

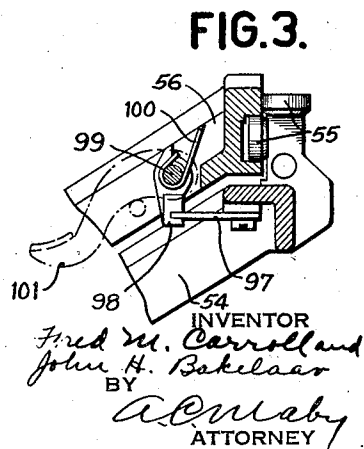
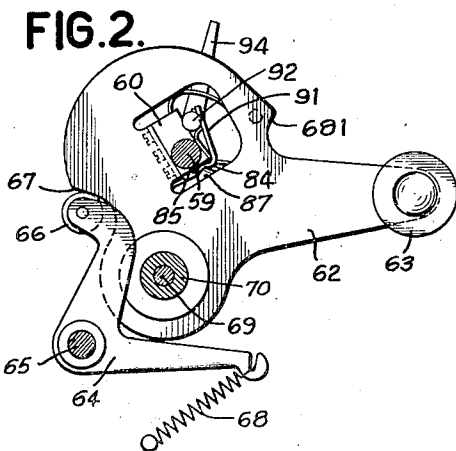
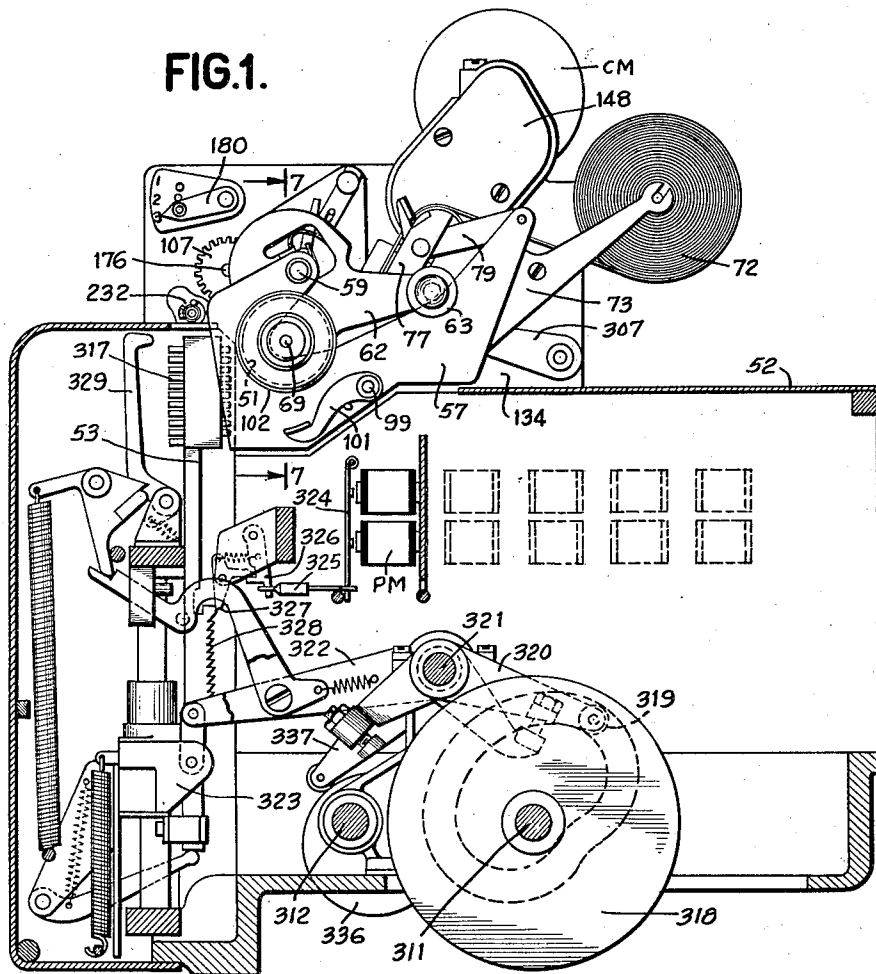
Dec. 29, 1936.

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2,066,029

RECORDING AND RECORD FEEDING DEVICE

Original Filed March 3, 1933 11 Sheets-Sheet 1



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RECORDING AND RECORD FEEDING DEVICE

Original Filed March 3, 1933 11 Sheets-Sheet 2

FIG. 4.

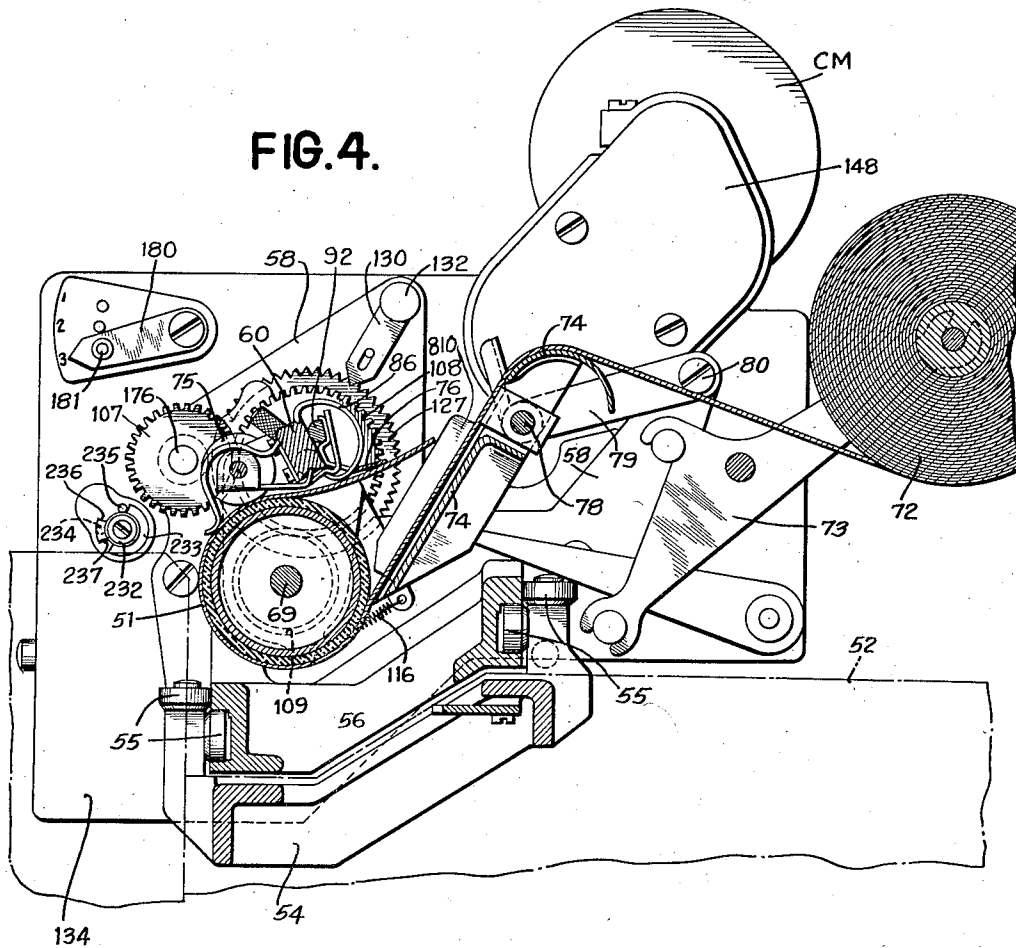
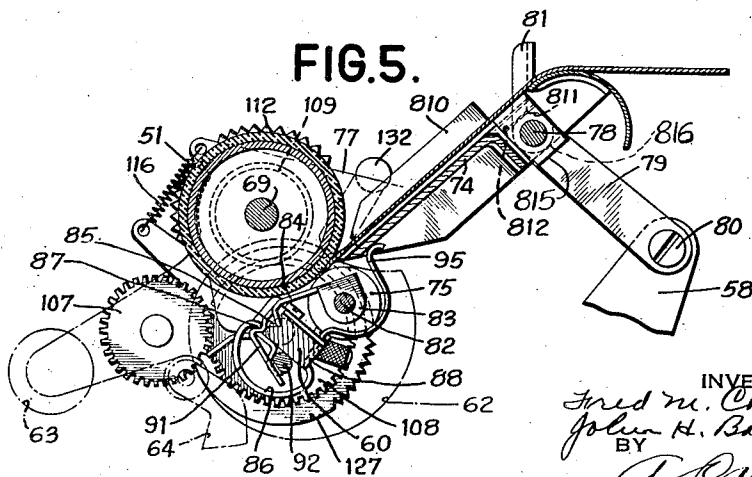


FIG. 5.



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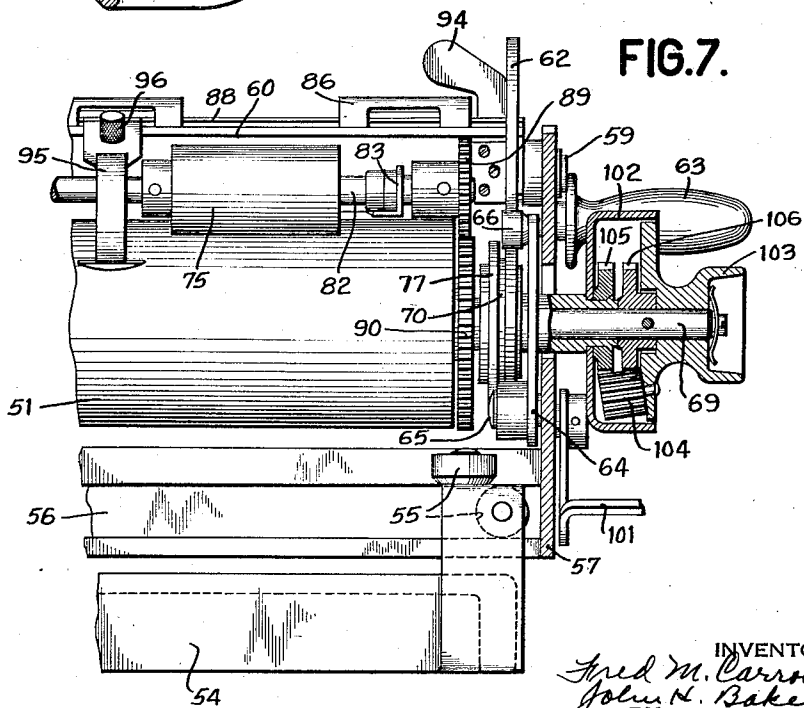
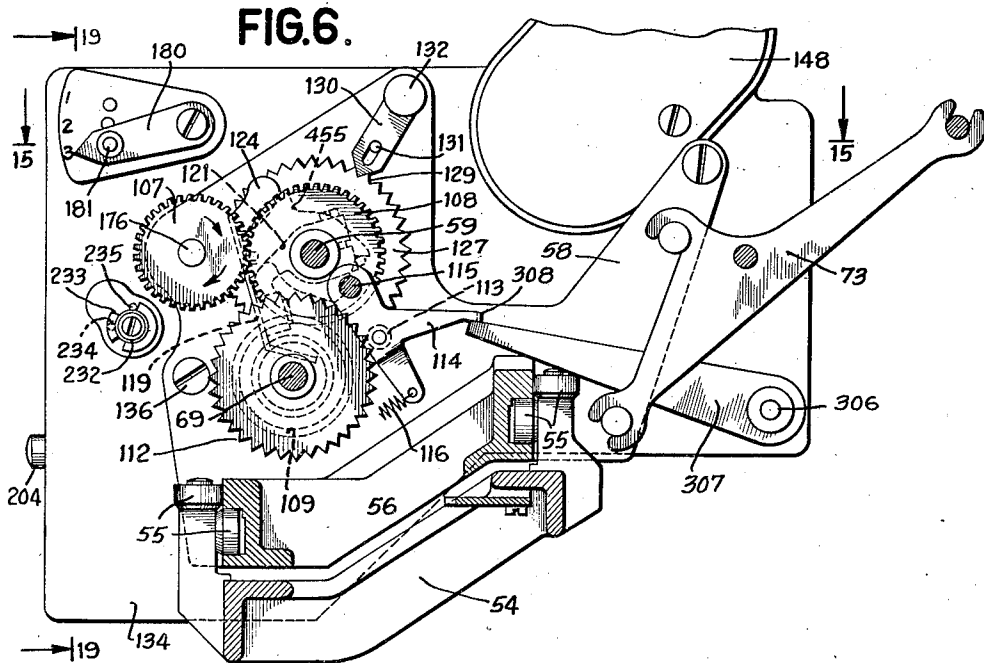
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RECORDING AND RECORD FEEDING DEVICE

Original Filed March 3, 1933 11 Sheets-Sheet 3



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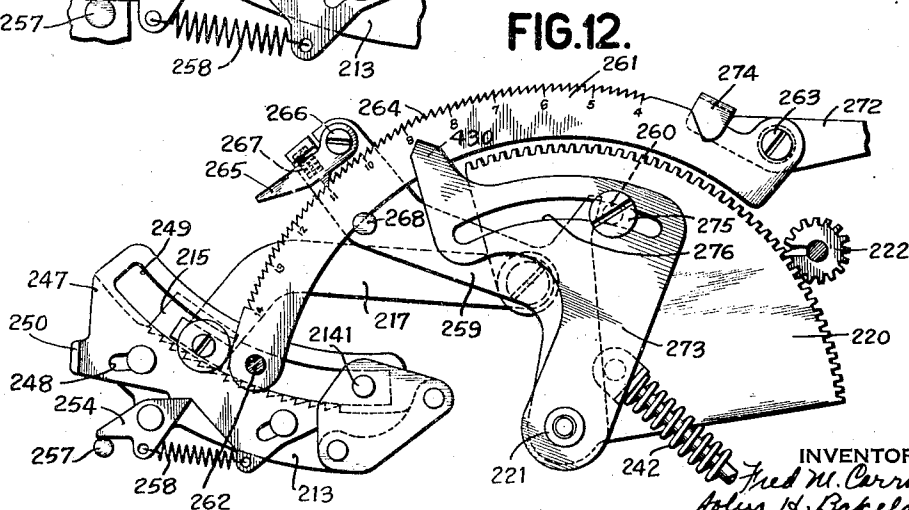
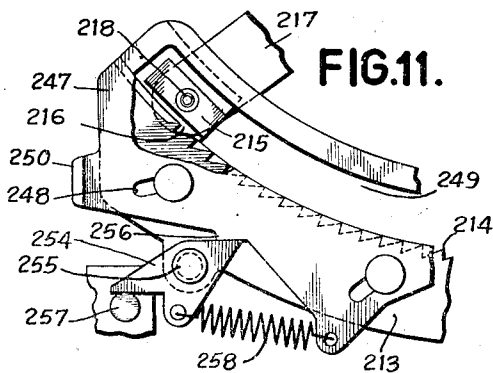
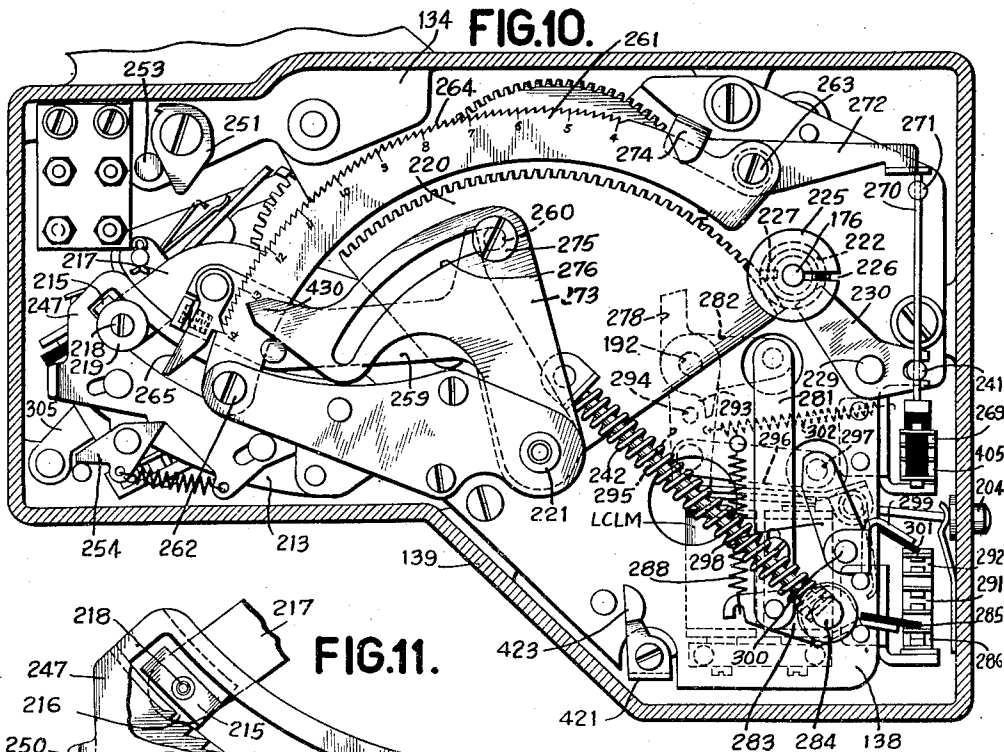
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RECORDING AND RECORD FEEDING DEVICE

Original Filed March 3, 1933 11 Sheets-Sheet 5



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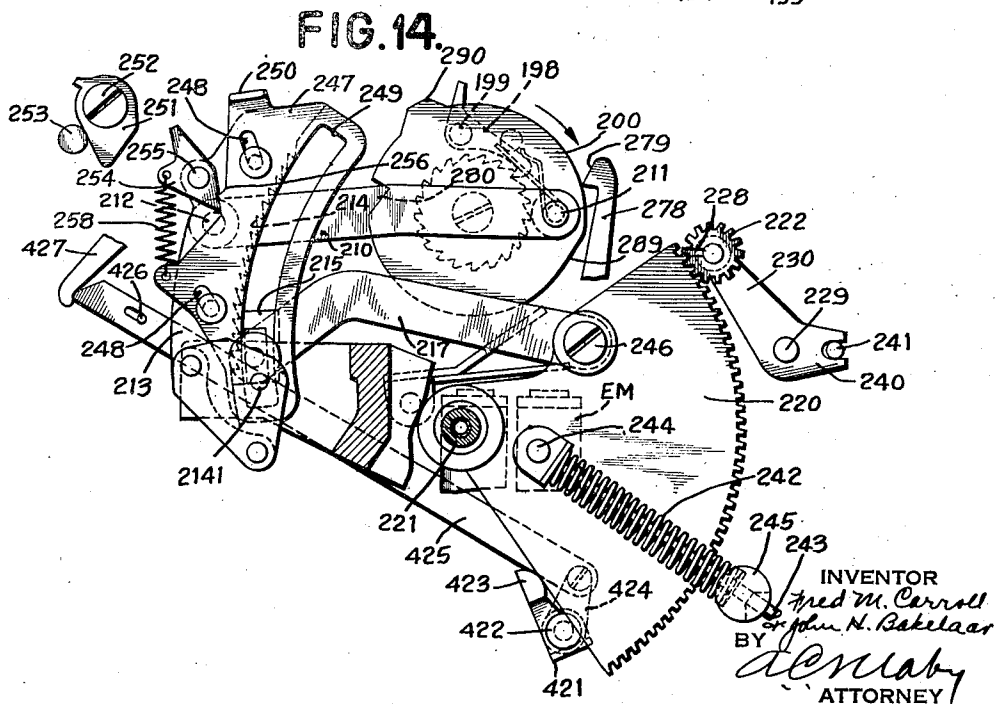
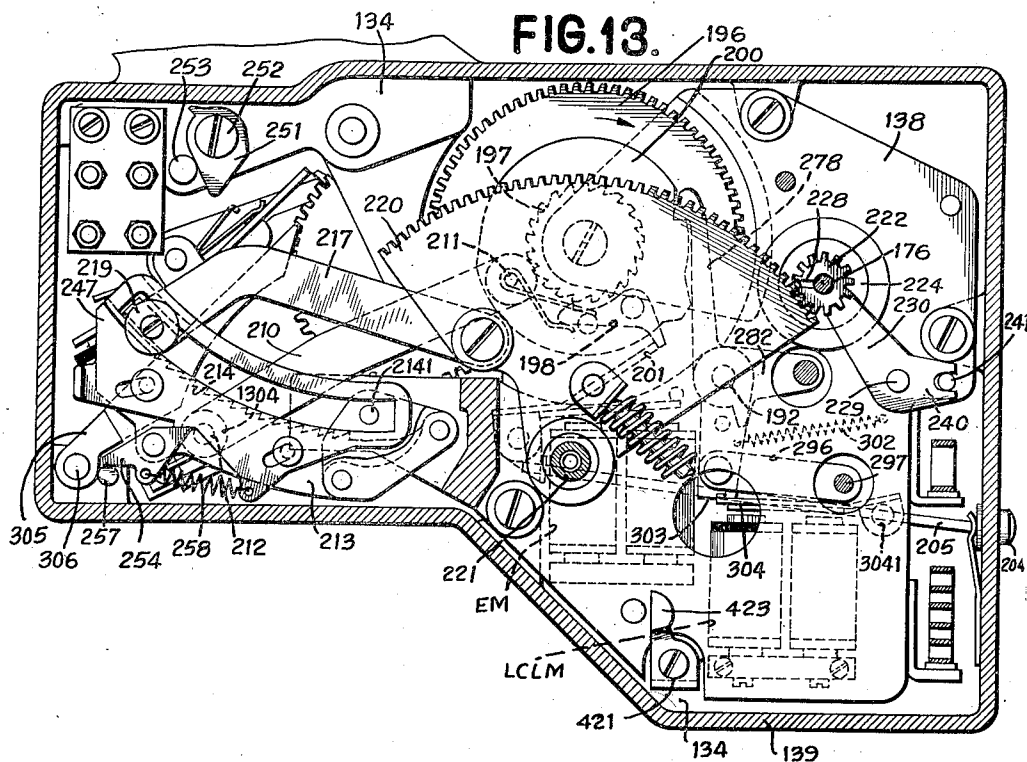
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RECORDING AND RECORD FEEDING DEVICE

Original Filed March 3, 1933 11 Sheets-Sheet 6



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RECORDING AND RECORD FEEDING DEVICE

Original Filed March 3, 1933 11 Sheets-Sheet 8

FIG. 19.

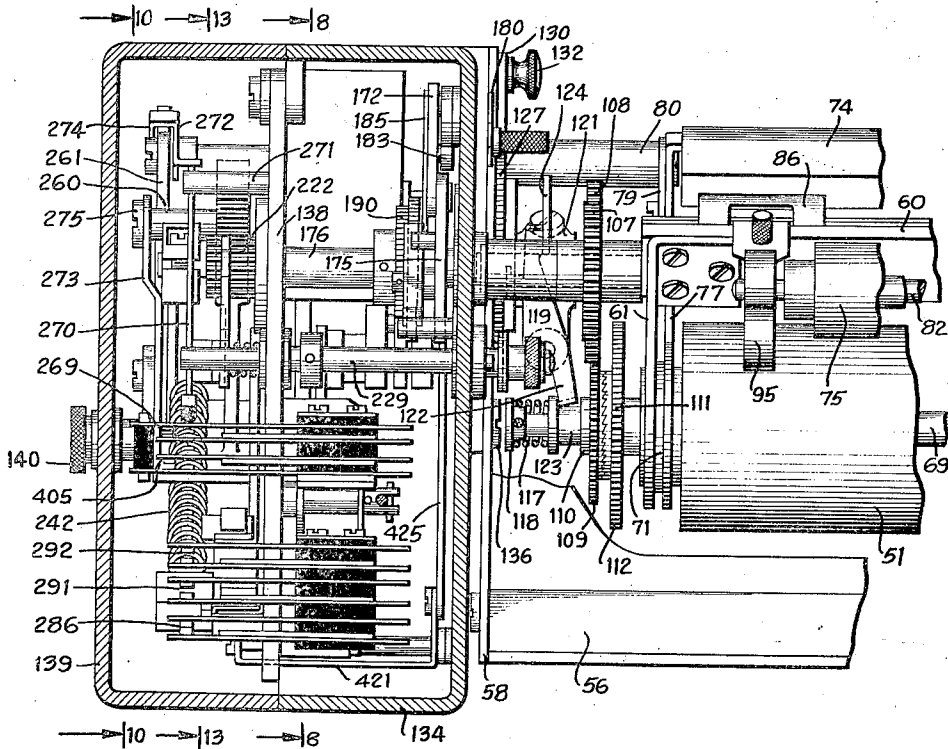


FIG. 20.

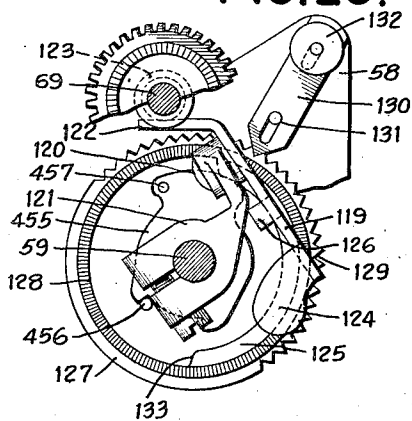
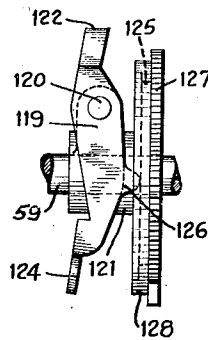


FIG. 21.



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RECORDING AND RECORD FEEDING DEVICE

Original Filed March 3, 1933 11 Sheets-Sheet 9

FIG. 22.

22 11	5678	5678
22 11	6958	6958
22 11	6387	6387
11 17	5498	5498
11 17	5786	5786

EJECT

FIG. 28.

12 12	288547*	57494*
12 45	23713*	23713*

FIG. 23.

11 12	57494*	57494*	57494*
12 45	23713*	23713*	
12 34	25958*	25958*	25958*

FIG. 29.

11 12	57494*	57494*	57494*
12 45	23713*	23713*	
12 34	25958*	25958*	49671*
17 21	*	31637*	
17 72	*	42321*	73958*
14 23	*	57683*	

EJECT

FIG. 24.

12 23	5689		
12 23	5678		
	31637*	31637*	
	*		* 31637
22 11	5678		

FIG. 25.

12 23	5689		
12 23	5689		
	31637*	31637*	
	*		* 31637
22 11	5678		

EJECT
AFTER
MAJOR
TOTAL

FIG. 30.

11 22	5698		
11 22	5698	57494*	57494*
12 45	5498		
12 45	6925		
12 45	8945	21368*	
12 34	6789		
12 34	3759		
12 34	7892		
12 34	674		

FIG. 26.

11 22	5698		
11 22	5678	57494*	57494*
12 45	5498		
12 45	6925	12423*	
12 34	6789		

EJECT
END
OF
FORM

FIG. 27.

HEADING SPACE			
12 23	4897		
SEVERING LINE OF FORMS			
12 23	9875		

EJECT

FIG. 31.

14 27	718		
14 27	268		
14 27	721		
	1707*		
14 23	1726		
14 23	4319		
14 23	7421		
14 23			

EJECT

EJECT

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Original Filed March 3, 1933 11 Sheets-Sheet 10

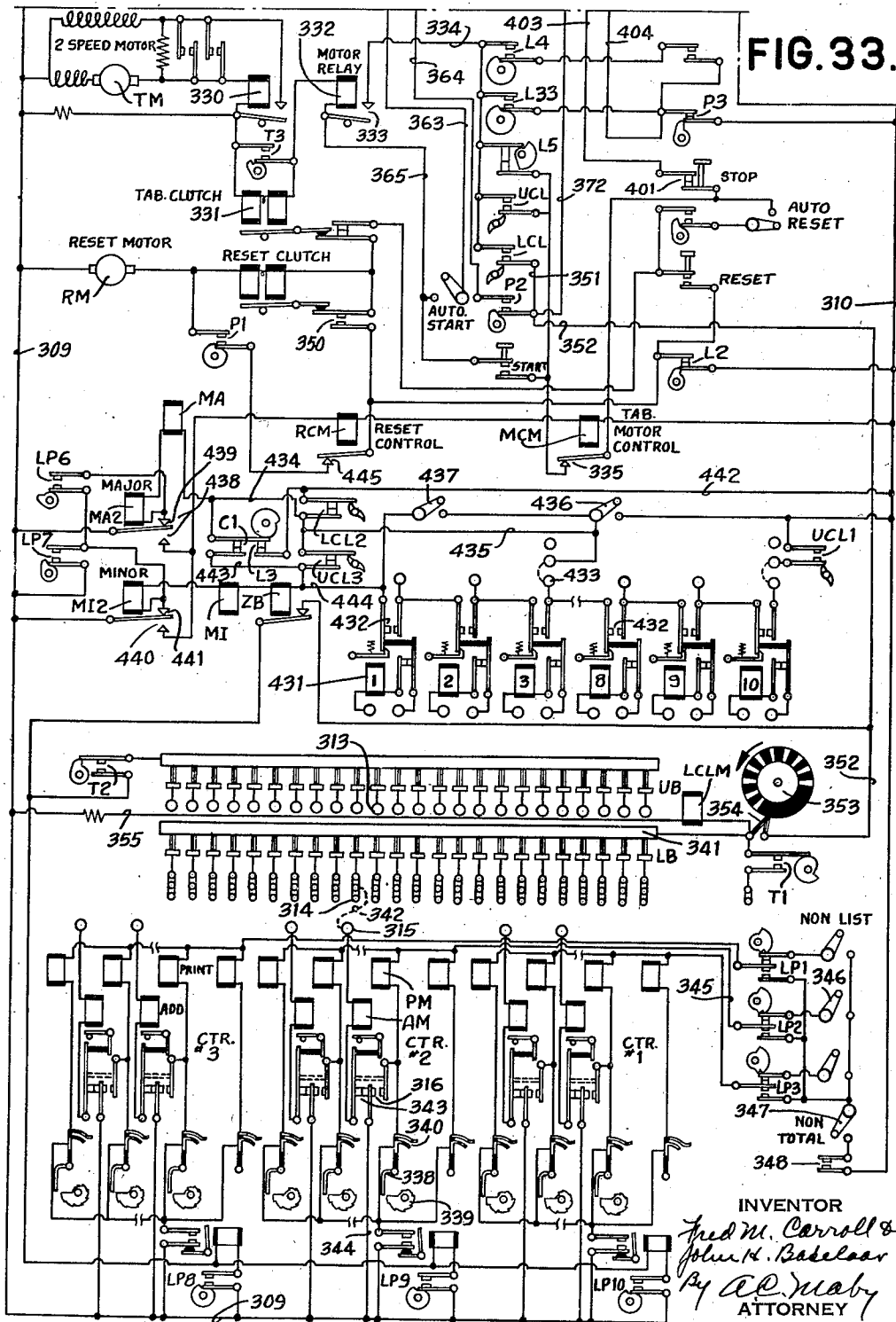
FIG. 32.

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2,066,029

Original Filed March 3, 1933 11 Sheets-Sheet 11



UNITED STATES PATENT OFFICE

2,066,029

RECORDING AND RECORD FEEDING
DEVICE

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Original application March 3, 1933, Serial No. 659,442. Divided and this application January 16, 1934, Serial No. 706,810

18 Claims. (Cl. 101-93)

This case is a division of the application Serial No. 659,442, filed March 3, 1933.

The invention relates to printing devices and means for feeding and ejecting the record material upon which the printed matter is impressed. The devices are illustrated as part of a perforated card controlled tabulating machine.

An object of the invention is to provide an improved form of automatic line spacing means.

Another object is to provide a simple and yet effective type of ejecting mechanism for feeding a printed form out of the carriage of the machine and picking up a new form and bringing it into position for the printing of the first item.

The mechanism is constructed as a compact unit which is attached to and movable with, the carriage frame. Wiring connections provide the means for establishing control between the regular tabulating mechanism and the record feeding devices.

A feature of the invention is the provision of means for controlling the spacing of the record material before and after the printing of data. The controls may be adjusted to suppress the feeding of the record material so that the data is printed in line with the last item. Other adjustments may be made so that a single or multiple line spacing operation may take place before and after the printing of the data.

The line spacing devices are manually adjusted to call for single, double, or triple spacing. The effecting of such spacing is brought about under electromagnetic control and a single impulse through the magnet brings about the single or multiple spacing of the record material.

An object of the invention is to make the ejecting mechanism settable so that a variable number of items may be printed on a form before ejection. Other adjustments may be made in the control of the eject devices so that a form is ejected after a single printing impression under listing control. When listing, each item may be printed on a separate form.

Another feature of the invention is the automatic ejection of a form when an impression is made at the bottom of the allotted printing area of such a form. This control is suppressed when the last item to be printed is the next to the last item of a group.

Another object of the invention is to provide a carriage with an adjustable head spacing feeding means to automatically carry the upper part of a form around to the printing line when the form is first entered into the carriage. If the form is part of a continuous strip, the automatic ejection device may be set to provide the same head spacing on all forms after the first form.

Another object of the invention is to provide an eject mechanism which starts and finishes the ejecting stroke with a slow motion. The device is constructed so that the ejecting may occur at any point along the form and for any number of line spaces with the same type of feeding motion. The record sheet starts from rest and is gradually accelerated to the mid-point of the feeding cycle, and then during the second half of the feeding operation the sheet is gradually brought back to rest.

A feature of the invention is the automatic disabling of the detent cooperating with the platen line spacing shaft on the carriage during ejection. This eliminates the noise which would otherwise attend ejection.

Another object of the invention is to provide means for increasing the power of the carriage motor during ejection. This is done by automatically cutting out a resistance which is placed in series with the motor during operation in line spacing.

The eject and line spacing devices are controlled by the presence of record cards in the tabulator. At the end of a run of cards the operating connections to the paper feeding mechanisms are disabled until other cards are analyzed.

Another feature of the invention is the provision of means to stop the tabulating machine during the operation of the ejecting mechanism when this mechanism is set to eject after every item and for ejection at the end of a form. This is done to give the paper feeding devices time to function between the printing operations of the regular tabulating machine. Devices are provided to delay the restarting of the tabulator until the eject mechanism is back in normal position.

These and other objects of the invention will be noted as the specification continues with reference to the drawings which accompany the

description and form part of the specification.

In the drawings:

Fig. 1 is a side view of the carriage in position adjacent the regular printing mechanism of the tabulator.

Fig. 2 is a detail view of the lever for swinging the platen into position for the insertion of record material.

Fig. 3 is a detail view of the locking means for holding the carriage frame in one of the printing positions.

Fig. 4 is a section through the carriage showing the path of the record material.

Fig. 5 is a section through the carriage showing the platen lifted in position to receive the record material.

Fig. 6 is a section along the lines 6—6 of Fig. 15, showing the head spacing devices and the detent for locating the platen shaft.

Fig. 7 is an elevation view of the right hand portion of the carriage.

Fig. 8 is a sectional elevation view taken along the lines 8—8 in Fig. 19 and showing the gearing connections to the carriage motor and line spacing mechanism.

Fig. 9 is a detail view showing the line spacing mechanism in an operated position.

Fig. 10 is an elevation view of the ejecting mechanism with the cover removed. This view shows the devices for selecting the length of form and number of printed items on each form.

Fig. 11 is a detail view of the ejecting operating connection.

Fig. 12 is an elevation view of the ejecting mechanism set in position for a certain size sheet.

Fig. 13 is a sectional elevation view taken along the line 13—13 in Fig. 19 and showing the ejecting mechanism in normal position.

Fig. 14 is an elevation view of the ejecting mechanism in operated position.

Fig. 15 is a sectional plan view taken along lines 15—15 in Fig. 6 and showing the relationship of the parts in the ejecting and line spacing mechanisms.

Fig. 16 is a detail view of the connection between the ejecting operating actuator and driving link.

Fig. 17 is a detail view of the contact adjusting levers operated by the ejecting cam.

Fig. 18 is a side view of the levers shown in Fig. 17, illustrating the position these levers occupy along the shaft.

Fig. 19 is a sectional end view along the lines 19—19 in Fig. 6, showing the head spacing clutch and the contacts controlled by the ejecting mechanism.

Fig. 20 is a detail view of the devices for clutching the platen shaft to receive an adjustable amount of head spacing.

Fig. 21 is a detail view of the head spacing clutch lever and settable cam.

Fig. 22 is a sample record sheet showing single, double, and triple line spacing.

Fig. 23 is a sample sheet showing printing under tabulating control with double spacing between the impressions.

Fig. 24 is a sample sheet showing the printing of items and totals under minor and major group control with a single space before and between total printing.

Fig. 25 is a sheet printed under minor and major control with double spacing before totals.

Fig. 26 is a sheet printed under minor and

major control with the total printed in line with the last item of a group.

Fig. 27 is a sample of a portion of the series of forms printed under listing control with ejection after every item.

Fig. 28 is an example of the kind of forms printed under tabulating control with ejection at the end of each form.

Fig. 29 shows a series of forms printed under tabulating control with ejection at the end of each form.

Fig. 30 shows a sample series of forms printed under joint eject control for ejection after major totals and for end of form.

Fig. 31 shows a record sheet printed under control for ejection at the end of a form. A total is printed below the last item before ejection.

Fig. 32 is a wiring diagram of the electrical control devices in the carriage paper feeding unit.

Fig. 33 is a wiring diagram of the regular tabulating machine with connections for control by the devices shown in Fig. 32.

Referring to Fig. 1, it is noted that the platen 51 is mounted on the carriage unit which in turn is supported on the tabulating frame 52 in position adjacent the type bars 53. The tabulating frame 52 carries a carriage supporting frame 54 (Figs. 4 and 6) which is provided with a series of rollers 55 for guiding and supporting the movable carriage frame 56. Attached to the right end of the carriage frame 56 is the carriage side plate 57 (Figs. 1 and 7). At the other end of the frame 56 is attached a side plate 58 (Figs. 4, 15 and 19) acting as a support for the left end of the platen holding members. Swinging between the side frames is a rectangular bar 60 (Figs. 4 and 5) with ends in the form of trunnions 59 (Fig. 1) fitting in bearings on the side frames 57 and 58. It is about this bar 60 that the platen 51 is swung through an angle of about 180 degrees in a counterclockwise direction to bring the platen in position to receive the end of the record material.

A bracket 61 (Fig. 19) attached to the left end of the rectangular bar 60 forms a support for one end of the platen, and the lever 62 (Figs. 2 and 7) forms the support for the platen at the other end. Parts 60, 61, and 62 form a bail which is pivotally mounted at 59 and adapted to be swung toward the rear of the machine. The lever 62 is provided with a handle 63 which may be grasped by the operator of the machine and swung in a counterclockwise direction through one half of a revolution to bring the platen in the upper position (Fig. 5).

The lever 62 is held in normal position and the adjusted position by a detent in the form of a bell crank 64 (Fig. 2) pivoted at 65 on the carriage side plate 57. A roller 66 on the end of one arm of the crank 64 cooperates with a cam face 67 cut in the periphery of the lever 62 to hold the lever in normal position. A spring 68 attached to the bell crank holds the roller 66 in cooperation with the lever.

As the lever is adjusted, a concentric surface cooperates with the roller until the lever reaches the adjusted position, then the roller drops into a notch 681 to hold the lever and the platen in the record receiving position (Fig. 5). The platen shaft 69 is carried in a bearing 70 (Figs. 2 and 7) on the lever 62 and the other end pivots in a bearing 71 on the bracket 61 (Fig. 19).

A roll of record material 72 (Fig. 4) is suspended between a pair of brackets 73 attached to the carriage side plates 57 and 58. The free end of

the paper is drawn from the roll and passes over a guide 74 and then is directed at a tangent to the platen 51 (Fig. 4) and is drawn around the platen, under the feeding rollers 75 and out beneath the cutting plate 76. The paper guiding and feeding devices are moved along with the platen when it is lifted from the normal position. The paper guide 74 is mounted on side plates 77 (Fig. 5) which are pivotally connected to the platen shaft 69 and to a shaft 78 suspended between the side plates 77 and links 79 pivoted at 80 on the carriage side frames 57 and 58. By means of this form of toggle link connection, the paper guide is adapted to maintain the position at an angle tangent to the platen when it is in a normal feeding position (Fig. 4) and in the raised paper inserting position (Fig. 5).

The record paper is guided on the sides by guide members 810 in the form of bails which are supported on shaft 78 (Fig. 15). Each member is formed with two ears 815 encircling shaft 78. Between the ears 815 is another ear 816 formed as part of a bail formation ending in a handle 81. A collar 817 on shaft 78 acts as a spacer between ear 816 and the left ear 815 on guide 810. Thus the handle and the guide are connected so that when handle 81 is moved along shaft 78 guide 810 is carried along therewith. An arc-shaped leaf spring 812 lies under guide 810 and is held there by an extension 818 encircling shaft 78. The guide may be locked in any position by the depression of handle 81. When the handle is so moved, a cam extension 811, Fig. 5, formed on ear 816 presses against spring 812 and flattens it against the under side of guide 810. With ear 816 and ears 815 pressed in opposite direction against shaft 78 they offer frictional resistance to any attempt to move the guide along the shaft.

The pressure feed rollers 75 (Figs. 5 and 7) are supported on a shaft 82 which is held on the over-turned projections 83 extending from a series of frames 84 pivoted at 85 on the rectangular bar 60. The pivot at 85 is formed by a projection on the frame 84 engaging a narrow slot cut in the rectangular bar 60.

The feed rollers 75 are normally held against the platen 51 by bow springs 86 each of which is tensioned and held between a notch 87 in frame 84 and a notch 88 cut in rectangular bar 60. The shaft 82 carrying the feed rollers 75 is provided with a pinion 89 secured in line with a gear 90 (Fig. 7) secured to the platen shaft 69. By means of this connection the feed rollers 75 are rotated whenever the platen is turned for a record feeding operation.

A means is provided to disconnect the feed rollers from engagement with the platen when it is desired to insert or remove record material. Each of the frames 84 carrying the feed rollers is formed with a projection 91 (Fig. 5) which is alongside the lower surface of the rectangular bar 60. Between projection 91 and bar 60 is placed a shaft 92 with a beveled side of the shaft cooperating with the end of the projection 91. The shaft 92 is held in this position by means of a groove 93 cut in the side of rectangular bar 60 (Fig. 15).

A thumb piece 94 (Fig. 2) is attached to the shaft 92 to operate the same. When the shaft 92 is rocked, the frames 84 are moved in a clockwise direction (Fig. 5) about the pivot 85 and withdraw the feed rollers 75 from the platen 51.

Attached to the bar 60 (Fig. 7) are a series of spring members 95 pressing against the platen 51. A knurled knob 96 holds the member on the bar

60. The end of the member may be used as a paper alining guide and also to hold the paper against the platen as it is fed away from printing position.

The entire carriage may be moved and locked in various printing positions. The locking device includes a notched bar 97 (Fig. 3) which is secured to the underside of one of the flanges on the machine frame 54. Cooperating with the notches in the bar 97 is an arm 98 secured to a shaft 99 mounted in the movable carriage frame 56. A spring 100 tends to hold the arm 98 in one of the notches on bar 97. Attached to the outer end of shaft 99 is an operating lever 101 (Figs. 1 and 3) which may be lifted to disengage arm 98 from bar 97 and lowered to lock the carriage in position when it is located as desired by the operator.

The platen 51 may be rotated manually by means of the knob 102 (Fig. 7) secured to the platen shaft 69. A fine adjustment of the line spacing may be had by rotating the knob 103 which is connected to the platen shaft through pinion 104 and gears 105, 106.

The automatic feeding of the platen is brought about by connections cooperating with the left end of the platen shaft, as shown in Fig. 19. The platen driving gear 107 (the actuation of which is described hereinafter) drives an idler gear 108 (Fig. 15) loosely mounted on the trunnion 59 of the rectangular bar 60. The connection continues through gear 108 meshing with the teeth 109 (Fig. 19) cut in a clutch member 110, which engages a clutch plate 111 secured to the platen shaft 69. The clutch plate 111 is formed with teeth 112 in the form of a star wheel (Fig. 6). Cooperating with the star wheel teeth in the clutch plate 111 is a roller 113 mounted on a lever 114 pivoted at 115 on the bracket 61 supporting the platen. A spring 116 urges the roller 113 into depressions formed by teeth 112 and thus serves to locate the platen in a correct position for each line space.

When the platen is adjusted by hand, the clutch member 110 is forced to the left (Fig. 19) against the pressure of spring 117 which normally holds it in engagement with the teeth on clutch plate 111. A collar 118 attached to the end of the platen shaft 69 forms an abutment against which the compression spring 117 rests, the other end pressing against the clutch member 110. The gear 108 is wide enough to maintain engagement with gear teeth 109 when it is out of clutching position.

When the platen is swung to the upper position, the gear teeth 109 cooperate with the stationary gear 108 to turn the clutch member 110 in a counterclockwise direction (Fig. 6). This rotating movement is not transmitted to the platen shaft because the shaft is held by the cooperation between the star wheel 112 on clutch plate 111 and the detent 114.

On the downward movement of the platen there is a positive driving connection between gear 108 and the platen shaft 69 unless the clutch member 110 is shifted to the left (Fig. 19) and disconnected from plate 111. For this reason, lever 119 (Figs. 6, 19, 20, and 21) is provided to shift clutch member 110. The clutch lever is pivoted at 120 (Figs. 20 and 21) on bracket 121 secured to the trunnion 59 of the rectangular bar 60. Thus the lever is connected to maintain a projection 122 in a slot 123 in clutch member 110 as the platen is lifted or lowered into position. The clutch lever 119 is provided with a finger piece 124 (Fig. 75

6) which may be manipulated to disconnect the clutch members when it is desired to back-space the platen.

An adjustable means is provided to control the time of engagement of the clutch member 110 with the plate 111 as the platen is lowered, thus providing for the feeding of an inserted strip to bring any desired amount of head spacing above the printing line for the first item. This is brought about by camming the lever 119 for a portion of the downward movement of the platen, and releasing the lever to permit the clutch connection to take hold during the remaining part of the motion. The cam surface 125 (Fig. 20) which cooperates with an extension 126 on the side of lever 119, forms an annular part of a disk 127 loosely pivoted about trunnion 59. The disk has a raised annular ring 128 which is knurled on the top face to permit circular adjustment by hand. A portion of the periphery of the disk is cut to form teeth 129 for locating and locking the disk in position. Cooperating with the teeth 129 is a locking member 130 slidably mounted on pin 131 projecting from carriage frame 58. A screw 132 may be tightened to hold member 130 against frame plate 58 after the disk 127 is brought around to the desired head spacing position. As the disk 127 is moved in a counterclockwise direction (Fig. 20) the end 133 of the raised cam portion 125 is brought closer to the projection 126 on the lever 119 when the lever is in the raised position.

Then, as the lever is swung to the lower position along with the platen, it reaches the end 133 whereupon the lever 119 is permitted to rock in a counterclockwise direction (Fig. 21) to shift the clutch member 110 and connect the platen so that it is driven from the time the projection 126 reaches the end 133 until the clutch lever is brought to the home position (Fig. 6). Each of the notches 129 represents a space of one line of head spacing. As shown in Fig. 20, the disk is adjusted to cause twelve lines of head spacing.

Another surface cooperates with extension 126 to cam lever 119 when a large range of head spacing movement is desired in rocking the platen back to normal position. This surface is presented by providing a cam 455 loosely mounted on shaft 59. The cam is confined in its movement by a pin 456 extending from the side of disk 127. Should the disk 127 be set for a narrow head space, the extension 126 rides up in a counterclockwise direction along the top of cam face 125 and past the upper end of face 125 and over to the support furnished by the side of the top of cam 455. The extension 126 is long enough to cooperate with the surfaces on face 125 and cam 455. If the cam 455 is not in position to act as an extended support for lever 119, the side of extension 126 strikes the right side of a pin 457 on cam 455 and carries the cam along before the upwardly traveling extension, the cam meanwhile supporting the extension. The cam 455 acts as a telescopic extension in extending the lever supporting cam face on disk 127 for narrow head spacing. When adjusted for wide head spacing the cam 455 is moved out of the way on the clockwise motion of lever 119 when extension 126 strikes the left side of pin 457.

The mechanism described hereinbefore is situated around the platen and between the platen side plates 57 and 58. Other automatic mechanism is provided to control rotation of the platen. This mechanism, which is about to be

described, is compactly arranged and formed as a unit which is secured to the left side of the platen frame. The only driving connection between this automatic carriage control unit and the other carriage control mechanism is through the gear 107 (Figs. 15 and 19).

The automatic carriage control unit is provided with manually adjustable mechanical arrangements for varying the line spacing, determining whether ejection is to occur or not, setting the length of form to be printed upon and setting the number of lines to be printed before ejection. Other electrical switches may be adjusted to control the unit so that line spacing may or may not be effected by the occurrence of a total, spacing under listing and tabulating control, and spacing without cards in the tabulator. Adjustments may be made to secure ejection after every item, or ejection at the presentation of the end of a record form. A motor drives the mechanism in the unit according to the setting of the controls mentioned. The entire unit is secured to the carriage frame and is moved along with the same to the various transverse printing positions.

The automatic carriage control mechanism is held in a frame comprising a casting 134 (Figs. 15 and 19) secured to the carriage side plate 58 by screws 136 (Fig. 6) and at other points by hubs between the casting and the plate. The casting frame 134 forms a support for the carriage motor CM (Figs. 1 and 8). A number of bosses project from the inner side of the casting frame and attached to some of these is a center plate 138 (Figs. 13 and 19) which acts as a support for many of the shafts in the unit. The mechanism projecting beyond the plate 138 is protected by a cover 139 (Fig. 19) which coincides with the contour of the frame 134 making an enclosed box-like unit of the carriage control mechanism. A thumb screw 140 holds the cover 139 on the unit. A bracket 141 (Fig. 8) projecting from the carriage frame 134 forms a bearing for the shaft 142 of the carriage motor CM. A pinion 143 on the motor shaft 142 meshes with a gear 144 pivoted at 145 on the side of the bracket 141. The gear 144 in turn meshes with another gear 146 attached to the shaft 147 which projects into the interior of the carriage control unit. A cover plate 148 (Fig. 1) is provided to conceal the gears 144, 146 and pinion 143.

The shaft 147 carries a pinion 149 (Fig. 8) which is connected to drive the line spacing and ejecting clutches in the unit. A gear 150 loosely mounted on a shaft 151 is in mesh with pinion 149 and is adapted to rotate continuously in a counterclockwise direction as long as the motor CM is energized. Attached to the sides of gear 150 are ratchet gear 152 and a driving pinion 153. Adjacent the gear 152 is a cam 154 (Fig. 15) loosely pivoted on shaft 151. This cam carries a clutching pawl 155 pivoted at 156, and a locking stud 157 for holding the cam in normal position. A compression spring 158 mounted in a stud 159 on cam 154 tends to engage pawl 155 with clutch gear 152, but an upwardly extending tail on the pawl is normally obstructed by the end of a lever 160 connected to the armature 161 of the line spacing magnet LSM. The lever 160 is pivoted on a stud 162 and is urged in a clockwise direction against stop pin 163 by a spring 164. A latch 165 pivoted on stud 162 is urged into latching position by a spring 166 which holds it against a stop stud 75

167 (Fig. 15). The shoulder on the latch cooperates with a flat face on stud 157 and serves to hold cam 154 from rocking counterclockwise when declutched.

When the line spacing magnet LSM is energized, the lever 160 (Fig. 8) is rocked in a counterclockwise direction, releasing the clutch pawl 155 which then engages the ratchet gear 152, thus connecting the cam 154 to the driving gear 150. As the cam 154 rotates, it operates a lever 168 through a roller 169 on the lever in cooperation with the periphery of the cam. The lever 168 is pivoted on shaft 170 and is provided with an upwardly extending arm 171 which is cut to form three notches. A link 172, placed adjacent the lever 168, carries a pin 173 adapted to cooperate with any one of the notches in lever 168.

The other end of link 172 is pivotally connected at 174 to a line spacing plate 175 loosely mounted on the platen feed shaft 176. The plate 175 carries a feed pawl 177 pivoted at 178 in the plate and adapted to cooperate with a ratchet gear 179 fixed to shaft 176. This shaft is secured to gear 107 (Fig. 15) and thereby is adapted to turn the platen.

From the connections mentioned it may be noted that as the cam 154 (Fig. 9) is rotated, the lever 168 is rocked in a counterclockwise direction, pulling on link 172 and rocking the plate 175 so that pawl 177 advances the platen shaft one or more steps in a counterclockwise direction. The amount of motion imparted to the platen feed shaft is determined by the adjustment of the end of link 172 so that pin 173 cooperates with any one of the three notches in lever 168. If the pin cooperates with the notch nearest the pivot of the lever, the motion imparted will amount to one line space. When the link is lifted to cooperate with the center notch the motion carried to the platen amounts to two line spaces. Lifting of the link to the highest position causes cooperation of the upper notch in lever 168 and connects the line spacing devices to produce three steps of motion.

The manual adjustment of link 172 is brought about by means of a manipulated arm 180 extending from the side of the carriage frame 134 (Figs. 4 and 6). The arm 180 carries a knob 181 with a plunger which the operator may set to hold the arm in any one of the three positions identified on the side of the frame. A shaft 182 (Fig. 9) is connected to the arm 180 and has secured thereon another arm 183 cooperating with the underside of a pin 184 extending from link 172.

By means of these connections the link 172 is raised or lowered by arm 180. The link is held against the side of lever 168 by a guiding strip 185 secured to lever 168. A spring 186 attached to strip 185 urges the lever 168 in a clockwise direction and tends to hold roller 169 against cam 154.

A spring 187 wound around stud 178 tends to move pawl 177 into cooperation with ratchet gear 179. However, in the normal position of the parts, a cam face on the lower portion of pawl 177 cooperates with a stud 188 projecting from the frame 134 in such manner that the pawl is forced away from the gear. The same stud 188 serves as a stop for the plate 175 when it is drawn to the home position by a spring 189.

Secured to the side of ratchet gear 179 is a star wheel 190 provided for the purpose of normally preventing backward movement of the line spacing shaft 176. Cooperating with the star wheel

190 is a pawl 191 loosely pivoted on shaft 192 and held into cooperation with the star wheel by spring 193. At certain times in the operation of the machine, the pawl 191 is disengaged from the wheel 190 by an arm 194 secured to shaft 192 and carrying a pin 195 cooperating with the upper edge of pawl 191, as explained hereinafter.

The view in Fig. 9 shows the line spacing devices in an operated position. There it is noted the manual adjustment is set for a spacing of three lines. The lever 168 is shown rocked by the cam so that the link is drawn to the left and feed pawl 177 engages the ratchet 179 for the turning of the shaft 176.

The driving connections described hereinbefore are connected to one side of a continuously rotating clutch gear which is in readiness to effect an ejecting operation at any point in the operation of the machine when a magnet is energized for controlling such operation. The driving pinion 153, which it is remembered is attached to gear 150, meshes with another gear 196 loosely pivoted on shaft 170. The gear carries attached thereto a ratchet gear 197. Located in alignment with ratchet 197 but normally out of engagement therewith is a ratchet pawl 198 pivoted at 199 on the side of an ejecting cam plate 200 (Figs. 13, 14 and 15). An extending tail on the pawl 198 (Fig. 8) cooperates with a lever 201 pivoted at 202 and attached to armature 203 cooperating with the ejecting control magnet EM. When the magnet EM is energized, lever 201 is rocked in a clockwise direction releasing pawl 198 and clutching the ejecting cam plate 200 to the driving gear 196. The ejecting operation may be effected by a manual adjustment on the outside of the carriage control unit. A button 204, extending out of the frame 134, is connected to a link 205 which is guided by a stud 206 and formed with an abutment 207 in contact with a projection 208 extending from the bottom of lever 201. A spring 209 holds the button 204 in an extended position. When the button is depressed, the lever 201 is rocked just as though the magnet EM were energized.

Before pointing out the connections for ejecting operation, it is believed well to mention that such an operation may take place at any point in the printing along the length of the record material, when initiated by the energization of magnet EM on the occurrence of a total, after a certain number of lines, or at the end of a form. In Fig. 13 the ejecting devices are shown in the normal position. There it is noted that a link 210 is articulated at 211 on side of plate 200 and at the other end is pivotally connected at 212 to the side of an ejecting frame 213 pivoted at 214 on the frame of the control unit. This rocking ejecting frame 213 is formed in the shape of an arc with a series of teeth 214 cut in the inner side of the arc. Cooperating with these teeth (Fig. 11) is a block 215 formed with a single tooth 216 adapted to ratchet over the teeth 214 and engage any one of the teeth as the link 217 carrying the block 215 is drawn along the inner surface of the arc during line spacing operation. The block 215 is loosely pivoted on link 217 by means of a stud 218 mounted on link 217. A washer 219 is secured to the stud by a screw and serves to hold the block 215 on the side of link 217. When the clutch connection comprising pawl 198 (Fig. 8) and ratchet gear 197 is made effective by the energization of the magnet EM or by pressing button 209, the plate 200 (Figs. 13 and 14) is connected to rock in a clockwise direction

and moves link 210 and frame 213 to the right with a gradually accelerated motion until the plate 200 has moved through an angle of ninety degrees and then the motion is retarded until the link is practically at rest as the plate reaches a position after 180° of motion. Then the same type of motion is repeated as the plate goes through the final 180 degrees in arriving back to the home position after a complete revolution.

This type of motion is admirably fitted to cause the ejection of a record strip because it picks up the record material without a jerk and thus provides for a firm grip on the material as it is started in the feeding operation. The same type of motion is in effect whether the sheet is ejected through a single line spacing motion or through the maximum distance possible to eject.

Continuing now with outlining the connections of link 210 to the line spacing devices for the purpose of ejection, it is noted that in its motion to the right (Figs. 13 and 14) the link carries along the ejecting frame 213 by rocking it in a clockwise direction about the pivot 2141. As this is done, the teeth 214 on the frame 213 engage the block 215 on the end of link 217 and move this link to the right. At the right end of link 217 there is connected a sector 220 loosely pivoted on a shaft 221. The sector teeth are in mesh with a pinion 222 which may be clutched to the line spacing shaft 176, which, as noted hereinbefore, serves to space the platen through the connections to gear 107 (Fig. 15).

Referring to the plan view in Fig. 15, it may be seen that shaft 176 is carried in a bushing 223 projecting from frame 134 and extending alongside the hub on gear 107. An enlarged collar 224 on the shaft is seated in an embossed section of the center plate 138. Adjustably secured to the end of shaft 176 by a screw 226 is a collar 225 provided with a projection 227 adapted to cooperate with a notch 228 (Fig. 13) cut in the side of pinion 222. If the pinion 222 is held out of cooperation with the projection 227, the motion of sector 220 is not imparted to the line spacing shaft 176. The pinion 222 may be moved and held out of engagement with the shaft 176 when it is desired to prevent ejection. The pinion is positioned by shaft 229 (Figs. 13, 14, and 15) carrying a positioning member 230 which cooperates with a circumferential slot 231 (Fig. 15) cut in the pinion 222.

An arm 240 (Fig. 13) on the member 230 is slotted to cooperate with a stud 241 located in the frame 138 and serving to hold the member in cooperation with the pinion. At the other end of the shaft 229 (Fig. 15) is mounted a knurled knob 232 attached to a positioning blank 233 cooperating with the pin 234 (Fig. 4) projecting from the side of frame 134. Another pin 235, slightly higher than pin 234, cooperates with an elongated notch 236 cut in the side of member 233. By means of the pins and the member 233, the shaft 229 may be positioned axially in two different ways. If the knob 232 is grasped by the operator and pulled to the right (Fig. 15) and given a counterclockwise twist (Fig. 4) and pin 234 holds the shaft 229 in this extended position by obstructing the return movement of the shaft to the left as seen in Fig. 15. When the shaft is in this position, pinion 222 is declutched from the shaft 176 and automatic ejection is prevented. If the operator wishes to set the devices for ejection, the knob 232 may be turned in a clockwise direction until a notch 237 (Fig. 4) in member 233 coincides with pin 234. Then the shaft 229

may move to the left (Fig. 15) carrying lever 230 and pinion 222 to the left and engaging the pinion with the driving projection 227 on the line spacing shaft 176. A collar 238 (Fig. 15) on shaft 229 limits the motion of the shaft into engaging position. A compression spring 239 placed between lever 230 and frame 138 tends to hold the pinion 222 in engagement with the collar 225. With the pinion so connected, any clockwise ejection movement of the sector 220 is transmitted through pinion 222, Fig. 19, shaft 176, gears 107 and 108, clutch member 110 and clutch 111 to turn the platen shaft, and the converse is true in that if the shaft 176 is spaced in line spacing by means of the ratchet gear 179, the sector 220 will be advanced step by step in a clockwise direction (Figs. 10, 12 and 13) as line spacing takes place.

As sector 220 is rocked step-by-step to the right in line spacing, the tooth 216 ratchets idly over tooth after tooth along the line of teeth 214, Figs. 11 and 12, while member 213 lies in a horizontal position. Then, at any selected point in the operation, and when tooth 216 is in mesh with any of the teeth 214, ejection is performed by rocking member 213, pushing link 217 connected thereto through tooth 216 and block 215, rocking sector 220, turning gears 222, 107, 108, 109, 112 and the platen.

After sector 220 is moved in a clockwise direction (Fig. 14) it is restored by a compression spring 242. A plunger 243 pivoted at 244 on a stud in the sector plate 220 is provided with a shoulder against which one end of the compression spring presses. The other end of the compression spring rests in a recess cut in a stud 245 secured to frame plate 138 and drilled to receive the sliding end of a plunger 243. The counterclockwise restoring movement of sector 220 under the urging of spring 242 does not effect any movement of the platen shaft, because the clutch plate 111 thereon and drive member 110 form a one way clutch for driving in the other direction.

It is noted from the showing in Fig. 14 that when the sector 220 is moved to the extreme adjusted position by the actuation of ejecting member 213, the teeth 214 arranged in an arc on member 213 form a perfect arc about the center 246 where link 217 is secured to sector 220. The radius of the arc is substantially the same as the length of link 217 and thus all teeth 214 are equidistant from the center 246 in the sector 220 when it is in the extreme eject position. The mechanism is designed in this way so that the sector 220 never moves beyond a certain position in ejection regardless of the point at which ejection is started by the engagement of one of the teeth 214 with the toothed block 215 on link 217 (Fig. 11). If, at the time ejection is initiated, the block 215 engages a tooth 214 near the center 2141, the ejection movement of sector 220 is short and the sector is rocked as far as the position shown in Fig. 14. On the other hand, if upon ejection initiation the block 215 engages a tooth 214 near the end of member 213 removed from center 2141, the ejection movement of sector 220 is long, but the extreme ejection position of the sector is the same as during short ejection and the same as the position shown in Fig. 14.

When the sector 220 reaches the extreme adjusted position, Fig. 14, as result of a plurality of line spacing operations, devices are operated to prevent further line spacing operation. Line

spacing at such a time would move the sector too far in a clockwise direction and demesh pinion 222. An interlock is provided to hold the armature lever 160, Fig. 8, in position to prevent the release of the spacing clutch pawl 155. The parts comprising the interlock include a bail 421, Fig. 14, pivoted on a stud 422 extending from frame 134. An arm 423 on the bail is operated by the side of the sector when the sector is moved to the end as shown in Fig. 14. Another arm 424 on the bail is connected to a link 425 which slides along a pin 426 on the frame. The end of the link abuts against an arm 427 (Fig. 8) attached to armature lever 160, preventing counterclockwise movement of the lever (Fig. 8) and keeping line spacing pawl 155 latched out of operation.

On the return counterclockwise motion of the sector 220 (Fig. 14) under the pressure of spring 242, the toothed block 215 (Fig. 11) is disengaged from the teeth 214 by means of devices mounted on the ejecting frame 213. A plate 247 connected to frame 213 by pin and slot connections 248 is formed with an arcuate slot 249 which engages the lower portion of block 215 (Fig. 11). When the plate is in normal position the tooth 216 is permitted to engage teeth 214. This relationship prevails as the ejecting frame member 213 is swung in a clockwise direction (Fig. 14). As the ejecting member is moved to the left in a counterclockwise direction, a projection 250 on plate 247 strikes a flipper 251 pivoted at 252 on a boss of casting 134. The flipper contacts against the stud 253 which prevents clockwise motion of the flipper and causes a downward camming of the plate 247. The plate is permitted to move on the lever 213 by means of the pin and slot connections 248 and after moving a short distance, it is held in adjusted position by engagement of a latch 254 with a shoulder 256 on plate 247. The latch is pivoted on a stud 255 which extends from the side of eject frame 213. The plate is thus held in adjusted position for most of the downward swing of frame 213 until latch 254 strikes a stud 257 projecting from the casting of the unit. Then, the latch is rocked in a clockwise direction to release plate 247 and allow spring 258 to draw the plate into normal position. When the plate is operated on the return motion of sector 220, the tooth 216 (Fig. 11) is moved out of cooperation with teeth 214 so that the left end of the link 217 may be moved along the slot 249 to bring the block 215 in position to cooperate with the teeth 214 at the left end of eject member 213 in readiness for a complete ejecting stroke.

The return motion of sector 220 may be adjustably varied to determine the length of the record sheet form to be printed upon in the machine.

The form may be shortened by stopping the sector 220 at any point along its travel towards the left (Fig. 12). For this purpose, a lever 259, pivoted on shaft 221, cooperates with a stud 260 mounted on the side of sector 220. The end portion of the form length setting lever 259 is adapted to be adjusted around and held in any position along an arc formed by a segment plate 261. This segment plate is secured to the frame of the machine at 262 (Fig. 10) and 263 by screws secured to the casting frame. On the outer edge of segment 261 are cut a series of ratchet teeth 264 each tooth representing a line space on the platen. A series of teeth in groups

representing inches of spacing are identified by numerals impressed on the side of the segment plate. An adjustable toothed member 265 pivoted at 266 on lever 259 cooperates with the teeth 264 to hold the lever in any adjusted position. A spring 267 normally holds the toothed member 265 in engagement with the segment plate but it may be lifted and moved to the right or left to any position and locked therein to form a stop for the return motion of sector 220, thus determining the length of the stroke for ejection on the following operation. A stud 268 on lever 259 is slotted to engage the inner arcuate surface of segment plate 261 to hold the lever against the side of the plate.

As explained hereinbefore, the ejecting operation is controlled by the energization of magnet EM. This magnet is energized at various times according to the setting of the controls and the closing of contacts to form a completed circuit. For one form of control the contacts are closed as the printing on the record form approaches the end of the form.

These contacts 269 (Figs. 10 and 19) are operated by plunger 270 guided by holes in studs 241 and 271 projecting from frame 138. The upper end of the plunger is contacted by an overturned shoulder on the contact operating lever 272 pivoted at 263. When the lever is rocked in a clockwise direction and the plunger is depressed, the contacts close to energize magnet EM and initiate an eject cycle of operation.

The lever 272 (Fig. 10) is operated in such a manner by the striking of the pointed end 439 of a lever 273, fastened to sector 220, against a cam surface 274 projecting from the side of one arm of lever 272. The lever 273 is loosely pivoted adjacent the segment plate 261 on shaft 221. The eject contact operating lever 273 is secured to sector 220 by a screw 275 in stud 260 and may be adjusted around the sector by means of an arcuate slot 276 cooperating with the shoulder of screw 275.

In Fig. 12 the lever 273 is shown in such an adjusted position to cause ejection before the usual time and thus provided for a larger unprinted space at the bottom of each record form.

When an eject operation takes place, various electrical and mechanical devices in the machine must be operated to control carriage feeding, the operation of the carriage motor, the disablement of the line space latch, and the operation of the tabulating machine. The contacts are opened to cut out resistance in series with the carriage motor so that the motor may have the benefit of an increase in energy to carry the increased load which is presented when the platen is spaced through more than the usual distance. Other contacts are operated to cause a delay in the restarting of the tabulating driving connections during an eject operation.

Other disengagements must be effected to free the line spacing shaft from ratchet connections during ejection. These and other controls to be described hereinafter with reference to the wiring diagram are effected by the cam faces formed on the periphery of plate 200, which, as is noted from the foregoing section of the description, turns through a complete clockwise revolution during an ejecting operation.

Cooperating with the cam plate 200 is a three-armed contact operating lever 278 (Figs. 13, 14, 17, and 18). The lever is attached to the shaft 192 already referred to in describing the mechanism in Fig. 8. The upper end of the lever 278 is

formed with a projection 279 which acts as a cam face and also as a latch in cooperating with a notch 280 (Fig. 14) cut in the periphery of plate 200. Early in each eject cycle the notch 280 acts as a cam face to rock the lever 278 in a clockwise direction, pressing down on a link 281 secured to one arm 282 formed on lever 278. The lower end of link 281 (Fig. 10) is secured to a ball 283 pivoted on stud 284 and carrying an insulation block 285 which normally holds contacts 286 closed. A spring 288 attached to ball 283 normally tends to hold the contacts closed and the link 281 lifted with lever 278 pressing against plate 200. However, when the lever is cammed in a positive way by the plate 200, link 281 is depressed and contacts 286 are allowed to open. As explained more fully hereinafter, the opening of these contacts causes the deenergization of a carriage motor relay to permit opening of contacts in series with a resistance normally decreasing the power of the carriage motor. The purpose of these connections is to increase the power of the motor during ejection operation at which time the load is greater than when line spacing. When the relay is deenergized, other contacts are opened to prevent operation of the tabulating machine during ejection.

As the plate 200 continues to move in a clockwise direction (Fig. 14), at about the mid-point of the operation, another cam face 289 strikes the end of lever 278 and rocks it another step in a clockwise direction. When the lever is so operated, the arm 194 (Figs. 8 and 18), connected to the lever through shaft 192, acts on detent 191 (Fig. 8) to lower the same and disconnect it from the star wheel 190. This is done to permit a free return motion of the line spacing shaft 176 under control of the connections from the ejecting mechanism.

The sector 220 (Fig. 14) is moved in a counterclockwise direction through link 217, eject frame 213, and link 210, when plate 200 is moved in a clockwise direction by ratchet gear 197. At the same time that the line space shaft is being reversed to restore the ejecting mechanism and is freed for such reversal by disengagement of pawl 191, the platen shaft is held from backward motion by roller 113 (Fig. 15) in engagement with star wheel 112, preventing motion as the clutch collar 109 (Fig. 19) idly ratchets over the teeth in clutch member 111.

Near the end of the eject operation, an extending portion 290 (Fig. 14) on plate 200 strikes lever 278 and moves the same another increment of movement in a clockwise direction. This motion is used to close contacts 291 and open contacts 292 (Fig. 10). The lower end of lever 278 is formed with a projection 293 cooperating with a pin 294 extending from the side of an arm 295 loosely pivoted on shaft 192.

A link 296 (Figs. 10 and 17) is articulated at one end on arm 295 and is connected at the other end by stud 297 on an arm 298 forming part of a bail 299 pivoted on stud 300 projecting from the frame 138. The bail 299 carries an insulation block 301 contacting the top of contacts 292. Since the lever 278 is rocked in a clockwise direction by the projection 290 (Fig. 14) arm 295 and link 296 (Fig. 10) is carried to the left to rock bail 299 in a counterclockwise direction about stud 300, releasing the pressure of insulation block 301 from contacts 292 and allowing said contacts to open. When the lever 278 is in normal position, the projection 293 is removed from the pin 294 so that the connections may be moved

to close contacts 292. Such a movement is urged by spring 302 connected to arm 295. However, the connections may be held from moving in this manner by the cooperation of an overturned portion 303 on arm 295 cooperating with the armature 304 attracted by magnet LCLM and movable about center 3041.

This magnet is controlled by the closing of the lower card contact levers which are operated when cards are present under the lower sensing brushes in the tabulator. The magnet is energized early in each item entering cycle and attracts the armature 304, releasing arm 295 and permitting the closing of contacts 292. This condition of the contacts is maintained until a time near the end of an eject cycle when the projection 290 strikes lever 278 and, through the various connections described, restores the linkage holding the contacts 292 closed, allowing the same to be opened. The function of the contacts in preventing paper feeding unless cards are in the tabulating machine, is explained more fully hereinafter with remarks referring to the wiring diagram.

At the same time that the lever 278 is being rocked to its extreme clockwise position in effecting the opening of contacts 292, it also serves to operate to close contacts 291 (Fig. 10). This is done through the linkage including link 281 and ball 283 already described. The insulation block 285, after releasing contacts 286, moves to a neutral position as the ejecting operation takes place, and then, near the end of the operation, the block is lifted a slight amount by the clockwise motion of lever 278 to close contacts 291. These contacts serve to initiate the automatic restarting of the tabulating machine so that cards are fed in regular operation after the completion of an eject operation.

The automatic form ejecting mechanism is provided with means for disabling the star wheel detent on the platen shaft during ejection. This is done to eliminate the noise which would otherwise be caused by the escaping of the roller 113 (Fig. 6) over the teeth of the star wheel 112 as the platen shaft is rotated through a wide arc during ejection.

Referring now to Figs. 13 and 15, it is noted that a boss 1304 on the end of link 210 is adapted to cooperate with an arcuate surface on a lever 305 secured to one end of a shaft 306. As the ejection actuating frame 213 rocks about center 2141, the boss 1304 strikes the lever 305 and rocks it through a short distance in a counterclockwise direction (Fig. 13) and maintains the lever in this position during the ejection stroke. The shaft 306 (Fig. 15) is supported in the frame 134 and extends therefrom and carries a long arm 307 (Fig. 6) which cooperates with an overturned shoulder 308 extending on the side of line spacing detent 114. When the lever 305 is rocked during ejection, the arm 307 is raised (Fig. 6) and the detent 114 is moved to position roller 113 out of the path of the teeth on star wheel 112.

Before considering the wiring connections of the automatic carriage control devices, it is believed well to outline the operation of the tabulating machine with which the devices cooperate. The printing devices of such a machine are illustrated in Fig. 1 and the adding, printing group control and other control devices are shown diagrammatically in Fig. 33. Most of the matter of interest in connection with the present case is described in detail in Patent No. 1,762,145.

The general details of construction of the ma-

chine are well known in the art and described in said patent, consequently there will be given herein only a brief explanation of such parts thereof as are necessary to an understanding of the present invention. It will be helpful in understanding the invention herein if it be noted that cam contacts identified by the letter L on the circuit diagram are operated by the tabulating mechanism through connections to the motor TM (Fig. 33) operative during listing operations, while the cam contacts identified by the letter P are operated by the resetting and total taking mechanism through the power of the motor RM.

Referring to Fig. 33, the record cards are successively fed from a stack and advanced past the upper analyzing brushes UB and exactly one machine cycle later past the lower analyzing brushes LB. Suitable wires connect these brushes to a plugboard terminating in sockets 313 and 314 respectively. The plugboard also includes sockets 315 which are connected to the counter magnets AM. As the perforated cards pass the upper brushes, a card lever is engaged by the cards to cause closure of card lever contacts UCL and hold them closed as long as cards continue to feed past the upper brushes.

As the cards pass the lower brushes their index points instantaneously close circuits through the proper lower analyzing brushes LB to energize counter magnets AM. As usual, the timed energization of these magnets control mechanism for entering data corresponding to the card reading on the counter wheels. When any magnet AM is energized, it causes contacts 316 to close, energizing a printer magnet PM to select the type corresponding to the entered data for printing. In this fashion the accumulated or entered items may be listed.

In Fig. 1 is shown the printing mechanism through which the type bar 53 is positioned relatively to the platen 51 to bring the proper type 317 opposite the platen. The listing shaft 311 driven by the tabulating motor TM is provided with a cam 318 cooperating with a roller 319 carried by an arm 320 operatively connected to a shaft 321. As the cam rotates, shaft 321 is rocked in a clockwise direction and an arm 322 secured thereto and linked at its free end to printing crosshead 323 serves to raise the type bars 53 in synchronism with the movement of the record cards past the analyzing brushes so that the type 317 successively pass printing position opposite platen 51. The type bar 53 is arrested under control of printing magnet PM, which, when energized, attracts its armature 324 and through a call wire 325 releases latch member 326, normally holding stop pawl 327.

When the pawl is so released, it is spring operated to engage the ratchet teeth 328 formed on the type bar 53 to prevent further upward movement of the type bar, thus holding a particular type 317 in printing position. The usual hammers 329 are provided to impel the type against the platen.

During tabulating and listing operations the machine is driven by the motor TM (Fig. 33) controlled by a group of relays and contacts shown at the top of the sheet. The circuit which serves to maintain the motor TM in operation is as follows: from left side of line 309 through motor TM, relay 330, clutch magnet 331, motor relay 332, its contact points 333 (closed while the motor is running), wire 334, upper card lever contacts UCL, automatic control relay points

335, stop key contacts 401, wire 403, contact 405 (Fig. 32), wire 406, switch 402, wire 407, wire 404, contacts P3 (Fig. 33) and the right side of line 310. This circuit maintains the motor TM in operation as long as cards continue to feed through the machine to hold contacts UCL closed.

During total taking operations the machine is driven by a reset motor RM controlled by a group of circuits, contacts and relays designated generally at 350. Shaft 312 (Fig. 1) is connected to be rotated by the reset motor during total taking. A cam 336 on the shaft cooperates with an arm 337 on shaft 321 to lift the type bars 53 in synchronism with the rocking of contact levers 338 (Fig. 33). These levers cooperate with the stepped cams 339 on the counter wheels and read the total amount registered thereon by closing contacts 340 in series with the printing magnets PM which then stop the type bars in the proper printing position in the manner noted hereinbefore.

With the machine adjusted for listing data from each card passing the brushes, the following circuits are completed through the lower brushes: from line 310, contacts P3, L33, LCL, wires 351 and 352, impulse distributor 353, contact plate 341, through the perforation in the card, brush LB, socket 314, connection wire 342, socket 315, magnet AM, contacts 343, and wire 344 to left side of line 309.

Energization of magnet AM will cause opening of contacts 343 to interrupt this circuit and closure of contacts 316 to complete the printing circuit from line 309, wire 344, contacts 316, print magnet PM, wire 345, contacts LP2, switches 346, 347, contacts 348, closed during listing operations, to line 310.

The major and minor automatic group control system used in the tabulating machine will be briefly described to bring out certain selective switching features. One form of such a control system is fully disclosed in British Patent No. 299,014. The usual automatic control magnets are shown at 431 (Fig. 33) and are provided with the usual series contacts to prevent sparking at the analyzing brushes. Each control magnet is adapted to be plugged in series between related upper and lower analyzing brushes to effect automatic control from any card column. The automatic control contacts 432 of which one is associated with each control magnet, are arranged to close individually when the corresponding control magnet 431 is energized and all of them are opened simultaneously towards the end of each tabulating or listing cycle. When the control perforations on successive cards under the upper and lower analyzing brushes agree, all control contacts 432 which are properly plugged for automatic control, close at some time during the cycle, while when the control perforations fail to agree, one or more of the contacts fail to close.

The automatic control contacts 432 are all connected in series and a socket 433 is provided between each pair of them so that any number of them may be utilized and the control split into major and minor sections at any point. Under such arrangement when a group change occurs in the minor section total printing takes place under control of the counters of the tabulator and certain ones thereof are reset.

When a group change occurs in the major section, the same procedure follows as on a minor change and in addition, totals are printed from

other counters of the adding devices and the entire apparatus zeroized.

Cam control contacts L3 govern the operation of the machine under major control and cam control contacts C1 govern the operation of the machine under minor control. Both of these contacts are normally closed but open an instant towards the end of each tabulating or listing cycle. The contacts L3 may be plugged in parallel with the control contacts 432 selected for major control and the contact C1 may be plugged in parallel with the control contacts 432 selected for minor control. As shown, contacts C1 are in parallel with minor automatic contacts 432 associated with magnets 431 numbered from 1 to 3 and contacts L3 are in parallel with the other major automatic contacts. The shunt formed across cam contacts L3 by major control contacts 432 extends from the upper terminal of contacts L3 through wire 434, wire 435, plug wire to socket 433, the terminal of the connected major control contacts 432 in series, thence through the last major control contacts 432 whose other terminal is plugged to upper card lever relay contacts UCL1, closed by cards under the upper brushes as long as major group control is operating, thence to line 310 to which is connected the other side of contacts L3. The switches 436 and 437 should be opened for group control operation. The parallel connection including the major control contacts 432 and cam contacts L3 is in series with a major control relay MA2 while the parallel connection including the minor control contacts 432 and cam contacts C1 is in series with a minor control relay MI2. The major control relay is provided with back contacts 438 and front contacts 439 while the minor control relay is provided with back contacts 440 and front contacts 441. The front contacts of the major and minor control relay contacts connect the relay coils directly to main line 309.

The stick circuit for the major control relay extends from main line 309, through front contacts 439 and major control relays MA2 and MA, and through the parallel connection L3 and wire 442 to line 310, or wires 434, 435 and major control contacts 432 and UCL1 to the main line 310. This circuit will be interrupted to deenergize the major control relay MA2 by the opening of cam contacts L3 at the end of any listing or tabulating cycle during which any of the major automatic control contacts 432 fail to close, due to disagreement of major classification perforations in the controlling record cards.

The stick circuit for the minor control relay MI2 extends from main line 309, front contacts 441, minor relay coils MI2 and MI, zero button control magnet ZB, wire 443, contacts C1, contacts L3, and wire 442 to line 310. When the contacts C1 are opened to test the minor control circuit, if there is no change, the magnets remain energized by a circuit from line 309, contacts 441, magnets MI2, MI and ZB, wire 444, minor and major control contacts 432, contacts UCL1 and line 310. It will thus be obvious that a change in the major group data deenergizes both major and minor control relays at the end of the cycle, while a change in minor group data alone, deenergizes the minor control relay only. Deenergization of these relays, opens the front contacts 439 and 441 and closes the back contacts 438 and 440.

The ultimate result of thus deenergizing the major and minor control relays is to force two reset cycles by the former to permit successively

major and minor total printing and to force only one reset cycle by the latter. The back contacts 438 of the major control relay connect the usual motor control relay MCM and the reset control magnet RCM to the main lines 309, 310 for energization, and the back contacts 440 of the minor control relay connect the same magnets in a similar way through a parallel circuit.

Deenergization of either the major or minor control relay, then, energizes the motor control relay MCM and reset control magnet RCM and they remain energized until both the major and the minor control relays are again energized. As explained in the patent to Daly and Page, No. 1,762,145, referred to hereinbefore, energization of motor control relay MCM opens the contacts 335 to stop the tabulating motor TM and prevent it from restarting until the motor control relay MCM is again deenergized. The energization of reset control magnet RCM opens the contacts 445 to prevent the cam contacts P1 from taking control of the reset motor RM thus forcing successive reset cycles until the reset control magnet RCM is again deenergized.

During each reset cycle, cam contacts LP6 make and break and directly after they break, cam contacts 6P7 make and break. Cam contacts LP6 connect major control relay MA2 to the line 309 through the front contacts 441 of minor control relay MI2. Hence the closure of cam contacts LP6 energizes major relay MA2 only if the minor relay has been previously energized and, since deenergization of the major control relay always entails deenergization of the minor control relay, the closure of these contacts during the first reset cycle is of no effect. The closure of cam contacts LP7 during the first reset cycle reenergizes the minor control relay MI2 which in turn re-establishes its stick circuit. If the major control relay is energized at this time with its back contacts 438 open, which will be the case if a group change has occurred in the minor control section alone, this energization of the minor control relay, opens the back contacts 440, breaks the circuit of motor control relay MCM and reset control magnet RCM, and contacts 335 and 445 close causing interruption of reset and resumption of tabulating after a single reset cycle.

If the major control relay has been deenergized by a group change, at the end of the first reset cycle in which the minor relay is energized, the back contacts 438 remain closed and provide a circuit for the motor control relay MCM and the reset control magnet RCM, thus holding the contacts 335 and 445 open to force a second reset cycle. During this second cycle the closure of cam contacts LP6 effects energization of major control relay MA2, establishing its stick circuit and opening the back contacts 438 to deenergize motor control relay MCM and reset control magnet RCM. The reset is then interrupted at the end of the second cycle and tabulating may be resumed.

The major and minor control features are not limitations in the machine as they can be incapacitated if desired, and the machine operated either under straight automatic control or last card operation. The switch 436, if closed, short circuits the cam contacts L3 and throws the entire bank of automatic control contacts 432 in parallel with the cam contacts C1. It also furnishes a current path for the major control relay exclusive of the contacts L3 and any of the automatic control contacts 432. Under these

conditions the major control relay MA2 remains energized constantly and the minor control relay MI2 controls the machine for straight automatic control. If the switch 437 is closed as well, a permanent current path is also provided for the minor control relay to maintain it constantly energized and the machine is adapted for last card operation if none of the magnets 431 is connected in series with any column of upper and lower brushes.

Referring again to the wiring diagram of the regular tabulating machine shown in Fig. 33, it is noted that extra magnets MA and MI are provided in minor and major group control devices. The magnet MA of the major control side of the wiring is adapted to be energized whenever the regular control magnet MA2 is so conditioned by agreement between successive cards of a group. The other magnet MI is connected in series with the minor control magnet MI2 and serves to follow the energization of this magnet.

Associated with these magnets MI, MA are a series of contacts shown in Fig. 32 and used to control the line space and eject devices of the present invention. The purpose of these contacts is explained hereinafter in connection with the wiring diagram in Fig. 32.

Another control is secured for the automatic carriage devices by means of a magnet LCLM (Fig. 33) shown connected to the wiring of the regular tabulating machine. This magnet is energized early in each card feeding cycle as long as cards are fed under the lower brushes. The circuit through the magnet LCLM is traced as follows: from the line 310, through contacts P3, contacts L33, lower card lever contacts LCL, wire 351, wire 352, to a common contact ring on impulse distributor 353, then through a contact spot which touches a brush 354 at the nine index position, magnet LCLM and wire 355 to line 309.

In describing the control of the automatic feeding devices, reference may be made to the wiring diagram (Fig. 32) for the explanation of the energization of carriage motor CM and the timing of the impulses passing through the line space control magnet LSM and the ejecting control magnet EM.

In describing the mode of operation of these controls, it is helpful to refer to the samples of records shown in Figs. 22 to 31, inclusive, for actual representations of various arrangements of line spacing and ejection of forms.

As explained hereinbefore, as long as the ejecting mechanism is held in normal position, the contacts 286 (Fig. 32) remain closed. With these contacts closed, a carriage motor relay magnet CMR is held energized by a circuit from line 309, through contacts 286, wire 356, magnet CMR and wire 357 to line 310. When this magnet is energized it operates a lever 358 against the tension of a spring 359 and acts to close contacts 360, 361 and open contacts 362.

When the magnet CMR is deenergized by the initiation of an eject cycle and rotation of a cam 200 serving to open contacts 286, the spring 359 is effective to open contacts 360 and 361 and close contacts 362. Then, since contacts 286 are opened, the line spacing magnet LSM cannot be energized to operate the line space pawl opposite to the platen shaft movement on restoration after ejection.

The opening of contacts 361 during ejection serves to delay the restarting of the regular tabulating operation during ejection. The contacts

361 are connected in series with the tabulating motor relay by wires 363 and 364. The tabulating starting circuit may be traced from line 310 (Fig. 33) through contacts P3, contacts L33, contacts LCL, contacts P2, wire 364, contacts 361 (Fig. 32) wire 363, auto start switch (Fig. 33), wire 365, tabulating motor relay, the tabulating clutch magnet, and line 309. As soon as the ejecting operation is completed the cam 200 permits the closing of contacts 286 and the energization of magnet CMR, causing closing of contacts 361 and allowing starting of the tabulating machine.

The other contacts 360 and 362 serve to switch a resistance in and out of series with the carriage motor CM. When the motor is operating in line spacing, the circuit is as follows: line 309, contacts 286, contacts 292 closed as long as cards are under the lower brushes, wire 356, resistances R, contacts 360, wire 367, motor CM, wire 368, to line 310. As soon as an eject operation is started, the contacts 360 are opened and the contacts 362 close to cut out the resistance R and connect the motor directly across the line by a circuit from line 309, wire 369, contacts 362, wire 367, motor CM, wire 368, to line 310.

A condenser 370 is connected to contacts 362 to prevent arcing at these contacts when they open after the power supply switch is closed to energize the magnet CMR while the contacts 362 are closed.

The timing of tabulator restarting after ejection is controlled by the closing of contacts 291 near the end of the eject operation by the projection on cam 200. These contacts are connected in series with the automatic start circuit by wires 371 and 372. The circuit includes contacts P3 (Fig. 33), contacts L33, contacts LCL, wire 372 (Fig. 32), contacts 291, wire 371, wire 363, auto start switch (Fig. 33), wire 365, the tabulating motor relay, the tabulating clutch magnet and the other side of the line 309.

Taking up the first example shown in Fig. 22 illustrating the operation of record spacing during listing to select single, double, and triple spacing, the variation of the spacing is controlled by the manipulation lever 180 (Fig. 4) as explained hereinbefore. The operation of the platen shaft for one or more spaces is controlled by the initiation of an impulse in the magnet LSM (Fig. 32). When the devices are set for listing, the lever 373 is shifted to "List" to close contacts 374. A circuit is thus prepared from line 309, contacts 286, contacts 292, wire 366, contacts 374, contacts L13 closed after printing and late in the tabulating operation by the cam on the listing shaft 311; the circuit continues through wire 375, contacts 376 and contacts 377 closed during ordinary listing, wire 378, wire 388, and through magnet LSM, to line 310. The energization of magnet LSM effects a line spacing operation as explained with reference to the devices shown in Fig. 8.

The illustration of Fig. 23 shows the operation of line spacing to secure a double space between the printing of totals when operating under tabulating control. With the machine set for tabulating, the lever 373 (Fig. 32) is shifted to open contacts 374. A circuit is established to energize the magnet LSM by connections comprising line 309, contacts 286, contacts 292, wire 366, contacts P12 and P13 closed by a cam on the total printing shaft 312, wire 379 and then the circuit branches through two different lines according to whether the total is a minor or major one.

If the total is a minor total, the impulse is carried through wire 380, wire 381, contacts 377 (these contacts are closed when the total is a minor total) closed unless there is a major change, wire 378, wire 388, and through magnet LSM. If the total printed is a major total, both contacts 377 and 382 are opened while the minor portion of the total is being printed. After the printing of the minor total, the contacts 382 are permitted to close and then after printing the major total a line spacing impulse is permitted to flow from wire 379, through wire 383, contacts 382, wire 384, magnet LSM, and line 310.

Fig. 24 illustrates the operation of line spacing with the tabulator set for listing under minor and major control with the printing to be arranged so that the record strip is to be fed a single line before the printing of a total. Such line spacing is adapted to be automatically disabled by the opening of contacts 376 and 377. When a single space control is desired, the double-throw switch 385 (Fig. 32) is moved to the on position, then on the occurrence of a total a single impulse is directed around contacts 376, 377 and through the magnet LSM, through the following circuit: line 309, contacts 286, contacts 292, wire 366, contacts 374, contacts L13, wire 375, wire 386, through the switch 385, wire 451, wire 378, wire 388, and through line space magnet LSM, to line 310. After the total is printed, the record strip is fed a double space by the energization of magnet LSM through the following connections: the first spacing operation is effected by the closing of contacts P12 by a circuit from line 309, through contacts 286, contacts 292, wire 366, contacts P12, P13, wire 379, wire 380, switch 385, wire 387, wire 388, magnet LSM, and line 310. Contacts P12 are closed earlier than contacts P18 in the total taking cycle. The closing of these other contacts serves to direct another impulse through the line spacing magnet. The connections are from line 309, contacts 286, contacts 292, wire 366, contacts 374, wire 389, wire 390, contacts P18, wire 380, switch 385, wire 387, wire 388, and through magnet LSM, to the line 310. During the cycle for the printing of a major total, the contacts P12 and P18 close to cause a similar line spacing operation.

Fig. 25 shows an illustration of the results procured by setting the tabulating machine for listing operation under minor and major control with the line spacing devices adjusted to secure a double space before total printing.

The switches in the machine are manipulated so that switch 385 is placed in the on position and switch 391 is shifted to contact the point DB, then, as the last item is printed, a regular line spacing impulse is directed through contacts 374 and through switch 385. Early in the total printing cycle, before the total is printed, another impulse is directed through magnet LSM by the closing of contacts P5. The circuit through P5 may be traced from line 309, contacts 286, contacts 292, wire 366, contacts 374, wire 389, contacts P5, wire 392, switch 391, switch 385, wire 451, wires 378, 388, and through magnet LSM to line 310. During the same cycle, after printing, two other impulses are directed through magnet LSM by the closing of contacts P12 and P18 as described hereinbefore. On the following cycle, to effect the printing of a major total, before the printing of the total, the contact P5 closes to again effect a line spacing operation. In the same cycle, after printing, the contacts P12 and P18 again close to effect a line spacing

operation before the printing of the first item of the following group.

Fig. 26 shows a record strip printed under listing control with minor or major totals printed in line with the last item of a group. To produce such a printing arrangement, the switches 385 and 391 are opened. When the last item is printed, the contacts 376 and 377 open before the closing of contacts L13 and thus prevent energization of magnet LSM. If the total to be printed is a minor total, the contacts 377 remain closed and permit two line spacing impulses to be directed through the magnet LSM by the closing of contacts P12 and P18 arranged in series with the magnet. When the total to be printed is a major total, the contacts 376, 377 and contacts 382 open to eliminate the line spacing operation between minor and major total printing operations.

The next example shown in Fig. 27 illustrates the operation of the machine under control of listing with ejection after every item. To effect such control, the switch 373 is manipulated so that contacts 374 are closed and switch 393 is also closed. Then on every listing operation the eject magnet EM is energized by an impulse over the following circuit: from line 309, through contacts 286, contacts 292, wire 366, contacts 374, contacts L13, wire 394, contacts 395, contacts 396, wire 397, wire 398, switch 393, wire 399, wire 400, and through magnet EM to line 310. The energization of magnet EM effects a multiple line spacing operation as explained in pointing out the mechanism shown in Figs. 13 and 14. The space that the eject mechanism moves the record sheet is equal to the space from the printed item to the end of the form, plus the head space at the top of the following form above the printing line.

During the eject operation the tabulating machine is stopped by the opening of a circuit in series with the stop key contacts 401 (Fig. 33). When the switch 393 (Fig. 32) is shifted for control to eject after every item, another switch 402, connected thereto, is shifted to an open position. This switch usually closes the line including wires 403, 404 in series with the stop key contacts (Figs. 32 and 33). The stop circuit is normally closed from contacts 401, through wire 403, contacts 405, wire 406, switch 402, wire 407, and through wire 404, back to the circuit normally holding the tabulating motor in effective operation. When the switch 402 is open, the control of the stop circuit is placed under control of the cam contacts L10 forming a shunt circuit about the switch. The cam cooperating with contacts L10 is mounted on the list shaft 311 and operates to open the contacts and stop the tabulating operation after the printing of each item. After ejection, contacts 291 close to restart the tabulator. The cam allows the closing of contacts L10 late in each listing cycle to permit the operation of the tabulating machine after ejection.

When the machine is operated in listing, another switch 408 is opened to prevent the formation of another shunt circuit about switch 402 placed in an opened position. During operation under tabulating control the switch 408 is closed to prevent stopping after the printing of a group number indication on each cycle.

Fig. 28 illustrates a record form produced on the machine as controlled for tabulating operation and for ejection after every total. To effect this sort of control the switch 409 is placed in the full line position as shown in Fig. 32 and the

switch 410 is placed to contact with the spot Minor, then, on every total printing operation, the eject magnet EM is energized by a circuit from line 309, contacts 286, contacts 292, wire 366, contacts P12, switch 410, wire 411, wire 412, switch 409, wire 413, through magnet EM to line 310. If it is desired to eject only after major total, the switch 410 is opened and control of the circuit is established by the major contacts 414 and minor contacts 415. The major contacts 414 are normally open and prevent the initiation of an eject impulse on the occurrence of a minor total. When a major group change occurs, contacts 414 are closed and the minor contacts 415 are opened for the first phase of the total printing operation. After the printing of the minor total, contacts 415 close and a circuit is established through contacts P12, contacts 414 and 415 through the eject magnet EM to the line 310.

The record strip shown in Fig. 29 is printed under tabulating control with an end of form ejection. This control of ejection relies on the positioning of the lever 273, which as noted hereinbefore with reference to Figs. 10 and 12, actuated the lever 272 to close contacts 269 and open contacts 405. For this form of control the switch 393 is opened, switch 409 is lifted to the dotted line position, and switch 410 is closed, if ejection after any total is desired. Then, when the end of a form is reached, the contacts 269 are closed and a circuit is established through the eject magnet. The wiring includes line 309, contacts 286, contacts 292, wire 366, contacts P12, switch 410, wire 411, wire 412, switch 409, wire 416, wire 398, contacts 269, wire 400, and through magnet EM to line 310.

At the same time that contacts 269 are closed, contacts 405 are opened to break the circuit in series with the stop key contacts in the tabulating machine. This effort to cause stopping of the tabulator is prevented by one or another of two contacts 417, 418, operated by the major or minor control magnet. These contacts close to continue the operation of the tabulating machine when a group change occurs at the end of a form while the devices are set for tabulating control.

In Fig. 30, an example of printing is illustrated when the machine is operated in listing with minor and major control with a combination of line spacing and ejecting controls to effect ejection after major totals and at the end of the form. The total is printed in line with the last item. The control switches are set so that contacts 374 are closed, switch 393 is open, switch 409 is placed in the full line position, switch 410 is open, switch 408 is open, and switches 385 and 391 are open. It is noted that on the first form shown in the illustration, ejection occurs after two items and a minor and a major total are printed. The impulse through magnet EM for causing such an operation is directed through contacts P12, contacts 414 and contacts 415, as explained hereinbefore. On the second form illustrated in the example, ejection is caused by the appearance of the end of the form after printing of five items. Here again the contacts 269 are closed by the mechanism shown in Figs. 10 and 12. The impulse is directed from line 309, through contacts 286, contacts 292, wire 366, contacts 374, contacts L13, closed after item printing, wire 394, contacts 395, contacts 396, wire 397, contacts 269, wire 400, magnet EM and line 310. It is noted that the distance through which the record strip is ejected in the first operation on the sheet illustrated in Fig. 30 is greater than the distance of

ejection after the end of form. This is taken care of automatically by the mechanism described hereinbefore.

If an insufficient number of cards are presented when the devices are set for end of form ejection, the automatic control in the tabulator is adapted to initiate a total taking and reset cycle upon the appearance of the last card, and then, if the total control of eject is set, ejection occurs to issue the last form indicating the last few items and the total.

Fig. 31 shows an example of ejection where the end of form ejection connections are disabled to permit the printing of a total after the last item on a form. This is done to prevent the separation of items from a related total. Therefore, ejection is disabled when a total follows an item coinciding with the end of form position. The contacts 395 and 396 in line with contacts L13 open on a group change before the closing of contacts L13, thus preventing the energization of magnet EM and ejection. During the printing of the total, the magnet EM is energized by a circuit from line 309, contacts 286, contacts 292, wire 366, contacts P12, switch 410, wire 411, wire 412, switch 409, wire 416, wire 398, contacts 269, held closed, wire 400, and through magnet EM to line 310. The tabulator is kept running by the closing of contacts 417 or 418 even though at this time contacts 405 are opened.

The card lever control switch 452 is closed to shunt contacts 292 and adapt the paper feeding devices for operation without cards being present in the tabulator.

The invention is described in connection with a single operative embodiment, but it will be understood that many modifications will readily occur to those skilled in the art without departing from the spirit of the invention. It is the intention therefore, to be limited only as indicated by the scope of the claims which follow.

We claim:

1. In a machine of the class described, a driving means, a line space cam, a pawl for connecting said cam with said driving means, a line space control magnet, means under control of said magnet for operating said pawl, mechanism for feeding a record sheet, a lever operated by said cam, a link connecting said lever and said mechanism, means for setting up items, means under control of said item setting means for printing on said sheet, and means under control of said item setting means for energizing said line space control magnet.

2. In a machine of the class described, a driving means, a line space cam, a pawl for connecting said cam with said driving means, a line space control magnet, means under control of said magnet for operating said pawl, mechanism for feeding a record sheet, a lever operated by said cam, a link connecting said lever and said mechanism, manipulative means for adjusting the point of connection of said link so that the amount the sheet is fed may be varied, means for setting up items, means under control of said item setting means for printing on said sheet, and means under control of said item setting means for energizing said line space control magnet.

3. In a record sheet feeding device, a driving means, a line spacing mechanism, a pawl for connecting said mechanism with said means, devices for operating said pawl, means for recording data on said sheet, a record sheet ejecting

device, and means under control of said ejecting device for holding said pawl out of operation.

4. In a record sheet feeding device, a line spacing mechanism for feeding said sheet step by step, means for operating said line spacing mechanism, means for recording data on said sheet, an ejecting device which is operated with a reciprocating motion to eject the record sheet, and means operated under control of the ejecting device to prevent operation of the spacing mechanism when the ejecting device is brought to the end of the operating stroke.

5. In a machine of the class described, means for analyzing record cards, means under control of said analyzing means for printing on a record sheet, line spacing means for feeding said sheet, contacts controlling the operation of said analyzing means and said printing means, means for ejecting said sheet, other contacts controlling said ejecting means, and means under control of said spacing means for operating the contacts to stop analyzing and printing and cause ejection of the record sheet after a predetermined number of line spacing operations.

6. In a machine of the class described, means for setting up amounts, means under control of said setting means for printing a record of said amounts on a continuous record sheet divided into forms, an ejecting mechanism for moving said sheet from form to form, a magnet for controlling said mechanism, contacts in line with said magnet, and means for operating said contacts to energize said magnet and cause an ejecting operation after every printing operation.

7. In a record controlled machine, means for analyzing the records to sense items thereon, means under control of said analyzing means for printing a record of said items on a continuous record sheet divided into forms, an adjustable means for setting the length of each form printed on the record sheet, other adjustable means for determining the length of printing area on each form, line spacing devices for feeding the sheet step by step, ejecting mechanism for moving the sheet from form to form, and means for operating said mechanism after printing at the bottom of the printing area on a form.

8. In a record sheet feeding device, a line spacing mechanism for feeding said sheet, means for recording data on said sheet, an ejecting frame provided with a series of teeth arranged in an arc, connections to the mechanism for feeding said sheet comprising a toothed member cooperating with said teeth and moved along said teeth as the sheet is fed during line spacing, and means for operating said frame to engage said member at any point along said arc to move said connections and operate said mechanism to eject the record sheet.

9. In a record sheet feeding device, a line spacing mechanism for feeding said sheet, means for recording data on said sheet, an ejecting frame provided with a series of teeth arranged in an arc, connections to the mechanism for feeding said sheet comprising a toothed member cooperating with said teeth and moved along said teeth as the sheet is fed during line spacing, means for oscillating said frame to engage said member at any tooth along said arc to eject said sheet, and means operated on the return stroke of the oscillation of said frame to disengage said member from the frame.

10. In a record sheet feeding device, means for recording data on said sheet, a platen shaft, means for moving said shaft in line spacing said

sheet, a star wheel on said shaft, a detent cooperating with said wheel to locate said shaft in line spacing positions, means for turning said shaft to eject said sheet, and means under control of said ejecting means for disengaging said detent during ejection.

11. In a record sheet feeding device, means for recording data on said sheet, a platen shaft, a main operating means, a record sheet ejecting mechanism, means for automatically connecting said mechanism to said operating means for operation, and manipulative means for disconnecting or connecting said mechanism and said shaft for selecting record sheet ejection.

12. In a machine for printing record forms, a driving means, a record form ejecting mechanism, a pawl for connecting said mechanism with said means, an ejection control magnet, means under control of said magnet for operating said pawl, item entering means, means for printing on said record form under control of said item entering means, and means under control of said item entering means for energizing said ejection control magnet.

13. In a record form feeding device, a driving means, a record form ejecting mechanism, a pawl for connecting said mechanism with said means, an ejection control magnet, an armature associated with said magnet and adapted to hold said pawl out of operative position, manipulative means for operating said armature to release said pawl, item entering means, and means under control of said item entering means for energizing said magnet to release said pawl and cause ejection.

14. In a machine of the class described, means for setting up data, means under control of said data setting means for printing said data on a record sheet, means for ejecting said record sheet, means under control of said ejecting means for stopping said printing means during ejection, and means for restarting said printing means at the end of an ejecting operation.

15. In a machine of the class described, means for setting up data, means under control of said data setting means for printing said data on a record sheet, a carriage carrying said sheet, a motor for said carriage, line spacing devices operated by said motor, record sheet ejecting devices operated by said motor, a resistance in circuit with said motor during line spacing, and means operated by said ejecting devices for cutting out said resistance during ejection.

16. In a record sheet feeding device, means for recording data on said sheet, a platen around which said sheet is fed, a bail carrying said platen and adapted to swing the same into sheet receiving position, a driving gear for operating the platen, a clutch connection for connecting said gear and said platen, an arm for operating said clutch, and an adjustable cam cooperating with said arm to determine the point in the swing at which the clutch is made effective to turn the platen and headspace the sheet when swinging the platen back from sheet receiving position.

17. In a machine controlled by record cards, means for analyzing said cards to enter amounts, means for printing said amounts on a record sheet, line spacing devices for feeding the sheet, ejecting devices for ejecting the sheet, a pair of contacts closed to make the line spacing and ejecting devices effective, means for determining whether record cards are presented for analysis, means under control of said ejecting devices for opening said contacts at the end of an eject cycle, and means under control of said de-

termining means for holding said contacts open if record cards are not presented.

18. In a record sheet printing and feeding device, means for printing on said record sheet, a platen for holding said sheet, a feeding means for said platen, a clutch for connecting said platen with said feeding means, a lever for operating

said clutch, a cam for operating said lever, and a telescopic extension on said cam for extending the time of operation of said lever and thereby controlling the extent of feeding movement.

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