946,372.

E. E. KLEINSCHMIDT.

KEYBOARD TELEGRAPHIC TRANSMITTER.

APPLICATION FILED FEB. 7, 1906.

Patented Jan. 11, 1910.

4 SHEETS—SHEET 1.

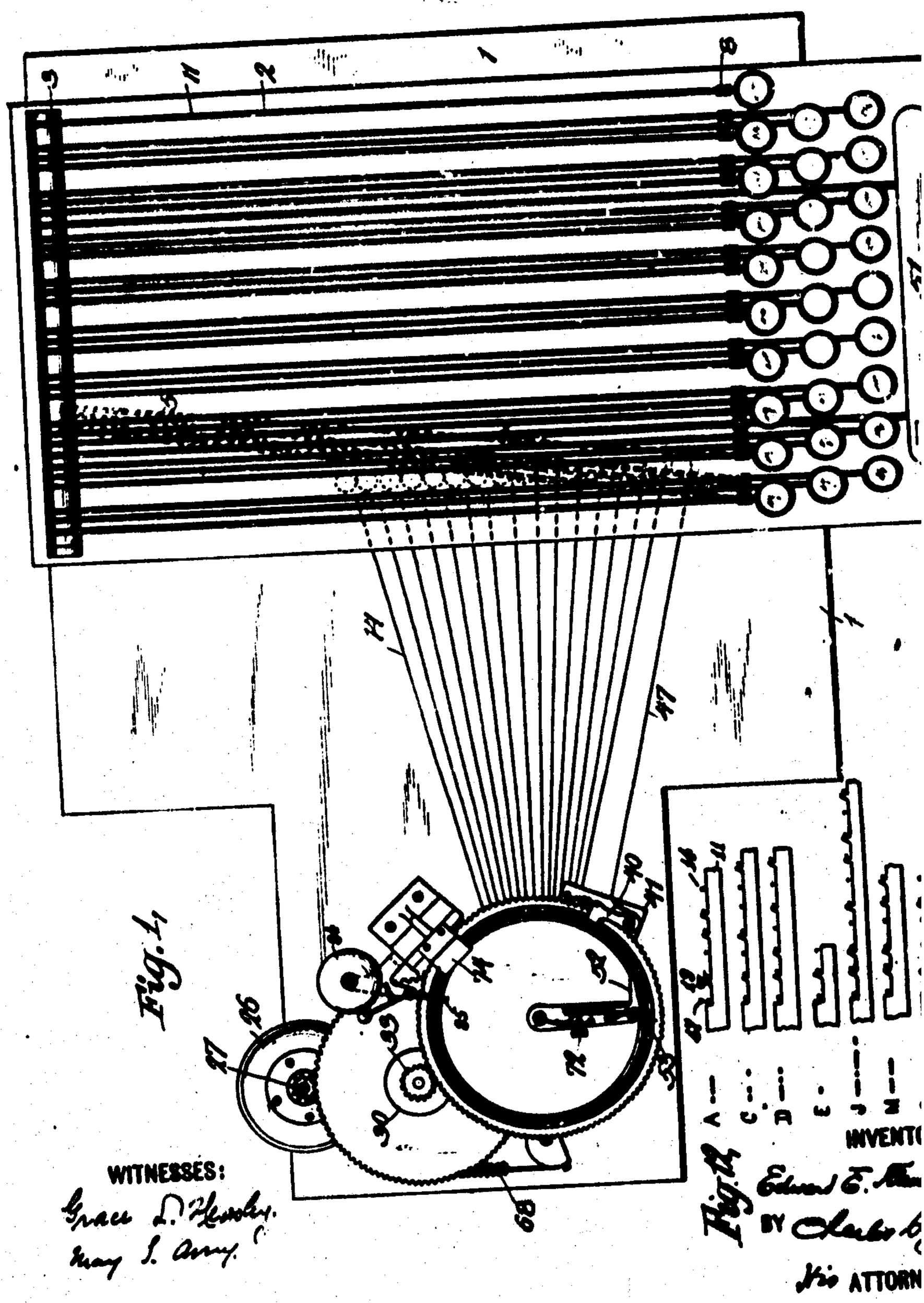

Fig. 1.

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4 SHEETS—SHEET 2.

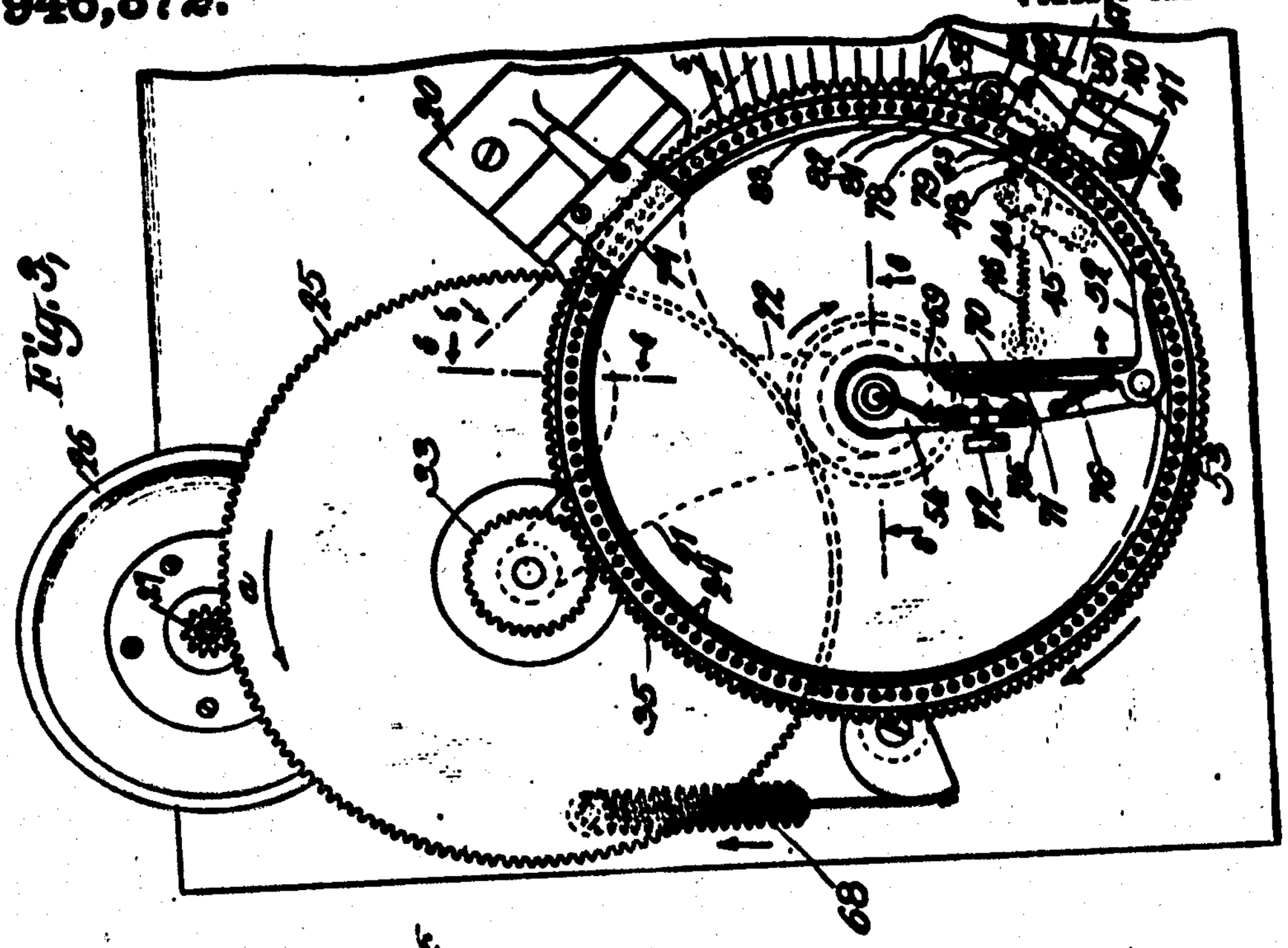

Fig. 3.

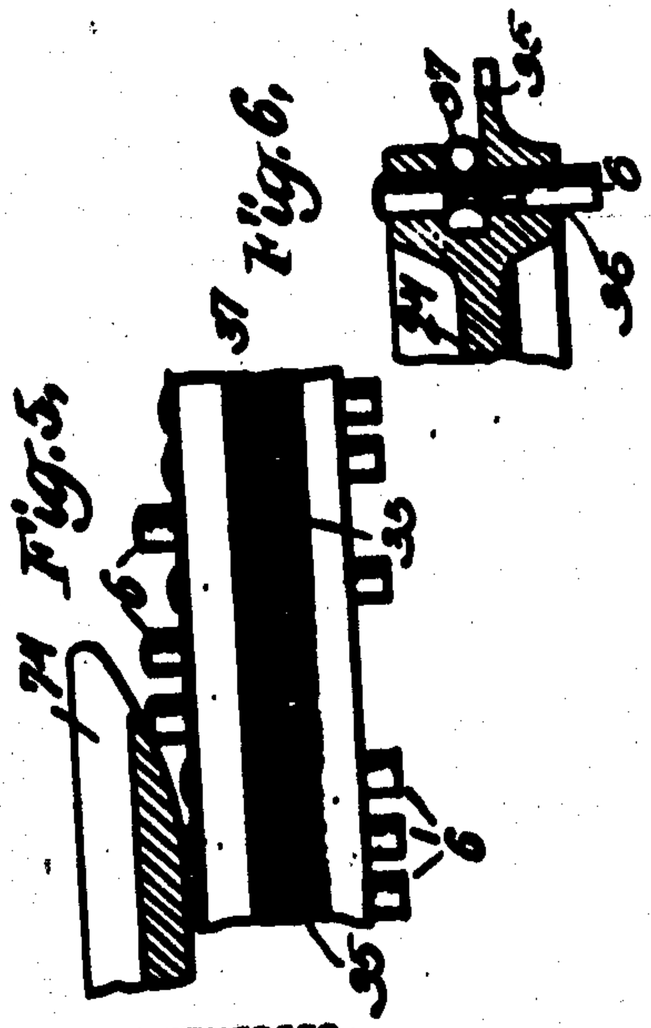

Fig. 5.

Fig. 6.

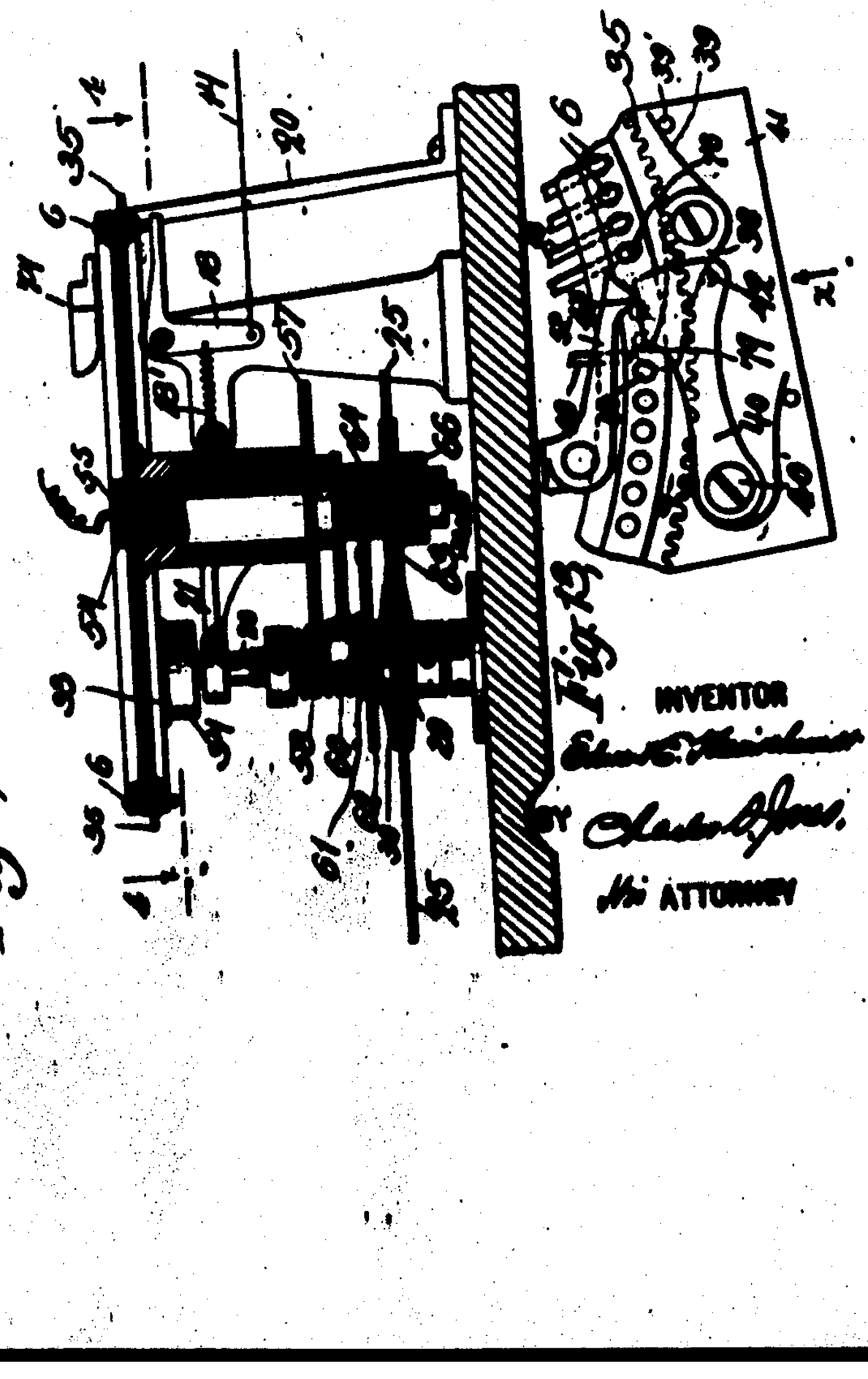

Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 1.

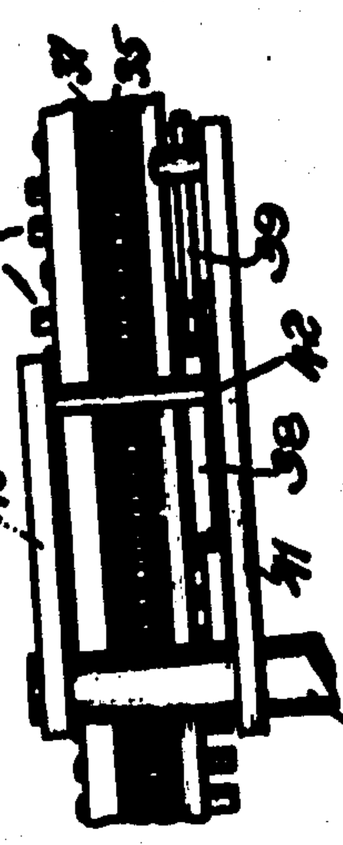


Fig. 8.

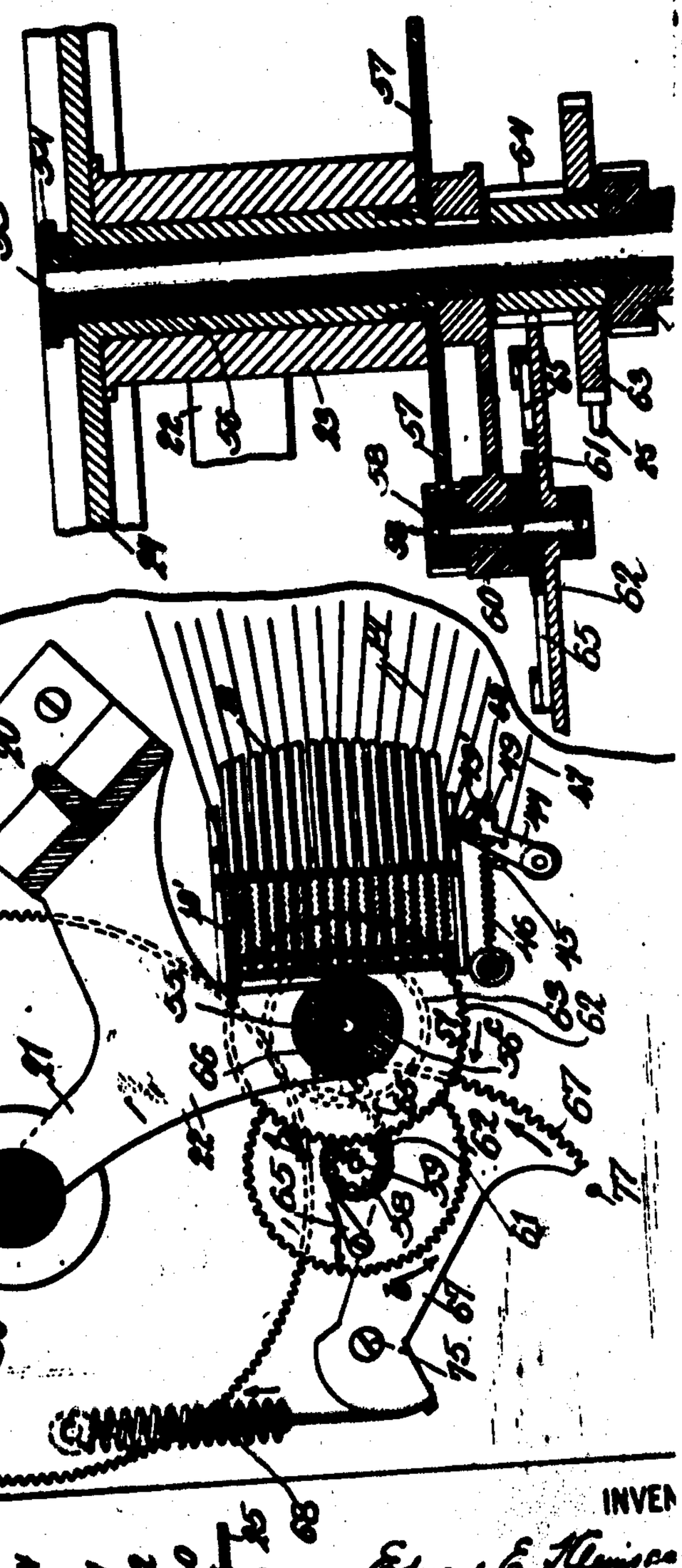
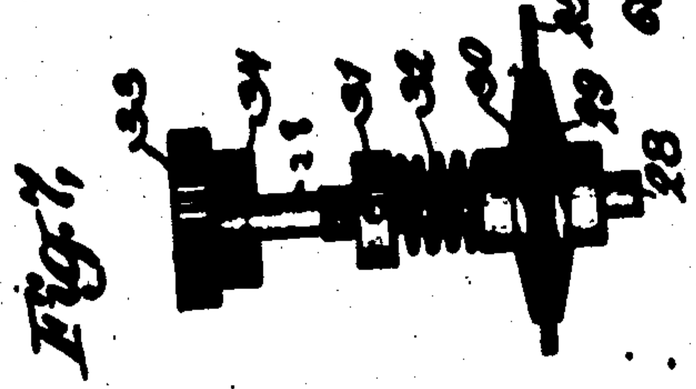


Fig. 4.

Fig. 7.



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4 SHEETS—SHEET 4.

Fig. 10

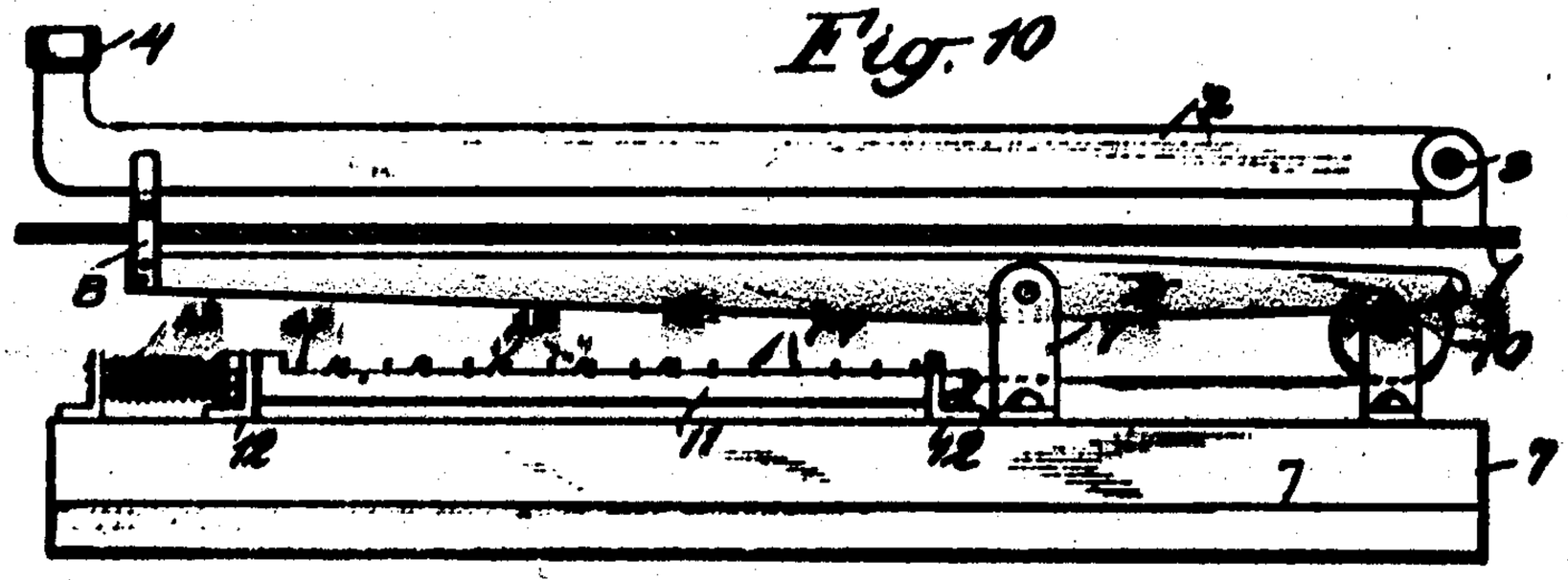
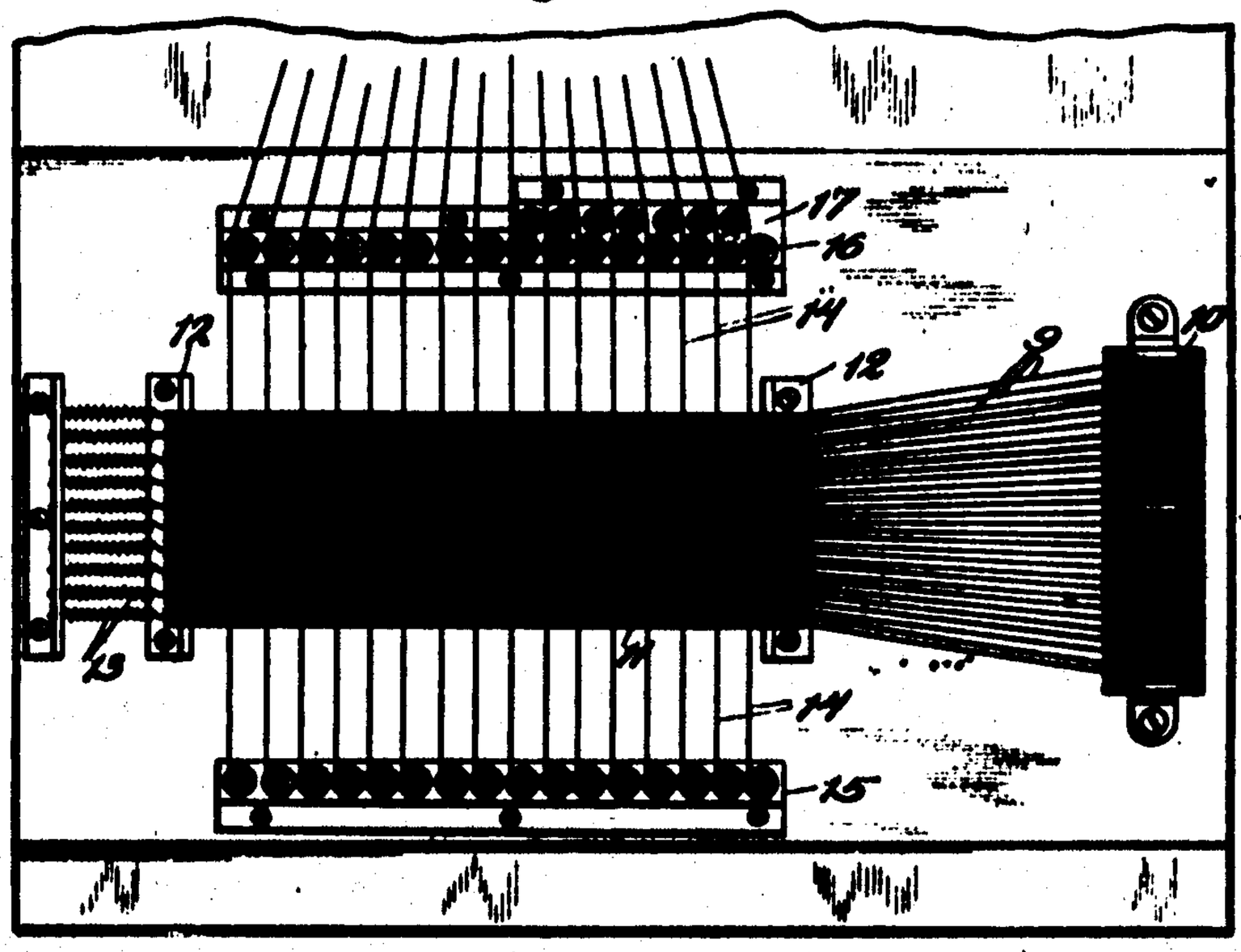


Fig. 11.



WITNESSES

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UNITED STATES PATENT OFFICE.

EDWARD E. KLEINSCHMIDT, OF NEW YORK, N. Y.

KEYBOARD TELEGRAPHIC TRANSMITTER.

946,372. Specification of Letters Patent. Patented Jan. 11, 1910.

Application filed February 7, 1905. Serial No. 244,585.

To all whom it may concern:

Be it known that I, EDWARD E. KLEINSCHMIDT, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Keyboard Telegraphic Transmitters, of which the following is a specification.

The present invention relates to a key board telegraphic transmitter adapted and designed to automatically transmit any well known or selected code of signals.

The object of the invention is to construct a transmitting machine which will continuously and automatically transmit telegraphic symbols at a uniform rate of speed independently of the speed at which the key board is operated, and which will enable the operator to accumulate or store up successive groups of telegraphic symbols in advance of their transmission, and which furthermore will allow of the transmission of the first symbol immediately after it has been set up, and the continuous transmission of the successive symbols so long as the key board is operated, thereby avoiding all loss of time in transmission.

The invention, generally stated, comprises a key board selective mechanism and a transmitting mechanism, the relation between the two being such that the selective mechanism acts to simultaneously set up all the parts of a telegraphic symbol, the regular transmission of successive groups of symbols by the transmitting mechanism not being affected by the speed at which the selective mechanism is operated.

The key board selective mechanism comprises a series of selective bars under the control of the key bars, said selective bars being constructed with projecting lugs arranged to correspond with the telegraphic symbol of the character of the corresponding key bar which controls it.

The transmitting mechanism by which electrical impulses of variable length are sent over the line, comprises what I have termed a "storage wheel" which wheel is provided with a series of pins adjustably supported thereon and at equal distances apart. These pins which may be arranged to be moved longitudinally either vertically or horizontally, or pivotally mounted, are adapted to be moved by the operation of the selective bars in groups and so arranged that the pins of each group shall correspond with the telegraphic symbol of the character struck on the key board. The storage wheel is adapted to be rotated by a continuously driven source of power and is automatically controlled in its movement by the key bars, the construction being such that said wheel is held in a position of rest when a telegraphic symbol is being set up and released so as to be rotated when the operator releases a key bar. The pins which are acted upon by the selective mechanism are all moved a like distance and when adjusted in position are adapted to operate a make and break lever by which an electric impulse to transmit a dot or a dash is sent over the line. The normal positions of these pins with relation to said lever is such that should the storage wheel be rotated when the pins are in their normal positions said lever will not be actuated and no impulse will be transmitted.

The transmitter make and break lever above referred to is so arranged relatively to the storage wheel as to be rotated in the same direction as the direction of rotation of the storage wheel when the latter is intermittently advanced after the setting up of a symbol but at a less rate of speed than said wheel is advanced. The normal position of said lever when it and the storage wheel are both at rest is immediately in advance of the first pin of the first symbol about to be set up, and when the storage wheel is brought to rest after having been rotated to advance a symbol, said lever immediately begins an independent return movement toward its normal position. If the interval between striking successive keys on the key board is less than that of the period of transmission then the return movement of said lever will be arrested and it will again be given an advance movement with the storage wheel, only to begin a return movement when the storage wheel is again brought to rest. Under normal conditions of operation the make and break lever is kept oscillating upon its axis through variable arcs, returning to its normal position only at the end of a message or when the interval between the striking of successive keys is sufficient to allow it to travel the full distance to reach its normal

osition. By reason of the relative arrangement of the several parts and the speeds at which they are operated, the operater is enabled to accumulate symbols on the storage wheel so that the transmission of the symbols is effected both when the storage wheel is being rotated to advance a symbol and when it is at rest while a symbol is being set up. The mechanism by which the storage wheel is alternately locked and unlocked is operatively connected with all of the key bars in such manner that the length of the symbols themselves determines the distance the storage wheel is rotated after it has been released.

The invention will be understood by reference to the accompanying drawings in which—

Figure 1 is a plan view of my improved transmitter; Fig. 2 is a view in elevation, partly in section, showing the storage wheel and the train of gears connected thereto; Fig. 3 is a plan view on an enlarged scale of the storage wheel and the means for rotating it; Fig. 4 is a horizontal section on the plane of the line 4—4 of Fig. 2; Fig. 5 is a sectional view on the plane of the line 5—5 of Fig. 3; Fig. 6 is a detail sectional view on the plane of the line 6—6 of Fig. 3; Fig. 7 is a detail view in elevation of the shaft and pinion for rotating the storage wheel; Fig. 8 is a vertical sectional view on the plane of the line 8—8 of Fig. 3; Fig. 9 is a detail view in elevation of a portion of the storage wheel and the means for locking and releasing it; Fig. 10 is a side view of the keyboard and the levers actuated thereby; Fig. 11 is a plan view of a portion of the selective mechanism; Fig. 12 shows the manner of arranging the lugs on several of the selective bars in connection with the corresponding Morse telegraphic symbol and Fig. 13 is an enlarged detail view of a portion of the transmitting mechanism.

Similar reference characters indicate similar parts in the several views.

The mechanism which controls the position of the pins in the storage wheel is adapted to be actuated by any suitable system of levers such as found in existing forms of typewriters, and for the purpose of illustration I have adopted that used in the Remington and other like machines, the drawing showing only so much of the typewriter lever system directly utilized by me in carrying out the invention.

Referring to the drawings the numeral 1 designates a suitable base supported a sufficient distance above the table to afford room for the proper assemblage and working of the mechanism actuated by the keyboard. The keyboard comprises a bank of bars 2 pivoted on a fixed shaft 3 supported in brackets on the base 1, said bars having keys on which are inscribed the letters of the alphabet, punctuation marks, etc., as usually found in typewriters. I prefer to arrange the letters, marks, etc., in accordance with the system known as the universal keyboard. Any desired number of bars 2 may be used in the keyboard, 29 being shown in the drawings, the bank including a spacing key 51. Beneath the base 1 is a bank of levers 5 the number corresponding to the number of key bars 2, said levers 5 being pivoted on a shaft carried by brackets 7 secured to a lower base piece 7. At the forward ends of levers 5 are secured U-shaped pieces 8 projecting upward through openings in the base 1 and in which are seated the bars 2 of the keyboard in such manner that as a bar 2 is depressed at its forward end, its corresponding lever 5 will be rocked on its pivot. To the rear of levers 5 are secured wires 9 running over pulleys 10 and connected to what I have termed "selective bars" 11, said bars being slidably mounted in brackets 12 secured to base 7. Springs 13 secured at one end to a fixed bracket on the base 7 and at the other to the selective bars 11 serve to retract the latter to their normal positions after the corresponding key bar 2 has been released by the operator. Each selective bar 11 is constructed with a number of projecting lugs 19 arranged in the manner and for the purpose presently to be described. Extending transversely of and immediately above the bars 11 in proximity to the sides of the lugs 19 are wires 14, said wires being attached at one end to a bracket 15 fixed to the base 7, and passing around guide rollers or pins 16 (see Fig. 11) supported in a fixed bracket 17, are attached at their other ends to a corresponding number of bell crank levers 18 (see Fig. 2), the simultaneous movement of a number of such bell crank levers, depending upon the character struck upon the keyboard, positioning the pins 6 of the storage wheel necessary to transmit the character struck.

As stated above each key bar 2 has a corresponding lever 5, and each lever 5 has a corresponding selective bar 11. It is essential therefore that the lugs 19 on the bars 11 shall correspond in arrangement with the telegraphic symbols of the characters on the keyboard, inasmuch as the function of said bars is to actuate through the wires 14 the bell crank levers 18 to set up in the storage wheel groups of pins also corresponding in arrangement with the telegraphic symbols of the keyboard characters. To facilitate the description it will be assumed that the invention is adapted to transmit the Morse code, and for that purpose each bar 11 will have its lugs 19 so arranged that when a given character is struck on the keyboard the wires 14, necessary to set up the proper

group of pins in the storage wheel, will be displaced by the bar 11 corresponding to the character struck, there being as many wires 14 as necessary to set up the symbol of the longest character on the keyboard. The number of pins on the storage wheel to transmit a dot, dash or space may be varied, but in practice with pins about one-sixteenth of an inch in diameter I have adopted the following units:—for a dot one pin up; a short dash, two contiguous pins up; a long dash four successive pins up; a symbol space, that is the space between the parts of a telegraphic symbol, one pin down for a short space and two contiguous pins down for a long space; a letter space, that is, a space between symbols, three successive pins down; a word space, that is a space between words, four successive pins down. This selection is purely arbitrary and may be varied as desired. It is, however, convenient in that the minimum number of pins is required for any given character. For example, as shown in Fig. 12, the letter A of the Morse code being represented by a dot and a short dash, the bar 11 corresponding to that character will have three lugs 19 so arranged as to act simultaneously upon three wires 14, one wire 14 between the one for the dot and the two for the dash being idle. A movement of that bar 11 will, through the wires 14, simultaneously act upon three of the bell crank levers 18 so as to raise one pin representing the dot, the next pin remaining down in its normal position and the next two pins being raised or a group of four pins. The letter C, which is represented by two dots, a long space and a dot, will require its lever 11 to have three lugs 19, so arranged that two act upon two wires 14 separated by an intervening idle wire, and the third lug on a wire for the last dot separated from the others by two intervening idle wires to represent the long space. This symbol requires a group of six pins in the storage wheel, that is, one up, one down, one up, two down in their normal positions, and one up. The letter D, represented by a short dash and two dots, will require its lever 11 to have four lugs 19 so arranged that two act upon two contiguous wires for the short dash and two wires for the two dots, the first of said two latter wires being separated from the two contiguous wires by an idle wire, and the two wires for the two dots being separated from each other by an idle wire or altogether a space of six wires setting up a group of six pins in the storage wheel. E, being the shortest symbol, represented merely by a dot, will require but one lug on its lever 11. The letter J, being the longest symbol, that is, a short dash, dot, short dash and dot, will require its bar 11 to have six lugs 19 so arranged that two act upon two contiguous wires; the third upon a wire separated from the second by an idle wire; the fourth and fifth on two contiguous wires separated from the third by an idle wire, and the sixth separated from the fifth by an idle wire, or a total space of nine wires, so as to set up in the storage wheel a group of nine pins; two contiguous pins for the first short dash, one down in its normal position for the short space, one up for the dot, one down in its normal position for a short space, two up for the second short dash, one down for the short space, and one up for the final dot. The letter L represented by a long dash will require its bar 11 to have four lugs so arranged as to act upon four consecutive wires 14 thus raising a group of four consecutive pins in the storage wheel, it being evident that if two pins are adopted as the unit for a short dash, the long dash will require four pins or double the number of pins for a short dash. The letter M represented by two short dashes will require its bar 11 to have four lugs 19, so arranged that the first and second act upon two contiguous wires, and the third and fourth on two contiguous wires separated from the first set by an idle wire, so as to set up in the storage wheel two contiguous pins for the first dash, one down in its normal position for the short space and two up for the second dash, or a group of five pins. The letter O represented by two dots with a long space between will require its bar 11 to have two lugs so arranged as to act upon two wires separated by two idle wires, so as to set up in the storage wheel one pin up for the first dot, two down for the long space and one up for the second dot, or a group of four pins.

In Fig. 10 the bar 11 is shown as connected with the key bar of the letter P. In a similar manner all of the other bars 11 have their projecting lugs 19 so arranged as to simultaneously act upon the proper wires to set up the desired group of pins in the storage wheel, and by "setting up" it is to be understood that I mean not only the raising of certain of the pins so as to project above the plane of the upper surface of the storage wheel to transmit a dot or a dash, but permitting certain of the pins of the group to remain in their normal positions for the symbol spaces, for it is just as essential in the practice of my invention that certain pins should be permitted to remain in their normal positions to transmit short and long symbol spaces, letter spaces and word spaces, as it is to raise certain pins to transmit dots and short and long dashes. In the universal keyboard the longest symbol is that of the period, requiring its bar 11 to have eight

lugs so arranged as to act upon eight wires to raise eight pins and allow five to remain in their normal positions, or a total space of 13 wires and 13 pins. As shown in the drawings a symbol requiring a group of 15 pins is provided for although it is obvious that a greater number of wires 14 may be used to effect the setting up of a symbol requiring any number of pins. The bar 11 connected to the spacing bar has but one lug to act upon a wire 47 (see Fig. 10), said wire 47 being operated not only by the spacing bar but also by all of the bars 11 as hereinafter described. It may be stated here that the storage wheel mechanism is so arranged as to provide for the escapement of three pins in their normal positions after the pins of each symbol have been set up. When the space bar 51 is struck its corresponding bar 11 will act upon the wire 47 to allow the storage wheel to move the space of one pin, thus making the four pins down which, as above stated, represent the space between words.

The series of lugs 19 on each bar begins near the outer end of the bar, the initial lugs being in alinement. The wire 47 lies between the initial lug and a shoulder on the bar and is moved by said shoulders when the keyboard is manually operated.

As shown by dotted lines in Fig. 1 the levers 5 converge toward the rear for the purpose of bringing the selective bars 11 close together or near the center of the wires 14 in order to get an even action on said wires.

Storage wheel.—Having described the selective mechanism by which the pins corresponding to a given character on the keyboard are set up in the storage wheel, I will now describe in detail the storage wheel and the means by which it is rotated intermittently to permit the setting up of the successive groups of telegraphic symbols of a word or sentence.

Referring more particularly to Figs 2, 3, 5, 6, 7, 8 and 9, the numeral 20 designates a standard secured to base 1, said standard having arms 21 and 22. On the arm 22 is rigidly secured a bearing 23 (see Fig. 8) forming part of the casting of the standard 20 which bearing supports the storage wheel 24. The other arm 21 has a bearing for the shaft 28 of a gear wheel 25 which is adapted to rotate the storage wheel. 26 designates a motor of any suitable kind, mechanical or electric, the shaft of which has a pinion 27 meshing with wheel 25, said wheel 25 being loose on the shaft 28 which shaft is supported in bearings on the arm 21 and in base 1 (see Figs. 2 and 7). 29 designates a friction disk fixed on the shaft 28, and 30 designates a friction disk slidably keyed on said shaft. Screw-threaded on shaft 28 is a nut 31 and between said nut and friction disk 30 is supported a spring 32 for the purpose of holding said disks in frictional engagement with gear wheel 25. At the upper end of shaft 28 is a gear 33 having a loose bearing on said shaft, and secured at one end to said gear and at the other end to the shaft 28 is a spring 34. Upon the rotation of shaft 28 the spring 34 will be wound, the force of the spring in unwinding driving the gear 33, the function of the spring 34 being to impart a quick rotary movement to the storage wheel when the latter is released as hereafter described. Referring to Fig. 3 it will be seen that the gear wheel 33 meshes with a gear 35 forming part of or secured to the storage wheel 24. The gear 35 may be inside of the periphery of the storage wheel or upon the outside, as shown in the drawings. The storage wheel 24 is in the form of a ring a section of which is shown in Figs. 2, 6 and 9. Near its outer edge said wheel is provided with a series of holes 36 in which are seated pins 6, said pins, when in their normal positions, having their upper ends substantially flush with or projecting only a slight distance above the upper plane of the wheel 24. As shown in Fig. 6 the pins 6 are cylindrical in shape and are circumferentially grooved at two points near the center and are adapted to be held either in their normal or in their raised position by a spiral spring 37 held in a seat in the wheel 24 and engaging the pins at their grooved portions. The wheel 24 may be made of any convenient size so as to carry any desired number of pins, the individual pins being about one-half inch in length and about one-sixteenth of an inch in diameter and are preferably made of steel. As shown in Fig. 2 the upper arms of bell crank levers 18 project beneath the plane of the lower ends of the pins 6, said levers having imparted to them in the manner before described sufficient movement to raise their corresponding pins 6 so that they shall project above the plane of the upper face of the wheel 24, and when so raised they will be held in that position by the spring 37 engaging the lower groove.

The wheel 24 is held against rotation by a stop pawl 38 (see Figs. 8 and 13) the toe of said pawl being adapted to engage a pin in the position of pin 79 which is always in its lower position. The pawl 38 is held in this, its normal position, by a spring-pressed lever 40 pivoted on a stud 40' fixed to a bracket 41, said lever 40 having a pin 42 which bears against the pawl 38 to hold the latter in its engaging position. The lever 40 has a face 43 broad enough to extend over a space of three pins from center to center, any one of which if raised will prevent said lever moving inward to thereby allow pawl 38 to engage a pin to stop the rotation of the wheel. In their normal

positions with the pins down, lever 40 projects far enough inward to extend part way over the tops of the pins, and the toe of pawl 38 projects between two pins near their lower ends, the relative positions of pawl 38 and lever 40 being shown in Fig. 9. To move the lever 40 back, I provide a lever 44 pivoted on bracket 41 and held normally against a stop pin 45 by a spring 46 (see Fig. 4). Attached to the lever 44 is the wire 47 controlled as above stated by all the bars 11. When any one of the bars 11 is moved, the lever 44 is drawn forward to cause an attached escapement 48 to project between two pins and to act against pawl 38 to move the latter out of its normal position, a spring 39 secured to pawl 38 acting against a pin 39' on the bracket 41 tending to hold the pawl 38 in its outward position. The movement of pawl 38 in this manner will also move lever 40 through the pin 42 from over the tops of the pins 6 the wheel now being held against rotation by escapement 48.

To illustrate the operation of the mechanism just described, I will assume that it is desired to set up in the storage wheel the pins necessary to transmit the word "jelly." The storage wheel being at rest by reason of pawl 28 engaging the pin in the position of 79, said pawl will be moved back by the forward movement of the escapement 48 upon the striking of the letter j upon the keyboard, the wheel now being maintained in a position of rest by said escapement. When escapement 48 is moved the first one of the three pins in front of lever 40 or that in the position of pin 79, will bear against it and the wheel allowed a very slight movement, less than one-thirty-second of an inch, or until said escapement is brought against stop pin 49, thus bringing pawl 38 against the outer side of said pin. As pawl 38 moves backward it bears against pin 42 and thus moves lever 40 from over the top of the three pins immediately in front of it, said lever being held in that position out of the path of the raised pins by the action of spring 39 on pawl 38 until the wheel is brought to rest. Simultaneously with the movement of lever 44 to effect the release of pawl 38, the selective bar 11 corresponding to the letter j will displace six of the wires 14 to set up the telegraphic symbol in the storage wheel in the manner before described. When the operator releases the key bar, the lever 44 will be retracted, thereby withdrawing the escapement 48 leaving the storage wheel free, and spring 34 will then act to give a quick rotary movement over a space of nine pins, six of the pins being raised to represent the two dashes and the two dots and four remaining down for the spaces between the parts of the symbol, and in addition to these nine pins the wheel will be advanced three pins all of which will be down and in front of the face 43 of lever 40. As there is now no raised pin in front of lever 40 to hold it back, said lever will be moved forward by its spring, causing pin 42 to move pawl 38, the latter being projected in front of the first pin down after the symbol or that in the position of pin 70 thus bringing the wheel to a position of rest. When the letter e is struck, but one pin will be raised and the wheel 24 will be advanced to bring that pin to the position immediately to the left of the face of lever 40, and the three pins following will be advanced to a position in front of said lever, the wheel again coming to a position of rest. When the next letter l is struck, four successive pins will be raised and the wheel advanced so that the last of said four pins is brought to a position immediately to the left of the face of lever 40, the three pins immediately following being advanced to a position in front of lever 40, the wheel again coming to a position of rest. The same movement occurs for the second l of the word. When the final letter y is struck, the wheel will be advanced a space of 11 pins, as follows:—one up for the dot; one down for the short space; one up for the dot; two down for the long space; one up for the dot; one down for the short space; one up for a dot and three down for the letter space.

Transmitting mechanism.—After the pins have been set up in the manner before described they are utilized to send electrical impulses over the line by causing one arm of a bell crank lever 52 to ride against and to contact successively with the sides of the raised pins. The lever 52 is pivoted at 53 on an arm 54, said arm being fast on a hollow shaft 55, the said arm 54 and lever 52 being moved as hereafter described. The toe of lever 52, as shown in Figs. 3 and 13, is made broad enough to prevent the lever projecting between two contiguous raised pins sufficiently far to break the circuit. The inner end of lever 52 is controlled by a spring 70 which tends to hold said lever normally against a stop pin 69 on the arm 54. A spring 71 fastened at one end to lever 52 and at its other end bearing against a shoulder on said lever, (see Fig. 3), carries a terminal point 75, adapted when lever 52 is moved by a raised pin, to contact with a terminal held in a binding post insulated from the arm 54. The circuit wires are secured to binding posts 73 on the base 1, the wire leading to the binding post 72 being conveniently carried through hollow shaft 55, the other wire being grounded in mass through a spring 76 connecting lever 52 and arm 54. The circuit will be closed by lever 52 whenever it is rocked on its pivot by a raised pin, the space between two or more successive raised pins being insufficient to permit the toe of lever 52 to break the cir-

cuit. Thus, for a dot the circuit will be closed for the space of a single pin; for a short dash it will be closed for the space of two contiguous pins and for a long dash for four successive pins. For a short symbol space the circuit will be broken for the space of one pin and for a long symbol space the circuit will be broken for the space of two pins.

As above stated, arm 54, on which lever 52 is pivoted, is fast on a hollow shaft 55, said shaft having a lose bearing in a depending sleeve 56 integral with the storage wheel 24 (see Fig. 8) said sleeve being supported in the bearing 23 forming part of arm 22. On the lower end of sleeve 56 is keyed a spur gear 57, said gear meshing with a pinion 58 fast on a short vertical shaft 59, which shaft has a loose bearing in the end of an arm 60, which arm is in turn fast with the hollow shaft 55. To the lower end of shaft 55 is keyed a pinion 66, which meshes with a sectional gear 67 pivoted on a stud 75 fixed to the base 1. A spring 68 is secured at one end to the gear 67 and at the other end to a stud on the base 1.

The gear wheel 25, which is connected to shaft 28 through friction disks 29 and 30, meshes with a spur gear 63 fast to a pinion 64 which pinion has a loose bearing on the hollow shaft 55 (Figs. 2 and 8). The pinion 64 in turn meshes with a spur gear 62 having a loose bearing on shaft 59, and immediately above the gear 62 is a ratchet wheel 61 keyed fast on said shaft 59. Spring pressed pawls 65 (see Fig. 8) pivoted on the upper side of gear 62 engage the teeth of said ratchet wheel.

The purpose and mode of operation of the several trains of gears just described are as follows: Gear 25 being continuously rotated in the direction of the arrow *a*, (Figs. 3 and 4) by the motor 26 its motion will be transmitted through gears 63 and 64 to gear 62 causing the latter to continuously rotate in a left handed direction as indicated by the arrow *b* (Fig. 4). These four gears are thus continuously rotated at a constant rate of speed whether the machine is transmitting or not. When the storage wheel is released, after a symbol is set up, by the withdrawal of escapement 48, the said wheel is given a quick rotary movement by spring 34 through gears 33 and 35 in a right-handed direction. After a symbol has been advanced the storage wheel is brought to rest in the manner before described. During this brief intermittent movement of the storage wheel, its motion will be transmitted to gear 57 the latter being rotated in the same direction as the storage wheel as indicated by the arrow *c* in Fig. 4. As gear 57 meshes with pinion 58, the latter will be rotated in a left handed direction at such time, imparting motion in the same direction to ratchet wheel 61 which is fast upon shaft 59, so that said ratchet wheel will be caused to rotate in the same direction as that of gear 62. During the intermittent movement of the storage wheel the gear 62, as above stated, is rotating at a constant speed, carrying with it the pawls 65 in a left handed direction, so that when the rate of speed of ratchet wheel 61 equals that of gear 62 said ratchet wheel will be locked with gear 62 through the pawls 65. When so locked the effect is to limit the speed of rotation of pinion 58 to that of gear 62, but inasmuch as gear 57 is caused to rotate at a comparatively high rate of speed the tendency is to rotate pinion 58 and ratchet wheel 61 at a high rate of speed also, such tendency, however, being checked by the gear 62 acting through pawls 65 which lock with the teeth of ratchet wheel 61, that is, the rate of speed of the ratchet wheel 61 can never be in excess of that of the gear 62. The ultimate effect is not only to cause a rotation of the shaft 59 but to swing said shaft and with it arm 60 in the arc of a circle. Such movement of arm 60 will cause shaft 55 to rotate, and arm 54 and its attached transmitting lever 52 to move forward in the same direction as that of the storage wheel. Although the arm 54 is thus moved intermittently at the time of the intermittent rotation of the storage wheel, the rate of movement of the latter is greater than that of the former, so that a certain number of pins of the symbol advanced by the storage wheel will pass, and the raised pins will contact with the end of lever 52 thereby actuating said lever to transmit that part of the symbol which thus passes the lever 52. During this forward movement of the storage wheel the pinion 66 will move gear 67 on its pivot 75 away from its position of rest against stop pin 77 thereby distending spring 68. At the instant the storage wheel comes to position of rest said spring acting through the sectional gear 67 and pinion 66, will rotate shaft 55 in a direction the reverse of that in which it was moved by the storage wheel, causing lever 52 to be moved in a direction toward its normal position in front of lever 49, and as said lever 52 is so moved it will contact successively with the remainder of the raised pins of the symbol set up in the storage wheel, thereby completing the transmission of the letter, the circuit being closed while the lever 52 is in contact with a raised pin or pins, and broken when passing over pins which are in their lower positions. When the lever 52 is thus caused to move in a return direction toward its normal position, the arm 60 which is fast to shaft 55 will also return to its normal position swinging with it the shaft 59. As gear 57 is now at rest the swinging of arm 60 in the return direction will cause pinion 58 to continue to rotate

in the same direction as when rotated positively by the gear 57. Shaft 59 will, therefore, continue to rotate as will also ratchet wheel 61. That is, during the return movement of arm 60, the pinion 58 and ratchet wheel 61 will be rotated at the same rate of speed as that of gear 62. It necessarily follows that the rate of movement of lever 52 toward its normal position is constant, and that the difference between the rate of movement of the storage wheel and said lever 52 when both are moved in a forward direction is also constant and equal to the rate of the return movement of lever 52, and that, therefore, the transmission of the symbols set up in the storage wheel will be at a constant and uniform rate of speed whether the pins are being carried past the lever 52 when the storage wheel is moved in a forward direction, or when the storage wheel is at rest and the lever 52 moving in its return direction.

If before lever 52 reaches its normal position the next letter to be transmitted is struck on the keyboard, then the return movement of lever 52 will be arrested during the time that the storage wheel advances the symbol of the last character struck, said lever being carried forward with the storage wheel in the manner before described. The transmission of the symbols however continues inasmuch as during such forward movement some pins of the symbols will be carried past lever 52, the latter resuming its return movement the instant the storage wheel comes to rest. The forward movement of lever 52 with the storage wheel when the latter is intermittently advanced, and the return movement of said lever when the storage wheel is at rest continues during the time that the keyboard is operated. At the usual rate of speed of operation it is possible by the present invention to store up symbols for transmission, such stored up symbols being those between lever 52 whatever its position in the arc in which it swings and its normal position in front of lever 40. The operator by making the interval of time between striking successive keys less than the time required for transmitting the symbol may keep the lever 52 swinging back and forth between its normal position and the cam shoe 74 which acts as a stop. In other words, the machine will automatically transmit all of the symbols set up in the storage-wheel at a constant and uniform rate of speed while the machine is being operated and will continue to transmit as long as any symbols are set up on the wheel, or until lever 52 is returned to its normal position. The pins after passing beyond lever 52 will remain raised until they are brought beneath the cam shoe 74 which is attached to the standard 20 when they will be depressed in the manner indicated in Fig. 5, the spring 37 then engaging the upper groove of the pins to retain them in their lower position, as indicated in Fig. 6.

In order that the operator may be warned of the near approach of lever 52 to the cam shoe 74, I may use a simple signal comprising a bell 84 adapted to be operated by a vertical extension of the pivot 53 which contacts with a horizontally projecting arm 85 extending over the storage wheel and placed a short distance in front of the cam shoe. Should the machine be operated so rapidly as to advance the lever 52 so that the extension of pivot 53 will contact with arm 85 a signal will be given.

In order that the mode of operation of the transmitting mechanism may be fully understood, I will state briefly the mode of operation of setting up of the pins and the transmission of the symbols of the letters represented by the pins on the storage wheel. In the normal positions of the several parts, lever 44 is held in its retracted position by a spring 46 against stop pin 45; pawl 38 is in engagement with the lower end of the pin in the position of 79, that is, the first pin in front of lever 40, or the first pin succeeding the last pin of the symbol last advanced by the storage wheel; the face of lever 40 projects slightly over the tops of the three pins directly in front of said face, that is, the pin in the position of 79 and the two next succeeding pins, said pins being in their lower positions: and the toe of bell crank lever 52 is directly in front of the face of lever 40 in advance of pin 78. When a bell crank lever 18 is rocked on its pivot by the displacement of its wire 14 through the movement of its corresponding selective bar 11, the forward end of said lever will be raised and caused to impinge against a pin in the storage wheel thereby raising said pin to its upper position. All of said levers of a given character are simultaneously operated in the same manner, so that the pins necessary for the transmission of a symbol are simultaneously set up in a group by the simple operation of depressing one of the key bars 2, the pins corresponding in arrangement with the telegraphic symbol of the character struck. Simultaneous with the movement of levers 18, the wire 47 controlling lever 44 is displaced, the effect of which is to project the escapement 48 between pin 79 and the pin immediately to the left thereof, pin 79 bearing against the escapement; and to push pawl 38 and lever 40 out of their normal positions. Although the pins necessary for the transmission of the character struck on the keyboard are now set up, the storage wheel will be held against rotation by the escapement 48 which will be maintained in front of pin 79 so long as the operator keeps the key bar depressed. When the key bar

is released the particular selective bar 11 is retracted by its spring 13, and levers 18 which have been actuated are retracted by the springs 18', and lever 44 is retracted by its spring 46. The storage wheel is thus freed and given a quick rotary movement by spring 34 carrying the pins of the symbol set-up, past the face of lever 40. As a long symbol space is represented by two pins down, there will always be at least one pin up of those passing in front of the face of lever 40 so that the latter will be held in its outward position during the interval that wheel 24 is rotating to thereby permit all of the pins of the symbol to pass beyond the face of lever 40. When pin in the position of pin 80, which is the last pin of the symbol, and which of course is up, passes face of lever 40 there will be nothing to hold said lever and it will be pressed forward carrying with it, through pin 42, pawl 38 which during the rotation of the storage wheel has been held outward by spring 39. When pawl 38 is so moved it will engage the pin in the position of pin 79 which is down, thereby stopping the movement of the storage wheel and bringing it to a position of rest. As before stated the pin in the position of 78 or the one immediately to the right of lever 40 when the storage wheel is at rest, is always the first pin of a symbol and no matter what may be the length of the symbol the storage wheel will be rotated sufficiently far to advance the entire symbol past the face of lever 40, the wheel being stopped the instant the last pin of the symbol passes the face of lever 40. For example if letter A is struck, the pin in the position of 78 will be raised for the dot, the next pin will remain down for the short space and the next two will be raised for the dash, the entire symbol covering a space of four pins, as shown in Fig. 9, so that when the storage wheel is rotated the pin in the position of 81 will be advanced to that of 80; that in the position of 82 will be advanced to that of 79; and that in the position of 83 will be advanced to that of 78. When the next character is struck the above operation will be repeated the advance movement of the storage wheel varying according to the length of the particular symbol, the wheel always starting from a position of rest. At the end of a word the spacing key 51 is struck so as to advance the wheel one pin, no pins being raised, thus adding one to the three pins down which represents a space between letters.

The impulses sent over the line may be received on an ordinary Morse sounder or recorder, or the invention may be used in connection with any well known type of printing telegraph by simply modifying the selective mechanism to adapt it to that particular code. While I have referred to the Morse code for the purpose of explaining the invention, it is to be understood that the invention is adapted for use with any other code. Also while I have described the storage wheel as having pins set up therein vertically, it is within the scope of my invention to adopt such modification as a wheel having the pins arranged horizontally therein and either moved outwardly or inwardly by the selective mechanism, the transmitting lever 52 and its actuating mechanism being modified to meet the requirements of such changes. Also I may use either a normally closed or open circuit. By having two contacts 72 and two springs 71, I may operate with an alternating current.

What I claim and desire to secure by Letters Patent is:—

1. In a telegraphic transmitter the combination with a series of key bars, of a series of selective bars provided with lugs corresponding in arrangement with telegraphic symbols of characters on the keyboard, a series of wires extending transversely of said selective bars in proximity to and adapted to be moved by said lugs when a key bar is manually operated, the arrangement being such that one lug represents a dot and two or more represent dashes, the wires moved being separated by idle wires to represent a space between the parts of a symbol.

2. In a telegraphic transmitter the combination with a series of key bars, of a series of selective bars provided with lugs corresponding in arrangement with the telegraphic symbols of characters on the keyboard, of a series of wires extending transversely of said selective bars in proximity to and adapted to be moved by said lugs, the arrangement being such that one lug will act upon a single wire for a dot and two lugs will act upon two contiguous wires for a short dash and upon four consecutive wires for a long dash, the wires displaced being separated by one idle wire for a short space and two idle wires for a long space.

3. In a telegraphic transmitter the combination with a keyboard selective mechanism, of a transmitting mechanism comprising a rotatable wheel having thereon a series of adjustably supported pins, means actuated by said selective mechanism for setting up successive groups of pins, the pins of each group being arranged to correspond with the telegraphic symbols of successive characters struck on the keyboard, a continuously rotating motor, and means for connecting said wheel with said motor so as to transmit the first symbol at substantially the same speed as subsequent symbols are transmitted.

4. In a telegraphic transmitter the combi-

nation with a transmitting mechanism comprising a rotatable wheel having thereon adjustably supported pins, means for setting up said pins in successive groups, the pins of each group being arranged to correspond with a telegraphic symbol, a continuously rotating motor, means for connecting said wheel with said motor so as to transmit the symbols without interruption and all of the symbols at substantially the same uniform speed, and means to permit the setting up of symbols while those previously set up are being transmitted.

5. In a telegraphic transmitter the combination of a wheel having adjustably supported pins, means for setting up said pins in groups to correspond with telegraphic symbols, means for advancing said wheel after each symbol is set up a predetermined distance for letter spacing, and means for advancing said wheel a predetermined additional distance for word spacing.

6. In a telegraphic transmitter the combination of a wheel having adjustably supported pins, means for setting up said pins in groups the pins of each group being arranged to correspond with a telegraphic symbol, means for advancing said wheel for a letter space after each group is set up, and means for advancing said wheel for a word space an additional distance without moving any of the pins.

7. In a telegraphic transmitter the combination with mechanism comprising adjustably supported pins, means for setting up said pins in groups the pins of each group being arranged to correspond with a telegraphic symbol, means to advance said mechanism after each symbol is set up, locking mechanism, and means to actuate said locking mechanism to engage the first pin immediately succeeding the last pin of each symbol.

8. In a telegraphic transmitter the combination of transmitting mechanism comprising adjustably supported pins, means to set up said pins in a prearranged order to make and break the circuit, a motor continuously rotating at a fixed speed, means to permit the intermittent movement of the transmitting mechanism by said motor, and means connecting said transmitting mechanism with the motor to effect the transmission of the first symbol at the instant the transmitting mechanism is released and at a speed proportional to the speed of the motor.

9. In a telegraphic transmitter the combination of mechanism for storing up telegraphic symbols, mechanism for transmitting said symbols, a motor for operating the storing up mechanism at a speed in excess of the speed of transmission, and means for limiting the speed of the transmitting mechanism directly to that of the motor.

10. In a telegraphic transmitter the combination with a wheel having pins adjustably supported thereon, a motor continuously rotating at a fixed speed, means to permit the intermittent rotation of said wheel by said motor, means for setting up said pins in groups when the wheel is at rest, and means connecting said wheel with the motor to effect the transmission of the first symbol at a speed proportional to the speed of the motor at the instant the wheel is released.

11. In a telegraphic transmitter the combination of a train of gears, means for continuously rotating said gears, mechanism for storing up telegraphic symbols, means to intermittently move said storing up mechanism, means to transmit the symbols, and means to limit the speed of the transmitting mechanism to that of said train of gears.

12. In a telegraphic transmitter the combination with a motor, of a train of gears continuously rotated thereby, a transmitting mechanism comprising a wheel, means to permit the intermittent rotation of said wheel by said motor, a gear connected to said wheel, a pinion meshing with said gear, and means to limit the speed of rotation of said pinion to that of the last gear of said train.

13. In a telegraphic transmitter the combination with a motor continuously rotating at a fixed speed, of a train of gears continuously rotated thereby, a transmitting mechanism comprising adjustably supported pins, means for setting up said pins in groups, means to effect the advance of said mechanism after the setting up of each symbol, a lever adapted to be actuated by said pins to open and close the circuit, and means connecting said motor and transmitting mechanism to effect the transmission of the first symbol at a given speed proportional to the speed of the motor at the instant said mechanism is released.

14. In a telegraphic transmitter the combination with a wheel having pins adjustably supported thereon, means for setting up said pins in groups corresponding in arrangement with telegraphic symbols, a lever adapted to be actuated by said pins to open and close the circuit, a motor, means to permit the intermittent rotation of said wheel by said motor, and gear connections between said wheel and lever whereby said lever is caused to move at a rate of speed less than that of the wheel.

15. In a telegraphic transmitter the combination with a wheel having means thereon for opening and closing the circuit, a motor, a train of gears continuously rotated by said motor, a shaft on which the last gear of said train is loosely mounted, a pinion fast on said shaft, a gear connected to said wheel and adapted to rotate said pinion in one direction, a ratchet wheel fast on said shaft,

pawls secured to the last gear of said train and adapted to engage said ratchet wheel whereby the speed of rotation of said pinion is limited to that of the last gear of said train.

16. In a telegraphic transmitter the combination with a wheel having pins adjustably supported thereon, means for setting up said pins in groups the pins of each group being arranged to correspond with a telegraphic symbol, locking mechanism adapted to engage said wheel, means to release said locking mechanism and to rotate said wheel after each symbol is set up, and means to prevent the locking mechanism from returning to its normal position until the wheel has been rotated sufficiently far to advance the entire symbol and an additional distance to transmit a letter space.

17. In a telegraphic transmitter the combination with a storage wheel, of a shaft loosely supported in a bearing thereon, an arm secured to said shaft, a transmitting lever carried by said arm, means to intermittently rotate said wheel, means actuated by said wheel when rotated to swing said arm in the arc of a circle, and means to swing said arm in a reverse direction when the wheel is at rest, both movements of said arm rotating said shaft but in opposite directions.

18. In a telegraphic transmitter the combination with a storage wheel, of a shaft having a loose bearing on said wheel, a transmitting lever carried by said shaft, an arm secured at one end to said shaft and at the other loosely engaging a second shaft, gear connections including a pinion between said wheel and said second shaft, a motor, a train of continuously rotating gears between said motor and said second shaft, and means for limiting the speed of rotation of said pinion to that of the last gear of said train.

19. In a telegraphic transmitter the combination with a motor, of a train of gears continuously rotated thereby, a storage wheel and connections between said wheel and motor tending to rotate the former, a shaft having a loose bearing on said wheel, a transmitting lever carried by said shaft, an arm secured at one end to said shaft and at the other loosely engaging a second shaft, gear connections including a pinion between said wheel and said second shaft, the last gear of said train having a loose bearing on said second shaft.

20. In a telegraphic transmitter the combination with storing and transmitting mechanism, of a motor, a gear meshing with a pinion on the motor shaft, a pinion having a loose bearing on the shaft of said gear and meshing with a gear of the storing and transmitting mechanism, and a spring connected to said shaft and to said second-named pinion for the purpose described.

21. In an apparatus of the character described the combination with mechanism comprising adjustably supported pins, means to intermittently advance said mechanism, a motor, a train of gears continuously driven by said motor, a transmitting lever, means to move said lever both when said mechanism is at rest and when it is in motion, and means to limit the speed of said lever directly to that of the last gear of said train.

22. In an apparatus of the character described the combination with mechanism comprising adjustably supported pins, means to intermittently advance said mechanism, a motor, a train of gears continuously driven by said motor the last gear of said train being loose on its shaft, a transmitting lever, means to move said lever both when said mechanism is at rest and when it is in motion said means comprising a pinion fast on said shaft, a ratchet wheel also fast on said shaft, and pawls pivoted on the side of the last gear of said train, whereby the speed of rotation of said pinion is limited to that of said gear.

23. In a telegraphic transmitter the combination with transmitting mechanism comprising a wheel having pins adjustably supported thereon, of means for intermittently rotating said wheel, a lever adapted to contact with said pins when the latter are adjusted, a shaft having a loose bearing in said wheel and on which said lever is carried, means for positively rotating said shaft in one direction by said wheel, a pivoted sectional gear connected to said shaft, a spring connected to said sectional gear and adapted to be distended when said wheel is moved and when said wheel is at rest to rotate said shaft in a reverse direction.

24. In a telegraphic transmitter comprising transmitting mechanism having circumferentially grooved pins, means to adjust said pins in position, and a spring to hold said pins both in their normal and in their adjusted positions.

25. A telegraphic transmitter comprising transmitting mechanism having a plurality of adjustably supported pins, means for adjusting said pins, and a spring engaging all of said pins and adapted to hold them in their normal and adjusted positions.

26. In a telegraphic transmitter the combination of mechanism for storing up telegraphic symbols, mechanism for transmitting said symbols, a motor continuously rotating at a fixed speed to which said transmitting mechanism is directly geared to obtain a constant and uniform rate of speed therein, and means to actuate said setting up and storing mechanism at a rate of speed in

excess of the rate of movement of the transmitting mechanism and independent of the speed of the motor.

27. In a telegraph transmitter, a movable carrier, means for driving the same, adjustable stops carried thereby, and bell cranks provided with means for adjusting said stops, of a keyboard, selecting mechanism operated thereby, mechanically connected with, and adapted to operate said bell cranks, and contact mechanism controlled said stops.

In testimony whereof I have here signed my name in the presence of two scribing witnesses.

EDWARD E. KLEINSCHMIU

Witnesses:
E. F. PORTER,
GRACE L. HEASLEY.