is rocked a sufficient extent. The spring 97 will then rotate the shaft or worm 38 and bring the carriage back to its initial position at the left of the machine.

In order to prevent the above operation from taking place at every revolution of the main power-shaft the return of the carriage is placed under the control of the operator by means of the following instrumentalities. As before stated, the end 105 of the lever 103 must be prevented from moving upward in order to raise the lever 100, since if the end 105 were free the lever 103 would rise idly on the cam 104, rocking on its pivotal connection 107 with a plunger or link to be described hereinafter. A movable abutment for the free end 105 is therefore provided, shown at 108, Fig. 6, notched, as indicated, at its lower end to engage the lever 103 when oscillated on its pivot 109, but normally held away from the lever by a spring 110. The other end of the pivoted abutment 108 is connected to a rod or plunger 111 which has a downwardly turned finger 112 in the path of an arm 113 rigidly mounted on the shaft 59 which raises and lowers the type-wheel. The arm is so arranged on the shaft that it reaches the finger 112 whenever the shaft is rotated sufficiently to bring the lowest row of characters to the printing position. If, now, the magnet 63, (Fig. 4), be again energized, the escapement will release the shaft 59 again, in the manner before explained, raising the type-wheel another step to a non-printing position, and at the same time engaging the finger 112 with the arm 113, drawing the former over and throwing the abutment 108 into engagement with the end 105 of the lever 103. Rotation of the main power-shaft will now raise the other end of the last mentioned lever, unlocking the pawls 87, 98, as before described, thus permitting the carriage to move back to its first position at the left of the machine. It is therefore necessary for the operator, whenever he wishes to return the carriage, to deliver sufficient impulses to the magnet 63 to raise the typewheel to its highest (a non-printing) position before rotation of the main power-shaft will effect the desired result. Raising of the type wheel to a non-printing position is important, since, as will be seen hereinafter, the platen is thrown forward to print a letter at each revolution of the main power-shaft, and if the wheel were in a printing position

a superfluous character would be stamped upon the printing surface whenever it is desired to return the carriage.

Since the shaft 3, which lifts the pawls 87, 98 through the instrumentality of the levers above described, rotates very rapidly the carriage might not have time enough for returning to its initial position before the pawls here again dropped into engagement with the ratchet, but means are provided to prevent this, as follows. The pawl 98 (Fig. 5), has a pin 114, adjacent to which is a vertical arm 115 pivoted at 116 and having a notch at its upper end, as shown. A flat spring 117 presses the arm outward to bring its stop into the path of the pin 114 to engage the same when the pawl 98 is raised and hold it out of contact with the ratchet 84. The pawl 87 being lifted and held by the pawl 98 the carriage can return to its first position irrespective of further rotation of the shaft 3. When the carriage has completed its return movement a pin 118 on the ratchet 84, striking the cam face of the arm 115, forces the latter back to its original position, releasing the pin 114 and permitting the pawls to drop back upon the ratchet teeth. In Fig. 5 the solid lines show the normal condition of the parts, and the dotted lines their position during the return of the carriage. In this position the pin 118 on the ratchet appears at the upper part of the ratchet and is lettered 118^a, having not yet descended to the position where it engages the vertical arm 115. The adjustable stop 119 is merely to limit the downward movement of the spacing or feeding ratchet 87, any excess motion of the link 88 being taken up by the spring 89 as before explained.

As the type-wheel carriage is returned to its initial position with considerable rapidity, it would strike a rigid abutment with such force as to result in an injurious shock. I therefore provide a yielding stop to receive its impact, for which purpose I employ a small air dash-pot 144, with a spring-seated plunger 145, the end of which projects into the path of some part of the type-wheel carriage and resists its return movement gradually. As the spring is somewhat compressed by the impact of the carriage it continues to exert a light pressure upon the latter, thus facilitating the starting of the carriage on its forward travel.

The mechanism for causing an impression to be made on the printing surface.—The platen, indicated by 122, consists of a bar supported by arms 124 on a transverse rock shaft 125, arranged adjacent to the type-wheel as shown. To rock the shaft and throw the platen and interposed paper 126 against the type-wheel an operating arm 127 is provided on the shaft, to which is connected a link 128, (Fig. 5), normally drawn upward by a spring 129. The link 128 is also connected to a lever 130, (Fig. 2), pivoted at 131 and bearing at 132 on a cam 133 on the main power-shaft 3. As the latter rotates it will permit the spring 129 to throw the platen forward, carrying the paper with a quick blow against the type-wheel and causing the same to receive an impression. This operation occurs once in every revolution of the shaft 3. A character would therefore be printed, and it would be impossible to cause the carriage to shift so as to leave a blank space, as between words, but blank spaces are provided for by leaving one of the type-spaces blank on the type-wheel, so that when a space is needed in the printing the operator first brings the type wheel to present the blank to the printing wheel, whereupon the platen moves forward as before but the paper does not strike a type. A spring guard 134 having a suitable opening in register with the printing position is provided on the type-wheel carrier, to permit only the impression of the proper character to be made on the paper.

The mechanism for feeding the paper to present successive lines to the platen.—The paper, 126, is wound in a continuous strip on a reel 120, suitably supported by the side plates 11, from which it passes under a rotary guide 121, thence between the platen 122 and guard 134 and over a feeding roller 123, being held in frictional engagement with the latter by pressure rollers 135. The pressure rollers are carried on pivoted arms 136 as shown in Fig. 1, to permit their being withdrawn from the feed roller for ready insertion of the paper.

The paper should of course be fed only after a line has been completed, and provision is therefore made for effecting the feed automatically whenever the carriage is returned to its starting position at the left of the machine. The transverse lever 103, which, as before described, controls the return of the carriage, is pivoted at its left end to a link 137, (Figs. 3 and 5), which latter is connected to an arm 138 loosely mounted on the feed roller shaft 139. The arm carries a pawl 140, which engages a ratchet 141 rigidly mounted on the same shaft. It will now be seen that, when the right end of the lever 103 is locked in the manner explained above, the lever 103, with the locked end as a fulcrum, will lift the link 137 and retract the pawl 140 over a tooth on the ratchet 141. As the cam 104 rotates farther it permits the spring 142 to draw down the lever 103 and link 137, advancing the pawl and rotating the feed roller 123 and paper 126. A locking pawl 143 prevents the roller from being rotated by the tension of the paper produced by the movement of the platen.

Mechanism for throwing the second character of any selected pair into the printing position.—I have explained above that by the operation of the escapement mechanism the type-wheel is rotated by steps of one quarter of a revolution, so that by this means alone, one half of the characters only can be brought into the printing position. But in order to print from any character adjacent to that which has been brought into the printing position by the escapement I have provided the following means. At the right of the instrument and in the second transmitting circuit is a magnet 146, operating an armature 147, which is connected by means of a rigid arm 148 with a horizontal sliding rod 149, the free end of which extends through an opening in the side plate 1 and remains normally below and in the path of an arm of a pivoted bell crank lever 150. To the end of the vertical arm of this lever is pivoted a pawl 151, the forward end of which plays between a fixed stop 152 and a ratchet wheel 153 on the knife-edge shaft 11. The rear end of the pawl 151 is beveled and bears against a fixed stop 154, so that the depression of the horizontal arm of lever 152 brings the pawl 151 into engagement with the ratchet 153 and imparts a movement of limited extent thereto. This movement is imparted to the escapement shaft 11, and is of such extent and direction as to turn the said shaft and through it the type-wheel backward the space of one

letter. When, therefore, a character is to be printed which cannot be brought to the printing position by the escapement, the proper number of impulses are sent over the first line to bring the character which precedes that desired into printing position, and a current is then sent over the second line in the same direction as the last preceding impulse on that line and of such duration as to operate the neutral magnet 146. This operates to withdraw the end of rod 149 from under the lever 150, whereupon the latter is drawn down by a spring 155, and the type-wheel is turned back to bring the desired letter into position to be printed. A lever 156, operated by a cam on the main driving shaft is connected with the bell-crank lever 150 by means of a link 157, and by the rotation of the said shaft is caused to force up the horizontal arm of lever 150 which is prevented from again descending by the interposition of the rod 149. The same operation disengages the pawl 151 from the ratchet 153.

The impulse which operates the neutral magnet 146 is always in the same direction as the impulse which last energized the magnet 63; otherwise, (the two being in series), the latter would be operated after it had been energized to bring the proper row to the printing position, and the type-wheel would be raised another step. In the apparatus illustrated the impulse to operate the neutral magnet 146 may be a distinct impulse or merely a sufficient prolongation (which may be very slight) of that which last energized magnet 63. In other words, if after the magnet 63 has been operated, when necessary, to set the type-wheel vertically, no more current be sent over its circuit, the first of the selected pair of characters will print; but if current be sent of sufficient duration, the typewheel will be moved back and the second character will print. The operation of the magnet 146 does not depend upon an increase of current, in the proper meaning of the term in this art, nor, except occasionally, upon an actual prolongation of a final impulse; but rather upon the condition of "current or no current" in this circuit. This feature I believe to be novel, and I consider it a very important part of my invention.

The unison mechanism.—This device is automatic, and operates at the end of each line whatever its length, to bring the type-wheels to unison. The following are the instrumentalities which I have devised for this purpose. On one of the two escapement wheels as 20 every alternate tooth is of double width. Normally the tongue 21 plays between the eight narrow teeth of wheel 20 and the eight teeth of wheel 19, and as each movement of the tongue produces one quarter of a turn of the type-wheel, it follows that if the escapement wheels be shifted so that the wide teeth of wheel 20 are interposed into the path of the tongue 21, the type-wheel will turn to unison, since the movement of the wheel 20 through one fourth of a revolution corresponds to a complete revolution of the type-wheel. To shift the escapement wheels, I employ a bell-crank lever 158, the upper end of which travels in a slot in the sleeve 160 carrying the escapement. The lever 158 is pivoted to a stationary part of the frame of the instrument. On lever 34 which winds the escapement spring 18, there is pivoted a latch 159 which is normally held by a spring 161 out of engagement with the lever 158, but a lever 162 pivoted to the frame is provided which carries a pin 163, that forces the latch 159 over into engagement with the end of lever 158, when the latter is drawn down by the lever 34. Whenever the lever 162 is operated therefore, the escapements will be shifted and the type wheel set to unison. Any part of the mechanism that is properly moved during the return of the type-wheel carriage may be utilized to tilt the lever 162, but for this purpose I employ the pawl releasing lever 99, Fig. 5. From the above it will be seen that the type-wheels will be brought to unison at the completion of each line or on the return of the carriage from any point in a line.

The mechanism for releasing the driving shaft.—A detail of this mechanism is shown in Fig. 9. From the main shaft project two arms 164, between which plays a tongue 165, mounted so as to turn freely about the shaft. Pieces of leather or fiber 166 are secured to opposite sides of said tongue to form cushions, and a spiral spring 167 is connected to the tongue tending to pull it in the direction ot rotation of the shaft.

To a plate 168 mounted on the base of the instrument, there is pivoted a vertical arm 169, with two beveled bearing surfaces at its free end. Normally the arm is held in a position in which the end of the tongue 165 engages therewith and locks the main shaft against rotation, but when the magnet 170 is energized by the final impulse sent for setting the type-wheel, a bar 171 sliding in guides on the plate 168 is forced forward by the armature lever 171^a. This bar carries a latch 172 that engages with the end of bell-crank lever 173 pivoted to plate 168 in such position that the end of its horizontal arm engages with the arm 169. By this forward movement of the bar 171, the bell-crank lever 173 is turned sufficiently against the tension of a spring 174 to allow the arm 169 to shift so that the end of tongue 165 slips out of engagement therewith. But as soon as sufficient movement has been imparted to the lever 173, the latch 172, which is depressed by engagement with a stud 175, is disengaged from said lever, whereupon the end of the latter which carries an anti-friction roller, pressed forward the arm 169 into position to engage the tongue 165, and arrest the main shaft at the end of one complete revolution.

With the above explanation of the construction and function of each of the several instrumentalities which make up my improved instrument, it is thought that their coöperation will be understood by any one possessing a knowledge of such instruments. A very general statement of the manner of using or operating the instrument will therefore be sufficient. It is understood that the instrument requires two line or transmission circuits. Over the first, indicated by A, A, are sent the impulses that rotate the type-wheel and release the main shaft. The quick impulses for controlling the operation of the escapements do not affect the magnet 170, as the latter is too sluggish, but the final or prolonged impulse of any series energizes this magnet and releases the main shaft. It will be further understood that all of the operations effected by the rotation of the main shaft will be properly timed by the proportions and adjustment of parts so that they will follow each other in the proper order.

The currents sent over the second line, B, B, are all of short duration, sufficient only to effect the operation of the escapement 61, with the exception of the im-

pulse which is to turn the type wheel back one step. It will be observed that to a large extent the functions of the two circuits are so independent that both may be transmitting at the same time. For example, while the type-wheel is being turned by one circuit to bring a certain character into alinement with the printing position, the other circuit may be conveying the impulses necessary for raising the type-wheel to present any given row of characters to such position. It will be further understood that while all of the necessary currents might be transmitted by simple keys under the control of an operator, in practice they are sent by a transmitter, which is as far as possible automatic in its action and which sends the proper combination of impulses by the mere depression of keys in a key-board. As the special means which I have devised for transmitting these impulses forms no necessary part of my present invention, however, I have not shown or described the same in detail.

Having now described my invention, what I claim is:

1. In a printing telegraph receiver, the combination of two independent line circuits, a type wheel having a plurality of circular rows of characters thereon, electromagnetic means in one of the independent circuits for adjusting the type wheel step by step in line with its axis, and electromagnetic means in the second independent circuit for simultaneously rotating the type wheel about its axis, as set forth.

2. In a printing telegraph receiver, the combination with two circuits, of a type-wheel having a plurality of circular rows of characters thereon, means for adjusting the type-wheel in line with its axis to bring a desired row to the printing position, a quick-acting magnet in one of the circuits for controlling said adjusting means, devices for rotating the type wheel step-by-step through spaces corresponding to two characters, a magnet in the second circuit for controlling said rotating devices, mechanism for turning the type-wheel a limited extent from any position to which it may be brought by the said rotating devices, and a slow-acting magnet in the first circuit for controlling said mechanism, as set forth.

3. In a printing telegraph receiver, the combination with a traveling type wheel carriage, a type wheel thereon and capable of rotation about a central axis and of vertical adjustment in line with its axis, of an escapement mechanism in gear with the type wheel shaft and adapted to rotate the same, a second escapement mechanism operatively connected with the type wheel to adjust the same step by step in line with its axis, and independent electromagnets in independent circuits for actuating the respective escapement shafts, as set forth.

4. In a printing telegraph receiver, the combination with two circuits, of a type-wheel, means for shifting the type-wheel in line with its axis, a magnet in one of the circuits for controlling said shifting means, mechanism under the control of the second circuit for rotating the type-wheel step-by-step, devices for turning the type-wheel a half-step from any position to which it may be brought by the said rotating mechanism, and a slow-acting magnet in the first circuit for controlling said devices, as set forth.

5. In a printing telegraph receiver, the combination with two circuits, a type-wheel and means under the control of one circuit for rotating the same, of means under the control of the other circuit for adjusting the type-wheel in line with its axis, and means controlled by prolonged impulses of current in the last mentioned circuit for turning the type-wheel backward a limited extent, as set forth.

6. In a printing telegraph receiver the combination with the type-wheel of two escapement mechanisms under the control of independent circuits, one adapted to rotate and the other to vertically adjust the said type wheel step by step, the said escapement mechanism also being capable of simultaneous operation, a constantly driven power shaft, a releasing mechanism therefor under the control of the circuit that effects the rotation of the type-wheel, and printing and feeding mechanism operated by the rotation of said shaft, as set forth.

7. In a two circuit printing telegraph receiver the combination with a type-wheel and an escapement mechanism under the control of one circuit for rotating the same, of an escapement mechanism under the control of the second circuit for vertically adjusting the type-wheel, means for imparting a backward movement of limited extent to the type-wheel, and a magnet in said second circuit capable of responding to prolonged impulses of current only, and controlling the operation of said means, as set forth.

8. In a page-printing telegraph receiver, the combination with a type-wheel, escapement mechanism for rotating the same, and means for shifting the type-wheel across the page from an initial position, of mechanism for returning the type-wheel to its initial position from any point in its line of travel, and automatic unison mechanism adapted to be brought into operation whenever the said returning mechanism is actuated, as set forth.

9. In a two circuit page printing telegraph receiver the combination with the type-wheel, a quick acting escapement magnet in one circuit, and a slow acting magnet in the other circuit, and means for turning the type-wheel to bring any given character thereon into alinement with the printing position, controlled by the action of said two magnets, a slow acting magnet in the first circuit, printing and feed mechanisms controlled thereby, a quick acting magnet in the second circuit, and means for vertically adjusting the type-wheel and restoring the same to its initial position controlled by said magnet, as set forth.

10. In a printing telegraph receiver, the combination with a longitudinally movable type wheel having circular rows of characters thereon, of means for actuating the same, an escapement for controlling the actuating means to produce a step-by-step movement of the type wheel to bring a desired row of characters to the printing position, an electromagnet for controlling the escapement, and automatic means for returning the typewheel to its initial position after a character has been printed, as set forth.

11. In a printing telegraph receiver the combination with a type-wheel of means for imparting thereto a step-by-step movement of rotation, means for imparting thereto a step-by-step movement in line with its axis and independent simultaneously operating escapements for controlling the operation of said means respectively, as set forth.

12. In a printing telegraph receiver the combination with a type-wheel, of means for imparting thereto a step-by-step movement of rotation, means for imparting thereto a step-by-step movement in line with its axis, and independent line magnets in independent transmission circuits for controlling the said means respectively.

13. In a printing telegraph receiver, the combination with a traveling type-wheel carriage, a type-wheel thereon capable of rotation on a central axis, and an escapement shaft in gear with the type-wheel, of means for rotating the shaft, a yielding connection between said means and said shaft, means for vertically adjusting the type-wheel, and means for justifying the type-wheel in any printing position, as set forth.

14. In a printing telegraph receiver, the combination with a traveling type-wheel carriage and a type-wheel thereon, of a worm or screw on which said carriage is loosely mounted, means for rotating said worm, to cause the carriage to travel, means for reversing the worm or screw to return the type-wheel carriage, and independent line-magnets in independent transmission circuits controlling said actuating and said releasing means, as set forth.

15. In a printing telegraph receiver, the combination with a traveling type-wheel carriage and a type-wheel thereon, of a worm or screw on which said carriage is loosely mounted, a spring normally actuating the worm in the reversed direction, means for rotating the worm or screw against the tension of the spring to advance the carriage, means for releasing said rotative means, and independent line-magnets in independent transmission cir-

cuits controlling said rotative and said releasing means, as set forth.

16. The combination with a traveling type-wheel carriage, a worm or screw on which said carriage is loosely mounted, and spring devices normally actuating the worm in the reversed direction, of means for locking said spring devices, mechanism for actuating the locking means to rotate the worm against the spring devices to advance the carriage, means for releasing the locking means, and independent line-magnets in independent transmission circuits controlling said actuating and said releasing means, as set forth.

17. In a printing telegraph receiver, the combination with a type-wheel capable of vertical movement on a central shaft, a rotatable shaft for effecting such movement, and a spring normally rotating the shaft to raise the type-wheel, of means for reversely rotating the shaft against the tension of the spring to lower the type-wheel, as set forth.

18. In a printing telegraph receiver, the combination with the type-wheel and means for rotating the same, of an escapement controlling said means, and means for permitting an abnormal release of said escapement to bring the type-wheel into unison therewith, dependent for operation upon the movement of the mechanism for returning the type-wheel to its initial position from any point in its line of travel, as set forth.

19. In a printing telegraph receiver, the combination with a type-wheel, means for adjusting the same, and a circuit for controlling said means, of mechanism for imparting a backward movement of limited extent to the type-wheel, a second circuit, and a neutral magnet in the second circuit to control said mechanism, as set forth.

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