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R. STUART ET AL

2,135,541

SYSTEM AND APPARATUS FOR HANDLING PAPER FOR PRINTING MACHINES

Filed Aug. 15, 1935

8 Sheets-Sheet 1

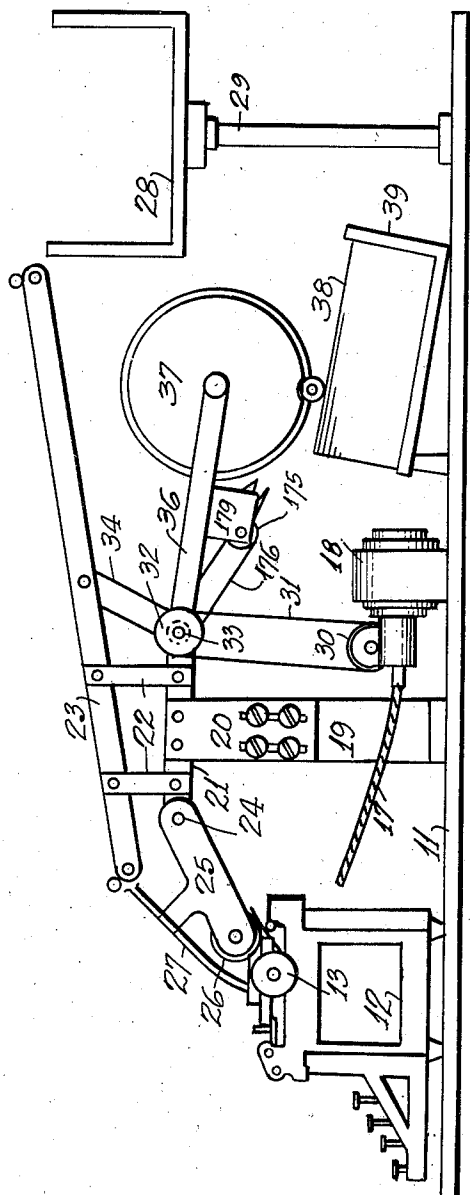


Fig. 1

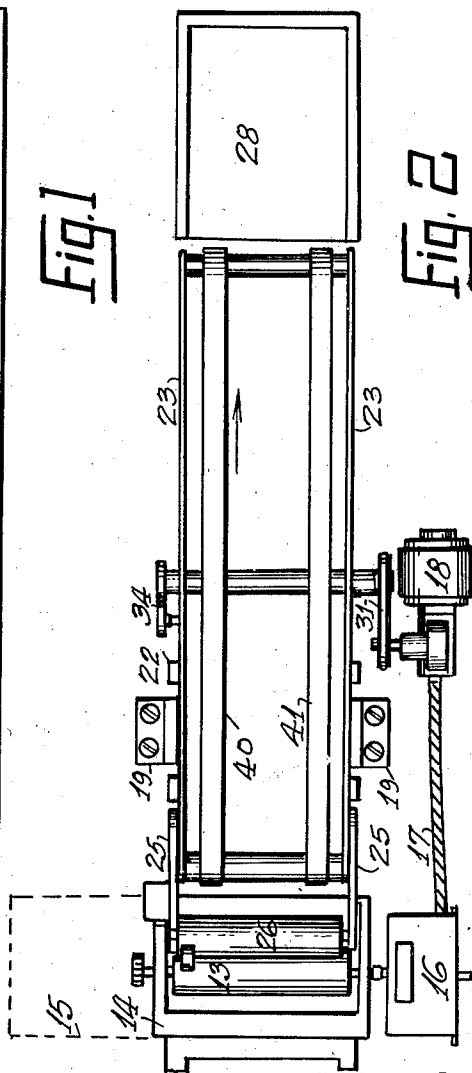


Fig. 2

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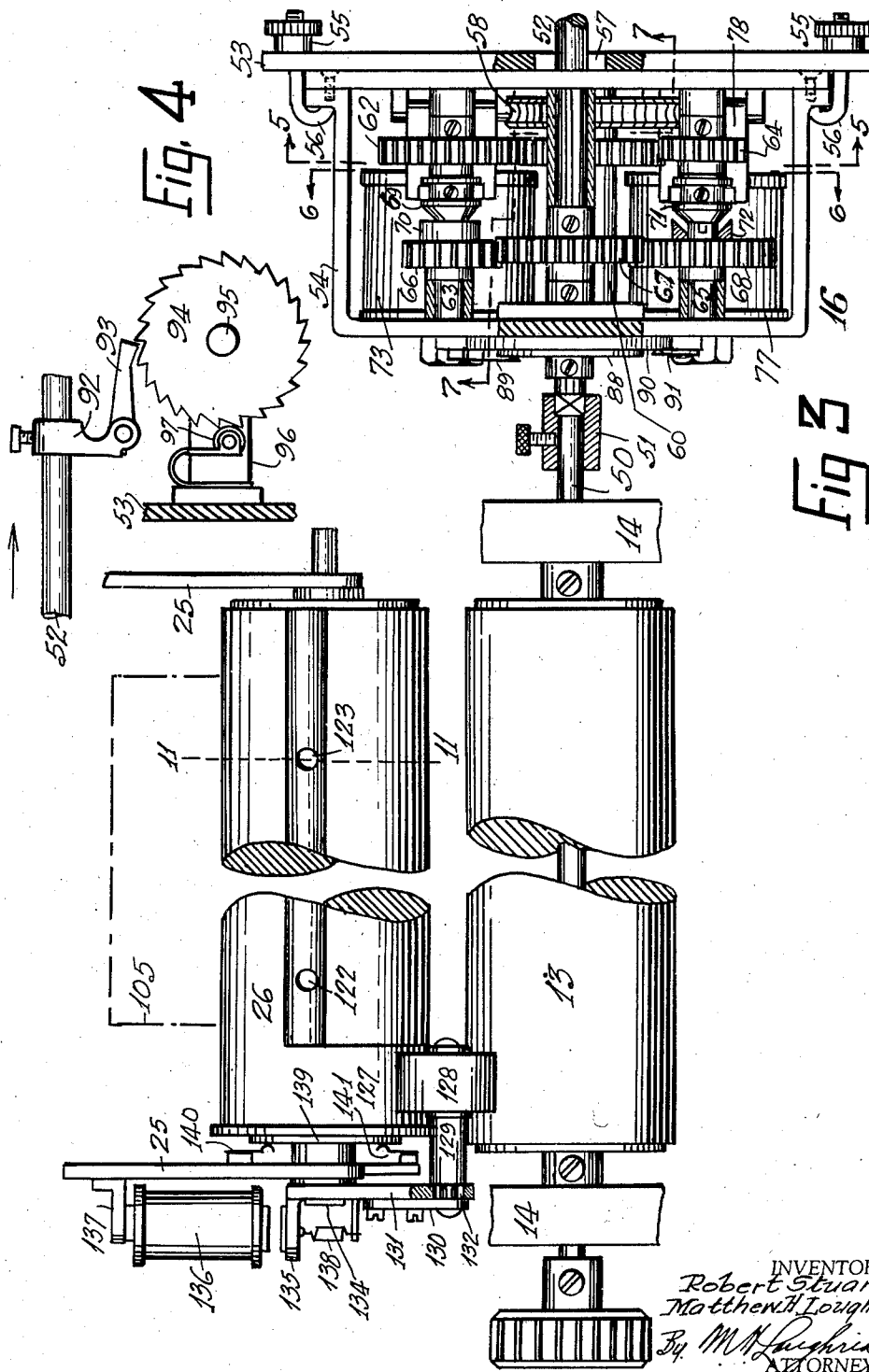
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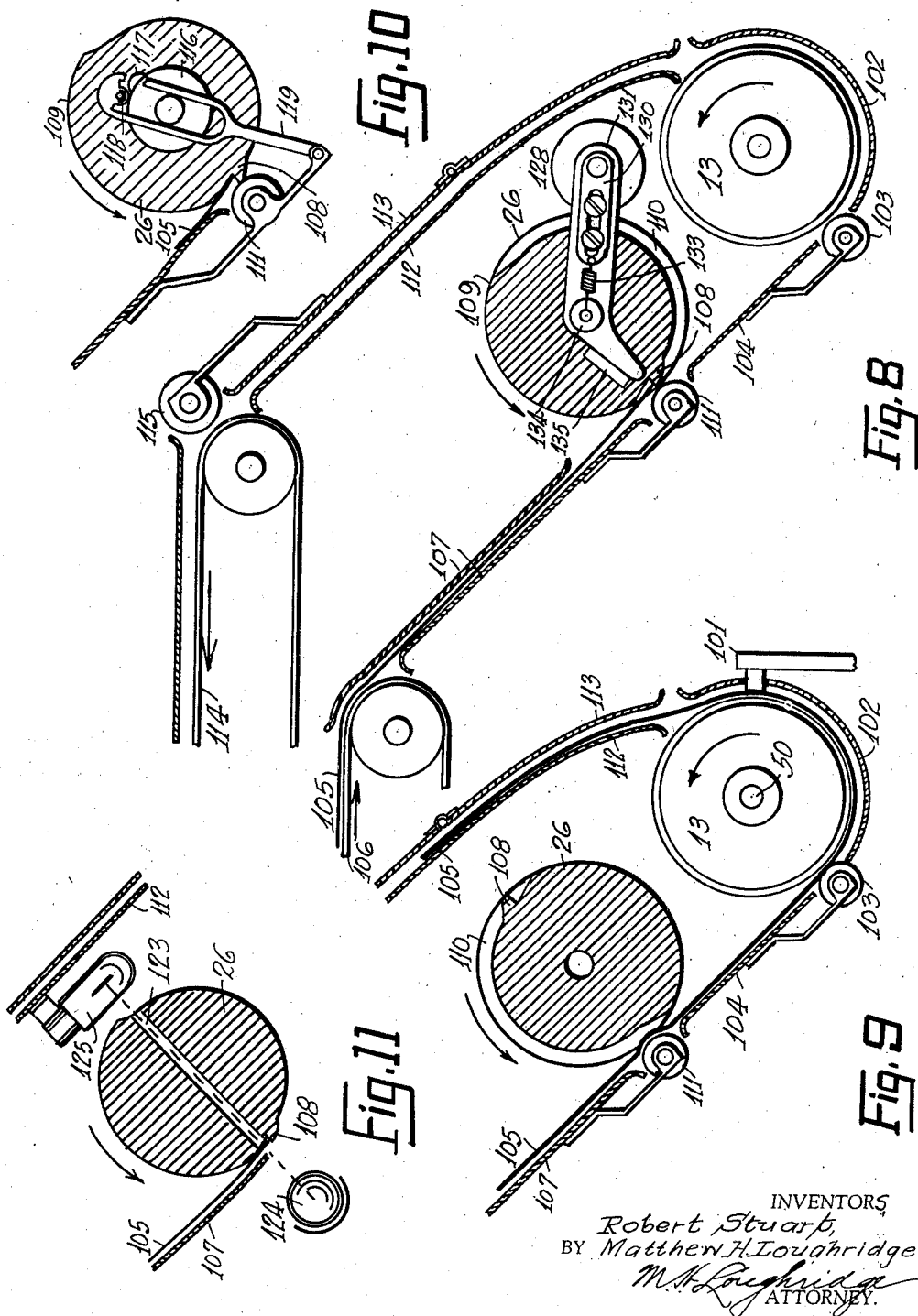
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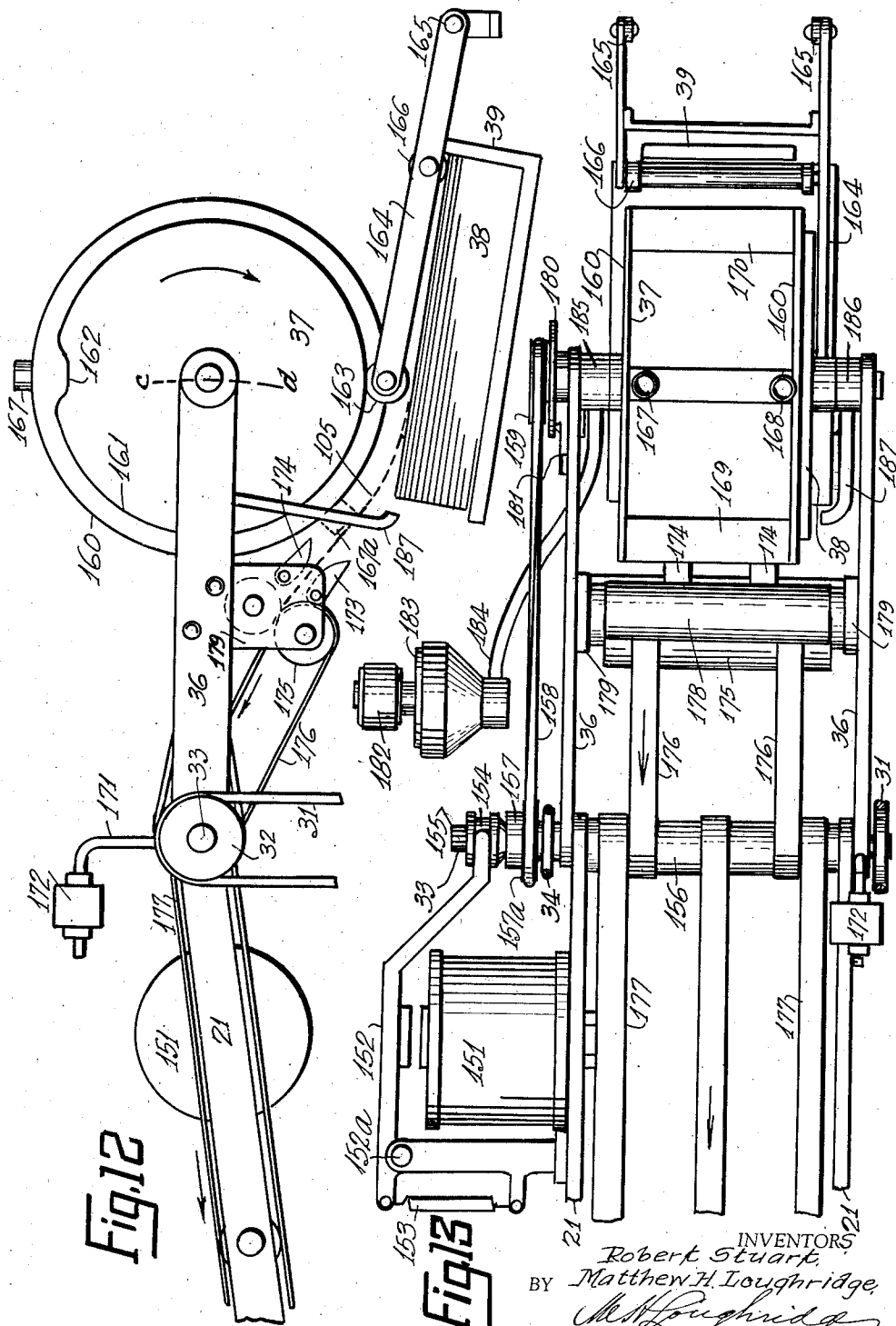
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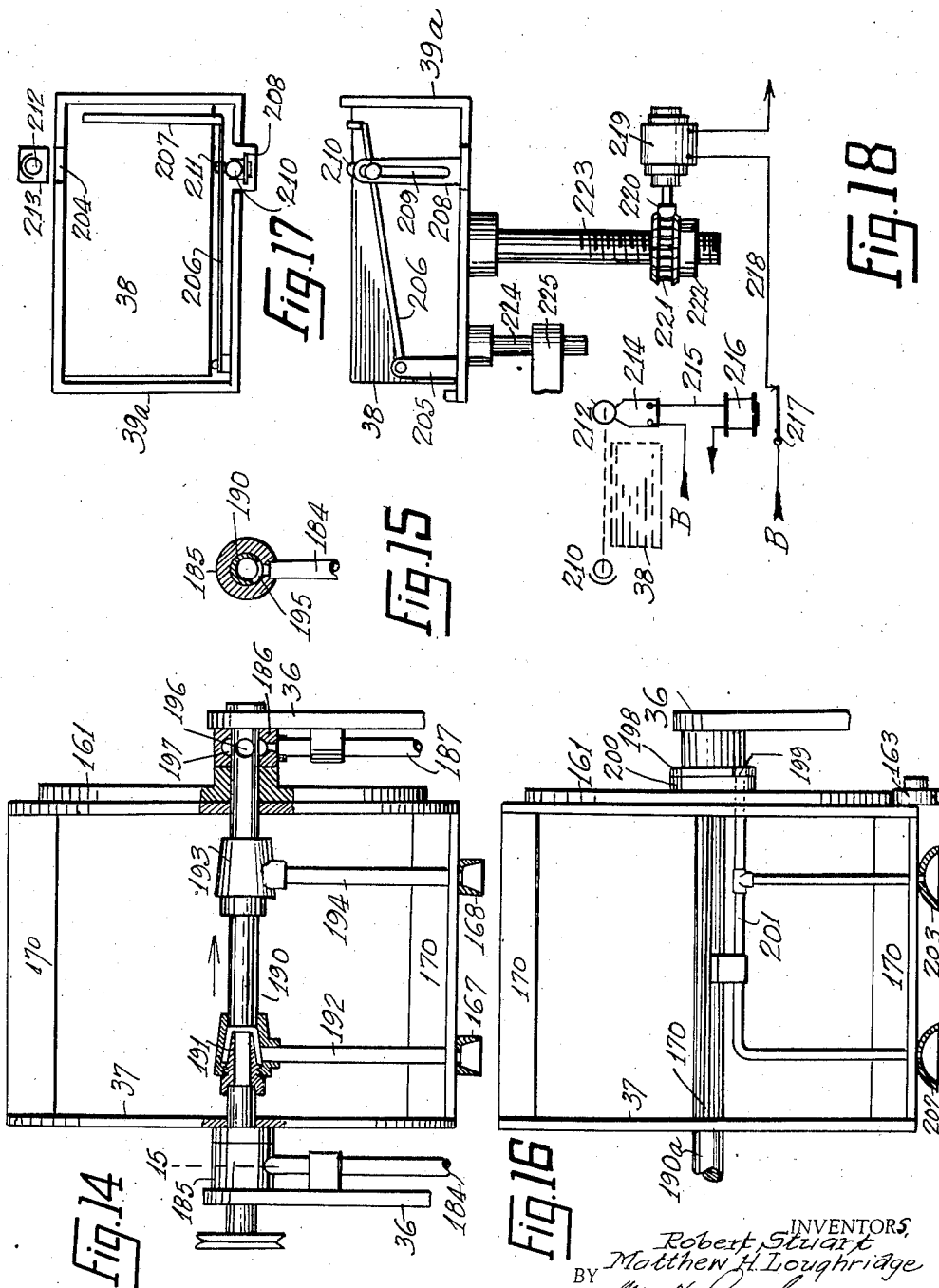
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8 Sheets-Sheet 6



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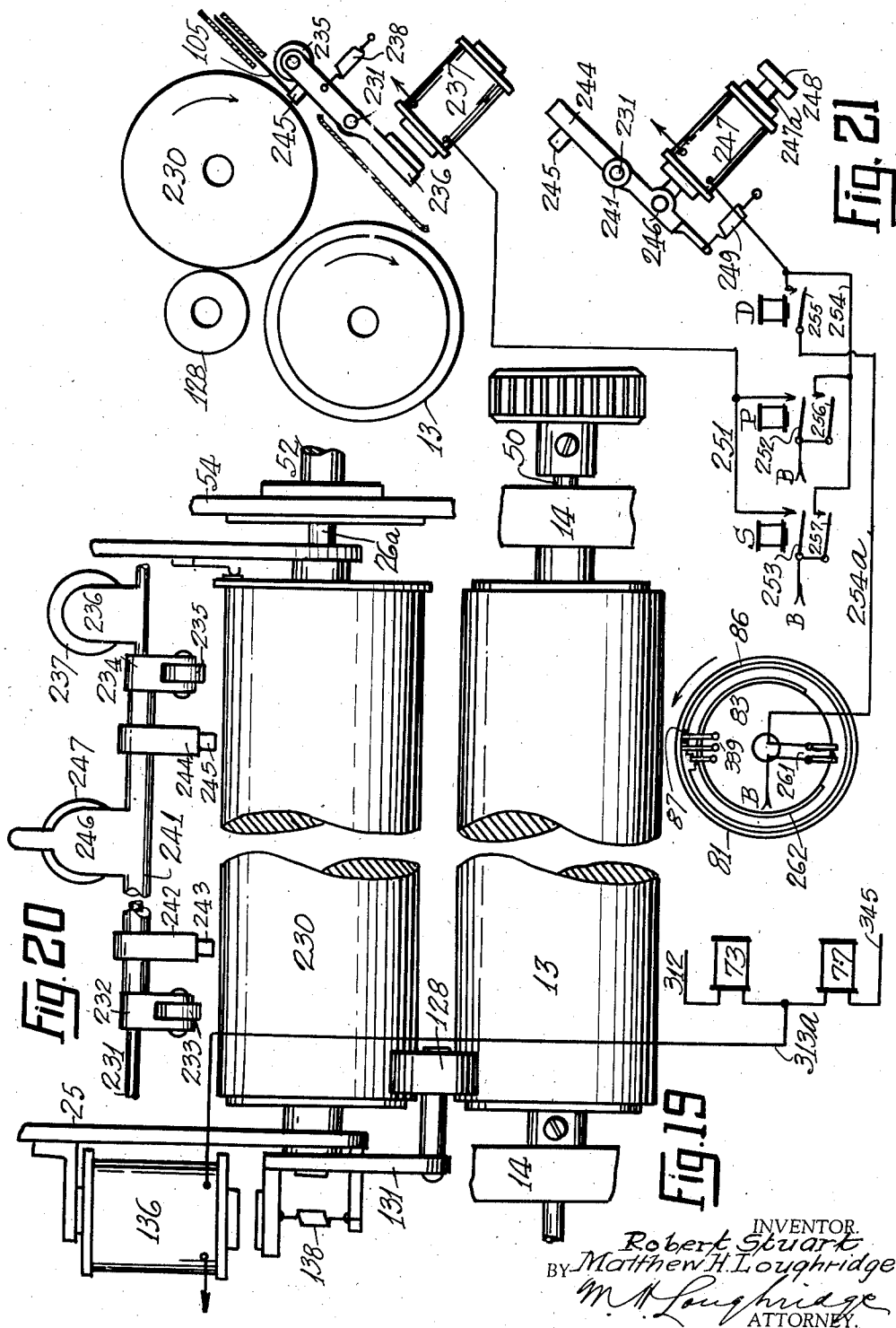
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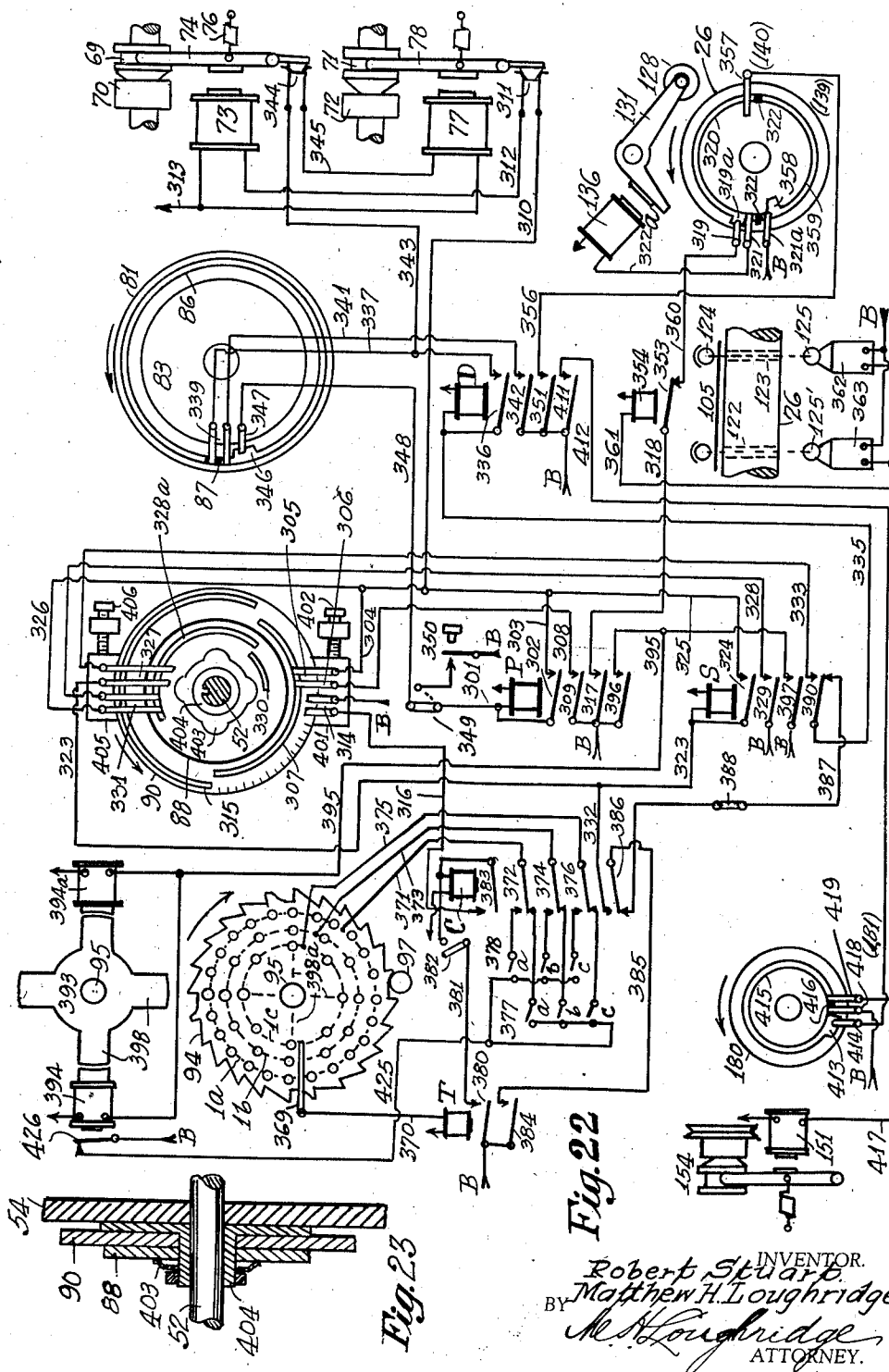


Fig. 22

Fig. 23

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UNITED STATES PATENT OFFICE

2,135,541

SYSTEM AND APPARATUS FOR HANDLING
PAPER FOR PRINTING MACHINESRobert Stuart, Forest Hills, N. Y., and Matthew
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Application August 15, 1935, Serial No. 36,392

77 Claims. (Cl. 197—130)

This invention relates to a system and the apparatus used in connection therewith, for taking up, aligning, and delivering paper sheets to a printing machine and it is shown in connection with the common form of typewriter. The paper is automatically located in the correct writing position and after a predetermined number of lines have been written it is automatically removed from the machine and conveyed to a tray and a fresh sheet of paper is supplied for repeating the operation. The system further contemplates the control of the paper feed in such a manner that the paper may be located for writing purposes in a plurality of positions in which any number of lines, with any line spacing, may be used for writing in each position. After the writing operation is completed the paper is automatically removed from the machine and a new writing sheet located for repeating the operation.

One purpose of the system is to address envelopes supplied automatically from a tray. When the predetermined number of lines for the address is written, the machine completes the cycle of operation by removing the envelope that has been addressed and supplying a new envelope in its place for another address. Another use of the system is to fill-in the headings of circular letters and, if required, to fill-in specific data in the body of the letter for each cycle of operation. Another use for the system is to supply the name and address and the charges on billing forms. Other uses of a similar character are readily supplied by the system in which the main purpose is to eliminate the manual handling of the paper to and from the writing machine and to limit the manual operation to the writing itself.

In the application of this system, a mechanism is provided for lifting the paper to be written upon, one sheet at a time, from a tray, and this mechanism cooperates with a conveyor which carries the sheet forward to a feed roller where it is aligned and held in readiness to be delivered to the platen roller. At the proper time in the cycle of operation the feed roller delivers the paper sheet to the platen roller which is revolved to a predetermined extent to position the paper in the correct writing position. At this point the automatic operation ceases until the predetermined number of lines have been written on the sheet in the usual manner by the typewriter keyboard. If another writing position is required on the same sheet, the platen is then automatically rotated until the new writing position is reached and after a predetermined number of lines have

been written, the sheet may be moved to another writing position by a further rotation of the platen, or the system may be adjusted to discharge the sheet from the platen as soon as any of the writing operations have been completed. A second conveyor carries the discharged sheet forward from the platen and delivers it into a storage tray. In the form selected to illustrate the system the various controls are carried out electrically, the apparatus operates entirely independently of the typewriter machine and may be used with any of the common forms of typewriter. The only connection between the typewriter and the apparatus is the connection for rotating the platen.

The apparatus used for carrying out the various functions of the system embodies certain novel features, most of which are of general application in the printing art and each of these features may be used alone, or in combination with the other features or with other systems of paper feed.

The paper lift comprises a roller mounted above the paper tray, on a swinging frame, which enables the roller to adjust itself automatically to the height of the paper in the tray. This roller is belt connected with the conveyor system and is normally held clear of the paper except when a sheet is to be taken out. For this purpose a pair of vacuum cups are provided on the roller, which may be vacuumed by an air blast obtained through a Venturi nozzle. These cups are brought into engagement with the top sheet which is carried forward by the rotation of the lift roller to the belt conveyor which delivers the sheet to the feed roller.

The feed roller is provided with a longitudinal ledge, which, in the normal position, engages the end of the sheet as it comes from the conveyor and as this roller is rotated a cam portion of its surface is brought into action to carry the paper sheet forward to the platen of the writing machine. In order to insure that the paper sheet is properly aligned on the ledge of the feed roller, a pair of spaced light valves are provided to "sight" the position of the sheet which cooperatively prevent the further operation of the mechanism unless the sheet is properly aligned.

The platen is rotated by one mechanism towards the writing position of the paper and is rotated by another mechanism operating at a higher speed to complete the cycle of operation and discharge the paper after the writing has been completed. The first mechanism rotates the platen to a predetermined extent to locate

the paper in the first writing position. In this position the number of lines that are to be written are known and a stepping mechanism, operated by the carriage of the typewriter, when the number of lines have been completed and the carriage is restored to the starting position, sets up the condition for the next movement of the platen. If this condition requires a second writing position on the paper, the platen is automatically rotated to locate the paper in this writing position and, after the required number of lines are written in this second location, the stepping mechanism operated by the carriage then establishes the conditions for discharging the paper, completing the cycle of operation and restoring the apparatus to the normal or starting position.

In the final operation of the platen, which discharges the paper, the lift roller is operated therewith to lift a new sheet and place it on the conveyor and the feed roller is moved to the normal position to arrest and align this sheet of paper. In the operation, as shown in the drawings, the platen is designed to make three complete turns for one cycle of operation, the printing positions of the platen may take one or more turns and the final operation completes the balance of the revolution of the platen until three complete turns have been made and the system is restored to the starting position. In each cycle of operation the feed roller is controlled to make one-half turn with the first movement of the platen and to complete a single rotation with the final movement of the platen and the lift roller makes one revolution for each cycle of operation.

In the control of the system the sequence of operation of the various parts is obtained by a progressive control of the following movement by the movement of the preceding apparatus and the extent of the movement is controlled by the part itself. In the electric control, movements cannot be prematurely obtained nor can a movement be had out of its sequence in the operation of the system.

The apparatus by which these and other features are accomplished and the mode of operation will be more fully understood from the following specification and the accompanying drawings, in which

Fig. 1 is a side elevation of the machine applied to a typewriter, showing the supporting frame and the general mechanism;

Fig. 2 is a plan view of the machine from the top, showing the top conveyor only;

Fig. 3 is a plan view, partly sectioned, showing the mechanism for automatically rotating the platen;

Fig. 4 is a stepping wheel and operating mechanism for registering the number of lines that have been written;

Fig. 5 is a section on line 5—5 of Fig. 3;

Fig. 6 is a section on line 6—6 of Fig. 3;

Fig. 7 is a vertical section on line 7—7 of Fig. 3;

Fig. 8 is a side elevation, partly sectioned, of the feed roller, platen and paper guides;

Fig. 9 is another side elevation, partly sectioned, of the feed roller in another position, and the platen;

Fig. 10 is a detail of the mechanism associated with the feed roller;

Fig. 11 is a detail, showing in section a method of controlling the system by the position of the paper sheet on the feed roller;

Fig. 12 is a side elevation of the paper take-up mechanism and conveyor carrying the paper to the feed roller;

Fig. 13 is a plan view corresponding to Fig. 12; Fig. 14 is an elevation of the take-up roller, partly sectioned, showing the application of the Venturi suction tubes;

Fig. 15 is a detail of the air control system on line 15, Fig. 14;

Fig. 16 is an alternative form, shown in elevation, of the take-up roller, using rubber vacuum cups;

Fig. 17 is a plan view of a paper tray provided with a light valve for controlling the elevation of the tray as the paper is removed;

Fig. 18 is an elevation of the mechanism in Fig. 17, including the apparatus for elevating the tray;

Fig. 19 shows another form of the invention in which the platen roller is driven by a friction roller which is operated by the driving mechanism;

Fig. 20 is a plan view of the mechanism for operating the stop fingers and the gripping rollers in connection with Fig. 19;

Fig. 21 is a side elevation, in diagram form, showing the relation of the friction roller to the platen roller and the stop fingers for controlling the paper feed;

Fig. 22 is a diagram of the operating circuits, and

Fig. 23 is a cross section of the adjustable circuit controller for controlling the position of the sheet on the platen.

General arrangement of apparatus

In Fig. 1, 11 represents a table or stand upon which the apparatus is placed, 12 is the typewriting machine having the platen 13 mounted in the usual carriage 14 which slides to the left as the writing progresses as indicated at 15. 16 is the driving mechanism which is coupled to the platen roller 13 and is connected by a flexible drive 17 with the motor 18.

The conveyors and the paper take-up are supported by the frame member 19 to which the member 20 is adjustably clamped for adjusting the height of the mechanism. The frame 21 of the lower conveyor is secured to the supporting member 20 and by the cleats 22 the frame member 23 of the upper conveyor is supported. Arms 25 are pivotally connected at 24 to the frame member 21 and these arms support the feed roller 26 and the paper guide 27.

The paper tray 28 is supported by the pedestal 29 on the base 11 to receive the sheets of paper discharged from the upper conveyor. The motor 18, through a suitable reduction gear, drives the belt wheel 30, which by belt 31, and belt wheel 32, drives the main shaft 33. This shaft through belt 34 drives the conveyor belts 40 and 41 of the upper conveyor and through roller 156, Fig. 13, drives the conveyor belt 177 leading to the feed roller 26.

A frame 36 is pivoted on shaft 33 and carries at its outer end paper take-up roller or drum 37, which is mounted above the stack of paper 38 in the tray 39 which is fixedly supported on the table 11. As the paper is removed from the stack, take-up roller 37, through the pivoted arm 36, follows the paper. The conveyors are shown in the drawings as of the usual type made of a plurality of bands but they may be made from a single belt or in other well known forms.

The automatic drive for platen

The mechanism for rotating the platen to position the paper in one or more writing positions and finally to discharge the paper from the ma-

chine is illustrated in Figs. 3, 5, 6 and 7. The shaft 50 of the platen 13 is coupled at 51 with the splined shaft 52 which passes through the housing 54 of the mechanism. This housing is supported by a vertical plate 53 which has a base 53a to rest upon a fixed support and the mechanism is clamped thereto by the hook bolts 56 and nuts 55. An aperture 57 is provided in plate 53 considerably larger than shaft 52 so that the mechanism may be clamped in place, properly aligned with shaft 50.

The flexible drive 17 connects to the worm 59 which engages the worm wheel 58, mounted on shaft 60 on which shaft the gear 61, Fig. 5, is mounted. Gear 61 engages gear 62, mounted on shaft 63, and it also engages gear 64, mounted on shaft 65, so that when the motor 18 is running the shafts 63 and 65 are continuously rotating. Mounted on the shaft 63, Fig. 6, is the gear 66 which engages gear 67, splined on shaft 52, which shaft is coupled to platen 13; also on shaft 65 the gear 68 is mounted which likewise engages gear 67, splined on shaft 52, thus rotating either gear 66 or gear 68 will rotate the platen. Gear 66 is connected with shaft 63 by an electrically controlled friction clutch 69 and gear 68 is similarly connected with shaft 65 by clutch 71.

The friction clutch 69, Fig. 7, when moved to the left, engages the clutch member 70, and 69 being splined on shaft 63, it thereby causes gear 66 to rotate with gear 62. This clutch is operated by the armature lever 74, pivoted at 75, and held in the released position by spring 76, which is opposed by magnet 73, so that when 73 is energized, the clutch is brought into engagement and when 73 is deenergized the clutch is immediately disengaged. A corresponding mechanism is used on shaft 65 in which the clutch 71 is brought into engagement with clutch member 72 to rotate gears 64 and 68 together on shaft 65. The clutch 71 is operated by armature lever 78, pivoted at 79, and controlled by magnet 77 in a manner similar to the clutch 69.

The gear ratio between the drive shaft 60 and the driven shaft 52 is lower when the clutch 69 is engaged than when the clutch 71 is engaged, with the result that when magnet 73 is energized, and which corresponds to the condition in which the paper is located in the writing position, the platen is rotated at a lower speed, due to the difference in the size of the gears, than when magnet 77 is energized and which corresponds with the condition in which the paper is discharged from the platen. The high speed in which the paper is discharged from the machine projects it forward onto the conveyor and enables the conveyor to be spaced a distance from the platen that will permit the use of the longest commercial sheets of paper without having the upper ends of these sheets engaging the conveyor at any writing position. At the same time, short sheets are projected forward by the high speed of the platen to engage the conveyor.

Control of platen

The machine is intended to operate on long sheets of paper as well as on short forms and envelopes. To position the paper on the platen may require more than one turn of the platen and to ultimately discharge the paper from the platen may require more than two turns of the platen. The control of magnets 73 and 77 is so arranged that for each cycle of operation the platen will make three complete turns. One of the controls for this purpose is illustrated in Fig.

6, in which the ring 81 is geared to the wheel 67 and is mounted to rotate on the stationary disc 83 which is secured by the hollow nut 84 to the upstanding head 85 of the frame member 54. The ring 81 is held in place by the cleat 82 and carries the contacting band 86 which controls the circuit of magnet 77. This ring or band is provided with the dead or insulated section 87 which marks the beginning of a cycle of operation. It will be noted that as the shaft 52 is rotated the ring 81 is also rotated and it requires three turns of gear 67 to complete one turn of the ring 81 or one cycle of operation. The hollow nut 84 enables the electrical conductors, whose circuit is controlled by 86, to pass through this nut.

The electrical control of magnet 73 is obtained by the disc 90 and the disc 88 mounted thereon and rotated by shaft 52 through a frictional engagement thereof so that these discs can be positioned to control magnet 73 through the contact fingers 89, 91, at any position of the platen desired, as more fully described in connection with the operating circuits, Figs. 22 and 23.

Mounted on the outer end of the shaft 52, Fig. 4, is an adjustably positioned bracket 92, carrying the detent 93 which engages the stepping wheel 94, mounted at 95 on the bracket 96 which is secured to the supporting plate 53. A spring pressed roller 97 engages the teeth of 94 to hold it in position. Each movement of the typewriter carriage to the right, which is preliminary to starting a new line, moves the stepping wheel 94 one step for setting up a control as defined in the operating circuits for either changing the platen to move the paper to a new writing position or for completing the cycle of operation by discharging the sheet of paper from the machine. It will be noted that the splined shaft 52 is the only part which is mechanically connected with the typewriter and in order to apply the mechanism to existing machines, the splined shaft 52 slides through the mechanism. It is obvious that if a special platen is provided the spline could be located in the platen roller itself.

The feed roller

In Fig. 9, the type bar is indicated at 101 engaging the platen roller 13 in the writing position, this roller is provided with the usual paper guide 102 and the spring pressed roller 103, mounted on the paper table 104 for conducting the paper sheet 105 into the writing position. The paper sheet 105 is brought forward by the conveyor belt 106 and is directed by the paper guide 107 to the ledge 108 of the feed roller 26. This ledge extends longitudinally of the roller and forms a stop for the entering edge of the paper sheet and upon which the paper sheet is aligned. The feed roller 26 has a raised or cam surface 109 which, as the roller rotates in the direction of the arrow, clamps the paper sheet 105 between this roller and the spring pressed roller 111 and thus urges the sheet forward to engage the platen during approximately one-half revolution of roller 26, representing the surface of cam 109. As soon as the paper sheet is engaged between the platen 13 and the roller 103 the paper is released by roller 26 owing to the depressed part of the roller indicated at 110, registering with roller 111 as indicated in Fig. 9. It will be noted in this figure that the paper 105, now in writing position on the platen, is free of the feed roller 26 and the longitudinal movement of the platen 13 with the carriage, and the paper 75

105, is not interfered with by the feed roller 26. The paper discharged from the platen is projected between the guides 112 and 113 and below the spring pressed roller 115 onto the upper conveyor 114 from which it is conveyed to the tray 28. If the nature of the paper to be written upon requires the immediate engagement of the roller 111 with the cam 109 when the ledge 108 is cleared, a cam arrangement as shown in Fig. 10 may be provided to secure this result. In this construction the support of the roller 111 is extended and connected with the arm 119 which is provided with the slot through which the axis of the roller 26 passes and this roller has a cam 116, with a rise 117, which engages the roller 118 of the arm 119 and which is arranged to pull the roller 111 into engagement with cam 109 at the proper time.

Aligning the paper sheet

In order to insure that the paper sheet 105 is properly aligned with the mechanism, a detector arrangement is provided as shown in Fig. 11, and which comprises the light bulb 124, placed in line with the diametrical opening 123 in the feed roller and so arranged that when the sheet of paper 105 is absent a light from the bulb shines directly upon the photo-electric cell 125 and thereby establishes a circuit to indicate this condition, the application of which is described in the operating circuits. The system contemplates a pair of detector circuits, one operating through the hole of 122 and the other operating through the hole 123 in Fig. 3. These holes are spaced apart to correspond with the outer edge of the paper and the control is so arranged that the paper must rest on the ledge 108 in such position as to block the light through both apertures at the same time, which results in the paper being properly aligned for writing purposes.

Drive of feed roller

The feed roller is driven by a friction drive from the platen by the mechanism shown in Figs. 3 and 8. The left hand end of the roller 26 has a circular section as indicated at 127 which engages the friction roller 128, carried by the arm 129, which is secured to the plate 130, slidably mounted on the arm 131 and normally held on account of the free movement provided at 132 in arm 131, by the spring 133, in engagement with roller 26. The arm 131 is pivoted at 134 on the axis of roller 26 and has an extension carrying the armature 135 to be attracted by the magnet 136, secured by bracket 137 to the frame 25. When this magnet is energized, the arm 131 is moved towards the platen 13 so that the friction roller 128 is brought into engagement with 26 and 13 and the sliding motion of plate 130 enables the frictional engagement to be equalized between these rollers. When magnet 136 is deenergized, spring 138 moves the arm 131 away from the platen and immediately disengages the friction drive. It will thus be noted that when magnet 136 is energized the rotation imparted to the roller 13 is correspondingly imparted to roller 26 and when 136 is deenergized, which condition always prevails during the writing period, the friction roller 128 is held free from the platen and thus avoids any interference with the movement of the carriage. The magnet 136 may be controlled by a disc 139, rotating with the roller 26 and the contact fingers 140 and 141 which are more particularly described in connection with the operating circuits.

The paper lift

In Figs. 12 and 13 the continuous running belt 31 drives the main shaft 33 with the roller 156 and the conveyor belts 176 and 177. Magnet 151, mounted on frame 21, has an armature 152, pivoted at 152a and normally held in the deenergized position by spring 153. When this magnet is energized the armature 152 moves the clutch 154 on the shaft 33 which is splined at 155, to engage the clutch member 157, of pulley 157a and by the crossed belt 158 and pulley 159 rotates the paper lift drum 37. One side of this drum 160 is provided with the cam 161 which has a depression at 162. A roller 163 engages cam 161 and is carried by the lever frame 164 which is pivoted at 165, has a roller 166 resting upon the inner end of the pile of paper 38 so that as the pile is used up this roller follows the paper and lowers the roller 163 supporting the drum 37 so that the drum by gravity, swinging on the arm 36 through the arc indicated by c—d, follows the paper in the tray and automatically adjusts itself to the quantity of paper in the tray. The pressure on roller 163 and roller 166 can be regulated by the counter weight 172, mounted on arm 171, attached to frame 36 and arranged to counter balance part of the weight of the drum 37.

The drum 37 is provided with blades, at 169 and 170 which may be used to create an air circulation through the paper as the machine is in use. The drum has provided thereon a pair of spaced vacuum cups 167 and 168, Fig. 13, which are aligned with the depression 162 of the drum so that when this depression registers with the roller 163 these vacuum cups are, by gravity, forced into engagement with the top sheet of the paper pile and by the suction in the cups the top sheet is lifted from below the roller 166 and carried forward between the jaws 173 and 174 to the conveyor belt 176 on roller 175 and below roller 178, mounted in the bracket 179 attached to frame 36. The position of a paper sheet being taken up is indicated in dotted outline in Fig. 12 at 105 in which the vacuum cup 167a has moved forward the sheet to the delivery position. As shown in the illustration, the take-up drum 37 has one set of vacuum cups and makes one delivery for each revolution. Its revolution is controlled by disc 180 and the contact finger 181 which controls magnet 151 as defined in the operating circuits.

The Venturi suction lift

It is common practice in printing machines to provide a suction for taking up the top sheet of a pile of paper and to provide an air blast to play on the pile to prevent the sheets from adhering to each other. An arrangement of this kind can be used with the present invention but for ordinary purposes a suction created by a Venturi nozzle is preferred. Instead of providing a compressor and a suction pump to operate the system, the Venturi nozzle enables the entire system to be operated by an air blast from a blower which is comparatively inexpensive. The air blast is operated through a pair of Venturi nozzles to create the suction for lifting the paper and then the air is discharged on the paper pile for the same purpose as the regular air jet.

The operation of the Venturi suction will be understood from Figs. 13, 14 and 15, in which the motor 182 operates the blower 183 to deliver a stream of air to the hose 184 which connects through valve 185 with the hollow shaft 180 upon 75

which the drum 37 is mounted. This shaft is provided with a Venturi nozzle as indicated at 191 and which connects by pipe 192 with the vacuum cup 167. A second Venturi nozzle 193 connects by pipe 194 with the vacuum cup 168. The air is discharged from pipe 190 through the opening 196, connecting with the annular chamber 197 in the collar 186 which connects to pipe 187 and which discharges the air against the paper pile 38 as indicated in Fig. 12. As long as a stream of air is maintained in pipe 190 a suction is maintained at 167 and 168 which lifts the paper and moves it forward as the drum is rotated. As soon as the air stream ceases the suction also ceases and the paper is released. This condition is obtained by the valve 185 and the segmental opening 195 in the pipe 190, Fig. 15. A connection is established between the air delivery pipe 184 and the pipe 190 only during the time that the aperture 195 registers with the aperture of pipe 184; this corresponds with the time just before the vacuum cups engage the paper and ceases at the time the paper is to be released. The term "venturi" is used in a generic sense herein and includes a suction created by an air stream.

In the alternative construction shown in Fig. 16 the shaft 190a of the drum 37 is not made hollow as in Fig. 14, instead the vacuum cups 202 and 203 are connected by tubing indicated at 201, with a collar 200 rotating with the drum 37. A second collar 198, secured to the frame 36 is provided with an aperture at 199, which in one position opens the tube 201 to atmosphere, but in all other positions of rotation the tube is closed. The cups 202 and 203 are made of soft rubber and connect with the tube 201. When the drum is lowered by the depression 162 of cam 161, these cups are forced into engagement with the paper, thereby creating a partial vacuum according to the well known rubber vacuum cups; this vacuum lifts a sheet of the paper and as soon as the delivery position is reached the vacuum is released at 199. The tube 201 is made as small as possible so as not to materially influence the vacuum created in the vacuum cups.

Elevating the paper tray

In the arrangement shown in Fig. 12, the take-up mechanism is shown as being self-adjusting relative to the height of the paper in the paper tray which rests on the fixed support or table 11, Fig. 1. In some cases it is desirable, either with this self-adjusting system or without the self-adjusting feature, to provide a mechanism that will automatically elevate the paper in the paper tray as it is used up; the arrangement in Figs. 17 and 18 is provided for this purpose. This comprises a paper tray 39a in which the paper pile 38 is placed. A post 205, rising from the bottom of the tray pivotally supports the lever 206 with the cross bar 207 resting upon the paper, so that by gravity the lever 206 is lowered as the paper is removed from below the bar 207. A stand 208, through the slot 209, supports a light bulb 210, which is linked to the lever 206 at 211. This has the effect of moving the light bulb 210 vertically in the slot 209 as the paper is removed from the tray. On the opposite side of the tray an aperture 204 is provided in the wall and opposite this aperture, on a fixed stand 213, is provided the light cell 212 which is directly opposite the light bulb 210 when the paper is at normal height. The bar 207 extends across the surface of the paper stack, holds the paper level and as

it is comparatively light it readily releases the sheets as they are taken off.

The light cell 212, through the amplifier 214 and circuit 215, energizes relay 216 when the light from the bulb 210 falls upon the cell. When relay 216 is energized a circuit is established from the source of energy B through contact 217 and circuit 218 to motor 219. The motor 219, through the worm 220, and worm wheel 221, supported on 222, and threaded on stem 223, raises the tray 39a, which is guided in its vertical movement by the slide 224, engaging the fixed arm 225. It will be seen that when the paper 38 is below normal and permits the light from 210 to energize 212, the motor operates to raise the paper tray until the light is shut off. When this occurs the circuit is interrupted, relay 216 is de-energized and the tray makes no further movement until the paper is again reduced below the normal height when the operation is repeated and in this way the level of the paper is maintained for operating conditions.

Auxiliary roller drive

The driving mechanism for the platen of the typewriter may be obtained through an auxiliary roller which can be mounted in the place of the feed roller and arranged by a friction drive to cause rotation of the platen as desired. An arrangement of this kind with finger stops for the paper sheet and the control therefor is illustrated in Figs. 19, 20 and 21. The auxiliary roller 230, through the friction wheel 128, drives the platen 13, which is controlled by the magnet 136 as in Fig. 3. The mechanism which rotates shaft 52 is coupled to shaft 26a of roller 230 so that this roller is controlled in the same way as the platen roller is controlled in Fig. 3. A rod 231, mounted at the back of the roller 230, carries the arm 232 with the roller 233, also the arm 234 with the roller 235. The rollers 233 and 235 are controlled by the armature 236 which is attracted by magnet 237 to bring the rollers into engagement with the paper sheet 105. When the magnet 237 is de-energized the rollers are moved away from the auxiliary roller 230 by the spring 238.

A sleeve 241 is mounted on rod 231 and carries an arm 242 with the stop stud 243 and a second arm 244, spaced from the first arm, with the stop stud 245. The sleeve 241 has an armature lever 246 connected by a stem 247a with the armature 248 which is attracted by the magnet 247 when this magnet is energized. Spring 249 brings the stop studs 243 and 245 into position to stop the paper sheet 105 and to hold the sheet in this position until these studs are withdrawn, which occurs when the magnet 247 attracts the armature 248.

The electrical operation of this apparatus will be understood from the circuits shown in the drawings from which it will be noted that magnet 136 is energized through circuit 313a in series with magnet 73 or magnet 77. Since magnets 73 and 77 are energized to operate the clutches of the driving mechanism, the magnet 136 is also energized at the same time, thereby establishing frictional engagement between the auxiliary roller 230 and the platen 13, and causing rotation of the platen 13 in correspondence with the rotation secured in Fig. 3. In this arrangement the drive is made to the mechanism which is stationary relative to the carriage movement of the platen and a splined shaft is not required.

Magnet 237 is controlled by circuit 251 through contact finger 253 when relay S is energized and through contact 252 when relay P is energized, 75

and magnet 247 is energized through circuit 254, including contact 255, when relay D is energized, contact 256 when relay P is energized, and contact 257 when relay S is energized. Thus the operating circuit of magnet 237 is established in multiple by relays S and P and the operating circuit of magnet 247 is established in multiple by relays S, P and D. In order to deenergize magnet 247 to permit the stops 243, 245 to stop the paper before the cycle of operation is completed the circuit through contact 255 is continued through line 254a, to contact fingers 261 on disc 83. The fingers are bridged by band 262 which interrupts the current before the cycle is completed.

The relay P when energized causes the primary, or first, movement of the platen to position the paper for the first writing operation and at the same time it energizes magnet 237 to cause the rollers 233 and 235 to clamp the paper against the auxiliary roller 236 and thereby deliver the paper to the platen. If a second writing position is to be established, the relay S is energized for this purpose which again establishes the circuit of magnet 237, thereby delivering the paper further to the platen. If, however, the platen is provided with the usual feed rollers, this second energizing of the magnet 237 by relay S will not be necessary.

The stop studs 243 and 245 stand normally in position to stop the sheet of paper from reaching the platen by the action of spring 249. However, when the paper stock is to move forward, these fingers must be moved out of the way to permit the rollers to act upon the paper. As the paper is moving onto the platen when relays P and S are energized and also when relay D is energized, which relay is energized when the paper is discharged from the platen, the magnet 247 is energized to remove the stop fingers under these conditions. The rollers 233 and 235 engage the paper above the fingers the instant that the stops release the paper and cause its forward movement to the platen. The control of relays S, P and D will be described in connection with the operating circuits.

The operating circuits

The synchronous operation of the various parts making up the system will be understood from the operating circuits as illustrated in the diagram in Fig. 22. The control is shown by one side of the circuit only, starting at a source of energy usually indicated by B and the return circuit is indicated by an arrow point. In this diagram relay P controls the circuit of the clutch magnet 73 until the platen has made a predetermined movement as determined by the positions of the controlling disc 90. After the predetermined number of lines have been written in this position as determined by the movement of the stepping wheel 94, the relay D is then energized, which energizes the clutch magnet 77 and discharges the paper. Should, however, a second writing position be desired, relay S is energized, following the relay P, which energizes the clutch magnet 73 a second time until the new position is reached as determined by the controlling disc 88. After the writing is completed in this position, the final movement of the stepping wheel 94 energizes relay D to complete the cycle of operation as determined by the controlling ring 81. When relay P is energized magnet 136 is energized to cause one-half turn of the feed roller 26 and when relay D is energized the feed roller completes its revolution and magnet

151 is energized to operate the paper lifting drum.

Relay P is energized through wire 301 by means hereafter to be described. This is a stick relay controlling its own circuit through contact 302, wire 303, wire 304 and contact fingers 305 and 306 bridged by band 307 on disc 90, which is rotated by the shaft 52. Finger 306 connects by wire 308 to contact finger 309 of relay P and to energy B. Wire 310 connects to wire 304 and is controlled by contact 311, held in the closed position by armature 78 when magnet 77 is deenergized, and the circuit continues by wire 312 to magnet 73 and to the return circuit on wire 313. This engages clutch 69 and rotates the platen until the band 307, moving in the direction of the arrow, moves from under the contact finger 306 and thus opens the circuit from the contact finger 309 to wire 310, thereby deenergizing magnet 73 and it also opens the holding circuit on wire 303, causing relay P to deenergize. The discs 88 and 90 engage an arbor 404, splined on shaft 52, through a disc spring 403, which enables these discs to be adjusted relative to the shaft 52. The point at which the band 307 opens the circuit to 306 is the point where the first line in the writing operation begins and the disc is adjusted for this position on a graduated scale. A micrometer adjustment may be obtained supplementary to the adjustment of disc 90 by the screw 402 adjusting the position of the block 401 carrying the contact fingers. A similar adjustment is obtained for the block at 405 by the screw 406, carrying the contact fingers engaging the disc 88.

When the relay P is energized a circuit is established through contact finger 317, wire 318, contact finger 353 of detector relay 354 deenergized, wire 360 to contact finger 319, contact 319a on band 320, contact finger 321 and wire 322a to magnet 136. This sets up the frictional drive for the feed roller 26 from the platen 13 to move the paper forward to the platen. The contact finger 319 maintains the circuit at 319a until the insulation 322 is moved by the disc and the band 320 engages the fingers 321 and 321a. The energy for maintaining magnet 136 energized is obtained through contact finger 321a until one-half revolution is made and the band 320 is moved from below the contact finger 321. In this position the feed roller is stopped clear of the paper that is being fed to the platen as in Fig. 9.

Relay S is energized through wire 323 by means hereafter to be described and closes a holding circuit through contact 324, to wire 325 which connects to wire 310 and energizes magnet 73. An energy circuit is established from energy B through contact 329 of relay S to wire 328 and a circuit is established from this wire across the contact fingers 331 by the band 328a until this band, which is mounted on disc 88, moves around to disengage one of the contact fingers and open the circuit. When the circuit is open, clutch magnet 73 is deenergized and the holding circuit of relay S is deenergized. It will be noted that the holding circuit of relay S and the circuit on wire 310 for magnet 73 is maintained through the contact fingers 331 until the second movement of the platen has been completed. The extent of this movement is determined by the adjustment of disc 88 to position the contact band 328a so as to open the circuit of magnet 73 at the correct place for beginning the writing in the second position.

Relay D is energized by wire 335 in a manner hereafter to be described and closes a holding circuit through contact 336 to wire 337, contact

fingers 339 on disc 83, bridged by contact band 86 and by wire 341 to contact 342 of relay D to energy. Wire 343 connects to wire 337 and to the circuit controller 344, closed by armature 74 of magnet 73 in the deenergized position, to wire 345, magnet 77 and to the return circuit on wire 313. This engages the clutch 71 to rotate the controlling ring 81 in the direction of the arrow until the insulated section 87 insulates one of the contact fingers 339 and opens the circuit which deenergizes the clutch magnet 77, and deenergizes the holding circuit of relay D and restores the system to the starting position.

It will be noted that the circuit of the clutch magnet 73 is controlled by the clutch magnet 77 and the circuit of clutch magnet 77 is controlled by magnet 73 so that both of these magnets cannot be energized at the same time. In the rotation of the platen as controlled by discs 88 and 90 a corresponding rotation is applied to ring 81, making a partial turn from the zero or starting position. When relay D is energized the ring 81 is rotated to complete the cycle of operation and to restore the apparatus to the starting position for another operation.

When relay D is energized a circuit is established through contact finger 351 and wire 356, to contact finger 357, engaging the disc 139. This contact finger 357 engages only the projection 358 of band 359 which has been moved under this contact finger by the previous half revolution of the feed roller 26. This continues a circuit through band 359, contact finger 321 and wire 322a to magnet 136, which brings the frictional drive of the platen, as rotated by the engagement of clutch 71 to rotate the roller 26 for the second half revolution, thus restoring this roller to where the ledge 108, Fig. 8, is in position to engage the next sheet of paper. The roller 26 makes two half turns in one cycle of operation of the mechanism.

The detector relay 354 is operated by circuit 361, controlled by the light valve or photo electric cell 125 and amplifier 362 and by a second light valve 125' and amplifier 363 to the energy wire B. The relay is controlled in multiple circuit by both of the light valves so that unless the paper sheet 105 shuts off the light through both the openings 122 and 123, relay 354 will be held energized and the circuit for the operation of magnet 136 by relay P will be interrupted until the paper is properly adjusted, that is, the paper will not be delivered to the platen.

When the mechanism is to automatically repeat its operation after each cycle of movement, the switch 349 is closed between wire 301 and 348, the latter connecting to contact finger 347 on disc 83, so that just before ring 81 rotates to the starting position, the projection 346 engages contact finger 347 and thereby picks up relay P from the energized band 86, which initiates the next operation of the system by rotating the platen at the reduced speed until a new sheet of paper is located in the writing position. If automatic repeating is not required, the switch 349 is connected to the manually operated push button 350 by which the operator establishes the circuit to energize relay P.

The line control

The automatic control obtained by the number of lines that are to be written may be adjusted to operate for a different number of lines at each writing position and with any line spacing desired, for instance, in the first writing

position the control may not become effective until three lines have been written, after which the platen is operated to place the paper in the second writing position, and in this position one line only may be all that is needed, after which the system should automatically complete the cycle of operation and adjust itself for the next operation. This is secured by the stepping wheel 94 and a relay which changes over the operating conditions prevailing at one writing location to the new conditions prevailing at the next writing location. The writing positions are set up automatically but the line spacing is manually operated at each position.

The wheel 94 is provided with three rows of contacts, 1a, 1b, 1c, which engage the contact finger 369, the outer row 1a has a contact for each step of the wheel, the second row 1b has a contact for each second step of the wheel and the third row 1c has a contact for each third step of the wheel. The first row connects by wire 371 to contact 372 of the change-over relay C. The second row connects by wire 373 to contact 374 and the third or inner row connects by wire 375 to contact 376. When the change-over relay C is deenergized these wires are in circuit with a group of switches 377, marked a, b and c, and when the relay C is energized these wires connect to another group of switches 378, marked a, b and c. When C is deenergized and switch 377a is closed the outer row of contacts are in circuit and when switch 377c is closed the inner row of contacts are in circuit. When relay C is energized and switch 378a is closed the outer row of contacts are in circuit, when switch 378b is closed the second row of contacts are in circuit and when 378c is closed the inner rows are in circuit. The switches 377 and 378 connect to the wire 425 which receives energy through contact 426 when magnet 394 is deenergized.

The contact finger 369, by wire 370, connects to relay T and when it engages an energized contact, relay T is energized; at other times relay T is deenergized. When relay C is deenergized, switch 388 closed and switch 382 open, a circuit is established through contact 384 of relay T, wire 385, contact 386 of relay C, switch 388, wire 387, contact 390 of relay S deenergized, and wire 335 to energize relay D for completing the cycle of operation. When relay T is energized and relay C is energized, the previous circuit is interrupted at 386 and another circuit is established on wires 332 and 323 to energize relay S for the second movement of the platen.

When the system is to operate to a second writing position the switch 388 is opened and the switch 382 is closed so that when the relay T is energized a circuit is established through contact 380, wire 381 and switch 382 to pick-up relay C; and a holding circuit is established for this relay through contact 383 and wire 316 to contact fingers 314 which are bridged by the contact band 315 on disc 90 in the second position so that when relay C is thus energized it remains energized and changes over the system. A circuit is established at the same time from wire 385, through contact 386, wire 332, wire 323 to energize relay S. After relay S is energized it operates the platen according to the position of disc 88, but once the circuit is interrupted at contact fingers 331 there is no further movement of the platen even if relay S should afterwards be energized.

The number of lines to be written in the first

location being known, a corresponding switch *a*, *b* or *c* of the group 377 is closed, say switch *c* is closed and the other switches are open, then the first line is written without any change in the carriage, but in returning the carriage to write the second line the wheel 94 is moved one step, and in returning the carriage after writing the second line, wheel 94 is moved the second step, and in returning the carriage after writing the third and last line, the wheel 94 is moved another step, which establishes the circuit of relay T. This condition occurs only as the carriage completes its movement to the right so that the carriage is in its normal position relative to the conveyor mechanism. If this is the only operation, then relay T energizes relay D to complete the cycle and relay C remains de-energized.

If a second writing position is required, say of two lines, then switch *b* of group 378 is closed while the other switches remain open and switch 382 is closed and switch 388 is opened. In this position, as soon as the carriage has been restored at the end of the first writing, relay T is energized which energizes relay C and the contact band 315 on disc 90 being now positioned to bridge the contact fingers 314, the circuit is established through wire 316 to hold relay C in the energized position for the remainder of the operation. Thus, in the first operation, relay C remains deenergized and establishes a line control by the switches in group 377 until the first writing is completed. The final movement of the carriage energizes the change-over relay for the new condition of writing at the next location.

When relay T is energized again after the second writing operation a circuit is established through 384 and 386 to energize relay S but this circuit does not affect the movement of the platen as it is interrupted at the contact fingers 331 which have rotated the platen to disengage the band 328*a* from 331 and to bridge the contacts 327 by the band 330. In this second writing position, therefore, with relay C energized, the circuit is established by relay T energized through contact 384, wire 385, contact 386, wire 332, wire 323, contact fingers 327, wire 33, contact 390 of relay S, which is now energized by wire 323, to wire 335 and relay D which restores the system to its normal position. The number of steps, or the number of lines, to be written at each location is limited in the drawings to three lines and this number is selectively determined by the group of switches 377 and 378.

Where the number of lines are the same following each other at a single writing location the system will adjust itself for repeating operations, and if the number of lines to be written at the first and at the second locations are the same, the system will automatically adjust itself for repeating operations; but, if the number of lines in the second location are different from those in the first location, then the stepping wheel would get out of step in each cycle of operation and in order to prevent this the stepping wheel is automatically restored to a neutral or starting position of which four positions are shown in the drawings. This is obtained by the magnets 394 and 394*a* rotating the four pole rotor 393 with the poles 398 between these magnets. This rotor is mounted on the axis 95 of the stepping wheel 94 and when the magnets are energized the poles are rotated into alignment with the magnets. These magnets are controlled by wire 395, and by contact 396 of relay P, also by contact 397 of relay S so that when

either relays P or S are energized to move the platen to a new writing position the stepping wheel is synchronized at the same time.

The paper feed roller operates with the discharge of the paper from the platen and is controlled by a circuit established through contact 411 of relay D, wire 412, contact finger 414, projection 413, band 415 on disc 180, to contact finger 419 and wire 417 to the clutch magnet 151. As soon as the initial movement of the disc has been made to remove the insulation 416 and bridge fingers 418, 419 by band 415, a circuit is established for operating the clutch magnet 151 for a single complete revolution.

The restoring apparatus 393 for wheel 94 is intended to complete its operation before the platen has completed its movement and deenergized relay P or relay S. Should, however, the wheel 94 be restored to the neutral position before the platen movement is completed, it cannot cause improper operation of the system as the energy for relay T is cut off at 426 during this operation. When restored to the neutral position from which any of the steps may be started, the finger 369 rests between the radial row of contacts on each band, on lines 398*a* and the next contact on the outer row so as to leave the circuit open until the first movement of the carriage completes the initial step and connects 369 with the next contact on the outer row. The teeth engaging roller 97 in this position are shaped to permit this movement.

The electric control enables the apparatus to be condensed and the use of stick relays in controlling the rotation of the platen gives results that would be complicated and involved if applied mechanically. It should, however, be understood that a system of cams could be used for operating the clutches for the paper take-up and operating the friction drive for the feed roller. The stop fingers and engaging rollers in Fig. 20 could also be operated by a cam movement. It is apparent that the apparatus for each specific feature may be used in a generic sense as well as in the combination shown. The paper has been referred to as a sheet of paper which is understood to include manifold sheets that are commonly used in making several copies on the typewriter.

An application was filed on August 6, 1934, Serial No. 738,609 now Patent 2,028,813, January 28, 1936, by Robert Stuart, one of the applicants in the present case, relating to a machine for securing part of the results disclosed in this application by a mechanism that is entirely mechanical in its operation.

Having thus described our invention, we claim:

1. A system for delivering paper sheets from a stack to printing machines comprising a fixed support for the paper, a conveyor for delivering the paper, a lifting drum for lifting the sheet from the stack to the conveyor, a pivoted frame for said lifting drum and means regulated by the height of the paper in the stack supporting said drum to follow the paper as it is used and to enable the paper to be taken up by the drum from the entire stack.

2. A system for delivering paper sheets from a stack to printing machines comprising a lifting device arranged to engage the top sheet of the stack and move it forward to the printing machine, a Venturi nozzle maintaining a suction for said lifting device and a pipe for maintaining an air stream through said Venturi nozzle when the sheet is to be lifted and delivering said air stream upon the paper stack.

3. A system for delivering paper sheets from a stack to printing machines comprising a lifting device arranged to engage the stop sheet of the stack, and move it forward to be printed, a pipe with a Venturi nozzle for maintaining a suction; means connecting said Venturi nozzle to said lifting device and a single means for maintaining an air stream through said nozzle and discharging said air upon the paper stack.

4. A system for printing comprising a platen roller and means for feeding the paper to be printed to said roller, line spacing means, manually operated for said roller, power operated means for automatically rotating said roller to position the paper for printing and power operated means for rotating said roller at a higher speed than the positioning speed to discharge the paper after printing said power operated means for discharging the paper controlled by said line spacing means.

5. A system for printing comprising a platen roller and means for feeding the paper to be printed to said roller, line spacing means for said roller, power operated means for automatically rotating said roller to a plurality of printing positions of the paper independently of said line spacing means, and power operated means for rotating said roller at a higher speed than the positioning speed to discharge the paper after printing.

6. A system for printing comprising a platen roller, a line spacer and means for feeding the paper to be printed to said roller, means controlled by the rotation of said roller for automatically rotating said roller to position the paper for printing and means controlled by the line spacer for automatically rotating said roller to change the paper to a new writing position after a predetermined number of lines have been written.

7. A system for printing comprising a platen roller, a line spacer and means for feeding the paper to be printed to said roller, means controlled by the rotation of said roller for automatically positioning the paper for writing a predetermined number of lines at a first location, means for automatically rotating said roller to change the writing position of the paper for writing a predetermined number of lines at a second location and means controlled by the line spacer for discharging the paper from the machine after the number of lines at the second location are completed.

8. A system for printing comprising a platen roller and means for feeding the paper to be printed to said roller, means controlled by the rotation of said roller for rotating said roller for a cycle of operation, additional means controlled by the rotation of said roller for rotating said roller to position the paper in a predetermined printing position within the cycle of operation and means for completing the cycle of operation after a predetermined number of lines have been written.

9. A system for printing comprising a platen roller and a feed roller for feeding paper to the platen roller to be printed, a ledge on said feed roller for positioning the paper, a cam on said feed roller engaging the paper for feeding purposes and means for rotating said feed roller a first time to feed the paper and rotating said roller a second time to position the paper for each sheet of paper fed to the platen.

10. A system for printing comprising a platen roller and a feed roller for feeding paper to the platen roller to be printed, a ledge on said feed

roller for positioning the paper, a cam on said feed roller engaging the paper for feeding purposes, and means connecting said roller with said platen for intermittently rotating said roller to feed the paper to the platen and to position the paper before feeding to the platen.

11. In a printing system, a platen roller, means for feeding paper to said platen roller to be printed and means for aligning said paper with said platen comprising a pair of spaced light sensitive cells placed in the path of an edge of the paper when in the aligned position and means for preventing the operation of the feeding means when either, or both, of said light cells are energized.

12. A system for printing comprising a platen roller for receiving the paper to be printed, a feed roller, means for driving said feed roller intermittently to position the paper on the platen, frictional means for driving said platen by said feed roller, stop studs for holding the paper before entering the feed roller, clamping rollers for clamping the paper against the feed roller and means for moving said studs to an inoperative position as said feed roller is rotated.

13. A paper feed system for printing comprising a conveyor, a paper tray for a stack of paper, means for taking up said paper one sheet at a time and placing said sheet on the conveyor, motor operated means for elevating said tray, a light bulb on said tray, means for moving said bulb vertically by the stack of paper, a light cell on a fixed location, said paper stack being located between said light bulb and said light cell to shut off the light when the height of the paper is normal and means for operating said motor to elevate the tray when the light to said cell is not shut off.

14. A system for delivering and placing paper sheets on the platen of a typewriter in a predetermined position, comprising a paper lift for the sheet, a conveyor receiving the sheet, a feed roller positioning the sheet and delivering it to the platen, means for automatically rotating the platen to a plurality of predetermined writing positions for writing a plurality of lines in each position and means for automatically rotating the platen to discharge the paper when the writing is completed.

15. A system for delivering and placing paper sheets on the platen of a typewriter in a predetermined position comprising a conveyor for the sheet, a feed roller receiving the sheet from the conveyor, aligning said sheet and delivering it to the platen, means initiated by the rotation of the platen for rotating the platen to position the sheet and means controlling the further rotation of the platen by the movement of the typewriter carriage.

16. A system for delivering and placing sheets of paper on the platen of a typewriter, comprising means for delivering the paper to the platen, adjustable means initiated by the rotation of the platen for rotating the platen to a predetermined extent, adjustable means controlled by the movement of the typewriter carriage after a predetermined number of movements of the carriage for rotating the platen to a second position and means controlled by a predetermined number of movements of the typewriter carriage for causing further rotation of the platen.

17. A system for rotating the platen of a typewriter to position the paper thereon, comprising a motor, a pair of independent gears of different gear ratio connecting said motor with the

platen, a magnetically operated clutch for each of said gears and means for operating said clutches for the predetermined rotation of said platen by said motor.

18. A system for rotating the platen of a typewriter to position the paper thereon, comprising a motor, a gear and a clutch connecting said motor with said platen, a line spacer for the platen, a magnet for operating said clutch, a circuit controller operated by the rotation of said platen and a stick relay controlling said clutch, having a holding circuit controlled by said circuit controller and having a pick up circuit controlled by the line spacer.

19. A system for rotating the platen of a typewriter to position the paper thereon, comprising a circuit controller connected to said platen to make a single revolution for a plurality of turns of the platen and a second circuit controller rotating with said platen, a motor, a gear with a clutch connecting said motor with said platen, a second gear and clutch connecting said motor with said platen, a magnet operating the first clutch and controlled by said first named circuit controller and a magnet operating the second clutch and controlled by the second circuit controller.

20. A system for delivering and placing sheets of paper on the platen of a typewriter, comprising a paper take-up, a magnetic clutch controlling said take-up, a feed roller for delivering the paper to the platen, a magnet controlling the rotation of said feed roller and controlled by said feed roller, a motor, a gear connecting said motor with said platen through a magnetic clutch and means for controlling the operation of said paper take-up, said feed roller and said platen to place a sheet of paper in writing position on said platen, to remove the sheet when the writing is completed and to continue the operation.

21. A mechanism for operating the platen roller of a typewriter with a movable carriage having a shaft for said roller, a motor, a gear mechanism operatively connecting said motor and shaft, a plate fixed relative to said carriage, means for detachably securing said mechanism to said plate, and means including a spline operatively connecting said shaft with said mechanism.

22. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism having gears of different ratio, a flexible shaft operatively connecting said motor with said mechanism, means operatively connecting said mechanism with said shaft to rotate said shaft by said gears at different speeds relative to the speed of said motor and electrically operated means for selecting the effective gear ratio of said mechanism.

23. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, a gear on said roller shaft, a pair of gears of different gear ratio connecting said drive shaft with said roller shaft and means for selectively making either of said gears effective at a time to drive said platen shaft from said drive shaft.

24. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, a gear on said roller shaft, a pair of gears of different gear ratio connected with said roller shaft and a clutch for each gear operatively connecting the gear with the drive shaft.

25. A mechanism for operating the platen roller of a typewriter mounted on a carriage with a shaft for said roller, a mechanism separate from the typewriter comprising a motor, a gear mechanism, a drive shaft operated by a motor, means including a clutch connecting said drive shaft with said roller shaft, and a magnet controlling said clutch, a disc operatively connected with said roller shaft to rotate at a lower speed than said roller shaft and a circuit controlling member engaging said disc and controlling the circuit of the magnet.

26. A mechanism for operating the platen roller of a typewriter mounted on a carriage having a shaft for said roller, a mechanism separated from the typewriter comprising a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a clutch connecting said drive shaft with said roller shaft, a magnet controlling said clutch, a pair of discs operatively connected with said roller shaft to rotate with said shaft and circuit controlling members engaging said discs and controlling the circuit of said magnet.

27. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a pair of clutches operatively connecting said drive shaft with said roller shaft, a magnet for each clutch controlling the clutch, a disc operatively connected with said roller shaft, a contact member carried by said disc and contact fingers engaging said contact member and arranged with the disc in one position to control a circuit to energize one of said clutch magnets and to control another circuit to deenergize the other clutch magnet.

28. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a pair of clutches operatively connecting said drive shaft with said roller shaft, a magnet for each clutch controlling the clutch, a disc operatively connected with said roller shaft to rotate at a lower speed than said roller shaft, a contact member carried by said disc and contact fingers engaging said contact member and controlling a circuit to energize one of said clutch magnets until said disc has completed a revolution and closing a circuit to energize the other clutch magnet when said disc has completed the revolution.

29. A mechanism for operating the platen roller of a typewriter having a carriage with a shaft for said roller, a drive mechanism comprising a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a clutch connecting said drive shaft with said roller shaft, and a magnet controlling said clutch, a disc operatively connected to rotate with said platen, means for manually adjusting the position of said disc and a circuit controlling member engaging said disc and controlling the circuit of said magnet.

30. A mechanism for operating the platen roller of a typewriter having a carriage with a shaft for said roller, a drive mechanism comprising a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a clutch connecting said drive shaft with said roller shaft, and a magnet controlling said clutch, a pair of discs operatively connected to rotate with said platen, means for manually ad-

justing the position of said discs and a circuit controlling member carried by each disc for controlling the circuit of said magnet.

31. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a clutch connecting said drive shaft with said roller shaft, a magnet controlling said clutch, a pair of discs operatively connected to rotate with said platen, means for manually adjusting the position of said discs relative to each other, a circuit controlling member carried by one disc for controlling the circuit of said magnet to rotate the platen to a first position and a circuit controlling member carried by the other disc controlling the circuit of said magnet to rotate the platen to a second position.

32. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a first clutch operated by a magnet connecting said drive with said roller shaft, means including a second clutch operated by a second magnet connecting said drive with said roller shaft, a first disc connected to rotate with said platen, means for manually adjusting the position of said disc, a second disc connected to rotate with said platen, a circuit controlling member carried by said first disc controlling the circuit of said first magnet and a circuit controlling member carried by said second disc controlling the circuit of said second magnet.

33. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a first clutch operated by a magnet connecting said drive with said roller shaft, means including a second clutch operated by a second magnet connecting said drive with said roller shaft, a first disc connected to rotate with said platen, means for manually adjusting the position of said disc, a second disc connected to rotate with said platen, a circuit controlling member carried by the first disc controlling the circuit of said first magnet to rotate the platen from a starting position a predetermined distance and a circuit controlling member carried by said second disc controlling the circuit of the second magnet to rotate the platen to the starting position.

34. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a first clutch operated by a magnet connecting said drive with said roller shaft, means including a second clutch operated by a second magnet connecting said drive with said roller shaft, a first disc connected to rotate with said platen, means for manually adjusting the position of said disc, a second disc connected to rotate with said platen but at a slower speed than said platen, a circuit controlling member carried by the first disc controlling the circuit of said first magnet to rotate the platen from a starting position a predetermined distance and a circuit controlling member carried by said second disc controlling the circuit of the second magnet to restore the platen to the starting position.

35. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft

in said mechanism operated by said motor, means including a clutch operated by a magnet connecting said drive with said roller shaft, a carriage for said platen, a circuit controller operated by the movement of said carriage in its extreme position and a circuit controlled by said circuit controller to energize said magnet to move said roller to a new position.

36. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a clutch operated by a magnet connecting said drive with said roller shaft, a carriage for said platen, a stepping circuit controller operated by the movement of said carriage and a circuit established by a predetermined number of movements of said carriage through said circuit controller to energize said magnet to move said roller to a new position.

37. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a motor, a gear mechanism, a drive shaft in said mechanism operated by said motor, means including a clutch operated by a magnet connecting said drive with said roller shaft, a carriage for said platen, a stepping circuit controller operated by the movement of said carriage, means for establishing the circuit of said magnet after a predetermined number of movements of said carriage to move said roller to a first position and means for establishing another circuit by said stepping circuit controller after a predetermined number of movements of the carriage with the roller in the first position to further move said roller.

38. A mechanism for operating the platen roller of a typewriter comprising a motor operated mechanism for rotating said roller, means controlling the operation of said mechanism, a carriage for the platen roller, a circuit controller adjusted to operate by a predetermined number of movements of said carriage and said circuit controller operating said controlling means to rotate the roller to a new position.

39. A mechanism for operating the platen roller of a typewriter mounted on a carriage for letter spacing movements comprising a motor operated mechanism for rotating said roller, means controlling the operation of said mechanism, a circuit controller adjusted to operate by a predetermined number of movements of said carriage in one direction and said circuit controller operating said controlling means to rotate said roller to a first position and by a predetermined number of movements of said carriage when the platen is in the first position operating said controlling means to rotate the roller to a second position.

40. A mechanism for operating the platen roller of a typewriter mounted on a carriage for right and left movement comprising a motor operated mechanism for rotating said roller, means controlling the operation of said mechanism, a circuit controller adjusted to operate by a predetermined number of movements of said carriage in one direction, said circuit controller operating said means to rotate said roller to the starting position.

41. A mechanism for feeding paper to a typewriter platen comprising a feed roller and a platen roller, a stop for engaging the paper and a cam for engaging the paper on the feed roller, means connecting said feed roller with said platen roller to rotate therewith whereby the cam

engages the paper resting on the stop and delivers it to the platen roller.

42. A mechanism for feeding paper to a type-writer platen comprising a feed roller and a platen roller located parallel to each other, means connecting the feed roller with the platen roller for intermittently rotating the feed roller with the platen and a cam on said feed roller engaging the paper to feed it to the platen and releasing the paper after the feed roller has made a predetermined movement.

43. A mechanism for feeding paper to a type-writer platen comprising a feed roller and a platen roller located parallel to each other, means connecting the feed roller with the platen roller for intermittently rotating the feed roller with the platen, a cam on the feed roller engaging the paper, a roller clamping the paper against the cam and a second cam operated by the feed roller for bringing said clamping roller into the clamping position.

44. A mechanism for feeding paper to a type-writer platen comprising a feed roller and a platen roller spaced in parallel relation, a friction roller engaging said platen roller and feed roller for rotating the feed roller to feed paper to the platen roller, a magnet for bringing said friction roller into engagement with said platen and feed rollers and means operated by the rotation of said feed roller controlling said magnet.

45. A mechanism for feeding paper to a type-writer platen comprising a feed roller and a platen roller, said feed roller feeding paper to said platen roller, a friction roller engaging said platen and feed rollers, a magnet for bringing said friction roller into operative engagement with said platen and feed rollers and a circuit controller operated by the rotation of said platen roller controlling the circuit of said magnet.

46. A mechanism for feeding paper to a type-writer platen comprising a feed roller and a platen roller located in parallel relation, a paper guide for sheets of paper to pass a sheet under said feed roller, around said platen roller on the opposite side from the feed roller and discharge over the feed roller, a carriage for said platen roller moving it longitudinally relative to the feed roller and friction means connecting the opposing faces of said rollers to rotate one roller by the rotation of the other.

47. A mechanism for feeding paper to a type-writer platen comprising a feed roller and a platen roller located in parallel relation, a paper guide for sheets of paper to pass a sheet under said feed roller, around said platen roller on the opposite side from the feed roller and discharge over the feed roller, a carriage for said platen roller moving it longitudinally relative to the feed roller, a friction roller normally held clear of said platen roller and means for bringing said friction roller into engagement with said platen roller and said feed roller to feed the paper to the platen roller.

48. A mechanism for feeding paper to a type-writer platen comprising a feed roller and a platen roller, said feed roller feeding the paper to the platen roller, means for automatically rotating said platen roller to place the paper in the writing position and means connected with the platen for rotating said feed roller for an initial movement, means for automatically discharging the paper from said platen and means connected with the platen for rotating the feed roller to the starting position as the paper is discharged from the platen.

49. A mechanism for feeding paper sheets to a platen comprising a feed roller for feeding the paper to the platen, stop means for holding the paper sheet in alignment on the feed roller, a light bulb, on one side of said feed roller, a light valve on the opposite side of said feed roller illuminated from said bulb through an aperture in said roller, said paper sheet intercepting said illumination when engaging said stops and means controlling the rotation of said feed roller by said light valve.

50. A mechanism for feeding paper sheets to a platen comprising a feed roller for feeding the paper to the platen, stop means for holding the paper sheet in alignment on the feed roller, a pair of spaced light bulbs on one side of said feed roller, a light valve opposite each of said bulbs and illuminated from said bulbs through apertures in said roller, said paper sheet intercepting said illumination when engaging said stops and means controlling the rotation of said feed roller by said light valves.

51. A mechanism for feeding paper sheets to a platen comprising a feed roller for feeding the paper to the platen stops for holding the paper in alignment on the feed roller, means including a magnet operatively connecting said feed roller with said platen to rotate the feed roller, a plurality of spaced light valves, means for illuminating said valves, means for shutting off said illumination by the paper sheet when in aligned position and means controlling the circuit of said magnet in parallel by said light valves.

52. A paper feeding mechanism for feeding from a stack of paper on a fixed support, comprising a pivoted frame, a rotating wheel mounted on said frame above and clear of said paper stack, means for rotating said wheel, means for lowering said wheel to engage said paper in a predetermined position and suction means carried by said wheel engaging said paper to lift the top sheet of paper and carry it forward by the movement of the wheel.

53. A paper feeding mechanism for feeding from a stack of paper on a fixed support, comprising a pivoted frame, a rotating wheel mounted on said frame above and normally clear of said paper stack, a fan carried by said wheel for circulating air over the paper, suction means carried by said wheel and a cam for lowering said wheel to bring said suction means into engagement with the top sheet of said stack.

54. A paper feeding mechanism for feeding from a stack of paper, comprising rotating means intermittently engaging said paper, a pipe with an air stream mounted on said means and discharging the air stream upon the paper stack, a Venturi nozzle in said pipe and a vacuum pipe connected with said nozzle and engaging said paper stack.

55. A paper feeding mechanism for feeding from a stack of paper, comprising means intermittently engaging the top sheet of said stack, a pipe with an air stream mounted on said means, means for discharging said air stream on the paper stack, a Venturi nozzle in said pipe and a vacuum pipe connected with said nozzle and arranged to engage the top sheet of the stack, by the movement of said means.

56. A paper feeding and printing mechanism comprising a pair of rollers, one of said rollers being mounted on a carriage and being movable longitudinally relative to the other, means for rotating one of said rollers, a friction roller engaging the opposing faces of said rollers so that

the rotating roller rotates the other roller, means normally holding said friction roller clear of the roller mounted on the carriage and means for releasing a writing sheet to pass over said rollers.

57. A mechanism for operating the platen roller of a typewriter comprising a shaft for said roller, a carriage for said platen, a stepping circuit controller operated one step for each movement of said carriage, adjustable means for establishing a circuit by said circuit controller according to the number of steps made from a starting position, means for controlling the movement of said platen roller by said circuit controller and means for restoring said stepping circuit controller to the starting position.

58. A mechanism for operating the platen roller of a typewriter comprising a carriage for said platen, a stepping circuit controller operated one step for each movement of said carriage, adjustable means for establishing a circuit by said circuit controller, a change over relay operated by said circuit controller and means controlled by said change over relay for controlling the movement of said platen roller.

59. A mechanism for operating the platen roller of a typewriter comprising a carriage for said platen, a stepping circuit controller operated one step for each movement of said carriage, adjustable means for establishing a circuit by said circuit controller, according to the number of steps, a power operated means for operating said platen roller, a relay controlling said power operated means to make a predetermined movement of said roller from a starting position, a second relay controlling said power operated means to make a second movement of said roller, said second relay being controlled by said stepping circuit controller.

60. A mechanism for operating the platen roller of a typewriter comprising a carriage for said platen, a stepping circuit controller operated one step for each movement of said carriage, adjustable means for establishing a circuit by said circuit controller, according to the number of steps, a power operated means for operating said platen roller, a relay controlling said power operated means to make a predetermined movement of said roller from a starting position, a second relay controlling said power operated means to move said roller to the starting position, said second relay being controlled by said stepping circuit controller.

61. A mechanism for operating the platen roller of a typewriter comprising motor operated means for rotating said platen, a carriage for said platen, a stepping circuit controller operated by said carriage and making a momentary contact for each step, a stick relay having a pick-up circuit controlled by said stepping circuit controller and having a holding circuit controlled by the rotation of said roller and interrupted after the roller has made a predetermined movement, said relay controlling said motor operated means.

62. A paper feeding mechanism for feeding from a stack of paper sheets, comprising means for removing said paper one sheet at a time from the top of said stack, a support for said stack, means including a motor for elevating said stack, an arm extending over and resting on top of said stack and moving vertically as the stack is used, a light beam controlled by said arm, a light valve controlled by said beam and means controlling the circuit of said motor by said light valve.

63. A paper feeding mechanism for feeding from a stack of paper on a fixed support comprising a pivoted frame arranged to adjust itself according to the height of the paper stack, a conveyor on said pivoted frame, a rotating member mounted on said frame and arranged to engage the top sheet of said paper stack an air pipe with an air stream on said member, a Venturi nozzle on said air pipe and a suction pipe connected with said nozzle for lifting the top sheet of said stack and delivering it to said conveyor.

64. A paper feeding mechanism for feeding from a stack of paper on a fixed support comprising a frame, a rotating member mounted on said frame, pneumatic means carried by said member for lifting the top sheet of said stack to be delivered to the feeding mechanism and means creating an air current by the movement of said rotating member for circulating air on said paper stack.

65. A paper feeding mechanism for feeding paper sheets to a printing machine with an intermittent action, comprising a rotating member arranged to engage the top sheet of the stack and to deliver it to the feeding mechanism and means operated by the printing machine controlling said rotating member to intermittently deliver the sheet to the feeding mechanism.

66. The combination, a printing machine having a platen roller and a line spacer, a stack of paper sheets, a pivoted member arranged to engage the top sheet of the stack and to deliver it to the platen roller and means operated by said line spacer controlling said pivoted member to bring it into action to deliver the sheet.

67. A writing machine comprising a platen roller with a line spacing mechanism, a stepping device arranged to be moved one step for each line of writing, means controlling the operation of said writing machine by said stepping device after a predetermined number of lines have been written and means for setting said stepping device in a neutral position.

68. A writing machine comprising a platen roller with a line spacing mechanism, a stepping device arranged to be moved one step for each line spacing position of the platen roller, means controlling the operation of said writing machine by said stepping device after a plurality of line spacing positions of the platen roller has been reached and means for setting said stepping device to a starting position after each controlling operation.

69. A writing machine comprising a platen roller with a line spacing mechanism, a stepping device arranged to be moved one step for each line spacing position of the platen roller, means in one writing position controlling the operation of said writing machine by said stepping device after a plurality of line spacing positions of the platen roller has been made and means in another writing position controlling the operation of said writing machine by said stepping device after a plurality of line spacing positions of the platen roller has been made and means for setting said stepping device to a starting position after each controlling operation.

70. A writing machine comprising a platen roller with a line spacing mechanism, a stepping device arranged to be moved one step for each line spacing position of the platen roller, means controlling the operation of said writing machine by said stepping device and adjustable means for de-

termining the number of steps required to bring said controlling means into operation.

71. A paper feeding mechanism for feeding paper a sheet at a time from a paper stack comprising a lifting device, an air pipe associated with said lifting device, a blower supplying air to said pipe, the air discharge from said pipe being arranged to play upon the paper stack, a Venturi nozzle in said pipe and a vacuum pipe connected with said nozzle and arranged to lift the paper sheet by vacuum.

72. A paper feeding mechanism for feeding paper a sheet at a time from a paper stack, comprising a lifting device for lifting and moving the sheet from the stack, a pivoted frame for said device, a lever engaging said lifting device to position it relative to the paper stack and a roller on said lever supporting said lever and engaging the paper stack close to the end opposite the feeding end of the sheet.

73. A paper feeding mechanism for a platen roller comprising a paper aligning device, a conveyor for delivering paper sheets to said aligning device, means for releasing said aligning device to deliver the sheet to the platen roller, means for rotating the roller for operating on the paper sheet, a paper guide above said platen roller to receive the sheet as it comes from the roller, a receiving conveyor at the end of said guide to remove the sheet and means for rotating the platen at a speed above its normal operating speed for the discharge of the sheet from the platen.

74. A paper feeding mechanism for a platen roller comprising a paper aligning device and a paper guide for directing the paper to the platen, said aligning device comprising a pair of stop fingers mounted on a shaft and a pair of rollers mounted on a shaft, a magnet for bringing said

stop fingers into position to align the paper before it reaches the platen and a second magnet for bringing said rollers into position to engage the paper when it is to be fed forward to the platen and means for controlling the circuit of said magnets so that as the stop fingers are disengaged the rollers are brought into the engaging position.

75. A paper feeding mechanism for a platen roller comprising a conveyor for delivering paper sheets to the roller and a receiving conveyor for removing the sheets after operation on the platen roller, means for operating said conveyors and said platen roller for a cycle of operation and means including a pair of photo-electric cells arranged responsive to the movement of the paper for controlling said operation.

76. A paper feeding mechanism for a platen roller comprising a feed roller placed parallel with the platen, said roller having a cam portion with an enlarged diameter and an idle portion with a smaller diameter, said roller spaced from said platen a distance corresponding to the lineal surface of said cam portion and arranged to engage the paper by the cam portion to feed it to the platen and means for co-operatively rotating said feed roller with said platen.

77. A paper feeding mechanism for a platen roller comprising a feed roller placed parallel with the platen, means for delivering paper to said feed roller, means for driving said platen roller including a clutch, magnetically operated means for driving said feed roller from said platen to feed the paper to the platen and means for simultaneously engaging said clutch and operating the magnetically operated means.

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