

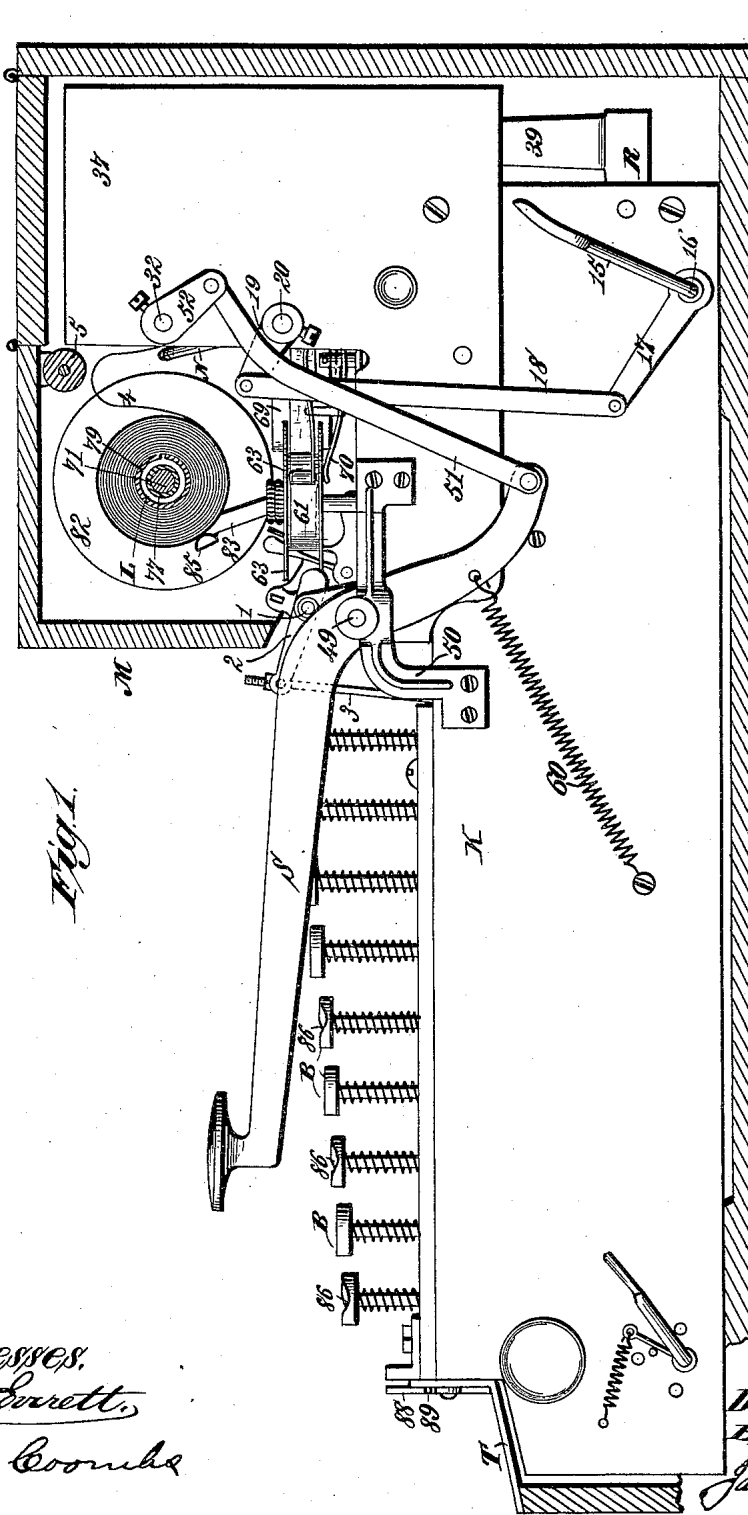
(No Model.)

4 Sheets—Sheet 1.

D. E. FELT.  
ADDING AND RECORDING MACHINE.

No. 441,233.

Patented Nov. 25, 1890.



*Fig. 1.*

*Witnesses,*  
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*Att'y.*

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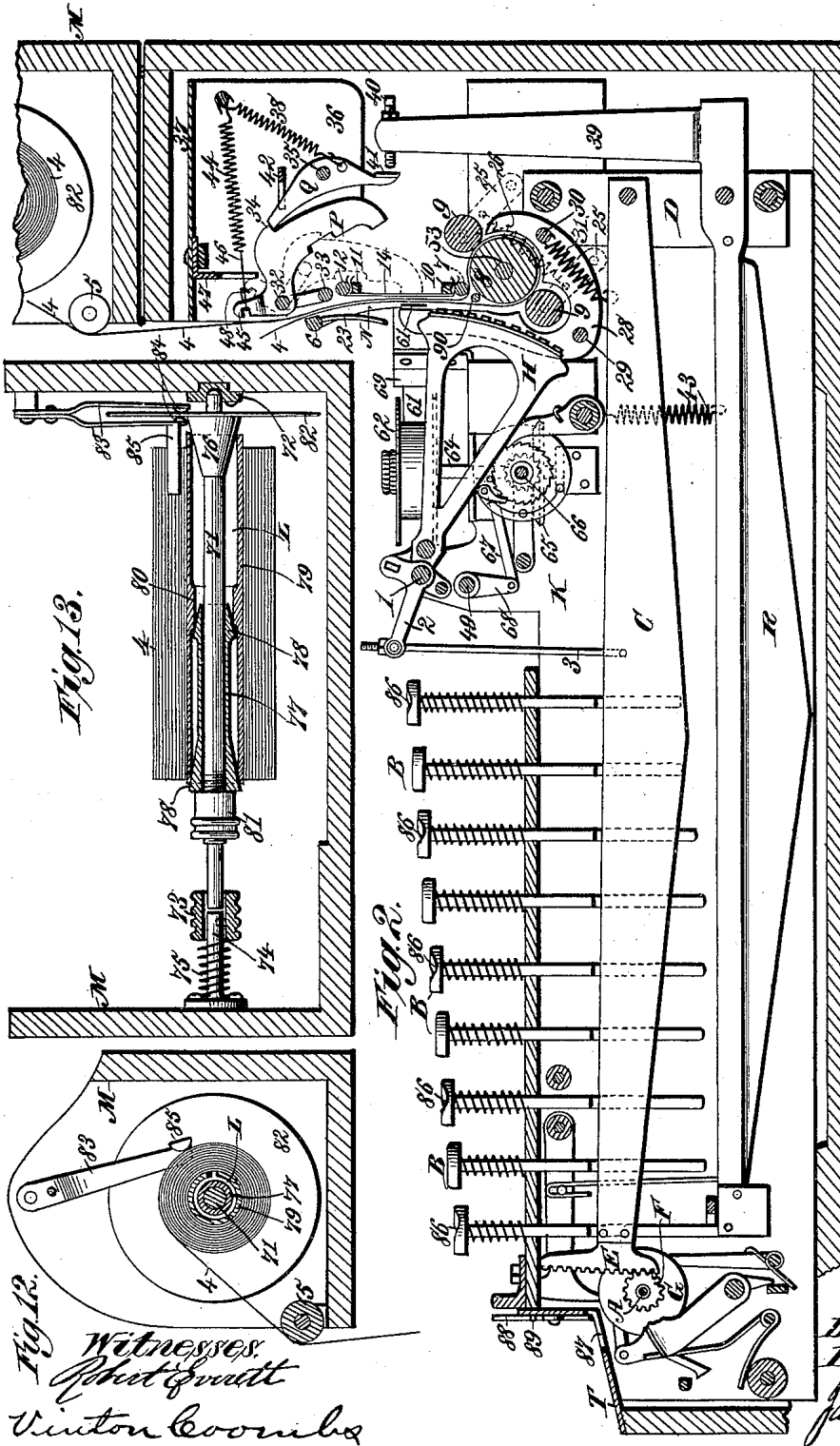


Fig. 12.  
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(No Model.)

4 Sheets—Sheet 3.

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Fig. 3.

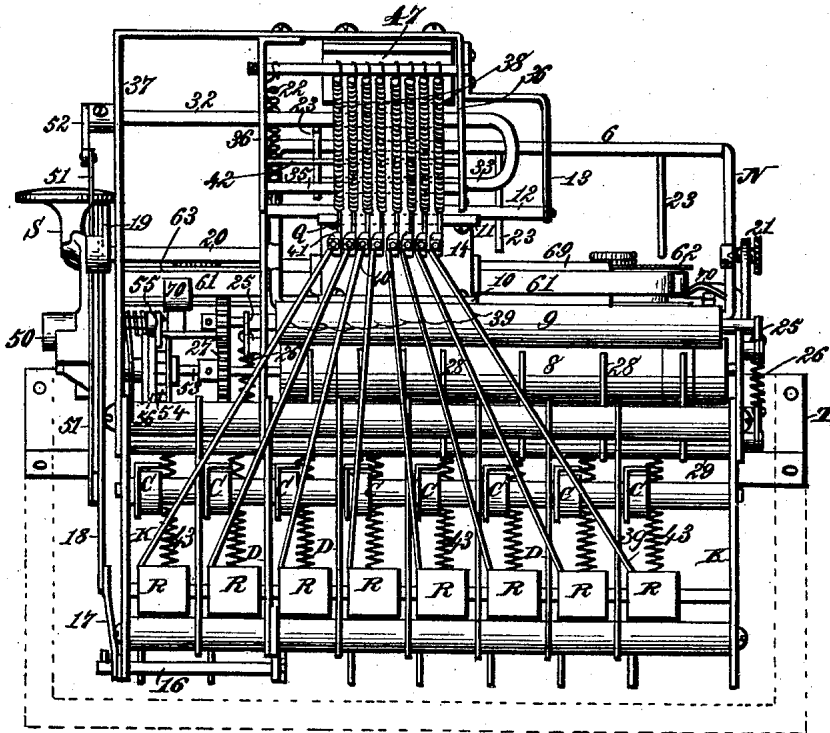
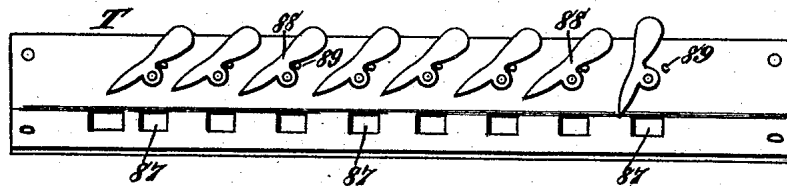


Fig. 4.



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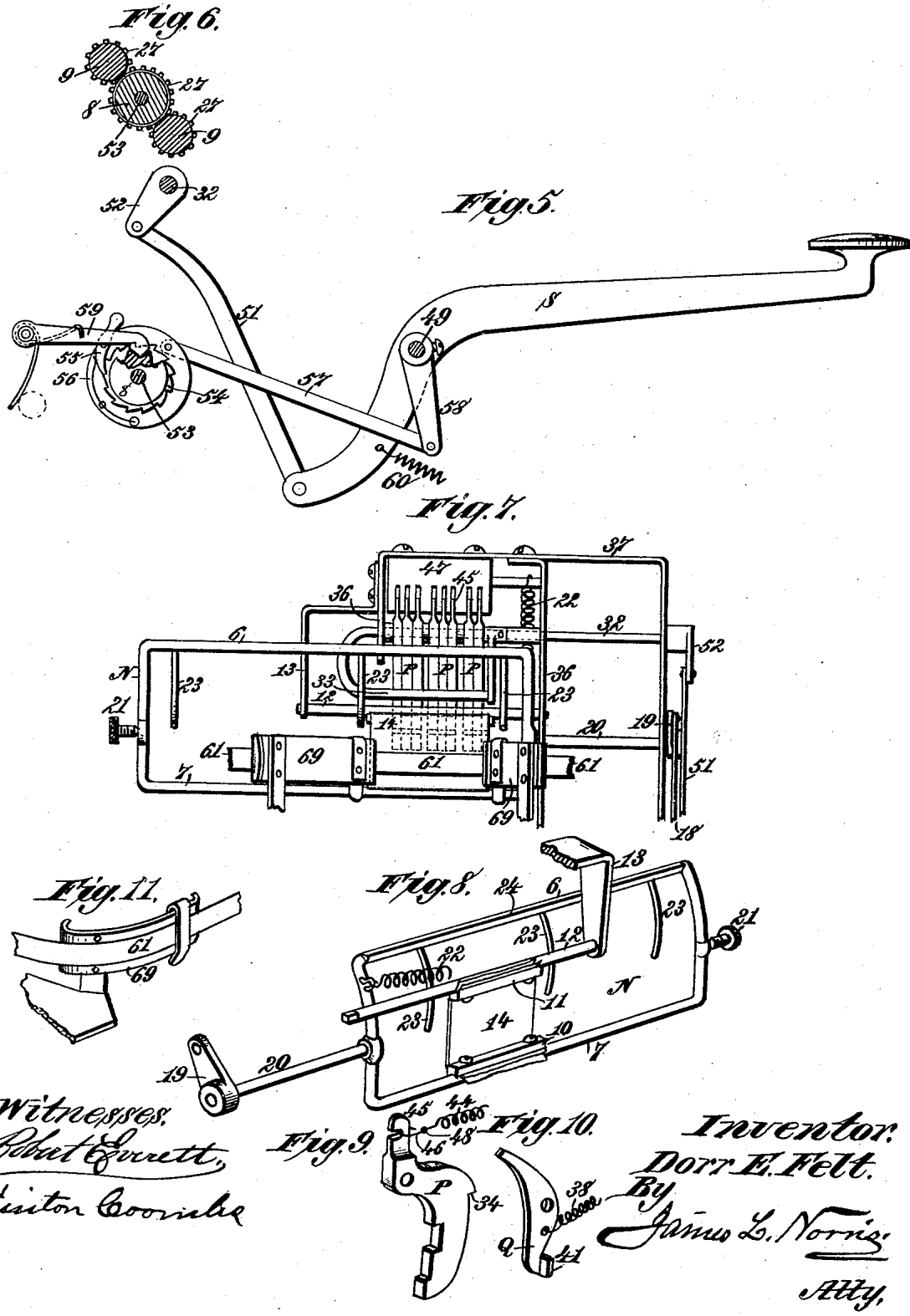
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4 Sheets—Sheet 4.

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ADDING AND RECORDING MACHINE.

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# UNITED STATES PATENT OFFICE.

DORR E. FELT, OF CHICAGO, ILLINOIS.

## ADDING AND RECORDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 441,233, dated November 25, 1890.

Application filed September 28, 1889. Serial No. 325,393. (No model.)

*To all whom it may concern:*

Be it known that I, DORR E. FELT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Adding and Recording Machines, of which the following is a specification.

The object of my invention is to improve the construction of adding-machines, especially with reference to their recording mechanism and the means for restoring the power of a series of hammers, by which the impression of the recording type-heads is produced on a moving strip of paper that is advanced at suitable intervals by means of a lever which is separate from the operating-keys of the machine, and which lever also sets the hammers and actuates the inking-ribbon.

The invention consists in the construction and combination of parts hereinafter described and claimed.

In the annexed drawings, illustrating the invention, Figure 1 is a side elevation of an adding-machine embodying my improvements, and shows the outer casing in section, with the hinged portion, that contains the paper-holding drum, turned down and closing the rear upper part of the case. Fig. 2 is a central longitudinal section of the machine. Fig. 3 is a rear elevation of the rear end of the machine with the case shown in broken lines. Fig. 4 is a view of a register or sight-plate attached to the front end of the machine. Fig. 5 is a detail view of a lever and its connections for actuating the the paper-feeding mechanism and for setting back the hammers after the type-heads have printed the record. Fig. 6 is a cross-section of the feed-roller and the pressure-rollers geared therewith. Fig. 7 is a front view of the hammers and their setting mechanism, and shows also a front view of a paper holding and guiding frame. Fig. 8 is a perspective view of the paper holding and guiding frame with attached buffer. Fig. 9 is a view of one of the hammers. Fig. 10 is a view of one of the hammer-catches. Fig. 11 is a view of one of the ink-ribbon guides. Fig. 12 represents a transverse section of the expandible paper-holding drum with the roll of paper thereon, and shows also the brake devices for controlling the delivery of the paper strip at a uniform tension as the diameter

of the paper roll decreases. Fig. 13 shows a longitudinal section of the same.

The drawings illustrate a calculating-machine of that class in which, on a suitable shaft A, is mounted a series of numeral-wheels, (not shown,) each of which stands for an order of numbers, or for fractions.

The construction and operation of the calculating mechanism, including the numeral-wheels and the stops and detents connected therewith, and the devices for setting the numeral-wheels in proper position before commencing an operation, so that they will all indicate nothing, is substantially the same as in the arrangement of like devices for such purposes shown and described in my former patent, No. 371,496, dated October 11, 1887, and in an application, Serial No. 302,549, filed by me March 8, 1889, and therefore a particular description of said adding or calculating mechanism is deemed unnecessary.

The letter B designates the operating-keys, of which there are several series, one series being provided for each order of numbers. Each of these keys is distinguished from others of the same series by one or more numerals marked on its face, as shown in my said former patent and application. The keys B are provided with stems that are adapted to engage and depress a lever C, one of which is provided for each series of keys. These levers C are pivotally supported at their rear ends in a frame D, and to the forward end of each lever is attached a segment E, that meshes with one of a series of pinions F on the shaft A, that supports the numeral-wheels. Each pinion F is integral with and actuates one of the numeral-wheels by means of an intermediate pawl-and-ratchet mechanism, (not shown,) the arrangement and operation of said parts being the same as shown and described in my before-mentioned application.

The recording or printing mechanism, to which my present invention more particularly relates, comprises a series of oscillatory type-heads H, having numerals arranged thereon to correspond with those on the numeral-wheels and on the operating-keys. These type-heads H are pivoted on a shaft I, supported in a frame K, and are connected

with the levers C by means of bell-cranks 2 and vertical rods 3, the latter being adjustably connected at their upper ends with said bell-cranks and having their lower ends pivoted to the lever C, whereby the downward movement of said levers when pressed on by one of the operating-keys B will move the connected numeral-wheel and type-head in a corresponding degree, the distance that each type-head is moved being controlled by the distance the struck key moves the lever C, so that the descent of each key will move a type-head sufficiently to bring the numeral on said type-head corresponding to that on the struck key in position to print or record said numeral, as hereinafter explained.

The paper strip 4, on which the record is to be printed, is wound on an expansible drum L, Figs. 1, 12, and 13, mounted in a hinged section M of the upper rear portion of the machine-casing. The free end of the paper strip 4 is passed down in front of a guide-roller 5, as shown in Fig. 2, and made to pass behind the upper horizontal bar 6 and in front of the lower horizontal bar 7 of a rectangular paper holding and guiding frame N, Fig. 8, that is pivotally supported in a transverse position in the rear part of the machine. After passing down through the frame N, the paper strip 4 is carried around a feed-roller 8 between said feed-roller and a pair of pressure-rollers 9, Figs. 2, 3, and 6, and its free end is thence returned upward through the frame N in front of the descending portion of said strip, as shown in Fig. 2.

The lower horizontal bar 7 of the frame N is provided with a clamp 10, and a similar clamp 11 is attached to a stationary transverse shaft 12, supported in a fixed hanger or bracket 13, as shown in Figs. 2, 3, 7, and 8. By means of these clamps 10 and 11 a strip or sheet of rubber 14 or other elastic material is supported at the rear of that portion of the paper strip 4 which is contained in the frame N, as shown in Fig. 2.

In order to properly place the paper strip 4 in the frame N and around the feed-roller 8, the upper end of said frame is tilted forward and its lower end thereby carried backward by drawing forward a lever 15, Fig. 1, attached to a rock-shaft 16, Fig. 3, having an arm 17, that connects by means of a link 18 with an arm 19 on a shaft 20, attached to one end of said frame N, which is pivotally supported by means of said shaft 20 at one end and an adjustable pivot-screw 21 at the other end. While the frame N is tilted forward by means of the lever 15 and intermediate connections, the paper strip 4 can be readily adjusted in said frame and around the feed-roller 8, and when the lever 15 is released a spring 22, Figs. 3, 7, and 8, will return said frame to its normal position, as shown in Fig. 2.

A series of depending forwardly-curved fingers 23 may be attached to the upper horizontal bar 6 of the frame N to prevent the front portion of the paper strip 4 from pass-

ing forward beneath the bar as said front portion of the strip ascends, and I prefer to provide the rear of said bar 6 with a knife-edge 24, against which the upper portion of the paper strip, with the record printed thereon, can be torn off at intervals after each complete operation.

The pressure-rollers 9, that coact with the feed-roller 8, are mounted in pivoted arms 25, connected by springs 26, whereby said pressure-rollers are held in yielding contact with the feed-roller. The shafts of the rollers 8 and 9 are connected by gears 27, Figs. 3 and 6, for transmitting a positive movement to the pressure-rollers from the feed-roller, to which the necessary power for feeding the paper strip is applied at suitable intervals, as hereinafter explained.

Beneath and in front of the feed-roller 8 and pressure-rollers 9 is a series of yoke-shaped guards 28 to guide the paper strip around the feed-roller 8 when said strip is first inserted, and to prevent the ascending portion of said strip from passing forward when it leaves the feed-roller, and to thus guide it upward at the rear of the type-heads H and through the frame N, in which said strip is adjusted. These guards or guides 28 are supported on transverse rods 29 and 30, of which the rear rod 30 also serves as a point of attachment for the springs 31, by which the levers C are returned to normal position after having been depressed by the operating-keys.

The impression of the required type-head numerals or other characters in their proper position on the paper strip 4 is effected by means of a series of hammers P, Figs. 2 and 9, one of which is provided for each order of numbers to be recorded. These hammers P are loosely mounted near their upper ends on a rock-shaft 32, having a depending transverse hammer-setting arm 33, by which the hammers are returned to their normal position after pressing the paper strip against the type-head.

On the rear of each hammer P is a shoulder 34 for engaging the upper end of one of a series of hammer-catches Q, fulcrumed on a transverse shaft 35, that is supported in plates or hangers 36, depending from a frame 37, inclosed in the machine-casing. These hammer-catches Q are held in engagement with the retracted hammers P by means of springs 38 until one of the operating-keys B is depressed. As the key B descends and actuates one of the levers C and the connected numeral-wheel and type-head, the lower end of the key-stem comes in contact with and depresses one of a series of vibrating levers R, the rear ends of which are pivotally supported in the frame D, as shown in Figs. 2 and 3. Each of these vibrating levers R carries at its rear end a vertically and inwardly inclined arm 39, provided at its upper end with a horizontal adjustable screw-stud 40, that is arranged to bear against a shoulder or

flange 41 on the lower part of the hammer-catch Q, and thereby trip said catch and release the engaged hammer P at the moment that the operating-key B completes its downward movement.

At the rear of the series of hammer-catches Q is a toothed guide-bar 42, Figs. 2 and 3, that holds the said catches a proper distance apart on the shaft 35 and prevents them from being thrown too far backward when they are tripped.

To each of the vibrating levers R is attached a spring 43, by which said levers are raised after tripping the hammer-catches.

When the hammer P is released from its engagement with the catch Q, as above described, the lower end of said hammer is thrown forward by the tension of a spring 44, connected with a lug 45 on the upper end of the hammer. As the hammer P is released and thrown forward its lower end comes in contact with the flexible or elastic buffer strip or sheet 14, and thereby forces the paper strip 4 against the type-head and inked ribbon to receive the required impression of the numeral that is opposite the lower or striking end of said hammer. In this operation the elastic buffer 14 preserves the paper strip 4 from injury by the hammer, and assists in producing a clear and uniformly legible impression of the type-head numerals. Each spring 44 is connected with its appropriate hammer by a piece of straight wire 46, that is passed between the depending teeth of a toothed guide-bar 47, and in each straight piece of wire is provided a knot 48 or other suitable stop to engage the toothed guide-bar 47 and relieve the hammer from the tension of the spring 44 just before the hammer reaches the end of its stroke, thereby allowing the hammer to yield slightly after delivering its blow, and thus prevent it from obstructing the subsequent movements of the type-head and ribbon. After each line of the record is completed the paper strip 4 can be advanced and the hammers P set for further operation by pressing down a lever S, which is fulcrumed at 49 in a bracket 50, Fig. 1, at one side of the machine. The lever S connects by means of a link 51, Figs. 1 and 5, with an arm 52, adjustably secured to one end of the rock-shaft 32, that carries the arm 33 for setting back the hammers. When the lever S is depressed, the arm 33 lifts those hammers that have been released in the previous operation of the machine and causes them to engage their respective hammer-catches, at the same time restoring the power of the springs 44, by which the hammers are to be subsequently actuated when their catches are again tripped.

On the shaft 53 of the feed-roller 8 is secured a ratchet-wheel 54, Fig. 5, through which said feed-roller and connected pressure-rollers 9 are actuated by means of a spring-pawl 55, carried by a disk 56, loosely mounted on the shaft 53 and driven by a link 57, con-

nected with an arm 58 on the fulcrum 49 of the lever S, as shown in Fig. 5. In order to check the rotation of the feed-roller 8 and prevent the paper strip 4 from being advanced too far, a spring-brake 59, Fig. 5, is provided.

It is obvious that by imparting a succession of downward strokes to the lever S the paper strip 4 can be advanced as far as may be required, either in the act of adjusting it in the frame N or in the subsequent operation of the machine. After each downward stroke of the lever S it is returned by a spring 60, Fig. 1, and in its upward movement it actuates the mechanism that applies ink to the type-heads.

The inking mechanism, like that shown and described in my former application, Serial No. 302,549, comprises an inked ribbon 61, mounted on spools 62 and 63, Figs. 1, 2, and 3. The spool 62 is provided with a shaft 64, to which is secured a beveled gear 65, meshing with a pinion on a shaft 66, provided with a pawl-and-ratchet mechanism that is connected by a link 67 with an arm 68, secured to the fulcrum or shaft 49 of the lever S, so as to be actuated therefrom on the upward stroke of said lever, as before mentioned. The inked ribbon 61 is provided with guides 69, Figs. 2, 7, and 11, and the ribbon-spools 62 and 63 are provided with friction devices or brakes 70, Figs. 1 and 3, substantially the same as in my said former application. The rotary expansible drum L, Figs. 1, 12, and 13, that holds the paper roll 4, is of such construction as to be capable of delivering the paper strip at a uniform tension whether the diameter of the roll is large or small. This drum L comprises a central shaft 71, that is supported at one end in a fixed bearing 72, and at its other end in a movable or yielding bearing consisting of a knurled sleeve or coupling 73, keyed to the end of a fixed stud 74, on which is a coiled spring 75, that forces said coupling into engagement with the drum-shaft. On one end of the drum-shaft 71, adjacent to the fixed bearing 72, is a cone 76, integral with said shaft. A longitudinally-movable sleeve 77, having a cone 78 at each end, is mounted on the drum-shaft near its other end. These cones 76 and 78 support a longitudinally-split tube 79, which is provided with a central internal shoulder 80 to contact with the cone on the inner end of the movable sleeve 77, as shown in Fig. 13. A portion of the shaft 71 is screw-threaded for engagement with a nut 81, by which the sleeve 77 can be forced inward along the shaft 71 and within the split tube 79, so as to expand said tube within the roll of paper 4, and thereby hold said roll firmly. When the sleeve 77 is forced inward, the cone at its inner end comes in contact with the shoulder 80, and not only expands the tube 79 at that point, but forces it along and onto the cone 76, so that by thus applying the power at both ends and at the center of the tube it will be expanded uni-

formly throughout its length. It will be understood, of course, that in rotating the nut 81 to move the sleeve 77 inward, and thus expand the split tube 79 within the paper roll 4, care must be taken to move the nut and parts actuated thereby only slightly or to a sufficient extent merely to cause the roll of paper to be held firmly without risk of splitting or tearing it by the expansion of the drum.

A friction-disk 82 is secured to the drum-shaft 71 adjacent to the large outer end of the cone 76, and has both sides in frictional contact with the brake or retarding device consisting of two depending arms 83, riveted together and pivotally supported at their upper ends. These depending or swinging brake-arms 83 are slightly bent in opposite directions, so that one will hang on each side of the friction-disk 82, as shown in Fig. 13, and on the lower end of each arm is a button or projection 84, that is in direct frictional contact with either side of the disk. The inner one of these arms 83 is provided with a laterally-projecting brake bar or shoe 85, that is always in direct contact with the outer periphery of the paper roll 4, the arms 83 being actuated by the rotation of the disk 82 in such a manner that as the diameter of the paper-roll gradually diminishes the roll will be followed immediately by the brake bar or shoe 85, as the arms 83 tend to swing toward the axis of the drum L under the frictional action of the rotating disk. This action of the disk 82 and brake-arms 83 in maintaining the brake bar or shoe 85 in constant contact with the periphery of the paper roll and causing the paper strip to be delivered at a uniform tension, notwithstanding the gradual decrease in its diameter, results from the manner of pivoting the arms 83 a suitable distance above and in vertical line with the drum shaft or axis, while the lower ends of said arms are arranged to be in frictional contact with the disk 82 at a point above the horizontal plane of the drum-shaft, but always in such position that they cannot be moved above and beyond the roll of paper by the forward rotation of the disk. It will thus be seen that by this construction and arrangement of brake mechanism a uniform leverage is maintained, so that the paper strip will always be delivered freely and at the same tension.

It will be seen that by swinging the pivoted brake-arms 83 upward and pressing back the knurled sleeve 73 against the tension of its spring 75 the expansible drum L and roll of paper thereon can be readily removed and replaced, as required.

By referring to Fig. 2 it will be seen that the keys B of every alternate row are formed with irregularly-concaved faces 86, that enable them to be readily distinguished from the ordinary plane-faced keys of adjacent rows by the sense of touch, and thus warn the operator in the event of his striking a key in the wrong transverse row. The odd-number

keys are preferably provided with irregular faces and the even-number keys with plane faces. This arrangement of keys facilitates rapid operation of the machine, and greatly reduces any liability of error in manipulating the keys.

To the front end of the machine frame or casing is secured a transverse register or sight plate T, Fig. 4, having a series of openings 87, through which any one of the characters on the numeral-wheels can be observed, and above these openings are pivoted a number of pointers 88—one for each numeral wheel or order of numbers. At the side of each pointer or index-finger 88 is a stop 89, to support the pointer when it is turned aside and not in use. The shape and distribution of weight in each pointer is such that it will maintain the position to which it is turned either when in use or while turned aside. These pointers or index-fingers are employed to point off decimals during the course of various computations for which the machine is adapted.

If desired, a stationary transverse shaft 90, Fig. 2, may be arranged beneath the paper holding and guiding frame N between the feed-roll 8 and the front portions of the guides 28 to prevent any tendency to a backward buckling of the front portion of the paper strip 4 during its upward advance.

What I claim as my invention is—

1. The combination, with a series of oscillatory recording type-heads H, keys B, and levers C, of a series of pivoted hammers P, a series of hammer-catches Q, and a series of vibratory levers R, having arms 39, adapted to trip said hammer-catches and release the hammers, substantially as described.

2. The combination of the pivoted hammers P, hammer-catches Q, springs 38 and 44, and the vibratory levers R, having arms 39, substantially as described.

3. The combination of the hammers P, having shoulders 34 and lugs 45, the hammer-catches Q, having flanges or shoulders 41, the springs 38 and 44, and the levers R, having arms 39, provided with studs 40, substantially as described.

4. The combination, with the hammers P and the springs 44, having straight wires 46 provided with stops 48, of the toothed guide-bar 47, substantially as described.

5. The combination, with the hammers P and hammer-catches Q, having springs 38, of the toothed guide-bar 42, substantially as described.

6. The combination, with the spring-actuated hammers P and hammer-catches Q, of the vibratory levers R, having arms adapted to trip said hammer-catches and release the hammers, substantially as described.

7. The combination, with a series of type-heads H and a series of hammers P, of a paper holding and guiding frame N and the rubber sheet 14, attached to said frame, substantially as described.



8. The combination of the tilting frame N, having horizontal bars 6 and 7, the stationary shaft 12, the rubber sheet or buffer 14, and the clamps 10 and 11 for attaching said sheet to the bar 7 and shaft 12, substantially as described.

9. The combination, with the feed-roller 8, of the tilting paper holding and guiding frame N, having horizontal bars 6 and 7, and shaft 20, the arm 19 on said shaft, the link 18, and the rock-shaft 16, having arm 17 and lever 15, substantially as described.

10. The combination, with the tilting paper holding and guiding frame N, having shaft 20, of the rock-shaft 16, having arm 17, the lever 15, the link 18, the arm 19, and the spring 22, substantially as described.

11. The combination, with the tilting frame N, having a cross-bar 6, provided with depending fingers 23 and knife-edge 24, of a lever and connections for tilting said frame, substantially as described.

12. The combination, with the feed-roller 8 and pressure-rollers 9, of the tilting frame N, substantially as described.

13. The combination of the frame N, the feed-roller 8, the pressure-rollers 9, and the guides or guards 28, located beneath and in front of said rollers and extended upward in front of said frame, substantially as described.

14. The combination, with the hammers P and the rock-shaft 32, having a hammer-setting arm 33, of the arm 52, the link 51, and the lever S, substantially as described.

15. The combination, with the feed-roller 8 and pressure-rollers 9, geared together, and the shaft 32, having a hammer-setting arm 33, of the lever S, connected with said feed-roller and hammer-setting devices, substantially as described.

16. The combination, with the type-heads, the inking mechanism, the paper-feed roll 8, and the hammer-setting devices, of the lever S, connected with the inking mechanism, feed-roll, and hammer-setting devices, and provided with a spring 60, substantially as described.

17. The combination, with a paper-delivering drum having a friction-disk 82, of a brake-arm 83, pivotally supported above and in a vertical line with the axis of the drum, and provided at its lower end with a button or projection 84 in frictional contact with said disk above the horizontal plane of the drum shaft or axis, substantially as described.

18. The combination, with a paper-delivering drum having a friction-disk 82, of a pivoted brake-arm 83, having a horizontal shoe or brake-bar 85, and provided with a projection 84 in frictional contact with the disk above the horizontal plane of the drum-shaft, substantially as described.

19. The combination, with the paper-delivering-drum having a friction-disk 82, of the brake-arms 83, pivotally supported above the drum and provided with projections 84 in frictional contact with opposite sides of said disk above the horizontal plane of the drum shaft or axis, substantially as described.

20. The combination, with the register-plate T, having a series of openings 87, corresponding with the numeral-wheels, of a series of pointers or index-fingers 88, pivoted above said openings, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

DORR E. FELT.

Witnesses:

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JAMES L. NORRIS.