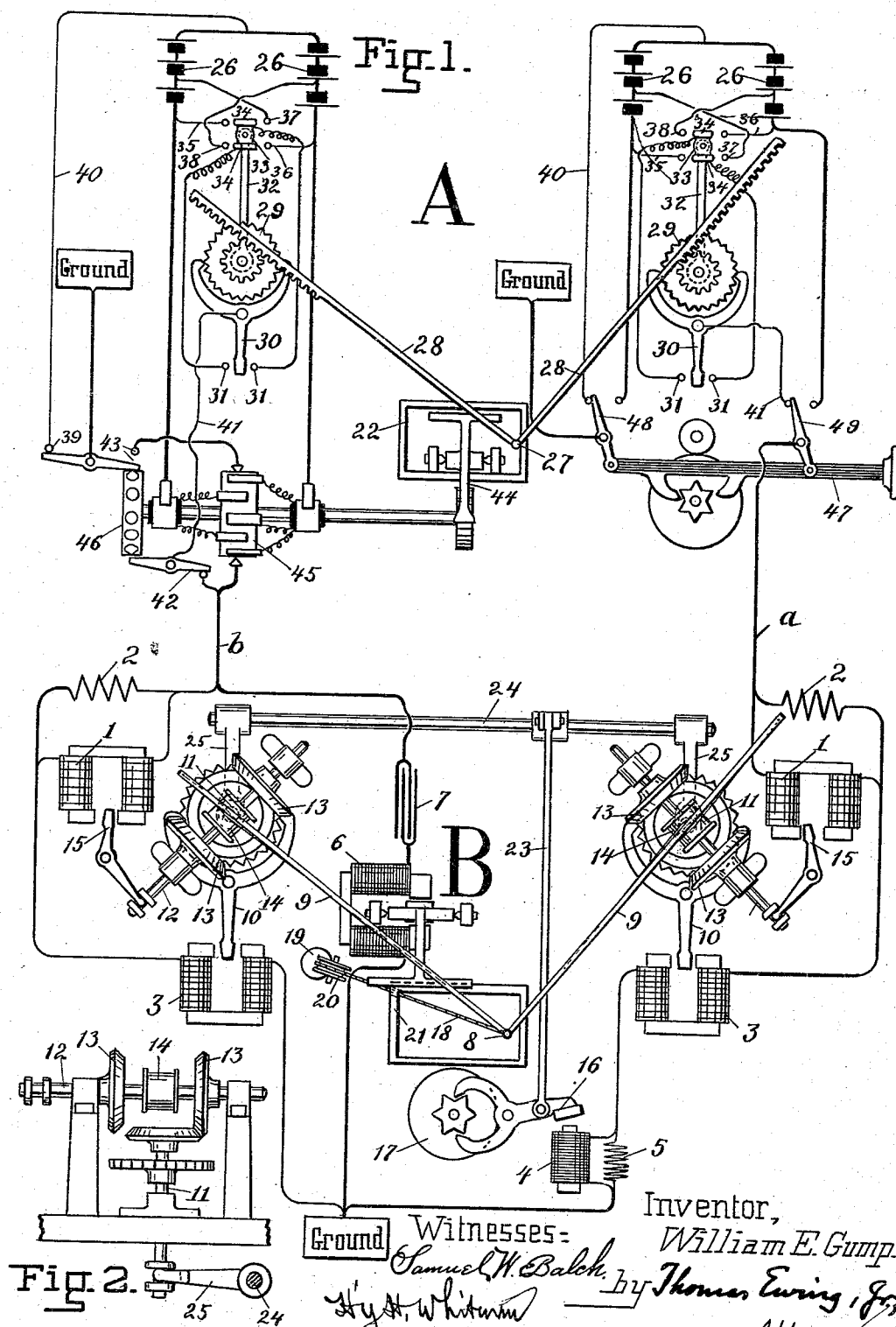


(No Model

W. E. GUMP.
WRITING TELEGRAPH.

No. 543,241.

Patented July 23, 1895.



UNITED STATES PATENT OFFICE.

WILLIAM E. GUMP, OF BROOKLYN, NEW YORK.

WRITING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 543,241, dated July 23, 1895.

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To all whom it may concern:

Be it known that I, WILLIAM EAKER GUMP, a citizen of the United States of America, residing at Brooklyn, county of Kings, State of New York, have invented certain new and useful Improvements in Writing-Telegraphs, of which the following is a specification.

My invention consists in a combination forming part of a writing-telegraph transmitter and comprising a pen and an alternating pulsator, together with a suitable source of energy and means for connecting up the pulsator to line so as to send strong pulsations of one polarity and weak pulsations of the other polarity when the pen is moved in one direction, and means for reversing the polarities of the two sets of currents on reversal of direction of movement of the pen; and it further consists in the combination of a pair of such half-transmitters with suitable receiving mechanism—such, for instance, as a receiving-pen, polarized pen-moving devices, and polarized devices for controlling the direction of movement of the pen; and it further consists in a novel unison device for bringing the transmitter and receiver pens into unison of position each time that the paper is shifted; and it further consists in a new location of the pen lifting and lowering magnet in the system of wiring the circuits; and it further consists in certain other combinations hereinafter more fully described and claimed.

Referring now to the accompanying drawings, which form a part of this specification, Figure 1 is a diagrammatic representation of the system; and Fig. 2 is a vertical view of the gearing by which one of the bars of the receiving-pen is actuated, together with a portion of the unison device.

In its general operation my invention is one already familiar in writing-telegraphs, the transmitter-pen being moved to trace the characters of the message and being connected with mechanism whereby pulsations are sent over two lines, the number of pulsations sent over each line being proportionate to the distance through which the transmitter-pen is moved relative to one of two co-ordinates making an angle, preferably about a right angle, with each other. The transmitter must also be provided with means for reversing the direction of movement of the re-

ceiver-pen with the reversal of movement of the transmitter-pen, and with means for lifting, lowering, and positioning the receiver-pen to keep it in unison of position with the transmitter-pen, and means for shifting the receiving-paper. The receiver must be provided with a pen and paper and suitable mechanism for effecting the various operations necessary in recording the message in unison with similar movements of the transmitter pen and paper.

Referring now to Fig. 1, it will be seen that it shows the transmitter of one station, which is herein called "station A," and the receiver of another station, which is herein called "station B," connected by two wires *a* and *b*. As the two stations are connected by two wires only the system is a two-wire system.

For simplicity I omit to indicate the receiver of the station A and the transmitter of station B and the manner in which they are connected to the lines *a* and *b*.

I shall first describe the receiver. This description may be very brief, since the only novelty that I claim is in the peculiar location of the pen lifting and lowering magnet in the circuit and in the unison device.

Construction of the Receiver.

The line *a* runs through one side of the receiver and the line *b* through the other side, the two ending in a common ground point for convenience. In each side of the receiver is a polarized magnet 1 for controlling the direction of movement of the pen. Around each of these magnets there is a shunt 2. In each side of the receiver, in the lines *a* and *b* in series with the direction-controlling magnet, is a polarized magnet 3 for controlling the extent of movement of the pen. In the line *a* is also a third magnet 4, not polarized, which operates the paper-shifter, provided with a suitable shunt 5 to prevent its being operated by the currents which operate magnets 1 and 3 in the same line.

The pen lifting and lowering magnet 6 is a polarized magnet placed in a loop, which includes, also, a condenser 7 in series with magnet 6, the loop being connected up with the line *b* as a shunt around the two magnets 1 and 3 of this line *b*. The currents which are sent over the line *b* to operate magnets 1 and

3 do not send sufficiently strong impulses through this loop to operate magnet 6, as can be easily arranged by any one skilled in the art.

5 The tracing-pen or stylus 8 is connected up with two rods 9, which make at their common point a junction with the pen approximately at right angles with each other. The movements of these two rods forward and back are controlled by two identical mechanisms, each of which with its rod may be termed a "half-receiver."

In each mechanism the polarized pen-moving magnet 3 vibrates an anchor-escapement 10 and through a ratchet and miter wheel on a vertical shaft 11 rotates a shaft 12, on which two miter-wheels 13 13 and a drum 14 are rigidly mounted. Each of the rods 9 rests upon the drum 14, and each rod has attached to it near its ends the ends of a cord, which cord is given one or more turns around the drum upon which the rod rests, thereby securing movement of the rod forward or back with rotation of the drum. The extent of movement of the rod is determined by the number of oscillations of the armature 10 of the magnet 3, and the direction of movement of the rod is determined by which of the two miter-wheels 13 13 is in engagement with the miter-wheel on the vertical shaft 11, which in turn depends upon the position of the armature 15 of the polarized direction-controller magnet 1.

35 The rods 9 are connected with the drums 14 whether the pen is lifted or lowered, and therefore the pen can be moved whether on or off of the paper.

The paper-shifter magnet 4 has an armature 16, which forms an anchor-escapement and controls the paper-shifting device 17. This device is preferably driven by a weight when released by the escapement.

The pen 8 has attached to it a cord 18, to which a small weight 19 is attached, the cord being run over a pulley 20. This weight tends to draw the receiver-pen into one corner of the platen-frame 21, which lies just above the paper. This is intended to operate as a stop-guide to bring the receiver-pen into unison of position with the transmitter-pen. To effect this unison of position of the two pens it will be necessary, when the paper is to be shifted, that the transmitter-pen be carried to the corresponding corner of the transmitter platen-frame 22. If, when this is done, there is any difference in the relative positions of the transmitter and receiver pens, the receiver-pen will either reach the corner before the transmitter-pen reaches its corresponding corner, and will be held thereby until the transmitter-pen reaches its corner or it will lag behind the transmitter-pen, and must be released from its operating mechanism, so that the weight 19 may draw it into its corner. This latter operation is effected by the paper-shifting magnet 4 whenever the paper is shifted. When the paper is to be

shifted, the transmitter-pen is brought to its corner and a current is then sent over the line *a*, which will operate the paper-shifting magnet 4. The armature 16 of this magnet has attached to it a rod 23, which is pivoted at its other end to an arm projecting at right angles from the shaft 24. Upon this shaft are fastened two arms 25, which support the ends of the vertical shafts 11.

When the magnet 4 is magnetized and attracts its armature it operates the paper-shifter 17 and lowers the miter-wheels on the shafts 11 out of gear with the miter-wheels 13. This releases the shafts 12 and permits the weight 19 to draw the pen 8 into its corner.

The current which operates the magnet 4 will also magnetize the magnets 3 and 1. The magnetization of the magnet 3 will effect nothing, because the miter-wheel on the vertical shaft 11 will not be in engagement with either of the miter wheels 13. The magnetization of the magnet 1 may reverse the position of the armature 15 of the direction-controlling magnet, but this is immaterial, since as soon as the transmitter begins to operate the direction-controlling magnet will be properly magnetized, as will be hereinafter seen.

Of course, any suitable power may be substituted for the cord and weight 19 for drawing the receiver-pen into its corner, and I do not limit myself to the use of a weight.

Construction of the Transmitter.

Each half of the transmitter must contain an alternating pulsator driven by the transmitter-pen, and when so moved sending currents over one of the lines, which shall properly operate the direction-controlling and pen-moving magnets in the same line at the receiver; and in addition to this provision for causing the receiver-pen to follow the horizontal movements of the transmitter-pen there must also be provided suitable means for sending currents that shall operate the pen lifting and lowering device at the receiver-station whenever the transmitter-pen is lifted and lowered, and suitable means for sending a current that shall shift the paper at the receiver-station whenever the paper-shifter at the transmitter-station is operated. As before indicated, the currents which operate to lift and lower the receiver-pen are sent over line *b*, and the currents which operate to shift the paper and at the same time to bring the two pens to unison are sent over the line *a*.

Each of the two halves of the transmitter consists broadly in a battery of cells 26 connected in series and having intermediate ground connection, a transmitter-switch thrown by the reversal of movement of the transmitter-pen 27, in the direction of its pen-rod 28, for sending currents which shall control the direction of movement of the corresponding receiver pen-rod, a pulsator which determines the extent of movement of the receiver pen-rod, and a commutator, which, when operated, breaks the branches through

the pulsator and switches, and connects the battery to line, as hereinafter described. One of the commutators is mechanically attached to the paper-shifter and the other to the pen lifting and lowering device. The only difference between the two parts of the transmitter is in the commutators, which will be described later. The two pen-rods 28 are connected to the transmitter-pen at their point of juncture the same as the pen-rods of the receiver-pen, and, although rack-and-pinion mechanism is shown for connecting them with their actuating mechanism, it is obvious that a cord and drum mechanism, such as is shown in the receiver, may be used instead.

For convenience of statement the description will now be confined to one-half of the transmitter, although applicable to each. The pen-rod through its rack and pinion, revolves a toothed wheel 29. This wheel as it revolves vibrates between two contact-points 31, and thus alternately and in rapid succession connects two different circuits to line. This mechanism will be called an "alternating pulsator." The escapement 30 is connected through a switch to line, and the points 31 are connected through switches to battery. Frictionally attached to each of the shafts that carry the wheels 29 is a swinging arm 32. This arm, when the shaft to which it is attached revolves in either direction, is thereby carried around until stopped by engagement with one of the pairs of contact-points which lie on either side of its end. This swinging arm has pivoted on its end a contact-bearer 33 of insulating material. There are two metallic contact members 34 carried by this contact-bearer, one on either end. The pivot by which the contact-bearer is attached to the arm 32 lies intermediately with respect to these contact members. One of the contact members is connected by a wire with one of the contact-points of the alternating pulsator and the other of these contact members is connected by another wire with the other contact-point.

The contact-points on the carrier are spoken of as "contact members" merely to distinguish them, for convenience of description, from the contact-points with which they co-operate. These members and the contact-points with which they co-operate constitute together what I have herein called "pairs of contacts." When the arm 32 is swung in one direction by the movement of the pen-rod, one of these pairs of contacts will be closed, and when the direction of movement of the rod, and, therefore, of the arm, is reversed this pair of contacts will be opened and the other pair of contacts will be closed. Of the four points which make up these two pairs of contact-points, point 35 is connected with one end of the battery, point 36 with the other end of the battery, point 37 is connected to the side of the battery to which point 35 is connected, but so as to cut off one or more cells, and point 38 is connected with the side of the

battery to which point 36 is connected, but also so as to cut off one or more cells. The points 35 and 38 form a pair of contact-points which lie on one side of the contact-bearer 33, and the points 36 and 37 form the other pair of contact-points which lie on the other side of the contact-bearer.

When the contact members of the contact-bearer are in contact with points 35 and 38 the circuit to the line in the left-hand halves of the transmitter and receiver is as follows: from the ground through contact 39 and wire 40, through half the battery to point 35, through one of the contact members on the contact-bearer and its connecting-wire to one of the contact-points 31 of the alternating pulsator, and thence, when this point is in contact with the escapement 30, by wire 41 through the contact 42 to line *b* to the receiver, thence through magnet 1 and its shunt 2 and through magnet 3 to the ground at the receiver. When the anchor-escapement of the alternating pulsator is in contact with the point on the other side, the circuit is, as before, from the ground through the contact 39 and wire 40, but next through a part of the other half of the battery to the contact-point 38, through one of the members on the contact-bearer and wire attached thereto to the other contact-point of the alternating pulsator, thence from the escapement 30 the circuit is, as before, by wire 41 to line *b* and ground at the receiver.

It will be seen that when the contacts 35 38 are closed a strong pulsation of one polarity and a weak pulsation of the opposite polarity are sent to line with each vibration of the anchor 30 between the points 31 of the alternating pulsator. When, however, the contact-bearer is carried to the other side, so as to bring its contact members into contact with points 36 and 37, the polarities of the strong and weak pulsations are reversed.

The contact-bearer 33 is mounted on a pivot in the manner shown to secure uniform pressure against the two contact-points of each pair. No matter at which point of the pair contact is made first, contact is immediately thereafter established at the other point and the pressure on the two equalized.

The currents which are sent from the ends of the battery through the points 35 and 36 are strong enough to operate the direction-controlling magnets of the receiver-pen and the currents which are sent from the battery through points 37 and 38 are not strong enough, but are strong enough to operate the pen-moving magnet. The direction in which the receiver-pen rod will be moved will therefore be determined by the pair of contact-points with which the contact members of the contact-bearer 34 engage. The extent of movement of the pen-rod is determined by the number of oscillations of the alternating pulsator.

It is not necessary that the points 37 and 38 should be connected with fewer battery-

cells than are the points 35 and 36, for instead they may be connected through resistance-coils with the ends of the battery and the strength of the currents taken from these points thus diminished.

As there is no novelty in the pen lifting and lowering and the paper-shifting devices of the transmitter which remain to be noticed, they will now be described briefly. The lifting or lowering of the receiver-pen is effected by breaking both the normal ground through wire 40 and the normal connection of the alternating pulsator with line *b* at the contacts 39 and 42, respectively, and connecting one end of the battery through a pole-changer and contact 43 with the ground, while the other end of the battery is connected through the pole-changer to the line *b*. The changes in the circuit above stated are effected whenever the transmitter-pen is either lifted or lowered. The vertical movement of one of the rods attached to this pen oscillates an anchor-escapement 44, which, when the pen is lifted, rotates the pole-changer 45 far enough to pass one pair of contact-strips thereon under its brushes. There is an even number of contact-strips on the pole-changer and they are grouped into two sets by electrically joining alternate strips and connecting one set so formed with one pole of the battery and the other set with the other pole. When a movement of the pole-changer has been completely made the normal condition of the circuit is re-established, so that the receiver-pen movements are again controlled by the movements of the transmitter-pen, whether the action of the pole-changer left the receiver-pen off or on the paper. During the movement of the pole-changer the contacts 39 and 42 are open and the contact 43 is closed. The switches controlling these contacts are operated by a disk 46, which is on the same shaft and revolves with the pole-changer. The circuit to the line is then from the ground through the contact 43, through one brush of the pole-changer, through the whole of battery 26 in series, through the other brush of the pole-changer, out to line *b*, and thence to ground at the receiver, as before. This sends a current of double the normal electromotive force and sets up a difference of potential at the receiver between the ends of the loop, which includes the magnet 6 and condenser 7 sufficient to operate the magnet 6 and lift the pen. When the transmitter-pen is lowered the pole-changer is again rotated one space in the same direction. The battery is reversed so as to send a current of opposite polarity but of the same strength as is sent during the other operation of the pole-changer. This current operates the polarized magnet 6 and lowers the receiver-pen.

When the paper is to be shifted, the paper-shifting rod 47 is pushed in, thereby operating the paper-shifter at the transmitter mechanically, as shown. At the same time the

normal intermediate ground connection of the battery is broken and one end of the battery is grounded through the switch 48. The other end of the battery is connected directly to the line *a* through the operation of the switch 49, which at the same time breaks the connection of the alternating pulsator with the line. The current thus sent to line *a* is of double the electromotive force of the direction-controlling pulsations, and as the resistance of the circuit is not increased beyond the extra resistance of the cells thrown in series, the current is sufficiently increased in strength to operate the magnet 4 at the receiver-station, and thereby shift the paper and release the receiver-pen, as before described.

Without limiting myself to the precise details and mechanism shown, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a writing telegraph transmitter, a pen, an alternating pulsator, a suitable source of energy, means for connecting up the pulsator to line so as to send strong pulsations of one polarity and weak pulsations of the other polarity, and means for reversing the polarities of the two sets of currents on reversal of direction of movement of the pen, substantially as described.

2. In a writing telegraph system, suitable receiving mechanism, in combination with a transmitter comprising a pen, two lines, two alternating pulsators, one arranged to be connected up to one and the other to the other of the two lines, suitable sources of energy, means for connecting up each pulsator to its line in such manner as to send strong pulsations of one polarity and weak pulsations of the other polarity, and means for reversing the polarities in these sets of currents with reversal of direction of movement of the pen, substantially as described.

3. In a writing telegraph system, suitable receiving mechanism consisting of a receiving pen, polarized pen moving devices, and polarized direction controlling devices, in combination with two lines, and a transmitter comprising a pen, two alternating pulsators, one arranged to be connected up with one and the other with the other of the lines, suitable sources of energy, means for connecting up each pulsator to its line in such manner as to send strong pulsations of one polarity and weak pulsations of the other polarity, and means for reversing the polarities in these sets of currents with reversal of direction of movement of the transmitter pen, substantially as described.

4. In a writing telegraph transmitter, a pen, an alternating pulsator driven thereby, suitable sources of energy, two pairs of contacts connected to opposite sides of the pulsator, and each connected to a strong and weak source of energy, one member of each pair of contacts being carried on a carrier pivoted intermediately with respect to said members,

means operated by the pen for closing one or the other of these pairs of contacts, and thus connecting the pulsator up to a strong positive and weak negative source of energy or to a weak positive and strong negative source of energy, according as the pen is moved in one direction or the other, substantially as described.

5. The combination of a transmitter pen, a shaft revolved thereby, an arm frictionally attached to the shaft and carried thereby in one direction or the other according to the direction of movement of the pen, a contact bearer pivoted to the arm intermediately with respect to the contact members on the bearer, two pairs of contacts of which these contact members are a part, the contact members and the other contact points which co-operate therewith to form the pairs of contacts being so located with respect to each other that one pair of contacts or the other is closed according as the pen is moved in one direction or the other, a suitable source of energy, and connections through the pairs of contacts whereby strong positive and weak negative or weak positive and strong negative currents are sent to line, according as one or the other of the pairs of contacts is closed, substantially as described.

6. The combination of a shaft, means for revolving it, a friction arm, a contact bearer pivoted thereto intermediately with respect to its contact members, and one or more pairs of contacts closed by movement of the friction arm and contact bearer, substantially as described.

7. In a writing telegraph transmitter, the combination of a transmitter pen, a shaft revolved thereby, a friction arm attached to the shaft and carried thereby in one direction or the other, according to the direction of movement of the pen, a contact bearer pivoted to the arm intermediately with respect to its contact members, and one or more pairs of contacts closed upon movement of the pen and corresponding movement of the friction arm and contact bearer in one direction or the other, substantially as described.

8. In a two wire writing telegraph system, at the receiver, the combination of a pen moving and direction controlling device in each line, a pen lifting and lowering magnetic device in a loop connected to one of the lines as a shunt around the pen moving and direction controlling magnets of that line, and a paper shifting magnetic device in the other line, substantially as described.

9. In a writing telegraph receiver, a unison device for bringing the receiver pen to a fixed point when the paper is shifted, which con-

sists in the combination of the receiver pen, a cord and weight attached thereto, a stop guide, and means for releasing the pen from the driving escapement, substantially as described.

10. In a writing telegraph receiver, a unison device for bringing the receiver pen to a fixed point when the paper is shifted, which consists in the combination of a receiver pen, a cord and weight attached thereto, a stop guide, a paper shifting magnetic device, means operated by the paper shifting magnet for releasing the receiver pen from the driving mechanism, substantially as described.

11. In a writing telegraph receiver, the combination of a pair of miter wheels, a pen-driving drum, a shaft on which the pair of wheels and the drum are all rigidly mounted, the drum being mounted between the wheels, a third miter wheel, which is power-driven and is mounted to engage with one or the other of the wheels of the said pair of miter wheels, means for throwing the said power-driven miter wheel out of engagement with one of the pair of wheels and into engagement with the other of the pair, and means for throwing the power-driven miter wheel out of engagement with both wheels of the pair, when the paper is shifted, substantially as described.

12. In a writing telegraph receiver, the combination of two sets of miter wheels of three wheels each, one of the wheels of each set being power-driven and engaging with the other two, a pen driven by the two sets of miter wheels, the power-driven wheel of each set being movable into and out of engagement with the other wheels of the set, and means for throwing both of the power-driven wheels out of engagement with the other wheels at the same time, substantially as described.

13. In a writing telegraph receiver, the combination of two sets of miter wheels of three wheels each, one of the wheels of each set being power-driven and engaging with the other two, a pen driven by the two sets of miter wheels, the power-driven wheel of each set being movable into and out of engagement with the other wheels of the set, a paper shifting magnet, and means operated by this magnet for throwing both of these power-driven wheels out of engagement with the other wheels at the same time, substantially as described.

WILLIAM E. GUMP.

In presence of—

THOMAS EWING, Jr.,
SAMUEL W. BALCH.