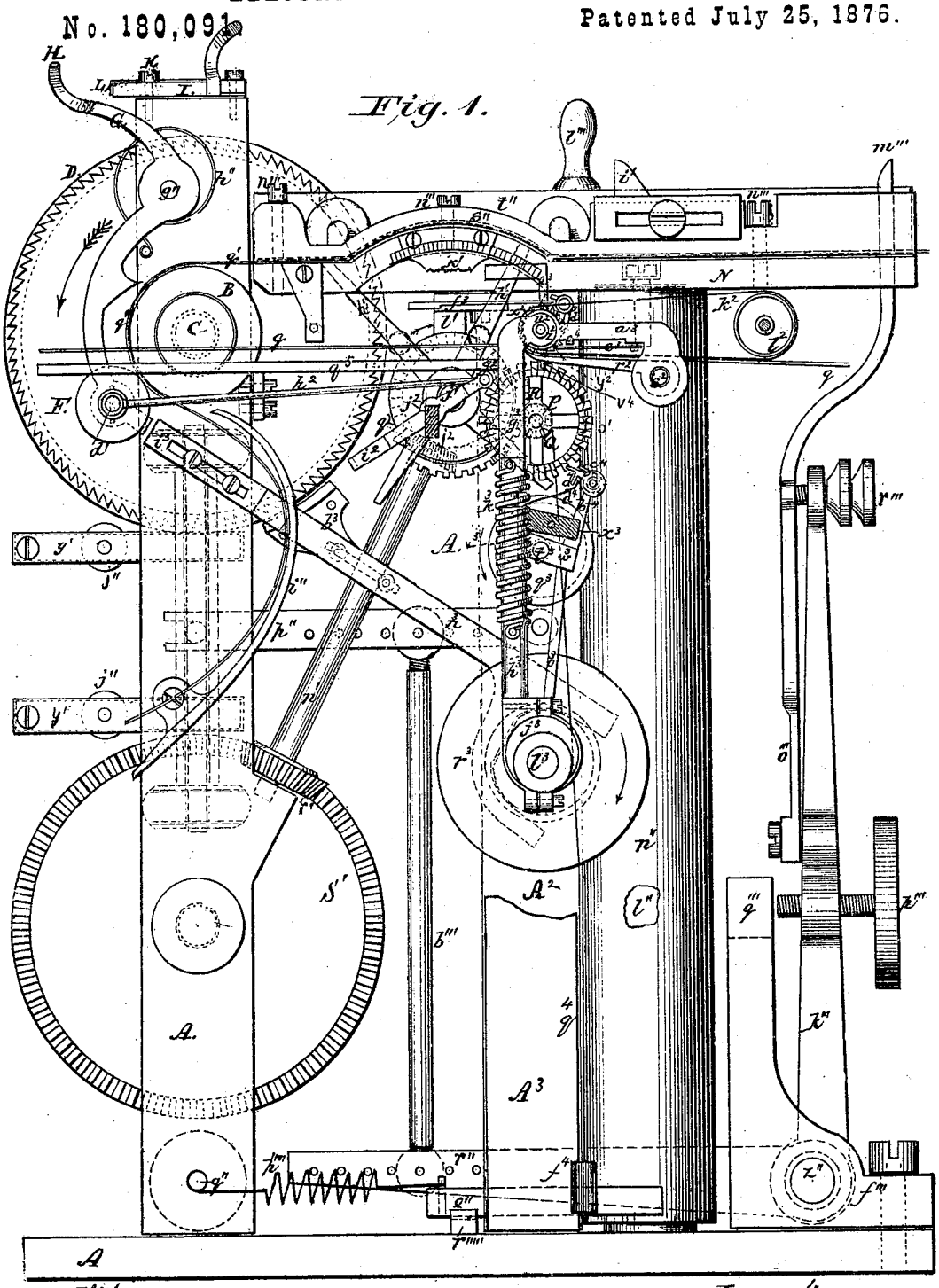
3 Sheets—Sheet 1

R. E. HOUSE.

ELECTRIC TELEGRAPH APPARATUS.

No. 180,091. Patented July 25, 1876.

Fig. 1.



Witnesses:

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J. McKenny.

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3 Sheets—Sheet 2.

R. E. HOUSE.

ELECTRIC TELEGRAPH APPARATUS.

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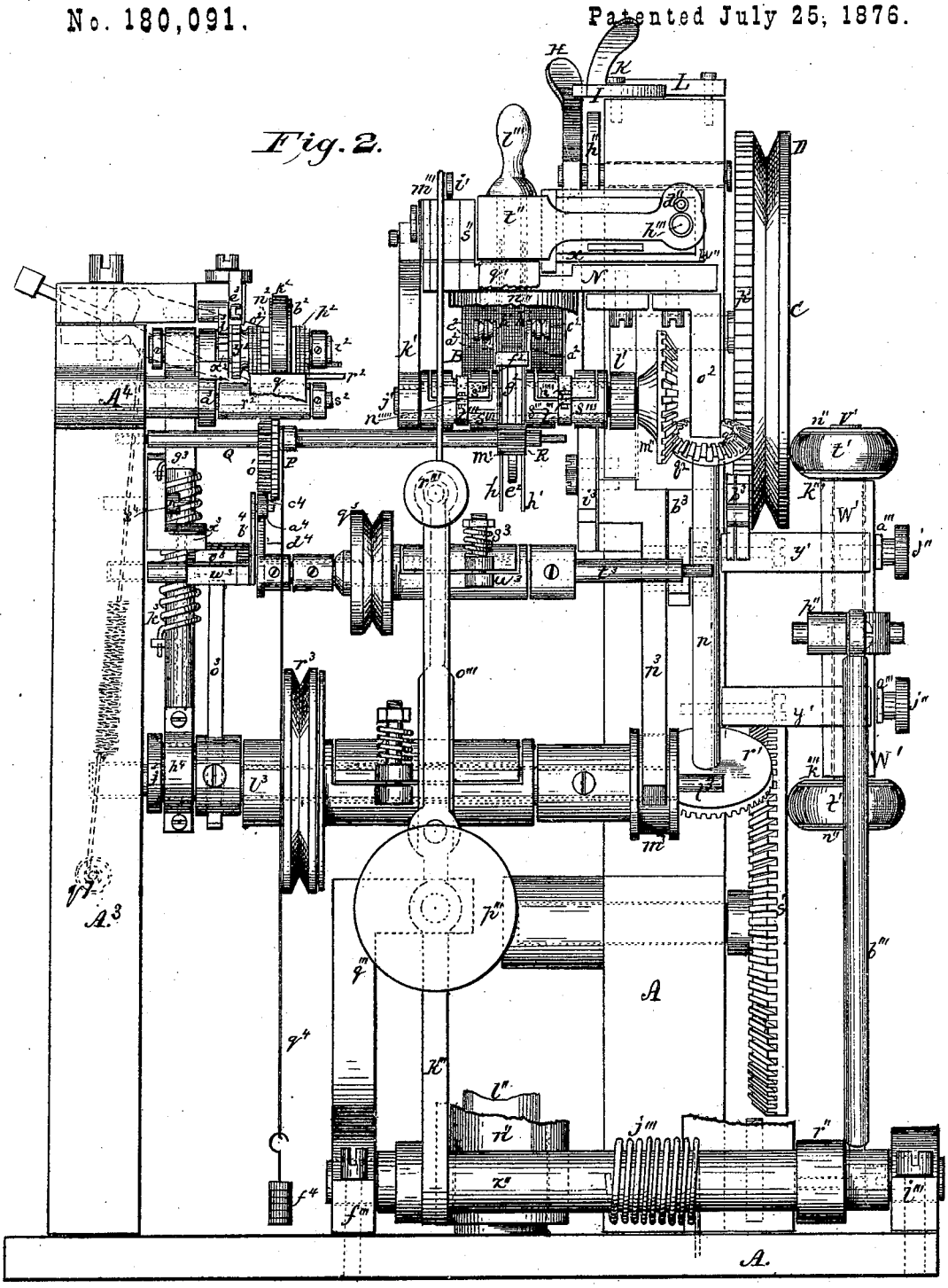
Fig. 2.



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3 Sheets—Sheet 3.

R. E. HOUSE.

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Fig. 3.

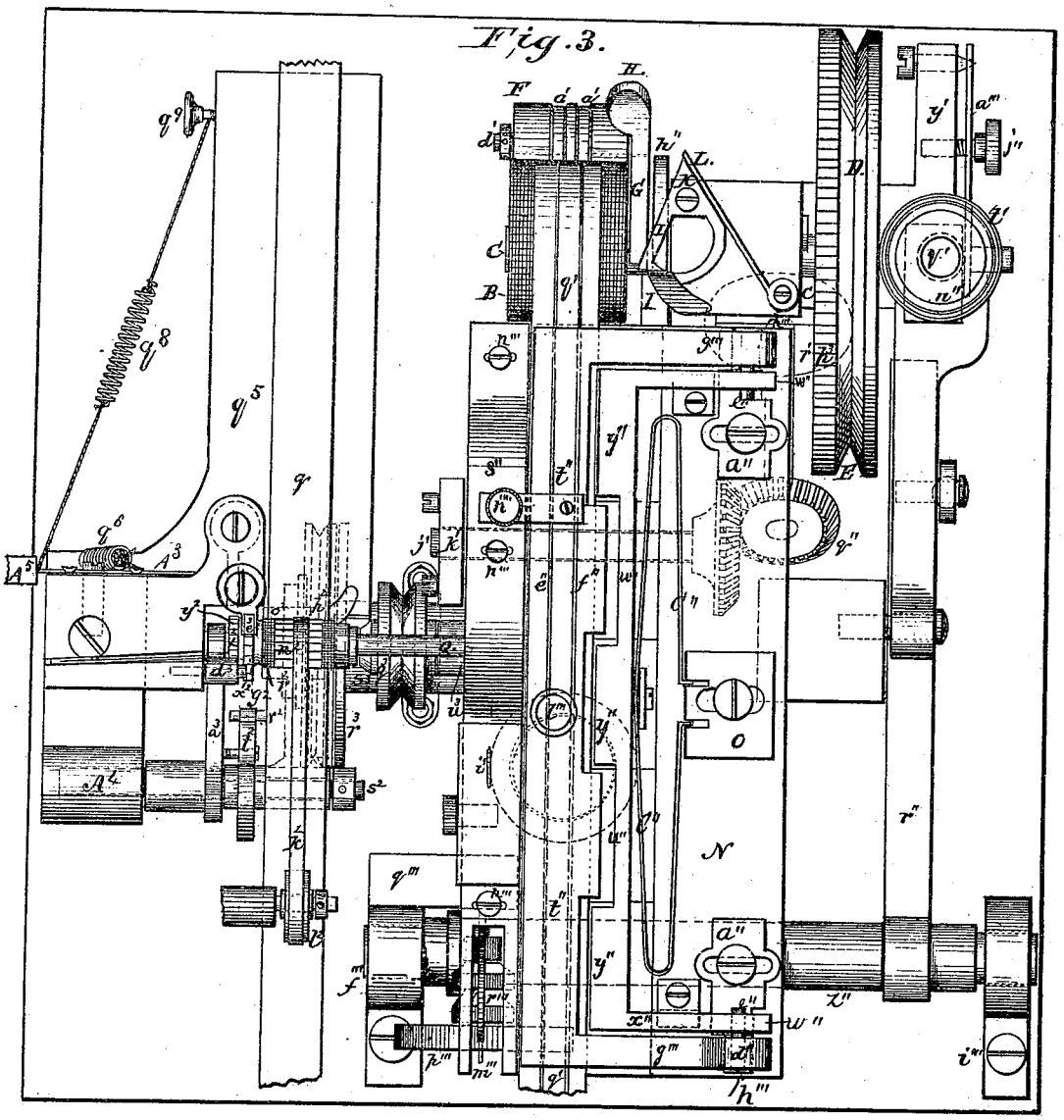


Fig. 4.

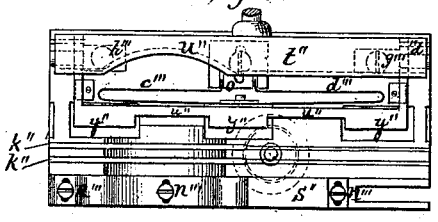
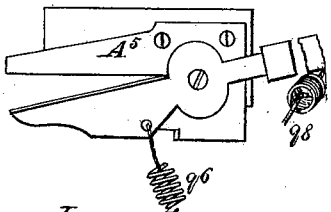


Fig. 5



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UNITED STATES PATENT OFFICE

ROYAL E. HOUSE, OF BINGHAMTON, NEW YORK.

IMPROVEMENT IN ELECTRIC-TELEGRAPH APPARATUS.

Specification forming part of Letters Patent No. **180,091**, dated July 25, 1876; application filed February 20, 1874.

To all whom it may concern:

Be it known that I, ROYAL E. HOUSE, of Binghamton, in the county of Broome and State of New York, have invented a new and useful Automatic Printing-Telegraph Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, Sheet 1, is a side elevation of the printing-instrument, partly in section. Fig. 2, Sheet 2, is an end view partly broken away. Fig. 3, Sheet 3, is a top-plan view. Fig. 4, Sheet 3, is a plan view of the guide-bed detached from the instrument; and Fig. 5, Sheet 3, is a detached view of the spring-shears and connections, by which the printed record is cut from the printing-fillet of paper.

Similar letters of reference in the accompaing drawings denote the same parts.

My invention has for its object to automatically print a telegraph-message in ordinary typography from a message-record composed of a narrow fillet of paper, in which two parallel rows of slits are cut and arranged to be read alternately from one row to the other, the slits indicating by their length the letters of the alphabet and other message-symbols.

To this end the invention consists, first, in mechanism for feeding the slitted record through the instrument, mechanism to set a type-wheel in position for printing by the movements of the slitted record, and mechanism for printing upon a plain fillet of paper after the type-wheel has been set. It further consists in the mechanism and combination of mechanisms by which the slitted fillet is fed through the instrument. It further consists in the mechanism and combination of mechanisms for setting the type-wheel. It further consists in the mechanism and combination of mechanisms for taking the impression of the type-wheel upon the plain fillet of paper. It further consists in an oscillating type-wheel, having the type arranged upon it in the order of the frequency of their occurrence in telegraph-messages, and adapted to be automatically set from an initial point for every message-sign by means of slits in a moving fillet of paper, which slits, by their length, or by the distance between the rear end of one and the rear end of that next adjoining, designate the message-signs and correspond to the message-signs on the type-wheel. It further consists in setting the type-wheel by the message-slits in the record-fillet through the medium of two gage-fingers, which work within the slits to turn the wheel. It further consists in automatically stopping the slitted record-fillet while an impression is being taken from the type-wheel upon a plain fillet of paper, and automatically setting the slitted record-fillet in motion again after the impression is completed. It further consists in the mechanism and combination of mechanisms by which these automatic movements are effected. It further consists in operating the printing cylinder or platen by the force of a spring, to impress the characters of a type-wheel upon a plain fillet of paper. It further consists in the mechanism by which the spring is operated. It further consists in adjusting the speed of the shaft which bears the gage-fingers relative to the feed of the slitted record by means of the slits themselves, for the purpose of securing the proper throw of the gage-fingers within the slits to set the type-wheel. It further consists in the mechanism and combination of mechanisms for adjusting the speed of such shaft from the feed of the slitted record. It further consists in a printing-telegraph instrument of the combination of an oscillating type-wheel, a time and escapement shaft, a cam-driving shaft, a pressing platen-cylinder, mechanism for feeding a slitted record-fillet over a guide-bed, and a brake for stopping the motion of such feeding mechanism, all operating automatically, so that at each oscillation of the time-shaft and each corresponding revolution of the cam-shaft, the type-wheel is set, the movement of the slitted record-fillet stopped, and an impression taken from the type-wheel upon a plain or printing fillet of paper simultaneously or in rapid succession, the pressing-platen lifted from the type-wheel, the printing-fillet fed forward, the slitted record-fillet again set in motion, and the type-wheel returned to its normal or first position. It finally consists in the construction and combination of various parts of the instrument, as will hereinafter more fully appear.

In the accompanying drawings, A is an upright, mounted upon a suitable frame, and supporting a cross-shaft, C, near its top, which shaft carries a grooved driving-pulley, D, at its outer end, and a serrated or toothed feed-cylinder, B, at its inner end.

F is a pressure-roller, hung upon the lower end of a bent arm, G, pivoted to the side of the upright, and supporting the pressure-roller just in front of the feed-cylinder. A spring, h'', attached to the upright, exerts its tension against the arm G, and bears the roller against the feed-cylinder with a yielding pressure, which may be regulated by making the spring adjustable in any convenient manner. The pressure-roller insures the feed of the paper containing the message-slits, by holding it against the sharp teeth of the feed-cylinder, and it is formed or covered with leather or other yielding substance, which shall receive the impress of the teeth and prevent the paper from slipping. The roller is further made with two parallel peripheral grooves, a', at the proper distance apart to receive the parallel embossed tracks in the paper fillet containing the message-slits. The upper end of the roller-arm G forms a finger-piece, H, which, when the arm is moved back to carry the roller out of contact with the feed-cylinder, is caught by a latch, I, pivoted to the top of the upright. The latch is also formed with a finger-piece, and its forward end is beveled in front of the pivot K, to receive the action of spring, L, by which it is held engaged with the roller-arm, as shown in Fig. 3.

N is a horizontal guide-bed, arranged in rear of and in line with the feed-cylinder, for the purpose of directing the message-fillet q' thereto, and to afford support for the mechanism by which the slits in such record are made to control the movements of the type-wheel in producing a printed message. The guide-bed is supported in position by means of a sleeve, n'', fastened to its under side, and fitted over an upright shaft or spindle, l'', secured to the main frame. The lower end of the sleeve is provided with a front projecting arm, o'', which is connected by a coiled spring, p'''', to a friction or other adjusting pin, q'', in the side of the upright A. This connection allows the bed a slight lateral swing, to compensate for any irregularities in the running of the paper to the feed cylinder, the holding-spring yielding readily for this purpose when the paper presses against the side of the bed.

r'''' is a stop secured to the frame of the instrument within the path of the sleeve-arm o'', and formed with two shoulders, between which the end of the arm works, to limit the swing of the bed.

The top surface of the guide-bed, for about half its width, and for a certain distance in front of the supporting-sleeve, is arched or made convex, and slotted longitudinally for the passage of two parallel gage-fingers, h', which are mounted upon a shaft, j', held in hangers k' l', upon the under side of the bed. The shaft forms the center of the arc described by the raised surface of the bed, and the fingers radiate from the shaft, so as to move through the slots in the arch with their points projecting slightly above the same. k'' k'' are parallel V-shaped ribs or rails, secured to the bed in front and rear of the arch, and in line with the slots therein, such slots and ribs being the same distance apart as the grooves in the pressure-roller. S'' is a gage side, arranged at the inner edge of the guide-bed, and composed of a band or strip, which curves over the arch, and forms deep guides at the front and rear thereof. It is held in place by set-screws n''', which are adjusted to regulate the position of the gage side, for the purpose of properly guiding the fillet q' with its tracks upon the ribs of the bed.

The opposite or pressure side of the bed is composed of a strip, u'', having a series of projections, y'', upon its face, and set into a wide groove formed lengthwise in the bed. It is held up near or against the side of the arch, so that its projections shall bear against the fillet of paper by means of the bent spring C'', placed behind it, and secured to a block, O, at or near the outer edge of the bed. The block is slotted for the passage of a set-screw, by which it is adapted for adjustment to regulate the position of the guide and its pressure against the paper. t'' is the cover, hinged to the outer edge of the bed, and formed with a slotted concavity terminating at each end in parallel grooves, to fit upon the arch and ribs of the bed beneath. The gage-fingers extend into the slots of the concavity to prevent the paper from slipping off their ends when in motion. The hinges are composed of lateral arms g''' at the ends of the cover, hung upon pintles h''', formed upon blocks a'', secured to the outer edge of the bed. The ends of the pressure-bar are provided with loops W'' W'', which extend around the pintles of the hinges, and rest upon the bed, so as to guide the pressure-bar in its movements to and from the paper. Pins or cams e'', secured to the hinge-arms g''', project within the loops above the pintles, and, when the cover is swung open by its handle l''', bear against the inner sides of the loops to move them back, and retract the pressure-bar from the fillet of paper. This construction facilitates the application and removal of the paper record, because the act of opening the cover draws back the pressure side, and widens the space between it and the gage side S''. When the position of the pressure-bar is changed by adjusting the spring C'', the guide-loops are also changed with it, and may, therefore, be so placed that the cams will have no effect to move them when the cover is opened. To overcome this difficulty the pintle-blocks are made adjustable by means of slots and set-screws, as shown in Fig. 3, so that they may also be changed whenever the position of the pressure-bar is altered by the springs. The

adjustment of the pintle-blocks is also necessary to compensate for wear of the loops and cams, and may in such case be made without adjusting the springs. The outer edge of the cover is formed with a series of lateral projections, which fit between the projections on the pressure side when the cover is closed, for the purpose of preventing the edge of the paper from curling up or wrinkling as it is drawn over the bed. The pressure or weight of the cover upon the fillet of paper is regulated by a set-screw, n'''', which passes down through a lateral plate or projection on the swinging edge of the cover, and bears upon the arched top of the guide side S″, as shown in Fig. 3. The opening between the cover and guide-bed is the deepest at the rear end, where the paper enters, to afford room for the passage of the paper when two fillets are pasted together at the ends. The shaft j' of the gage-fingers is operated from the driving-pulley D in the following manner: n' is an inclined shaft, having its bearings, respectively, in the side of the upright A, and in a hanger, o^2, on the under side of the guide-bed. q^2 and r' are beveled pinions, mounted upon opposite ends of the shaft, the former to engage with a beveled pinion, m'', on the end of the shaft j', and the latter with a beveled gear-wheel, S′, mounted upon a short stud in the side of the upright beneath the driving-pulley. Motion is communicated to the gear-wheel from the driving-pulley by means of two friction-wheels, t', mounted upon a vertical shaft, V′, so as to bear against the faces of the gear-wheel and pulley between their respective shafts. The friction-wheels are clamped to their shaft between a fixed plate, k''', and a screw-plate, n'', by which means they can be readily applied and removed when desired. The faces of the wheel and pulley are corrugated, notched, or otherwise roughened, in radial lines, to prevent the friction-wheels from slipping; and to still further guard against such difficulty, and at the same time prevent too much wear, the friction-wheels are made of leather, vulcanized rubber, or other yielding substance.

The shaft of the friction-wheels works within a long tubular bearing, W′, which, to prevent it from turning, is squared upon the outside and fitted within corresponding recesses in the parallel arms y', secured to the side of the upright. Flat springs a''', attached to the parallel arms, bear against the tubular bearing to hold the friction-wheels against the pulley and gear wheel, the degree of pressure being controlled by set-screws j''.

The instrument is operated by a belt or band having a frictional connection with a suitable motor, and passing around the grooved driving-pulley, so as to move it in the direction of the arrow, Fig. 1. Its motion is communicated, through the connections above described, to the shaft j', and moves it and the gage-fingers in the opposite direction. The gage-fingers are held upon the shaft j', independently of each other, being mounted upon friction-sleeves S‴, having a loose segmental gear, e^2, between them. Each sleeve is composed of two half-boxes held upon the shaft by a spring, t''', bent to embrace them, and which is secured together at the ends by a screw, n''''. By adjusting this screw the ends of the spring are moved to and from each other, for the purpose of regulating the force with which the sleeves shall grasp the shaft.

When the fillet of paper containing the message-slits, to be produced in printed characters, is placed in the guide-bed, the cover of the latter is shut down upon it, and the pressure-roller released so as to hold it in contact with the feed-cylinder. The paper is arranged with the concave side of the parallel grooves fitting upon the ribs of the bed, and the gage side S″ adjusted up to its edge, for guiding it properly to the roller, and so that its slits shall register with the points of the gage-fingers. The pressure-bar is adjusted to bear against the opposite edge with sufficient force to guide it without wrinkling. The gage side and pressure-bar thus guide the paper to the pressure-roller, with its embossed tracks within the parallel grooves thereof, and on the ribs of the bed, for the purpose of insuring the proper registry of the slits with the gage-fingers. If the points of the fingers do not accurately coincide with the slits, they are further adjusted by set-screws c^2 bearing against their sides, and held in the ends of arms a^2, rising from the friction-sleeves. This guidance of the paper directs its tracks within the parallel grooves of the pressure-roller, for the purpose of preserving the form of the tracks, in order that the paper may be used as often as desired to reproduce the message. After the paper has been adjusted, the instrument is set in motion to move it over the bed. Its pressure is sufficient to overcome the force of the friction-sleeves S‴, and hold the points of the gage-fingers below the surface of the bed, within the slots at the front end of the arch. When, however, a slit in the paper presents itself to the point of a gage-finger, the pressure of the paper is removed, so that the friction-sleeve turns with the shaft j', and throws the gage-finger back to the rear end of such slit, where it is again arrested by the paper and moved forward to its starting-point. Thus the fingers are alternately thrown back and carried forward as the alternate rows of message-slits present themselves, the length of their backward throws being governed by the length of the slits, for the purpose of setting the type-wheel, as I will presently describe.

It is essential that the force with which the friction-sleeves grasp their shaft shall not be strong enough to cause the fingers to tear the paper when thrown back to the rear ends of the slits, and since the paper fillets may sometimes vary in strength, or the speed of the machine increase the force of the fingers, the friction-sleeves are made adjustable, as above

described, so that the fingers may be thrown back with a force proportioned to the resisting strength of the paper at the ends of the slits.

A curved guide, i'', secured to the front upright A of the frame under the feed-cylinder, serves to direct the slitted record out of the instrument. After a slitted record has passed out of the guide-bed it often occurs that the gage-fingers have not been returned to the front of the arch, and inasmuch as their return to such point is necessary before a new record can be applied to the guide bed, I have provided the following means for effecting this result by operating the arm of the pressure-roller F: A bent lever, i^2, is hung upon the end of a horizontal arm, j^2, projecting inward from the upright A^3 to a point near the gage-fingers. Its horizontal portion extends in front of such fingers, and the upper end of the upright portion is connected, by a long rod, h^2, to the shaft or pin of the pressure-roller. When the arm of the pressure-roller is moved away from the feed-cylinder the connecting-rod moves the bent lever against the lower ends of the gage-fingers to throw their points to the front of the arch, as will be clearly understood by reference to Fig. 1.

The mechanism thus far described is employed solely for feeding and otherwise manipulating the record containing the message-slits, so that it shall be operated upon by the mechanism for reproducing the message in printed characters, as I will now proceed to describe.

A^2 and A^3 are uprights arranged upon the frame of the instrument, the former a short distance in rear of the upright A and the latter across the frame opposite the upright A^2. P is a light type-wheel mounted upon a shaft, Q, having its bearings in these two uprights near the top, and carrying a small pinion, m', which engages with the segmental gear, e^2, on the shaft of the gage-fingers. The segmental gear carries a cross-bar, f^2, at or near its rim, of sufficient length to bear against the rear edges of both gage-fingers.

When the fingers are at rest in front of the arch of the guide-bed the type-wheel is also at rest, with a blank space or type at the top; but when a finger is released by the presentation thereto of a slit in the moving fillet of paper, it presses against the cross-bar, and bears back the segmental gear so as to turn the pinion m', and with it the shaft and type-wheel, in the direction of the arrow, Fig. 1. The type-wheel continues to move until the finger is arrested at the rear end of the slit, when it stops with the required type at the top in a position to print upon the blank paper when the pressing mechanism is brought down upon it. After the impression has been taken the paper at the end of the slit again moves forward the gage-finger to the front of the arch, and the type-wheel is turned back to its first position by the influence of the suspended weight f^4 upon the type-wheel shaft. This return movement also causes the pinion m' to carry back the segmental gear and hold the cross-bar f^2 in contact with the returning gage-finger, so that it shall be in position to receive the action of the adjoining finger for again setting the type-wheel. The weight therefore serves the twofold purpose of holding the cross-bar up to the gage-fingers for setting the type-wheel and returning the latter after it has been set. A spring may, however, be employed for this purpose instead of the weight, if preferred.

From this description it will be seen that the type-wheel starts always from the same point to bring the required type under the pressing devices, and is returned to such point after the impression has been taken.

The type are arranged at regular intervals upon the wheel, and the distance the latter must turn to bring the required letter under the pressing devices is governed by the length of the message-slits in the moving fillet of paper; or, in other words, the gage-fingers are thrown back to different points, according to the length of the slits, and, therefore, move the wheel a greater or less distance to bring the required type uppermost under the pressing mechanism.

As certain letters occur more frequently than others in telegraphic messages, I have transposed the alphabet, and represented the most frequently-occurring letters by the shortest slits in the fillet of paper, gradually increasing the length of the slits in proportion to the decrease in the occurrence of the letters. This arrangement is adopted in order that the recording-instrument by which the slits are made, and which forms the subject of a separate application for Letters Patent, filed by me, may be operated with great rapidity. The order in which the letters most frequently occur, and in which they are arranged upon the recording-instrument, is as follows, to wit: *e t i a o s r n h d l c u f m p b w y g v k x q j z*. To these are added the separatrix or space between the words and the period or finis. The separatrix being the most frequently-occurring sign in all messages, precedes the others, and is therefore represented by the shortest slit, while the period or finis necessarily concludes a message, and is represented by the longest slit. This number and order are followed in arranging the type upon the wheel P, not only for the purpose of harmonizing with the recording-instrument, but so that the wheel shall move the shortest distance for the message-symbol most frequently used, its throws gradually increasing in length as the letters or symbols decrease in use. By this means the type wheel may also be operated with great rapidity to print a message accurately from the copy or slitted record-fillet.

A^4 is a bracket arranged upon the rear side of the upright A^3, near the top, and provided with a horizontal stud, S^2, projecting inward toward the upright A^2. n^2 is the press-

ing or platen cylinder, borne immediately over the type-wheel, and at right angles thereto, by means of a pin, z^2, in the forward end of an arm, a^3, which in its turn is hung upon the stud of the bracket. The bracket is slotted and adapted for adjustment by a set-screw to regulate the position of the platen-cylinder with respect to the type-wheel. The cylinder is constructed with a series of flattened surfaces or platens, and with a row of circumferential teeth or spurs at each end of the platens. r^2 is a wide flat arm, articulated upon the stud S^2, and formed with a concave front end to fit up against the under side of the platen-cylinder, for the purpose of supporting and holding the fillet of paper q, upon which the message is to be printed, in contact with the platens while an impression is being taken. The concave end is slotted for the passage of the type upon the wheel beneath, and is also grooved to receive the spurs by which the paper and ink-band are fed along. A spring, t^2, attached to the stud and to a projection on the side of the arm r^2, holds the latter up to the cylinder and insures the action of the spurs upon the paper. k^2 is the endless ink-band passing around the platen-cylinder and its spurs, and around a roller, l^2, mounted upon the frame of the instrument, in rear of the guide-bed.

The ink-band is fed along upon the arm a^3, over the plain fillet of paper q, which, after receiving the impression of the type-wheel, passes out of the instrument along a horizontal table, q^5, secured to the front of the upright A^3, in line, or nearly so, with the arm a^3, as shown. x^2 and y^2 are reversed ratchet-wheels or rows of ratchet-teeth, formed beside each other upon the end of the platen-cylinder, next the arm a^3; and there are as many teeth in each row as there are platens upon the cylinder. The row x^2 is employed in connection with a spring-pawl, f^3 d^3, pivoted immediately above it to the upright A^3, for the purpose of rotating the platen-cylinder to feed the ink-band and fillet of paper over the type-wheel, while the teeth of the row y^2 engage with the fixed pawl e^3 on the upright, to prevent the platen-wheel from being rotated too far by its momentum. A flat spring, c^3, hung to the under side of the arm a^3, engages the ratchet-wheel y^2 with its forward end, and prevents the platen-cylinder from rotating backward. This spring is held at the proper distance from the arm, to operate as a locking-pawl, by means of a short stud, c^4, on the under side of such arm, as shown in Fig. 1.

l^3 is a cam-shaft, having its bearings in the uprights A^2 A^3, at some distance below the shaft of the type-wheel. It is employed to the printing-platen down upon the type-wheel, and to apply a brake to the driving-pulley for the purpose of stopping the movement of the slitted fillet while an impression is being taken upon the printing-fillet.

j^3 is a cam secured to the end of the shaft l^3 under the pressing mechanism, and h^3 is an upright rod mounted upon the cam by an eccentric band, h^4, with its upper end entering a socket, g^3, hung upon the inner end of the pin z^2, which carries the platen-cylinder. The socket and rod are connected by a spring, k^3, coiled around the latter, so that when the cam-shaft is rotated the platen-cylinder will be vibrated vertically over the type-wheel, the arms r^2 a^3 turning freely on the stud S^2 for this purpose. When the longest radius of the cam is underneath the shaft, the rod and socket are separated somewhat, and the tension of the spring pulls down the platen-cylinder to press the ink-band and paper against the letters of the type-wheel. The printing is therefore done by the force of the spring at each revolution of the cam-shaft. As the cylinder is moved up by the rotation of the shaft, and just before it reaches the limit of its upward throw, a tooth of the ratchet x^2 encounters the spring-pawl d^3, and rotates the cylinder the distance of one tooth and platen, as above stated, thereby causing the spurs to feed along the ink-band and paper to receive the next impression of type.

m^3 is another cam, fixed upon the opposite end of the shaft l^3, to support the lower forked end of an inclined brake or stop-bar, n^3. The forward or upper end of this bar fits and works within an inclined groove in the side of the front upright, A, under the feed-cylinder B, and carries at its extremity an adjustable stop, i^3, which nearly touches the projecting shaft of the pressure-roller F, when the latter is in contact with the feed-cylinder. An adjustable brake, b^3, is also attached to the bar, and is curved round to the opposite side of the upright, so that its shoe shall occupy a position just under, and slightly to the rear of, the driving-pulley B.

The forward end of the brake is guided and supported by a notch in the rear end of the upper arm y', or in any other proper and convenient way. The two cams j^3 and m^3 are so arranged upon their shaft that when, under the influence of the former, the printing devices are making an impression upon the paper, the latter will throw the brake against the driving-pulley, and prevent its further rotation. This stops the movement of the slitted paper fillet, and, therefore, the movement of the gage-fingers and type-wheel, until the impression has been completed. The periphery of the driving-pulley may be roughened, if desired, to render the action of the brake more certain.

When the brake is applied the stop i^3 moves out the pressure-roller F from contact with the paper, and prevents the possibility of any failure in arresting the movement of the latter at the proper instant.

One of these stopping devices might, perhaps, be dispensed with without impairing the efficiency of the instrument; but I prefer to employ them both, to prevent accidents in case one should fail to perform its office.

The brake and stop are made adjustable, to

compensate for wear, and to enable them to be brought into action at the proper time. t^3 is a time-shaft, having its bearings in the uprights A^2 and A^3, between the cam-shaft and the shaft of type-wheel; and b^4 is an upright arm, secured to the time-shaft beneath the type-wheel. The upper end of the arm carries a pivoted pawl, a^4, to engage with a row of adjusting teeth, o^1, on the side of the type-wheel, equaling in number the type on the periphery. The point of the pawl is held up to the teeth by a spring, d^4, secured to the time-shaft in any convenient manner, and the extent of its upward movement is limited by a stop, c^4, at the top of the pawl-arm. The time-shaft is further constructed, beside the pawl-arm, with a transverse open frame, of quadrangular shape, which tips forward and back when the shaft is oscillated. The front surfaces of the forward and rear sides of the frame form stops or detents v^3 and w^3, respectively, for the long radial detent-arm o^3, secured to the cam-shaft beneath. The point of the detent-arm rests against the forward stop when the time-shaft is stationary.

The cam-shaft and time-shaft are driven by the same motor that moves the driving-pulley, and its power is communicated to them by means of belts or bands running over pulleys q^3 r^3, attached to friction-sleeves thereon. The pulleys and sleeves rotate continuously in opposite directions, as shown by the arrows, Fig. 1, and grasp their shafts with sufficient frictional force to rotate them also, excepting when they are locked by the stopping or detaining devices. When this occurs the friction-sleeves turn on the shafts, so that their rotation is unimpeded. The friction-sleeves are each composed of two half-boxes, held together upon the shaft by bolts and nuts, and by springs S^3, surrounding the bolts. By moving the nuts the tension of the springs is adjusted to regulate the force with which the sleeves shall grasp the shafts.

The pulley r^3 is made in two parts, one being a flat disk, secured firmly to the friction-sleeve, and the other a shallow drum or barrel, mounted loosely upon the sleeve, and containing a coiled spring. One end of the spring is secured to the drum, and the other to the disk, so that when the cam-shaft is stationary, and the drum is moved by the driving-belt, it will wind up the spring until its tension overcomes the frictional force of the sleeve, and causes the latter to turn also. When the detent-arm o^3 of the cam-shaft is released by the stops of the time-shaft, the force of the coiled spring throws the shaft, cams, and arm rapidly round, and thus insures their prompt action without expending the power of the motor, which would otherwise be required to drive the belt, and, therefore, the shaft and its attachments, at the proper speed.

The operation of the instrument to produce a printed message is as follows: The slitted record is first set in motion over the guide-bed, as above described, and the plain fillet laid upon the spring-arm r^2, over the type-wheel, and under the ink-band and pressing-cylinder. As the moving record-fillet presents a slit to one or the other of the gage-fingers, the latter is thrown back to the rear end of the slit, as already stated, thereby turning the type-wheel to bring the type which corresponds to the slit up under the plain fillet, beneath the pressing-cylinder. When the type-wheel moves it bears back the spring-pawl a^4 and pawl-arm b, to oscillate the time-shaft and release the detent-arm o^3 from the front stop v^3, so that the cam-shaft shall be turned by its driving-force and throw the point of the detent-arm o^3 against the rear stop w^3. At the instant the type-wheel stops, the point of the spring-pawl just clears the side teeth, thus allowing the time-shaft to be tipped forward by its driving force, and again throw forward the pawl to engage the teeth farther under the wheel. The forward tip of the time-shaft clears the rear stop w^3 from the detent-arm, and permits the cam-shaft to revolve, so that its cams m^3 j^3 shall simultaneously, as near as may be, apply the brake to the driving-pulley B, for stopping the feed of the slitted paper, and bring down the pressing-cylinder to bear the plain fillet upon the type for taking the impression. The cam-shaft rotates until the detent-arm is again arrested by contact with the front stop v^3, which is thrown down, when the time-shaft is tipped, to clear the detent-arm and stop w^3.

The oscillations of the time-shaft are limited by an inclined plate, x^3, attached by a set-screw, x^4, to the side of the upright A^3, immediately over the stops v^3 w^3. By varying the inclination of the plate the oscillations of the time-shaft are also varied to adjust the throw of the spring-pawl with respect to the type-wheel.

As soon as the impression is taken the rotation of the cam-shaft carries round the cams m^3 j^3, the first to release the brake and unlock the driving-pulley B, so that the slitted fillet of paper may continue its forward movement over the guide-bed, and the second to throw up the pressing devices, feed the printing-fillet of paper forward, and release the type-wheel, in order that it may be returned to its first position by the weight, as hereinbefore described. In the return movement of the type-wheel its side teeth strike the point of the locking-pawl a^4, which, owing to its supporting-spring, yields readily for their passage. Thus at each oscillation of the time-shaft, and each corresponding revolution of the cam-shaft, the type-wheel is set, the slitted fillet stopped, and the impression taken upon the plain fillet simultaneously or in rapid succession, the pressing-cylinder lifted from the type-wheel, the slitted fillet of paper again set in motion, the printing-fillet fed forward, and the type-wheel returned to its first position. In other words, the type-wheel is set, the impression taken upon the plain fillet of paper,

and the various parts returned to their first positions, ready to repeat the operation, when another slit in the record-fillet releases the gage-finger.

When the printing devices are pressed down to do the printing, a short correcting-tooth, v^4, on the under side of the spring-arm r^2, enters between the two top teeth on the side of the type-wheel, for the purpose of locking it in position and causing it to register accurately with the platens of the pressing-cylinder. This provision insures a correct impression of the type.

The speed at which the slitted record is fed over the guide-bed is practically the same under all circumstances, but the speed of the shaft j' must be adjusted relative to the feed of the slitted record for the purpose of securing the proper throw of the gage-fingers to set the type-wheel. The speed of this shaft is first gaged to the standard length of slits made in the first-produced record, *i. e.*, the record made by the recording instrument hereinbefore referred to. If, however, from any cause the standard length of the slits is varied, the speed of the shaft must be correspondingly varied. For example, if the slits become shortened, the gage-fingers, when thrown back by the shaft, encounter the rear end of the slits before the type-wheel has had time to bring up the corresponding types into position for printing. This variation in the standard slits necessitates a slight increase in the speed of the shaft in order that the gage-fingers may be thrown back a little quicker to meet the rear ends of the slits. When the slits become lengthened beyond the standard, the gage-fingers throw the type-wheel too far, and the speed of the shaft j' must, therefore, be decreased.

To regulate the speed of the shaft j', the friction-wheels t' are adjusted vertically upon the faces of the grooved pulley D and gear-wheel S′, so as to take the motion of the former at any suitable point between its center and circumference, and transmit it to the latter in the same manner. This adjustment is effected by the following mechanism:

z'' is a cross rock-shaft, having its bearings in blocks f''' i''' at the rear of the instrument, behind the guide-bed sleeve, and carrying at its outer end a long horizontal arm, r'', extending forward under the gear-wheel S′. This arm is connected, by a vertical rod, b''', to a second and shorter horizontal arm, p'', pivoted at its rear end to the upright A^2, and jointed at its front end to the center of the tubular bearing W′.

k''' is a stop-bar rising from the inner end of the rock-shaft, just behind an upright, q''', attached to the bearing f''', and o''' is a flat spring fastened at its lower end to the front side of the stop-bar about midway thereof. m''' is a long flat metal strip secured to the top of the spring, or forming a continuation of the same, and terminating at its upper end in a beveled gage-point, which projects through a longitudinal slot in the gage side of the guide-bed at the rear end, as shown in Fig. 1.

The spring gage-point is arranged to move edgewise through the slot in line with a beveled gage-point, i', attached to the side of the guide-bed, and adapted for adjustment by means of a slot and set-screw, as shown.

The beveled edges of the gage-points are placed opposite each other, so that their outer edges shall form catches to bear against the opposite ends of a slit in the record-fillet when such slit is hooked over them.

Instead of arranging the two gage-points in or upon the guide-bed, they may be placed upon the frame of the instrument beside the guide-bed, or at any other convenient point.

The gage-point m''' is adjusted with respect to the gage-point i' by means of a set-screw, p''', passing through the stop-bar to bear with its point against the upright q'''. A spring, j''', coiled about the rock-shaft, and secured at one end to the bed of the instrument, holds the set-screw against the upright q''', and prevents the parallel arms r'' p'' from being casually moved up to displace the friction-wheels. When the speed of the shaft j' is to be adjusted by this mechanism, one end of the longest slit in the record-fillet is hooked over the gage-point i'. The point m''' is then placed within the slit, and adjusted up to its opposite end by the set-screw p''', the spring of the gage-point preventing the paper from being torn by the back of the point, in case the stop-bar is moved too far from the upright q'''. To afford nicety of adjustment, and to relieve the tension of the spring, a set-screw, r''', is employed, passing through the top of the stop-bar, and bearing against the back of the spring, as shown in Fig. 1. The operation of the set-screw p''' moves the stop-bar with respect to the upright q''', and, through the connecting device, raises or lowers the friction-wheels upon the driving-pulley B and gear-wheel S′, to change the speed of the latter, and therefore the speed of the shaft j' and its gage-fingers proportionally. Thus the variation in the standard length of the slits furnishes the guide for adjusting the speed of the shaft j' relative to the speed of the driving-pulley, for the purpose of securing the proper throw of the gage-fingers, within such slits, to set the type-wheel.

Instead of employing the set-screw p''' and coiled spring, to adjust the gage-point m''', right and left set-screws may be arranged in the stop-bar and upright for this purpose; and in place of the several arms for communicating the motion of the rock-shaft to the friction-wheels, a single arm may be arranged upon the rock-shaft, to connect with the tubular bearing of such wheels in any convenient way.

It may happen that, from inadvertence in the original construction of the instrument, and from the wear of the parts, more particularly the friction-wheels, the adjustment of the gage-points produces a movement of the fric-

tion-wheels slightly more or less than is required. In such case the connecting-rod b''' is adjusted by any suitable means upon the parallel arms p'' r'', so as to increase or diminish the movement of the friction-wheels when operated by the gage-points, and thereby cause the movement of the latter to produce precisely the required adjustment of the driving-wheel.

A^5 represents a pair of shears attached to the top of the upright A^3 over the type-wheel, between the printing devices and the guide-table q^5, for the purpose of severing the printed record from the plain fillet of paper. The blades of the shears are held apart, so that the fillet may travel between them, by a spring, q^6, connecting the lower blade with a set-screw, q^7, as shown by dotted lines in Fig. 2, near the foot of the upright. The spring also serves to throw open the blade again, after it has been closed by the operator to cut off the record.

A second spring, q^8, connects the handle of the lower blade with a set-screw, q^9, in the side of the guide-table, for the purpose of holding such blade up to the stationary blade, and insure the proper action of their cutting-edges. By adjusting the set-screws, the tension of the two springs is preserved, to render the blades certain in their action at all times.

The drawings herein illustrate one form of my invention; but I desire it understood that I do not confine myself to such form, so long as I do not depart from the principle of my invention.

Having thus described my invention, what I claim is—

1. A telegraph-instrument for automatically printing a telegraph-message in ordinary typography from a slitted paper message-record, consisting essentially of the following mechanism, to wit: first, mechanism for feeding the slitted record through the instrument; secondly, mechanism which sets the type in position for printing by the movements of the slitted record; and, thirdly, mechanism for printing upon a plain fillet of paper after the type have been set.

2. An oscillating type-wheel, having the type arranged upon it in the order of the frequency of their occurrence in telegraph-messages, and adapted to be set from and returned to the same point for every letter or sign of the message to be printed, substantially as described.

3. An oscillating type-wheel, adapted to be automatically set from an initial point for every message-sign by means of slits in a moving fillet of paper, which slits, by their length, or by the distance between the rear end of one and the rear end of that next adjoining, designate the message-signs, and correspond to the message-signs on the type-wheel, substantially as described.

4. An oscillating type-wheel, adapted to be set from an initial point for every message-sign by a slitted message-record, the length of its oscillations to bring the required type in position for printing being governed by the length of the message-slits in the record-fillet, substantially as described.

5. Setting the type-wheel by the message-slits in the record-fillet, through the medium of gage-fingers, substantially as described.

6. The combination of the feed mechanism with the slitted record-fillet, the gage-fingers, and the type-wheel, to operate together substantially as described, for the purpose specified.

7. Mechanism by which the slitted record-fillet is adapted to be automatically stopped while an impression is being taken from the type-wheel upon a plain message-fillet, and to be automatically set in motion again after the impression is completed, substantially as described.

8. The combination of a brake with the feeding mechanism, to automatically stop the feed of the slitted record-fillet while an impression is being made by the type-wheel upon a plain message-fillet, substantially as described.

9. The combination of the brake with the cam-driving shaft of the pressing devices, for the purpose of automatically releasing the feed of the slitted record-fillet, to set the latter in motion after the impression has been made by the type-wheel upon the plain message-fillet, substantially as described.

10. The feed mechanism for the slitted record-fillet, consisting essentially of the toothed feed-cylinder and the grooved pressure-roller, substantially as described.

11. The beveled spring-latch I, combined with the arm of the pressure-roller, to lock it out of contact with the feed-cylinder, substantially as described.

12. The arched guide-bed, combined with the feed mechanism, substantially as described, for the purpose specified.

13. The gage-fingers, combined with the arched guide-bed, substantially as described, for the purpose specified.

14. The combination of the gage-fingers, the arched guide-bed, and the feed mechanism for the slitted fillet, substantially as described, for the purpose specified.

15. The pivoted guide-bed, constructed with a slotted arch for the passage of the gage-fingers, and with parallel ribs or rails in front and rear of the arch, in line with the slots, to receive the grooves or tracks of the slitted record-fillet, substantially as described.

16. The cover of the guide-bed, constructed with a slotted concavity to fit down upon the arch, and with parallel grooves in line with the slots of the concavity, to fit down upon the ribs, substantially as described, for the purpose specified.

17. The construction of the cover and guide-bed to form the deepest space between them at the rear end, for the passage of the paper fillet to the ribs and grooves when two fillets are pasted together at the ends, substantially as described.

18. The combination of the gage-side and pressure-bar with the guide-bed and its cover, for the purpose of guiding the slitted fillet upon the ribs of the bed and over the points of the gage-fingers, substantially as described.

19. The cover adapted for adjustment to regulate the pressure with which it holds the slitted record down upon the ribs of the guide-bed, substantially as described, for the purpose specified.

20. The gage-side of the guide-bed, adapted for adjustment with respect to the arch and ribs, substantially as described, for the purpose specified.

21. The pressure-bar, held up to or against the arch of the guide-bed, so that its projections shall bear against the slitted fillet by means of the adjustable springs, substantially as described.

22. The pressure-bar and cover, having a series of projections and spaces, so arranged that the projections upon one shall enter the spaces of the other when the cover is shut down upon the slitted fillet, for the purpose of preventing the latter from wrinkling or curling up at the edge, substantially as described.

23. The combination of the cams or pins e'' on the hinge-arms of the cover with the guide-loops w'' on the ends of the pressure-bar, for the purpose of retracting the pressure-bar from the fillet of paper when the cover is swung open, substantially as described.

24. The pintle-blocks a'' of the cover-hinges and the spring-block O of the pressure-bar, adapted for adjustment with respect to each other, substantially as described, for the purposes specified.

25. The gage-fingers, mounted upon the shaft j' beneath the arch of the guide-bed, so as to move through the slits in the arch, with their points projecting slightly above the same, substantially as described, for the purpose specified.

26. The gage-fingers, having a frictional connection with their supporting-shaft j', independently of each other, by means of the friction-sleeves S$''$, substantially as described, for the purpose specified.

27. The combination of the arm a^2 and set-screw c^2 with the gage-points, substantially as described, for the purpose specified.

28. The friction-sleeves of the gage-fingers, adapted for adjustment upon the shaft j', to grasp the same with a force proportioned to the resisting strength of the paper fillet at the rear ends of the message-slits, for the purpose of preventing the gage-fingers from tearing the paper when thrown back within the slits, substantially as described.

29. The loose segmental gear, mounted upon the shaft j' between the gage-fingers, to engage with a pinion, m', on the shaft of the type-wheel, substantially as described.

30. The cross-bar f^2, combined with the segmental gear and gage-fingers, for the purpose of moving the gear back to turn the pinion m' and set the type-wheel when the gage-fingers are thrown back within the slits of the moving record, substantially as described.

31. The cross-bar f^2, held up to the gage-fingers by means of a spring, or by a weight suspended from the shaft of the type-wheel, for the purpose of returning the segmental gear with the gage-fingers, and for returning the type-wheel to its normal position after having been set, substantially as described.

32. The shaft j' of the gage-fingers, driven from a grooved pulley upon the shaft of the feed-cylinder, through the medium of the cog-gearing and the adjustable friction-gearing, substantially as described.

33. The gear-wheel S$'$, having its shaft-bearings in the main frame of the instrument, beneath the driving-pulley, and connected with a pinion, m'', on the end of the shaft j' by means of the inclined shaft n' and its pinions, substantially as described.

34. Communicating the motion of the driving-pulley to the beveled gear-wheel S$'$ by means of two friction-wheels, t', mounted upon a vertical shaft, V$'$, so as to bear against the faces of the pulley and gear-wheel between their respective shafts, substantially as described.

35. The friction-wheels t', held up to the faces of the pulley and gear-wheel with an adjustable yielding pressure, substantially as described, for the purpose specified.

36. The friction-wheels t', adapted for vertical adjustment upon the faces of the driving-pulley and gear-wheel between the shafts thereof, substantially as described, for the purpose specified.

37. The driving-pulley and gear-wheel S$'$, having their faces corrugated, notched, or otherwise roughened in radial lines, to prevent the friction-wheels from slipping, substantially as described, for the purpose specified.

38. The friction-wheels t', composed of leather, vulcanized rubber, or other yielding substance, to prevent them from slipping upon the roughened faces of the driving-pulley and gear-wheel S$'$, substantially as described.

39. The shaft of the friction-wheels t', working within a long tubular bearing, W$'$, which is squared upon the outside, and fitted within suitable recesses in the parallel arms y', to prevent it from turning with the shaft, substantially as described.

40. The adjustable springs a''', combined with the parallel arms y', to hold the tubular bearing W$'$ within the recesses of the arms, substantially as described.

41. The locking-ratchet y^2 and pawl e^3, in combination with the pressing-cylinder, substantially as described, for the purpose specified.

42. The combination of the locking-ratchet y^2 and pawl e^3, the feeding-ratchet x^2 and pawl d^3, and the pressing-cylinder, substantially as described, for the purpose specified.

43. The combination of the spring-stop c^3 with the feeding-ratchet and arm a^3, substantially as described, for the purpose specified.

44. The pressing mechanism, suspended from the frame of the instrument immediately over the type-wheel, substantially as described, for the purpose specified.

45. The pressing mechanism, suspended from the frame of the instrument immediately over the type-wheel by means of an adjustable bracket, substantially as described, for the purpose specified.

46. The combination of a correcting-tooth, v^4, with the lateral adjusting-teeth on the side of the type-wheel, substantially as described, for the purpose specified.

47. The correcting-tooth v^4, arranged on the under side of the arm r^2, to engage with the adjusting-teeth o' on the side of the type-wheel, substantially as described.

48. In a telegraph printing apparatus, the combination of a pressing-cylinder, a driving-shaft, and a spring-connection between the two, substantially as described, for the purpose specified.

49. The connection between the pressing-cylinder and pressing-platen, consisting of the socket g^3, the adjustable spring k^3, and the eccentric rod and band mounted upon the cam j^3 of the shaft, substantially as described.

50. A spring-pawl combined with a time and escapement shaft, to release the pressing mechanism for operation when the type-wheel is set to print the required message-sign, substantially as described.

51. The spring-pawl a^4, supported from the time and escapement shaft by means of an upright arm, b^4, substantially as described.

52. The stops v^3 w^3 of the time-shaft, in combination with the detent-arm o^3 of the cam-shaft, substantially as described, for the purpose specified.

53. The combination of the adjustable stop-plate X^3 with the time-shaft, substantially as described, for the purpose specified.

54. The combination, with the cam-driving shaft, of a spring which is compressed by the driving force of the shaft when the latter is held at rest by a detent, and which exerts its force to turn the shaft when the detent is released, substantially as described, for the purpose specified.

55. The spring driving-pulley r^3, combined with the cam-shaft and its friction-sleeve, substantially as described, for the purpose specified.

56. The time-shaft and cam-shaft, and their attachments, in combination with the printing mechanism, substantially as described, for the purposes specified.

57. The time and cam shafts, together with their attachments, in combination with the printing mechanism and the feeding devices for the slitted record-fillet, substantially as described.

58. The feeding-cylinder for the record-fillet, driven by a frictional connection between it and a motor or prime mover, substantially as described, for the purpose specified.

59. The time-shaft, driven by a frictional connection between it and a motor or prime mover, substantially as described, for the purpose specified.

60. The cam-shaft, driven by a frictional connection between it and a motor or prime mover, substantially as described, for the purpose specified.

61. The feeding-cylinder for the record-fillet, the time-shaft, and the cam-shaft, each driven by a frictional connection between it and a motor or prime mover, substantially as described, for the purpose specified.

62. The several frictional connections, adapted for adjustment to regulate the force with which they grasp their shafts or supports, substantially as described, for the purpose specified.

63. The stop i^3 for the pressure-roller F, and the brake b^3 for the feed-cylinder B, both mounted upon the same arm, and operated by the cam m^3 on the driving-shaft, substantially as described, for the purpose specified.

64. The stop i^3 and brake b^3, adapted for adjustment upon their supporting-arm, substantially as described, for the purpose specified.

65. In a printing-telegraph instrument, the combination of an oscillating type-wheel, a time and escapement shaft, a cam-driving shaft, a pressing platen-cylinder, mechanism for feeding a slitted record-fillet over a guide-bed, and a brake for stopping the motion of such feeding mechanism, all operating automatically, so that at each oscillation of the time-shaft, and each corresponding revolution of the cam-shaft, the type-wheel is set, the movement of the slitted record-fillet stopped, and an impression taken from the type-wheel upon a plain or printing fillet of paper, simultaneously or in rapid succession, the pressing platen-cylinder lifted from the type-wheel, the printing fillet fed forward, the slitted record-fillet again set in motion, and the type-wheel returned to its normal or first position, substantially as described.

66. The shaft j', the speed of which is adjusted to correspond with any variation in the standard length of the slits in the record-fillet, substantially as described, for the purpose specified.

67. Adjusting the speed of the shaft j' relative to the feed of the slitted record by means of the slits themselves, for the purpose of securing the proper throw of the gage-fingers within such slits to set the type-wheel, substantially as described.

68. Two gage-points, adapted to enter a slit in the record-fillet, so as to bear against its opposite ends, and, through suitable intervening mechanism, adjust the friction-wheels t' upon the grooved driving-pulley D and gear-wheel S', for the purpose of gaging the speed of the shaft j' relative to the speed of

the driving-pulley, and the consequent feed of the record, substantially as described.

69. The gage-point m''', adapted for adjustment within a slit of the record-fillet, substantially as described, for the purpose specified.

70. The combination of the adjustable stop-bar k''' and rock-shaft z'' with the gage-point m''' and friction-wheels t', substantially as described, for the purpose specified.

71. The stop-bar k''', adapted for adjustment to and from the upright q''' by means of the set-screw p''', substantially as described.

72. The coiled spring j''', combined with the shaft z'', to hold the point of the set-screw against the upright q''', substantially as described, for the purpose specified.

73. The gage-point m''', supported from the stop-bar by a spring, to prevent the back of the point from tearing the paper of the slitted record, when the stop-bar is adjusted out from the upright q''', substantially as described.

74. The set-screw r''', combined with the stop-bar and spring-support of the gage-point m''', substantially as described, for the purpose specified.

75. The rock-shaft z'', connected to the tubular bearing of the friction-wheels t' by means of the parallel arms p'' r''', and the connecting-rod b''', substantially as described.

76. The connecting-rod b''', made adjustable on the parallel arms p'' r'' to increase or diminish the movement of the friction-wheels t', when operated by the gage-points, substantially as described, for the purpose specified.

77. The combination of the spring-shears with the printing mechanism, substantially as described, for the purpose specified.

78. The combination of the guide-table q^5 with the printing mechanism, substantially as described, for the purpose specified.

79. The combination of the spring-shears with the guide-table q^5, substantially as described, for the purpose specified.

80. The combination of the gage-fingers and the pressure-roller F, connected by suitable intervening mechanism, by which the roller, when moved out from the feed-cylinder, shall return the gage-fingers to the front of the arch in the guide-bed, substantially as described, for the purpose specified.

81. The bent lever i^2 and connecting-rod h^2, in combination with the gage-fingers and pressure-roller F, substantially as described, for the purpose specified.

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Witnesses:

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