

Nov. 18, 1924.

1,516,200

E. L. MOONEY ET AL

TRANSFER PRINTING MACHINE

Filed Jan. 21, 1924

8 Sheets-Sheet 1

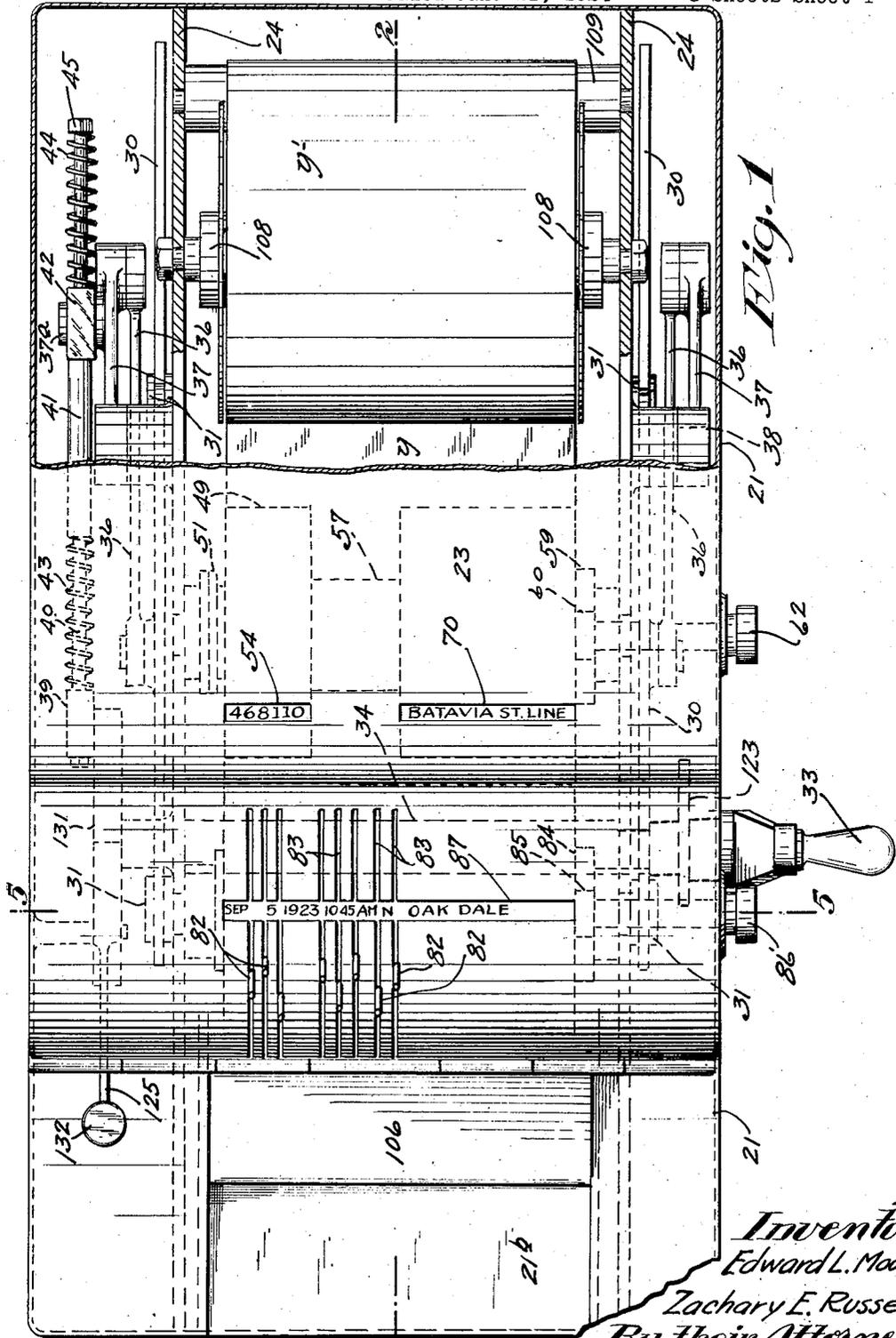


Fig. 1

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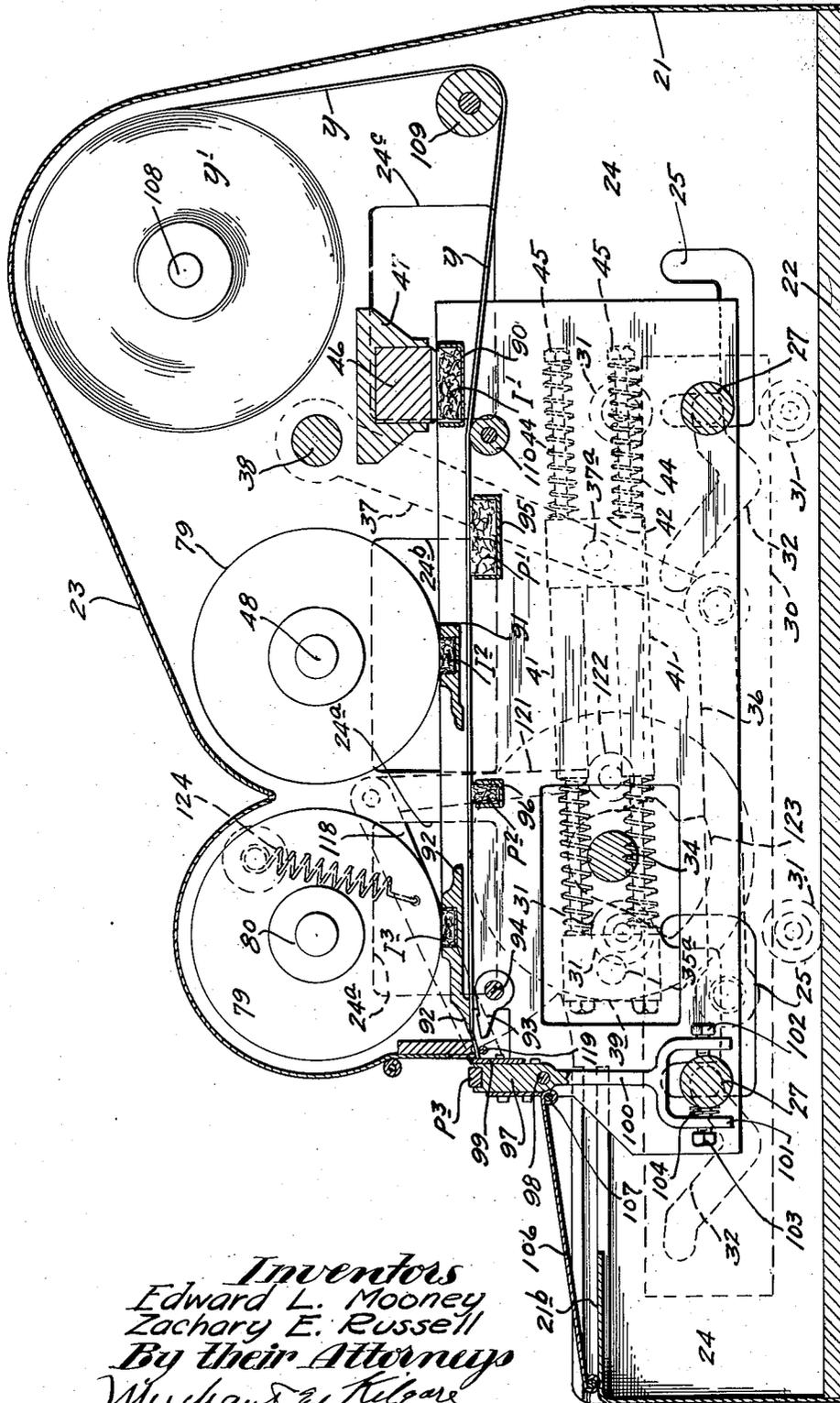
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8 Sheets-Sheet 2

Fig. 2



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8 Sheets-Sheet 3

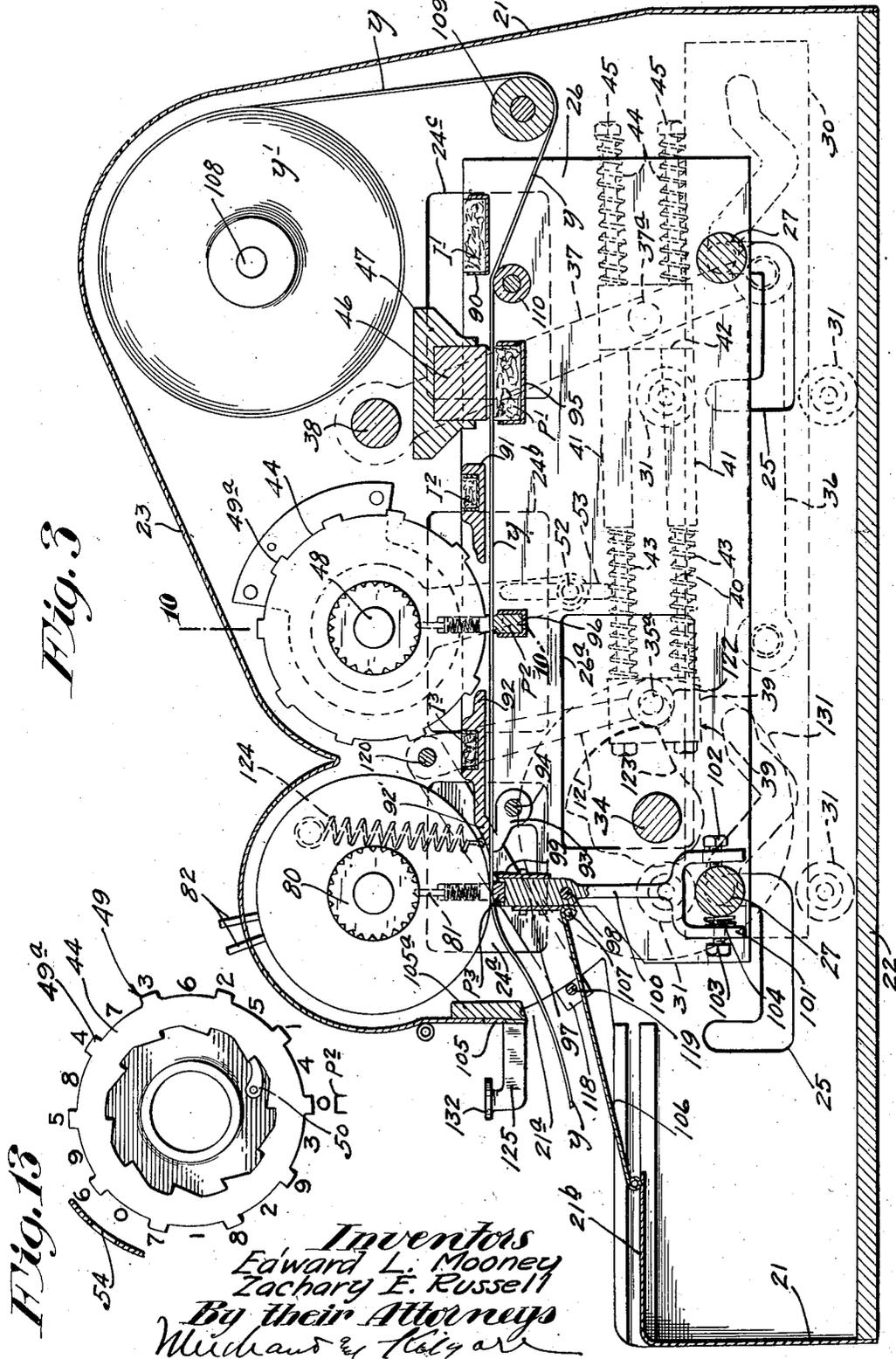


Fig. 3

Fig. 13

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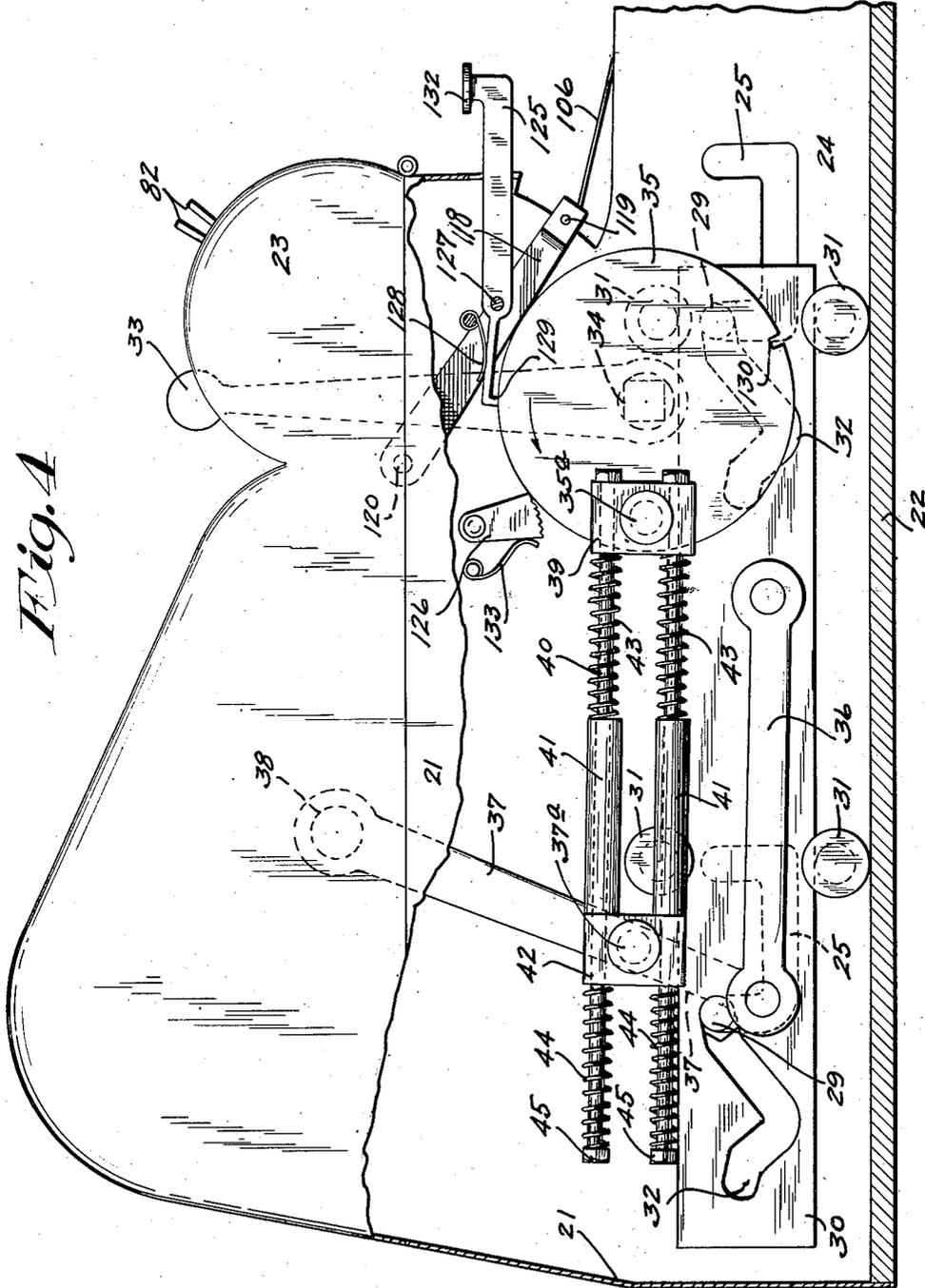
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8 Sheets-Sheet 4

Fig. 4



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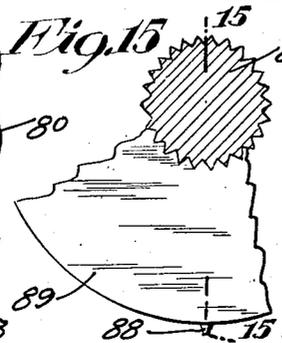
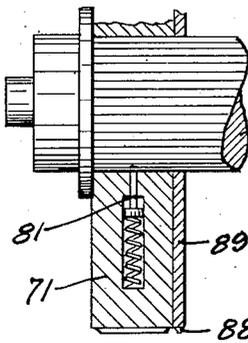
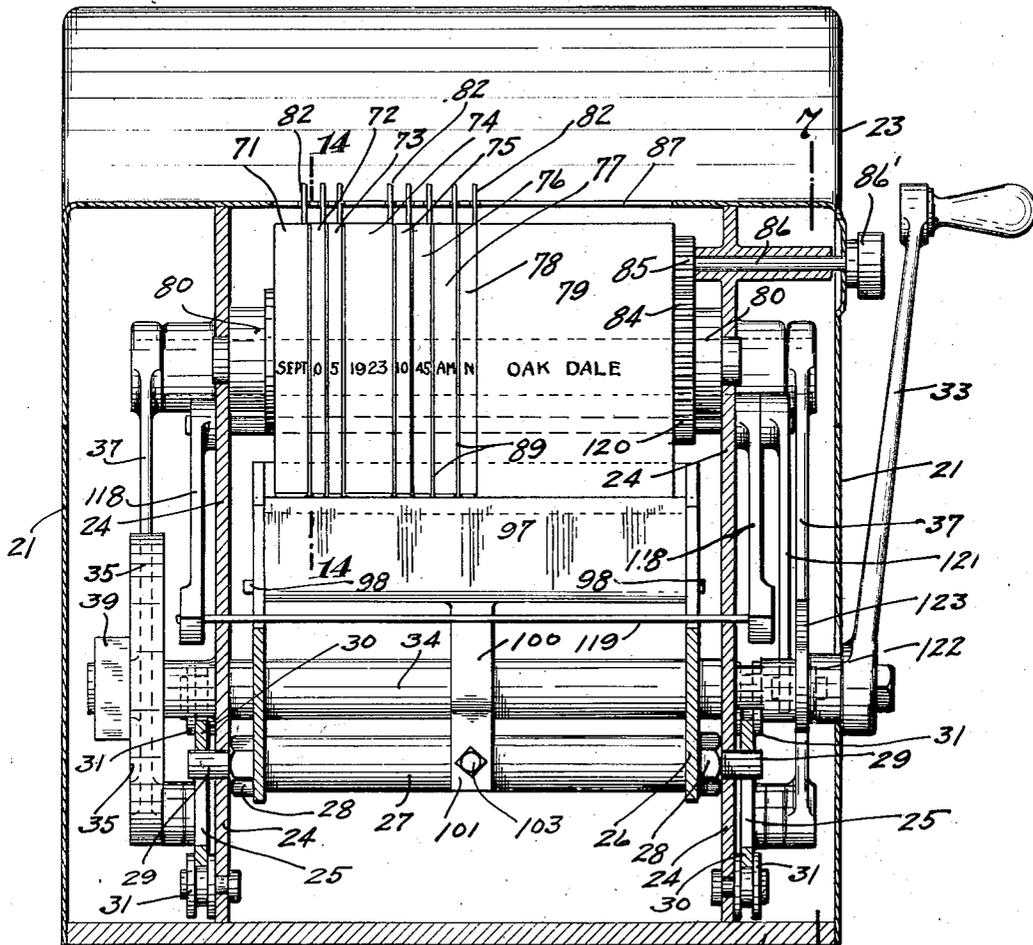
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8 Sheets-Sheet 5

Fig. 5



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Fig. 18

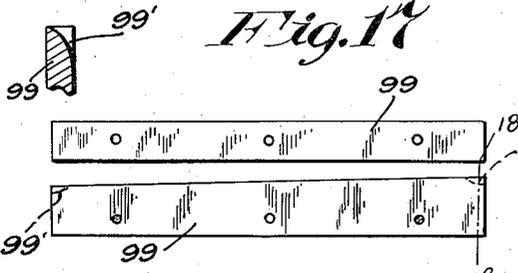


Fig. 17

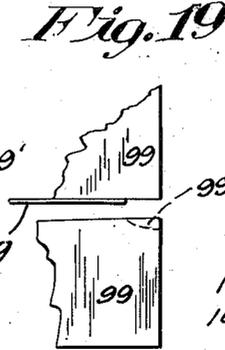


Fig. 19

Fig. 16

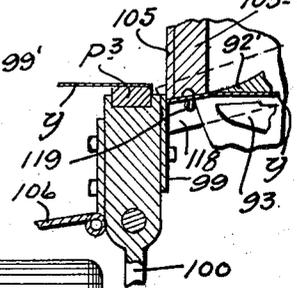
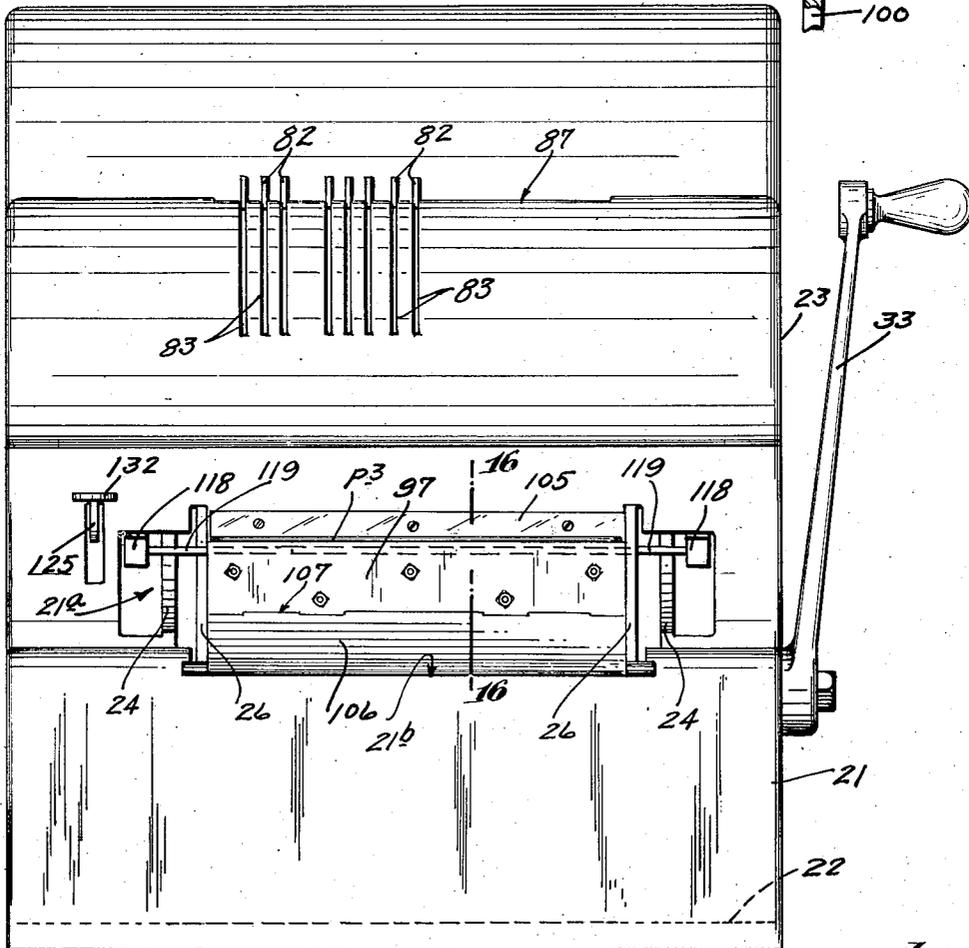


Fig. 6



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Fig. 20

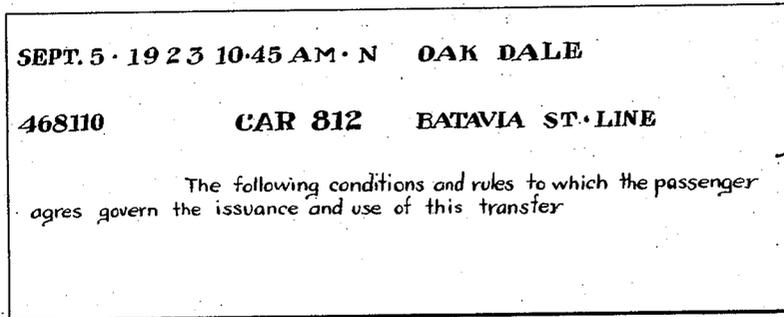


Fig. 10

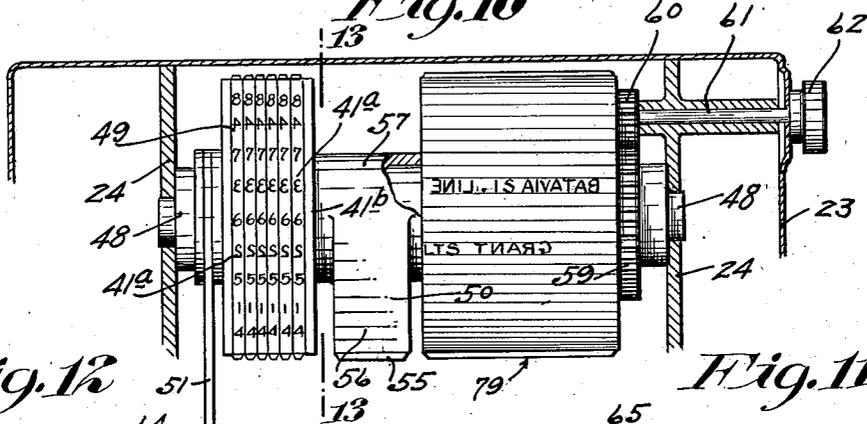


Fig. 12

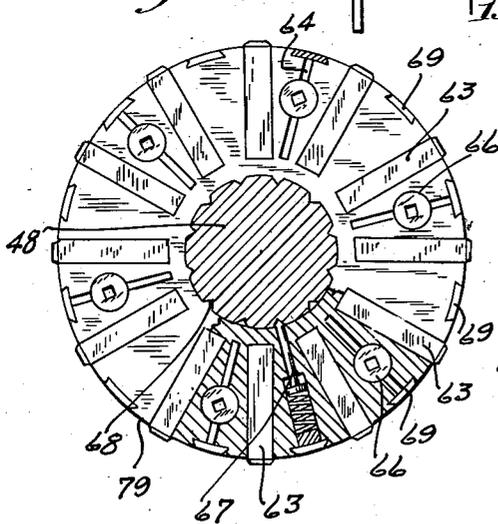
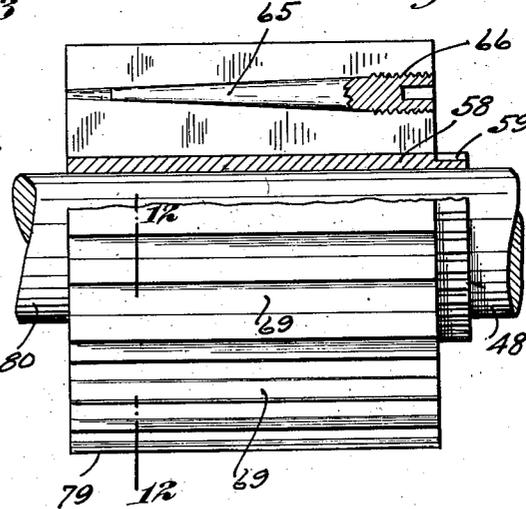


Fig. 11



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UNITED STATES PATENT OFFICE.

EDWARD L. MOONEY, OF MINNEAPOLIS, AND ZACHARY E. RUSSELL, OF ST. CLOUD,
MINNESOTA.

TRANSFER-PRINTING MACHINE.

Application filed January 21, 1924. Serial No. 687,424.

To all whom it may concern:

Be it known that we, EDWARD L. MOONEY and ZACHARY E. RUSSELL, citizens of the United States, residing, respectively, at Minneapolis and St. Cloud, in the counties of Hennepin and Stearns and State of Minnesota, have invented certain new and useful Improvements in Transfer-Printing Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Broadly considered, our invention relates to machines for the printing of tickets, the subject-matter or data of which is subject to continuous or frequent change. The tickets known as transfers, issued by street railway companies, afford a good illustration of continuous or very frequent change in the printed data or conditions which, in actual business, must be met and indicated.

The transfers generally issued by street railway companies contain a large amount of printed matter, which is given significance by punch holes produced at the appropriate places. For instance, by six punch holes produced at different places in a transfer, the transfer may be made to indicate the month, the day of the month, the hour, A. M. or P. M., the direction of car travel, and the point of transfer. Such transfers also contain a printed statement of the conditions under which the transfer is issued and the name of the car line on which the transfer is to be used, which two subjects are unchanging but require the transfers when once printed always to be used on the car line for which they are intended. Moreover, such transfers include a printed statement of the year of issue and the serial number of the transfer, which latter must be independently printed on the transfer in advance of its use, either daily or to correspond to certain series. The punching of such transfers requires considerable time when the conductor is busily engaged in collection of fares, and this frequently results in delays in traffic at the points of transfer. This improved machine has been especially designed to meet the conditions encountered in the printing of transfers for street rail-

way service and the production thereof at the time of delivery.

The machine will print and deliver transfers as rapidly as they can be picked up or handed out, and may be pre-set so that it will print all of the conditions above referred to and others, such as the number of the car from which issued and the serial number of the transfer issued by the particular car.

In the operation of our improved machine, the transfers are cut from a continuous paper web or ribbon, the width of which is preferably that of the length of the desired transfer; the printed matter is clearly displayed, the lines thereof extending lengthwise of the transfer; and the transfer, after printing, is cut off and delivered outside of the machine.

The printing is produced progressively and in such manner that such data as the hour and minute, date and point of transfer, which require most frequent change, may be made any instant previous to the operation of completing and delivering the transfer. The means whereby this last noted important result is obtained constitutes a vital and important feature of this invention.

The following brief statement will indicate the preferred order in which the several steps leading to this result may be carried out.

The various printing devices are disposed progressively along the line of travel of the paper web and some thereof are axially or transversely aligned, or, in other words, located side by side. The first printing operation will, for example, print the unchanging or less frequently changing data, such as a statement of the conditions and rules under which the transfers are issued. The second printing operation will print the serial number of the transfer, the car number and the name of the car line on which the car is running. The third printing operation will print the year, month, day, time, (in hours and minutes), direction of the car's travel, and the name of the transfer point. The knife or shearing device for cutting off the printed transfer is arranged to perform its cutting operation as a step

that closely follows the completion of the third noted printing operation, so that up to almost the very instant of cutting off the transfer, the frequently changing data printed by the third printing operation may be changed, at will, and this, as is evident, prevents wasting of transfers.

The printing devices above referred to are of such size that they cannot be closely assembled and cannot be assembled anywhere nearly as closely as the lines must be printed on the transfer and, for this reason, the above outlined progressive printing operation is highly important.

All of the above noted printing devices, except the first, which prints conditions that seldom if ever change, are arranged for quick readjustment or setting. Also, the machine involves highly important mechanical features whereby the functions above noted are carried out automatically with properly timed actions and whereby the paper web is automatically fed step by step the proper distance to present the successive transfers to the printing and shearing devices.

The accompanying drawings illustrate an operative machine embodying our invention as above generally outlined.

Referring to said drawings, wherein like characters indicate like parts throughout the several views,

Fig. 1 is a plan view of the complete machine, some parts being broken and some parts being in horizontal section;

Fig. 2 is a vertical section on the line 2—2 of Fig. 1, viewing the parts from the right-hand side toward the left-hand side of the machine and showing the parts in what is treated as the normal position or position in which they remain at rest at the completion of a cycle of operation;

Fig. 3 is a view corresponding to Fig. 2 but showing the movable parts in a position extreme in respect to the positions shown in Fig. 2;

Fig. 4 is a left-side elevation of the machine, some parts broken away and some parts in vertical section;

Fig. 5 is a transverse vertical section taken approximately on the line 5—5 of Fig. 1, looking from the front toward the rear of the machine;

Fig. 6 is a front elevation of the machine; Figs. 7 and 8 are fragmentary sections taken approximately on the line 7—8 of Fig. 5, showing, respectively, positions of the parts corresponding to Figs. 2 and 3;

Fig. 9 is a view partly in plan but with some parts sectioned on the line 9—9 of Fig. 7;

Fig. 10 is a view partly in front elevation and partly in vertical section on the line 10—10 of Fig. 3, some parts being broken away;

Fig. 11 is a detail partly in plan, but with some parts broken away and with some parts sectioned, showing the "car line" printing device shown at the extreme right in Fig. 10;

Fig. 12 is a view partly in elevation and with some parts in section on the line 12—12 of Fig. 11;

Fig. 13 is a detail chiefly in side elevation but with some parts sectioned on the line 13—13 of Fig. 10, showing the unit member of the transfer number printing and counting device;

Fig. 14 is a fragmentary view with some parts sectioned on the line 14—14 of Fig. 5;

Fig. 15 is a fragmentary view partly in elevation and partly in vertical section on the line 15—15 of Fig. 14;

Fig. 16 is a fragmentary vertical section on the line 16—16 of Fig. 6;

Fig. 17 is a front elevation showing the two shearing blades removed from the machine;

Fig. 18 is a section on the line 18—18 of Fig. 17;

Fig. 19 is an enlarged fragmentary view in front elevation, showing the right-hand ends of the shearing blade; and

Fig. 20 is a plan view of the completed transfer.

The various parts of the mechanism are placed within a suitable casing, which, as shown, comprises a main lower shell 21 secured to a base plate 22 and provided with a hinge cover 23. Rigidly secured to the base plate 22 within the casing is a pair of parallel vertically disposed main bearing plates 24. These bearing plates 24, as shown, extend to the top of the casing and are provided with longitudinally spaced openings 24^a, 24^b and 24^c, (see particularly Figs. 2, 3, 7 and 8). Moreover, these bearing plates 24 are formed with front and rear guide slots 25 that are approximately U-shaped but are rectangular, being provided with horizontal main portions and vertically extended end portions. Located between the bearing plates 24 is a travel carriage made up chiefly of laterally spaced parallel plates 26 and front and rear connecting shafts 27. The shafts 27 have reduced threaded ends extended through the plates 26 and clamped thereto by nuts 28 and, moreover, the said reduced ends are extended beyond the nuts to provide smooth trunnions 29 that work in the U-shaped guide slots 25 of the bearing plates 24.

For operation on the carriage to produce a peculiar rectilinear movement corresponding to the guide slots 25, there is provided a pair of actuating slides in the form of cam plates 30, best shown in Figs. 2, 3, 4 and 5. These cam plates 30 are guided for true horizontal movements and held against vertical movements by suitable devices, such as

flanged rollers 31 journaled on the bearing plates 24. The cam plates 30 are provided with cam slots or channels 32 in which the projecting ends of the trunnions 29 of the carriage are arranged to work. These camways 32 are provided with approximately horizontal extremities and with approximately V-shaped intermediate portions and they bear an important relation to the guide slots 25, as will hereinafter appear.

The power for operating the machine may be either a motor or a hand-operated crank, the latter being the arrangement illustrated in the drawing. The operating lever 33 is secured to an operating shaft 34 journaled in the bearing plates 24 and extended through large openings 26^a in the carriage plates 26. The operating lever 33 is preferably at the right-hand side of the machine and the operating shaft 34 at the left-hand side of the machine has a crank in the form of a disc 35 equipped with a wrist pin 35^a, (see particularly Figs. 4 and 5).

To connect the two slides or cam plates 30 for like movements, they are connected by links 36 to a pair of parallel arms 37, the upper ends of which are rigidly secured to a rock shaft 38 journaled in the bearing plates 24. The cam plates 30 are given their reciprocating movements from the operating lever 33 through the crank disc and an elastic or longitudinally yielding pitman, preferably constructed substantially as best shown in Fig. 4. This pitman comprises a head 39 journaled on the wrist pin 35^a and provided with a pair of projecting parallel rods 40 that work telescopically through the sleeve-like portions 41 of a head 42, which latter is journaled on a wrist pin 37^a carried by one of the parallel arms 37. Coiled springs 43 are placed on the rods 40 and compressed between the head 39 and sleeves 41, and similar coiled springs 44 are placed on said rods and compressed between the head 42 and nuts 45 applied to the extreme ends of said rods. Normally, the springs 43 and 44 hold the heads 39 and 42 spaced substantially as shown in Fig. 4 and the tendency of the pitman is to operate with the heads substantially thus spaced, but there will be a yielding action that will prevent shocks and there will be compression of the springs at the extremities of the movements of the cam plates 30.

Referring to Fig. 20, which illustrates a printed transfer, attention is now called to the fact that the so-called "first" printing operation printed the matter at the bottom of the ticket, reading "The following conditions and rules to which the passenger agrees govern the issue and use of this transfer", (the rest of the printed matter being omitted from the ticket illustrated in the drawings); that the "second" printing operation printed the serial number of the

ticket, to wit: "468110", the car number, to wit: "812", and the name of the street car line on which the car is running, to wit, "Batavia St. Line"; and the "third" printing operation printed "Sept. 5, 1923; 10:45 A. M., N." and the transfer point, to wit: "Oak Dale".

The device for performing the first noted printing operation, as here illustrated, comprises a cast type bar 46 held in an inverted channel-shaped transverse bar 47, the ends of which are rigidly secured to the bearing plates 24 (see particularly Figs. 2 and 3).

For performing the above noted second printing operation, there is provided what amounts to three independent printing devices transversely aligned and located side by side, as best shown in Fig. 10, and all located on a strong non-rotary transverse shaft 48, the ends of which are rigidly secured in the bearing plates 24. The device for printing the serial number of the transfer comprises a plurality of combined printing and counting wheels 49 rotatably mounted on the shaft 48 and having the usual carrying devices provided in automatic counting or recording devices. For example, they may have the carrying means of an ordinary cyclometer, whereby the tenths are carried from a wheel of lower order to a wheel of higher order. Each wheel 49 is provided with peripheral type for printing the digits 0 to 9, inclusive, such printing type, in Figs. 10 and 13, being designated by the character 49^a. The said type 49^a are in reverse, so that they will properly print when aligned at the lowermost portions of the wheels. The unit member of the wheels 49 is provided with internal ratchet teeth adapted to be engaged by a driving dog 50 carried by an oscillatory operating lever 51, the depending end of which has a laterally projecting pin 52 (see Fig. 3), that works in a vertical slot 53 in the adjacent carriage plate 26, whereby, as will hereinafter appear, the unit member of said wheels 49 will be given one step of movement for each to and fro reciprocating movement of the carriage.

The top 23 of the casing (see particularly Figs. 1, 2 and 13), is provided with a slot 54 that affords a sight opening through which portions of the wheels 49 may be seen; and to indicate to the observer the printing type of said wheels that are turned down to the printing point, said wheels are provided between their printing type with numeral marks so arranged that the same numbers will be presented at said sight opening that were represented by the type assembled to print the serial number of the last cut off transfer.

The word "car" and the number of the car in which the transfer printing device is installed (the number of the car illustrat-

ed being "812"), will be printed by type 55 contained in a holder 56 depending from a sleeve 57 that is rigidly secured to the non-rotary shaft 48 (see particularly Fig. 5 10).

For printing the name of the car line on which the car is running, to wit: as in the illustration given, the words "Batavia St. Line", we preferably provide the printing device best shown in Figs. 1, 10, 11 and 12. This printing device comprises a cylinder 10 58 that is rotatably mounted on the non-rotary shaft 48 and at one end is provided with a spur gear 59 engaged by a pinion 60 15 on the inner end of a small shaft 61 journaled in a suitable bearing on the front bearing plate 24, extended through the casing and provided at its outer end with an operating knob 62. The cylinder 58 is provided with circumferentially spaced longitudinal 20 extended seats that receive and hold printing bars 63 having type at their outer ends arranged to print the names of various different lines onto which the car 25 is liable to be shifted.

At certain points between the type bars 53, the cylinder is formed with radial slits 64 in which are seated conical expanding pins 65 having threaded engagement with 30 correspondingly formed seats at 66.

The cylinder 58 is adapted to be rotated by manipulation of the knob 62, but to hold the same in the various different printing positions against accidental rotation, said 35 cylinder is provided with a spring-pressed retaining pin 67 (see particularly Fig. 12), the conical end of which is engageable with the conical depressions 68 formed in the non-rotary shaft 48. Between the exposed 40 type faces of the printing bars 63, the cylinder 58 is provided with dove-tailed seats that receive and detachably hold dove-tailed indicator strips 69, on the face of which are 45 letters corresponding to the type on adjacent printing bars and so arranged in respect to the sight opening 70 in the casing that the name of the street car line will appear at said opening that corresponds to the type on the down-turned bar 63 that is at 50 the printing point or at the extreme bottom of the cylinder.

The device for performing the third printing operation is best shown in Figs. 1, 3, 5, 14 and 15, and comprises rotative or 55 oscillatory cylinder sections 71, 72, 73, 74, 75, 76, 77, 78 and 79, having on their peripheries circumferentially spaced type adapted to be set to print, respectively, the month, the day of the month, the year, the hour and 60 the minute, A. M. or P. M., N. or S. or other character-indicating direction of the travel of the car, and the name of the point of transfer. These cylinder sections are all rotatively mounted on a non-rotary shaft 80 rigidly secured at its ends to the bearing 65 plates 24.

The shaft 80 is provided with longitudinal grooves and the several above noted rotary cylindrical sections 71 to 79, inclusive, are preferably provided with radially movable 70 spring-pressed retaining pins 81 (see Fig. 3), having conical ends that yielding engage said grooves. These spring-pressed retaining pins prevent accidental movements of the said rotary members but permit the 75 same to be readily moved by the application of hand power. The above noted members 71 to 78, inclusive, are provided with radially projecting fingers 82 that project through slots 83 in the top of the casing (see 80 particularly Figs. 5 and 6). For adjusting the member 79, said member, at one end, is shown as provided with a spur gear 84 that is engaged by a spur pinion 85 carried by the inner end of a short shaft 86 mounted 85 on a suitable bearing on the right-hand bearing frame 24, extended through the casing, and provided at its outer end with an operating knob 86'. The printing elements 71 to 79, inclusive, between type, have characters which, when viewed through a sight 90 opening 87 in the casing, indicate which of the type are at the printing point.

Between certain of the printed notations performed by the third printing operation, 95 it is desirable to print periods, and for this purpose, there is shown a period-printing die 88 (see Fig. 15), carried by the lower portion of spacing type or a washer 89 that is slid onto the grooved portion of the non-rotary shaft 80 and is thereby held against 100 rotation with its period-printing die always in position to print.

For inking the type of the devices for performing the above first, second and third 105 printing operations, there are provided three inking pads indicated, respectively, by the characters I¹, I² and I³; and for cooperation with the said devices for performing the first, second and third printing operations, 110 there are further provided three printing platens P¹, P² and P³. The inking pads I¹, I² and I³, respectively, are held in transverse channel plates 90, 91 and 92 rigidly secured at their ends to the upper portions 115 of the carriage plates 26. By reference particularly to Figs. 2 and 3, it will be noted that the plate 92 has a forwardly extended and slightly depressed portion 92' that affords a paper-gripping surface for 120 cooperation with underlying grapple-acting feed dogs 93 that are secured to a rock shaft 94 journaled in the upper front portions of the carriage plates 26. These feed dogs are arranged to be operated automatically by 125 means presently to be described.

The printing platens P¹, P² and P³ are preferably suitable blocks or bars securely

but detachably held in channel-shaped holders 95, 96 and 97. The bars 95 and 96, at their ends, are rigidly secured to the carriage plates 26, but the channeled holder 5 or bar 97 is mounted on a pivot shaft 98, the ends of which are secured to the front portions of the carriage plates 26. Also, this bar 97 is used as a knife carrier to which a knife or shearing blade 99 is detachably 10 secured by screws, bolts or otherwise. Further, said bar 97 is provided with depending arms 100, the lower ends of which are preferably forked, as shown, at 101 and provided in their prongs with opposing set 15 screws 102 and 103 that are engageable with the opposite sides of the front carriage tie-rod 27. A light coiled spring 104, placed around the inner ends of the set screws 103, is compressed between said tie-rod 27 and the front prongs 101 so that the set screws 20 102 will be always held against said tie-rod when the set screw 103 is set slightly out of contact with said tie-rod. The knife or shearing blade 99 is arranged to cooperate with a relatively fixed shearing blade 105 that is rigidly but detachably secured to a transverse bar 105^a, which, in turn, is rigidly secured to a transverse upper front portion 25 of the casing 21, which casing, below said fixed shearing blade, has a large opening 21^a and forward of said opening has a delivery shelf 21^b. The numeral 106 indicates a delivery deck, the upper rear edge of which is connected to the combined platen 30 and knife-carrying bar 97 by a hinge 107. The lower front edge of said delivery deck rides freely on the shelf 21^b.

The paper web or ribbon γ from which the transfers are to be produced is primarily 40 in the form of a roll γ^1 mounted on a spindle 108 detachably applied to the sides of the rear upper portion of the casing. This paper web γ is brought downward and under a guide roller 109 journaled to the rear 45 portion of the casing; and from said roller, said web is brought forward over a guide roller 110 journaled to the upper rear portions of the carriage plates 26. The web is brought forward under the three ink pad 50 holders 90, 91 and 12 and under all of the printing devices, and it is carried over the three platens P¹, P² and P³. The said web is also carried over the said dogs 93 and movable knife blade 99 and under the paper-gripping surface 92' and under the fixed 55 shearing blade 105.

By reference particularly to Figs. 16, 17 and 18, it will be noted that the cutting edges of the shearing blades 99 and 105 are 60 oblique in respect to each other, so that the cut will be produced by progressive shearing action or sort of draw cut. By reference to Figs. 17, 18 and 19, it will be noted that the cutting edge of the blade 99, at its high 65 end, is beveled at 99' so as to produce a sort

of camming action when the two shearing blades are forced into initial cutting contact and thus permitting the spring 101 to yieldingly hold the two blades tightly 70 pressed together throughout the cutting action and without danger of the two knife blades being locked at the point of initial contact.

For automatically throwing the feed dogs 75 93 into and out of operative positions, there is provided a device best shown in Figs. 7, 8 and 9, and which device comprises an arm 111 intermediately secured to one end of the shaft 94. At its intermediate portion, the rock shaft 94 is provided with an arm 112 80 that is pivotally connected to the forked end of a thrust bolt 113 that works endwise for angular movements through a guide lug 114 secured to the adjacent carriage plate 26. The bolt 113 and the arm 112 act as a sort 85 of a toggle that is movable from one side to the other of a dead center and is arranged to be yieldingly held in one extreme position or the other by a coiled spring 115 placed on the bolt 113 and compressed between its 90 head and the lug 114. When the carriage is moved rearwardly and upwardly, the rear end of the arm 111 will engage with a tripping pin 116 on the adjacent fixed bearing plate 24 (see Fig. 8), so that the feed 95 dogs 93 will then be thrown upward and caused to grip the paper web against the gripping surface 92'. When the carriage is moved forwardly and upwardly, the front 100 end of the arm 111 will be engaged with a tripping pin 117 that projects from the upper forward portion of the adjacent fixed bearing plate 24, so that the feed dogs will then be thrown downward or out of contact with the paper web, thereby releasing 105 the latter (see Fig. 7).

Releasing of the feed dogs from the paper web, as just above stated, prevents the paper web from being dragged backward by the dogs, but to positively hold the paper web 110 against return movement, while the carriage is being moved downwardly, rearwardly, and then upwardly, there is provided a retaining gripper, preferably made up of a pair of arms 118 and a transverse clamping 115 rod or bar 119, which latter is connected to the free ends of said arms. The said elements 118 and 119 make up a sort of a bale. The arms 118 are rigidly secured to a transverse rock shaft 120 that is journaled in 120 the fixed bearing plates 24. At one end, this rock shaft 120 is provided with a depending arm 121 equipped with a roller 122 that is subject to a cam 123 secured to the operating shaft 34. A coiled spring 124, 125 attached to one of the arms 118 and anchored to one of the plates 24, tends to hold the gripping bar 119 in its uppermost position against the lower edge of the bar 105^a. The cam 123 operates on the roller 122 with 130

an action timed to retract and release the arms 118 and gripping bar 119, as will appear in the description of the operation. Here it may be noted, however, that the paper web y runs over the said bar 119.

Normally, the operating shaft 34 is locked against forward rotation by a lock key or lever 125 and is held against backward rotation by a back lash stop dog 126. The lock key 125 is pivoted at 127 to the adjacent bearing plate 24, is yieldingly pressed downward at its rear end by a spring 128, and is provided at said rear end with a depending lock lug 129 that normally engages a notch 130 formed in the disc 35 secured to and carried by the operating shaft 34. The front end of the key 25 projects through an opening in a casing and terminates in a cap 132 adapted to be struck by a finger. The dog 126 is pivoted to the adjacent plate 24 and is yieldingly held in contact with the periphery of the disc 35 by a spring 133 and permits free rotation of the disc and shaft 34 in an anti-clockwise direction in respect to Fig. 4 or in a clockwise direction in respect to Figs. 2 and 3, but prevents backward or reverse rotation thereof. The completed cut off transfer, as shown in Fig. 20, is indicated by the character y^2 .

Summary of operation.

The individual functions performed by the various different devices and certain groups of devices has already been made clear, but the important correlation of such devices in the complete machine may, with advantage, be traced as follows:

When the parts of the machine are in what are herein designated as their normal positions, the notch 130 of the disc 131 will be engaged with the lug 129 of the trip key 125, which engagement is accomplished by rotation of said disc in an anti-clockwise direction in respect to Fig. 4, through approximately 170° . Figure 2 shows the position of the parts when said crank disc has been rotated approximately 10° beyond normal position. However, the positions of the parts shown in Fig. 2 are the same as in normal positions, except that the carriage will be dropped slightly, so as to separate the inking pads I^1 , I^2 and I^3 from the type about one-eighth of an inch, so that the printing device is then free for adjustment, and except that the movable knife blade 99 is dropped about one-eighth of an inch, but not, however, below its cutting position.

When the machine is to be operated, the key 125 will be struck and depressed and then the operating crank 33 and shaft 34 will be rotated in a clockwise direction in respect to Fig. 2, or, in other words, in an anti-clockwise direction in respect to Fig. 4.

In the normal position of the parts, the cam slide 30 will be nearly but not quite to

its extreme forward position or position toward the left in respect to Fig. 2, and the trunnions 29 that project from the carriage plates 26 will then be in the rear extremities of the cam slots 32, so that the inking pads I^1 , I^2 and I^3 will be aligned with but slightly out of engagement with the overlying type. In such normal position of the parts, the knife blade 99 will be in its forward position, so that it will cooperate with the fixed shearing blade 105 and will then have cut off the paper web to deliver the transfer, but said knife will not be quite to its extreme uppermost position. The cut off transfer will be dropped onto the underlying deck 106. Moreover, at this time, the cam 123 has released the arm 121, thereby permitting the spring 124, acting through the arms 118, to cause the gripper rod 119 to press the forward end of the paper web y tightly against the under edge of the fixed bar 105^a. It is further important to here note that, at the time above just noted, the gripper-acting feed dogs 93 are lowered and released from the paper web, so that they are free to make their return movement of the carriage without action on the paper web and during a time that the latter will be held against backward movement by the gripper rod 119. Attention is further called to the fact that, in the normal position of the parts, the first and second printing operations have been produced on the most forward transfer-forming portion of the paper web, but that the third printing operation has not yet been produced on such most forward transfer-forming section.

When the next transfer is to be completed, cut off and delivered, the operating crank 33 and parts carried therewith will first be released, as before stated, by depressing the projecting forward end of the lock key 132, and then the said crank will be given a complete rotation in a clockwise direction in respect to Fig. 2 or in an anti-clockwise direction in respect to Fig. 4, and at the termination of such complete rotation, the lug 129 of said key will again engage the notch 130 of the disc 131 and again lock the mechanism with the parts positioned as shown in Fig. 2. The complete cycle of operations performed by the rotation of said crank will now be traced in detail.

The first action that takes place, and which is produced by approximately the first ten degrees of rotation of the said crank and shaft, is to raise the carriage so as to press the inking pads I^1 , I^2 and I^3 against the overlying type of the printing devices. This completion of the lifting movement of the carriage, when in extreme forward position, is produced by the completion of the forward movements of the cam slides 30, but continued rotation of the crank beyond the said first approximate ten degrees

causes the cam slides 30 to move rearwardly or toward the right in respect to Fig. 2, thereby causing the cam slots 32, acting on the carriage trunnions 29, to lower the carriage and all of the parts carried thereby vertically downward in the forward vertical portions of the guide slots 25, until said trunnions reach the level of the horizontal portions of said guide slots, and thereupon, the oblique portions of the cam slots 32, acting on the trunnions 29, will cause the entire carriage to move horizontally rearward until the trunnions 29 reach the rear vertical extremities of the cam slots 25, and thereupon, said cam slots, acting on said trunnions, will cause the carriage, while in its rearmost position, to move vertically upward until the parts have reached the positions shown in Fig. 3. The parts reach the positions shown in Fig. 3 under 180° of movement of the operating crank 33 and shaft 34, and in the position of the parts shown in Fig. 3, the printing platens P¹, P² and P³ press the paper web *y*, respectively, against the type that perform the hitherto described first, second and third printing operations. Here it will be noted that the printing platen P³, which is carried by the head 97 that also carries the movable knife blade 99 has its upper surface slightly above the upper edge of said knife blade, so that the latter does not, in the position of the parts shown in Fig. 3 come into contact with the paper web.

The knife blade 99 is preferably designed to completely cut off the printed transfer, but, as is obvious, it might only partly perform that function.

It should be here further noted that the approximately horizontal extremities of the cam slots 32 are not truly horizontal but are slightly inclined, so that the carriage will be given slight raising and lowering movements while moving in the extremities of said slots.

When the carriage made its above described rearward movement, the gripper rod 119 remained in its operative position, holding the paper web against return movement, but about the time that the carriage trunnions 29 were given their upward movement in the rear vertical extremities of the guide slots 25, the cam 123 on the operating shaft 34 engaged the roller 122 of the arm 121 and moved the gripper bar 119 downward, thereby releasing said gripper rod from the paper web. Also, during the time that the said carriage trunnions were making their upward movements in the rear vertical extremities of the guide slots 25, the rear end of the arm 111 was engaged with the fixed pin 116 and the spring-pressed toggle made up of the arm 112 and bolt 115 was moved below its dead center, so

that the spring 115 then quickly flipped the gripper-acting feed dogs 93 upward, causing the same to grip the paper web against the overlying gripper plate 92' before the gripper rod 119 releases its grip on the paper web. It will now be remembered that, at the completion of the first 180° of movement of the operating crank 33 and shaft 34, the carriage while in its rearmost position was moved upward to simultaneously perform the so-called first, second and third printing operations, which printing operations, however, were performed on different portions or transfer-forming sections of the paper web.

When the operating crank 33 and shaft 34 continue their rotation beyond the first 180°, the cam slides 30 are caused to begin their return or forward movements from their position shown in Fig. 3 back to their normal positions shown in Fig. 2, and thereby, the cam slots 32, acting on the carriage trunnions 29, first move the carriage vertically downward, then horizontally forward, and then again vertically upward to the position shown in Fig. 2, the cam slots 25, of course, guiding and holding the carriage to its rectilinear downward, forward and upward movements. Under forward movement of the carriage, the paper web will be fed forward a distance to form one transfer, or, in other words, represented by the width of the transfer.

When the carriage reaches its forward position and its trunnions 29 move upward in the forward vertical extremities of the guide slots 25 to normal positions, three important actions take place, to wit: first, the cam 123, acting on the roller-equipped arm 121, releases the gripper rod 119, so that the spring 124, acting through the arms 119, cause said gripper rod to press the front end of the paper web against the lower edge of the bar 105^a; second, the front end of the trip arm 111 comes into contact with the fixed pin 117, thereby forcing the yielding toggle 111-112 past its upper dead center and permitting the spring 115 to throw the feed dogs downward and then hold the latter out of contact with the paper web; and third, the movable knife blade 99, in cooperation with the fixed knife blade 105, cuts off the completely printed transfer-forming section of the paper web. The carriage, having now again reached what is designated as its normal position, will be locked in such position by the trip key and notched disc and the inking pads I¹, I² and I³, as already noted, will then be positioned immediately below the overlying type, slightly out of engagement therewith, but ready for quick inking action by the initial movement of the operating crank 33 and shaft 34.

It will be noted that the forward ex-

5 tremities of the cam slots 32 of the cam slides 30 are at a higher elevation than the rear extremities thereof; and this is because the inking pads are at a correspondingly higher elevation than the printing platens, so that the carriage must be given greater vertical movements in performing the printing operation than in performing the inking and cutting operations. Also, it will be noted that the vertical forward extremities of the guide slots 25 are so positioned that, acting on the carriage trunnions 29, they guide the movable knife blade 99 into cutting alignment with the fixed shearing blade 105. The manner in which the unit member of the device for printing the serial number of the transfer will be given one step of movement for each complete oscillation of the carriage has already been noted.

20 It must now also have been made clear that the performing of the so-called third printing operation, to wit: In the illustration given, the printing of the frequently changeable matter, such as the month, day, year, hour, A. M. or P. M. direction of car travel, and the name of the car line, takes place under the same cycle of operation that cuts off the last printed and delivered transfer and that the cutting off of the transfer is substantially the last action to be performed. Of course, this is highly important, because it allows the conductor or manipulator of the machine to change any of the matter of the third printing operation up to the very time that he starts to perform the operation that will result in the completion and delivery of the particular transfer. If such provision were not made, there would be a frequent waste of transfers.

40 What we claim is:

1. A ticket printing machine comprising means for guiding a paper web, printing devices progressively spaced along the line of travel of said paper web, a movable carriage, cooperating printing devices on said carriage, means also on said carriage for imparting an intermittent feed movement to said paper web, and means for moving said carriage to produce the progressive printing actions and the intermittent paper web feeding action.

2. The structure defined in claim 1 in combination with inking devices progressively spaced on said carriages and engageable with the first noted printing devices by actions that are alternated in respect to the printing actions.

3. A ticket printing machine comprising means for guiding and feeding a paper web, printing devices progressively spaced along the line of travel of said paper web, means for progressively producing the several printing operations on said web, and type-inking means alternated in respect to the printing actions.

4. A ticket printing machine comprising means for guiding and feeding a paper web, printing devices progressively spaced along the line of travel of said paper web, means for progressively producing the several printing operations on said web, timed means for cutting the completely printed tickets from said web, and type-inking means alternated in respect to the printing actions.

5. The structure defined in claim 4 in which the movable elements of the printing, inking and cutting means are connected for common movements.

6. The structure defined in claim 4 in further combination with a carriage mounted for horizontal movements and for vertical movements at the limits of its horizontal movements, and in which the movable elements of said printing, inking and cutting means are mounted on said carriage.

7. The structure defined in claim 4 in further combination with a carriage mounted for horizontal movements and for vertical movements at the limits of its horizontal movements, and in which the movable elements of said printing, inking and cutting means are mounted on said carriage, the movable printing elements being alternated in their actions in respect to said movable inking elements.

8. The structure defined in claim 4 in further combination with a carriage mounted for horizontal movements and for vertical movements at the limits of its horizontal movements, and in which the movable elements of said printing, inking and cutting means are mounted on said carriage, the movable printing elements being alternated in their actions in respect to said movable inking elements, and the movable cutting element being arranged for action approximately simultaneously with said movable inking elements.

9. A ticket printing machine comprising means for guiding a paper web, independently adjustable printing devices progressively spaced along the line of travel of the paper web and arranged to print on different portions of the web to form completely printed ticket sections, and a paper web feeding device on said carriage for imparting intermittent feed movements to said web, said carriage being movable toward and from and along the line of travel of said paper web.

10. The structure defined in claim 9 in further combination with a carriage and means for imparting thereto horizontal movements and vertical movements at the extremes of its horizontal movements, and printing platens and inking devices on the said carriage, vertical movement of the carriage at one extreme serving to throw said platens into printing action and vertical movements of said carriage at the other ex-

treme serving to throw said inking devices into action.

11. The structure defined in claim 9 in further combination with a carriage and means for imparting thereto horizontal movements, and vertical movements at the extremes of its horizontal movements, and printing platens and inking devices on the said carriage, vertical movement of the carriage at one extreme serving to throw said platens into printing action and vertical movements of said carriage at the other extreme serving to throw said inking devices into action, one of the elements of the cutting means also being applied on said carriage.

12. The structure defined in claim 9 in further combination with a carriage and means for imparting thereto horizontal movements and vertical movements at the extremes of its horizontal movements, printing platens and inking devices on the said carriage, vertical movement of the carriage at one extreme serving to throw said platens into printing action and vertical movements of said carriage at the other extreme serving to throw said inking devices into action, and gripper-acting paper-feeding devices mounted on said carriage.

13. The structure defined in claim 9 in further combination with a carriage and means for imparting thereto horizontal movements and vertical movements at the extremes of its horizontal movements, printing platens and inking devices on the said carriage, vertical movement of the carriage at one extreme serving to throw said platens into printing action and vertical movements of said carriage at the other extreme serving to throw said inking devices into action, gripper-acting paper-feeding devices mounted on said carriage, and means operative to throw said paper-feeding devices out of action at the extreme forward movement of said carriage and to throw the same into action at the extreme rearward movement of said carriage.

14. The structure defined in claim 9 in further combination with a carriage and means for imparting thereto horizontal movements and vertical movements at the extremes of its horizontal movements, printing platens and inking devices on the said carriage, vertical movement of the carriage at one extreme serving to throw said platens into printing action and vertical movements of said carriage at the other extreme serving to throw said inking devices into action, gripper-acting paper-feeding devices mounted on said carriage, and means operative to throw said paper-feeding devices out of action at the extreme forward movement of said carriage and to throw

the same into action at the extreme rearward movement of said carriage, and in further combination with a paper gripping device arranged to hold the paper web against return movement with said carriage but permitting free forward movement of said web under forward movement of the carriage.

15. In a ticket printing machine, the combination with printing devices and means for guiding a paper web to and past said printing devices, of a carriage mounted for movements along the line of travel of said paper web and for movements toward and from the paper web and printing devices, means for moving said carriage as stated, a printing platen on said carriage, a gripper-acting paper-feeding device on said carriage, the said platen being movable with said carriage to press the paper web against said printing device.

16. A ticket printing machine comprising means for guiding a paper web along a line of travel, a carriage mounted to move longitudinally of the line of travel of said paper web and at the extremes of its longitudinal movement to move toward and from said web, cooperating printing devices, certain of which are mounted on said carriage, the paper web being arranged to pass between said printing devices, and means for imparting to said carriage the movements above indicated.

17. The structure defined in claim 16 in which said carriage is also provided with gripper-acting paper-feeding means.

18. The structure defined in claim 16 in which said carriage is also provided with gripper-acting paper-feeding means and a knife for cutting off the printed sections of the paper web.

19. The structure defined in claim 16 in which said carriage is also provided with gripper-acting paper-feeding means, and an inking device also mounted on said carriage.

20. The structure defined in claim 16 in which said carriage is also provided with gripper-acting paper-feeding means, and a paper-gripping device alternated in its action in respect to the gripper-acting feed means on said carriage and serving to hold the paper web against return movement of the carriage.

21. The structure defined in claim 16 in which said carriage is also provided with gripper-acting paper-feeding means, a knife for cutting off the printed sections of the paper web, and a paper-gripping device alternated in its action in respect to the gripper-acting feed means on said carriage and serving to hold the paper web against return movement of the carriage.

22. A ticket printing machine comprising means for guiding a paper web along a line of travel, independently adjustable printing

devices progressively arranged along the line of travel of said web for action thereon, a carriage mounted to move longitudinally of the line of travel of said paper web and at the extremes of its longitudinal movement to move toward and from said web, means for imparting to said carriage the movements just stated, and printing platens and type-inking devices mounted on said carriage and arranged to be rendered operative by the different extreme movements of said carriage toward said web.

23. The structure defined in claim 22 in which said carriage is also provided with gripper-acting paper-feeding devices.

24. The structure defined in claim 22 in which said carriage is also provided with gripper-acting paper-feeding devices, and a paper-retaining gripper alternated in its action in respect to the gripper-acting feed devices on said carriage and serving to hold the paper web against return movement with the carriage.

25. The structure defined in claim 22 in which said carriage is also provided with gripper-acting paper-feeding devices, a paper-retaining gripper alternated in its action in respect to the gripper-acting feed devices on said carriage and serving to hold the paper web against return movement with the carriage, and a paper-shearing device including a relatively fixed blade and a cooperating blade mounted on said carriage.

26. The structure defined in claim 22 in which the means for moving said carriage includes trunnions on said carriage, guide plates having approximately U-shaped guide slots in which said trunnions work, and reciprocating cam slides having cam surfaces operative on said trunnions.

27. The structure defined in claim 22 in which the means for moving said carriage includes trunnions on said carriage, guide plates having approximately U-shaped guide slots in which said trunnions work, reciprocating cam slides having cam surfaces operative on said trunnions, an operating shaft having a crank, a pair of oscillatory arms connected for common oscillatory movements and connected to said cam slides, and a yielding pitman connecting one of said arms to the crank on said operating shaft.

28. The structure defined in claim 22 in which the means for moving said carriage includes trunnions on said carriage, guide plates having approximately U-shaped guide slots in which said trunnions work, reciprocating cam slides having cam surfaces operative on said trunnions, an operating shaft having a crank, a pair of oscillatory arms connected for common oscillatory movements and connected to said cam slides, and a yielding pitman connecting one of said

arms to the crank on said operating shaft, the said operating shaft having a gripper-actuating cam and connections subject to said cam for operating said paper-retaining gripper with a properly timed action.

29. The structure defined in claim 22 in which the means for moving said carriage includes trunnions on said carriage, guide plates having approximately U-shaped guide slots in which said trunnions work, reciprocating cam slides having cam surfaces operative on said trunnions, an operating shaft having a crank, a pair of oscillatory arms connected for common oscillatory movements and connected to said cam slides, and a yielding pitman connecting one of said arms to the crank on said operating shaft, and in further combination with a releasable lock for locking said operating shaft at the completion of its full rotation.

30. A ticket printing machine comprising means for guiding a paper web along a line of travel, knife-equipped printing devices progressively arranged along the line of travel of said web, and a relatively fixed shearing blade located beyond the last printing device but on the same side of the paper web, a carriage having projecting trunnions, bearing plates having approximately rectangular U-shaped guide slots in which the trunnions of said carriage move, a pair of cam plates mounted for simultaneous movements parallel to the line of travel of the paper web and provided with approximately V-shaped cam slots in which the trunnions of said carriage also work, and which cam slots under reciprocating movements of said cam slides cause said trunnions to travel in the U-shaped guide slots and said carriage to travel parallel to the line of travel of said paper web and to move toward and from the web at the extremes of its traveling movement, means for reciprocating said cam slides, and printing platens and a movable shearing blade mounted on said carriage and by the noted movements of said carriage cooperating respectively with the type of said printing devices and with the fixed shearing blade.

31. The structure defined in claim 30 in which said carriage is also provided with gripper-acting paper-feeding devices.

32. The structure defined in claim 30 in which said carriage is also provided with gripper-acting paper-feeding devices, and in further combination with a paper-retaining gripper engageable with the paper web adjacent to said fixed shearing blade and alternated in its action in respect to the paper-gripping devices on said carriage.

33. The combination with means for feeding a paper web along a line of travel, of a carriage mounted for limited traveling movements parallel to the line of travel

of said web and for vertical movements toward and from said web at the extremes of its traveling movement, means for thus moving said carriage, and cooperating printing devices located one above and the other below said web, the lower printing device being mounted on said carriage.

34. The combination with means for feeding a paper web along a line of travel, of printing type above said web, a carriage mounted for limited traveling movements parallel to the line of travel of said web and for movements toward and from the web at the extremes of its traveling movement means for thus moving said carriage, a printing platen and an inking device mounted on said carriage and arranged to cooperate with the said type at the opposite extreme movements of said carriage toward said web.

35. The structure defined in claim 33 in further combination with gripper-acting paper-feeding means mounted on said carriage and operative to feed the web under forward movements of the carriage.

36. The structure defined in claim 33 in further combination with gripper-acting paper-feeding means mounted on said carriage and operative to feed the web under forward movements of the carriage, and in further combination with cooperating paper-shearing blades, one of which is relatively fixed and the other of which is mounted on said carriage and is rendered operative under extreme forward and upward movement of the carriage.

37. The structure defined in claim 33 in further combination with gripper-acting paper-feeding means mounted on said carriage and operative to feed the web under forward movements of the carriage, and in further combination with cooperating paper-shearing blades, one of which is relatively fixed and the other of which is mounted on said carriage and is rendered operative under extreme forward and upward movement of the carriage, and in still further combination with a relatively stationary gripper-acting paper-retaining device that is operative to hold the paper adjacent to the cutting point while said carriage makes its return or rearward movement.

38. The structure defined in claim 34 in further combination with gripper-acting paper-feeding means mounted on said carriage and operative to feed the paper web forward under forward movement of the carriage.

39. The structure defined in claim 34 in further combination with gripper-acting paper-feeding means mounted on said carriage and operative to feed the paper web forward under forward movement of the carriage, and in further combination with

paper-cutting means rendered operative by the vertical movement of the carriage at the extreme of its forward movement.

40. The structure defined in claim 34 in further combination with gripper-acting paper-feeding means mounted on said carriage and operative to feed the paper web forward under forward movement of the carriage, and in further combination with paper-cutting means rendered operative by the vertical movement of the carriage at the extreme of its forward movement, and in still further combination with a gripper-acting paper-retaining device operative to hold the paper against return or rearward movement of the carriage.

41. The structure refined in claim 33 in which the printing devices include a serial number printing device arranged to be automatically advanced one unit for each complete reciprocation of said carriage.

42. The structure defined in claim 34 in which the upper printing device includes different groups of axially aligned rotatively adjustable type-carrying elements, the one group being a serial number printing device and the unit element thereof having a connection to said carriage whereby it is operated therefrom.

43. The structure defined in claim 33 in further combination with a paper feeding device comprising a rock shaft mounted on said carriage, a gripper-acting paper-feeding dog on said rock shaft, a trip arm intermediately secured to said rock shaft, a spring-extended toggle connected to said rock shaft and tending to hold the same in the one extreme position or the other, and forward and rearward trip stops secured on a fixed part of the machine, the front end of said trip arm being engageable with the forward trip stop to trip said feed dog out of action and engageable with said rear trip stop to trip said feed dog into action.

44. The structure defined in claim 22 in which each cycle of operation involves, first, moving of the inking pads against the aligned type, second, movement of the platens into cooperating printing action in respect to the aligned type, third, movement of the paper web forward, and fourth, cutting off of the paper web.

45. The structure defined in claim 22 in which each cycle of operation involves, first, moving of the inking pads against the aligned type, second, movement of the platens into cooperating printing action in respect to the aligned type, third, movement of the paper web forward, and fourth, cutting off of the paper web, certain of said printing devices having adjustable elements capable of readjustment when said carriage is in normal position or position of rest at the completion of a cycle of operations.

46. The combination with a carriage having projections thereon, of relatively fixed plates having tortuous guideways for the projections of said carriage, and a cam slide having a tortuous cam also operative on the projections of said carriage and cooperating with said tortuous guideways to cause said carriage to partake of a movement corresponding to the lines of said guideways.

In testimony whereof we affix our signatures. 10

EDWARD L. MOONEY.
ZACHARY E. RUSSELL.