Sept. 2, 1947. J. MUELLER 2,426,944

PAPER FEED MECHANISM

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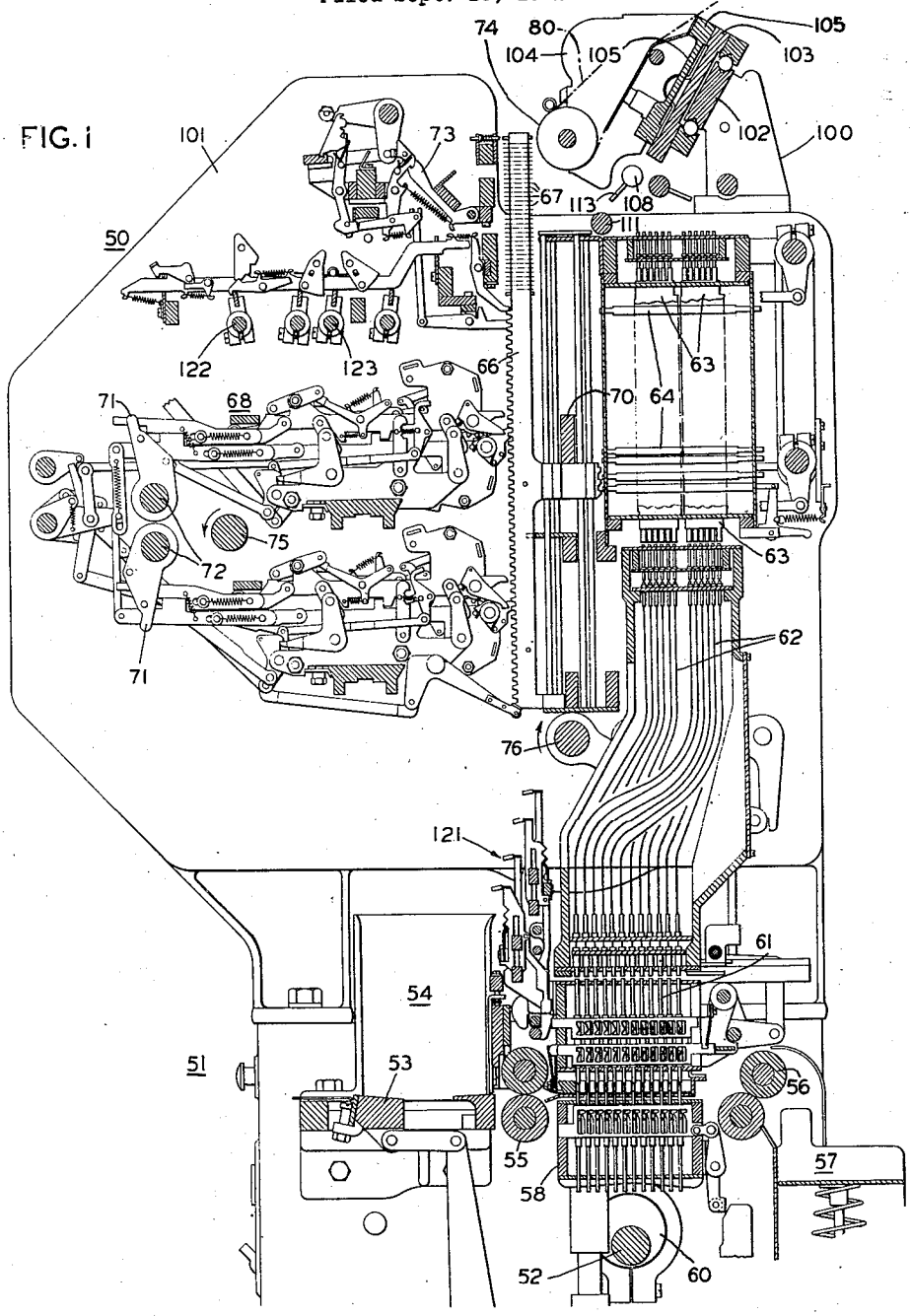
FIG. 1



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PAPER FEED MECHANISM

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FIG. 2

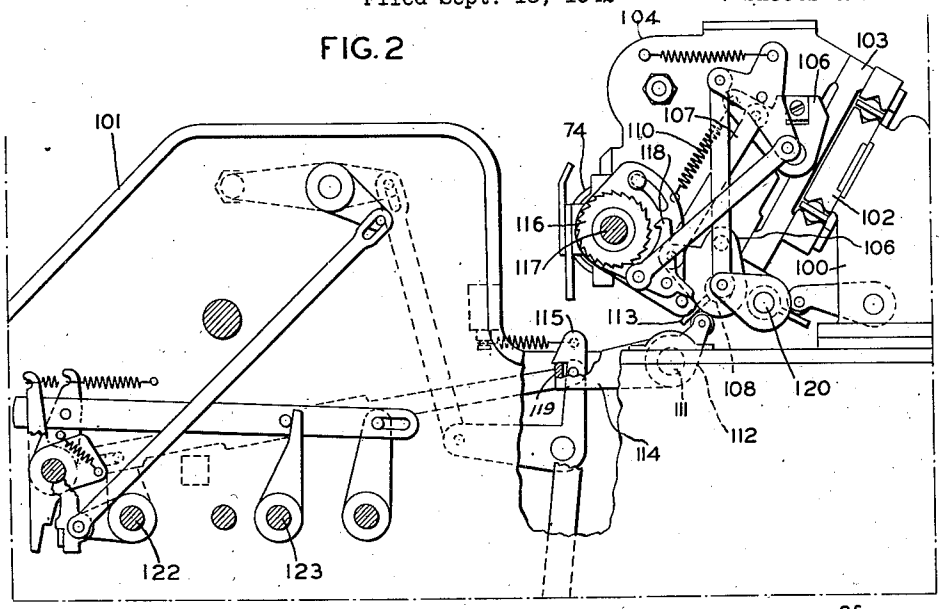

FIG. 3

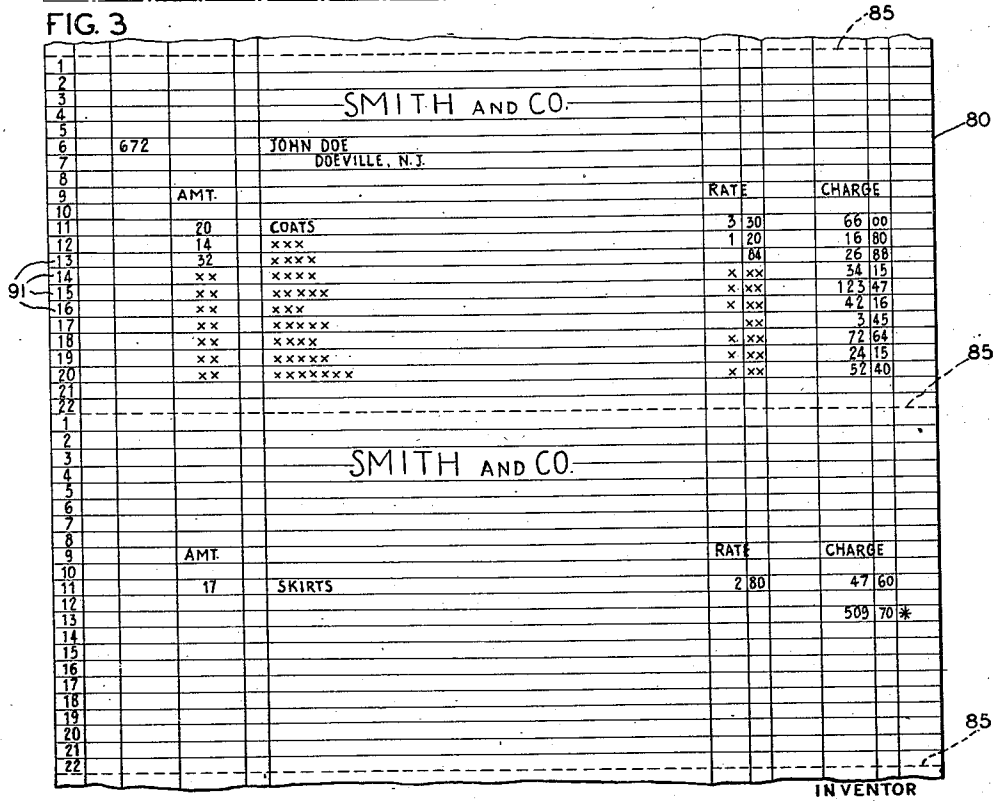

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FIG. 4

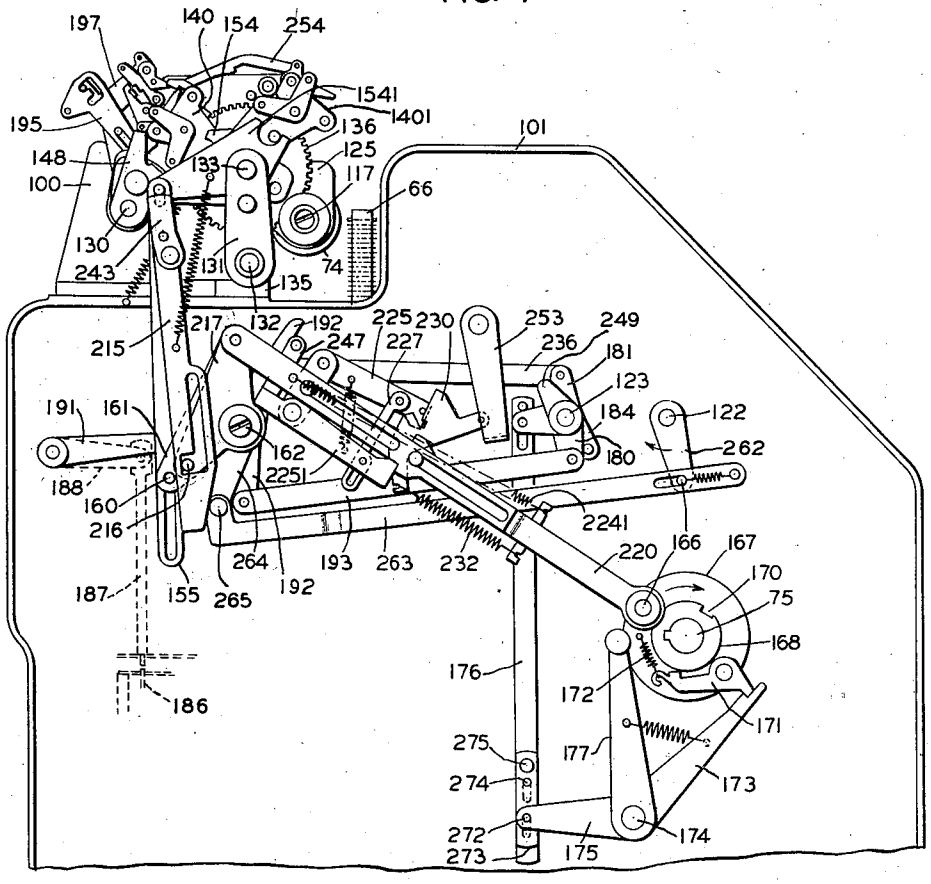

FIG. 5

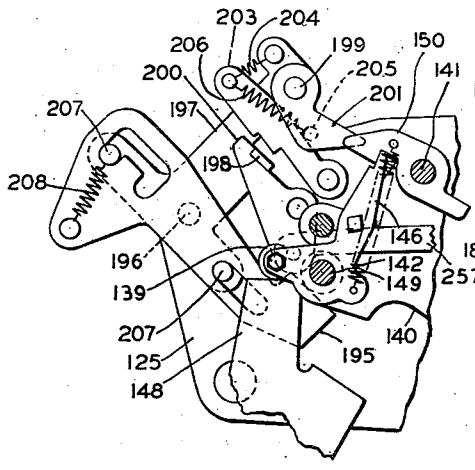

FIG. 6

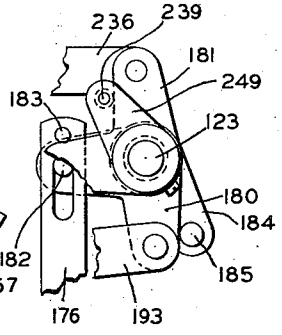

FIG. 7

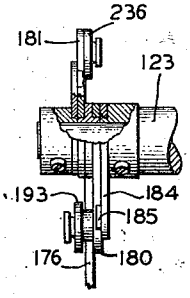

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FIG. 8

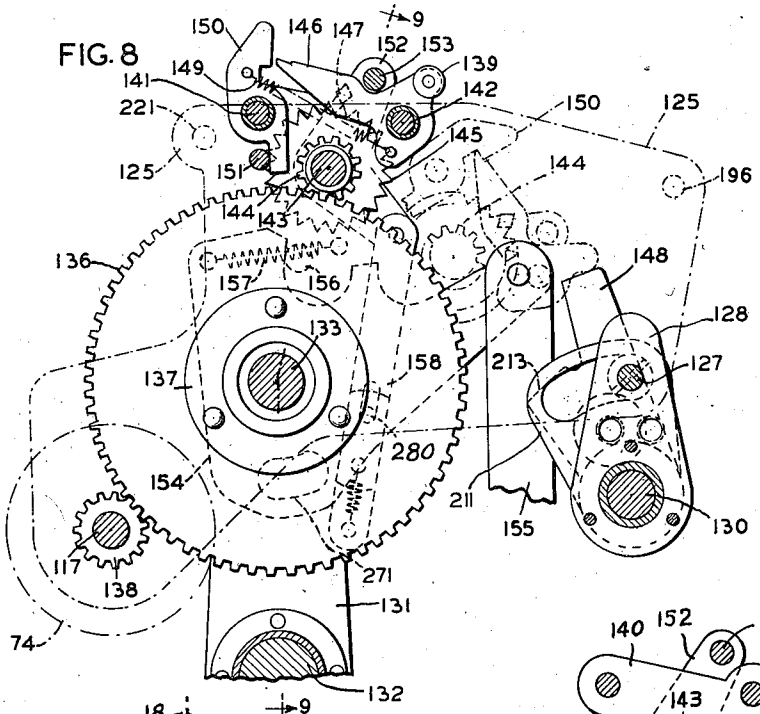


FIG. 9

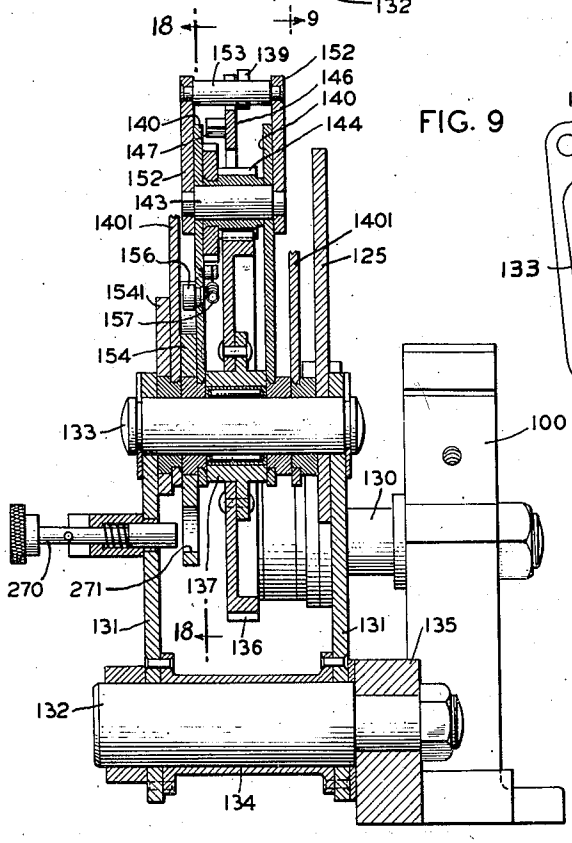
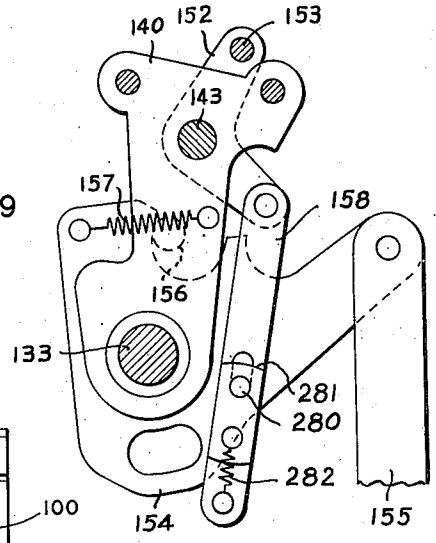


FIG. 18



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PAPER FEED MECHANISM

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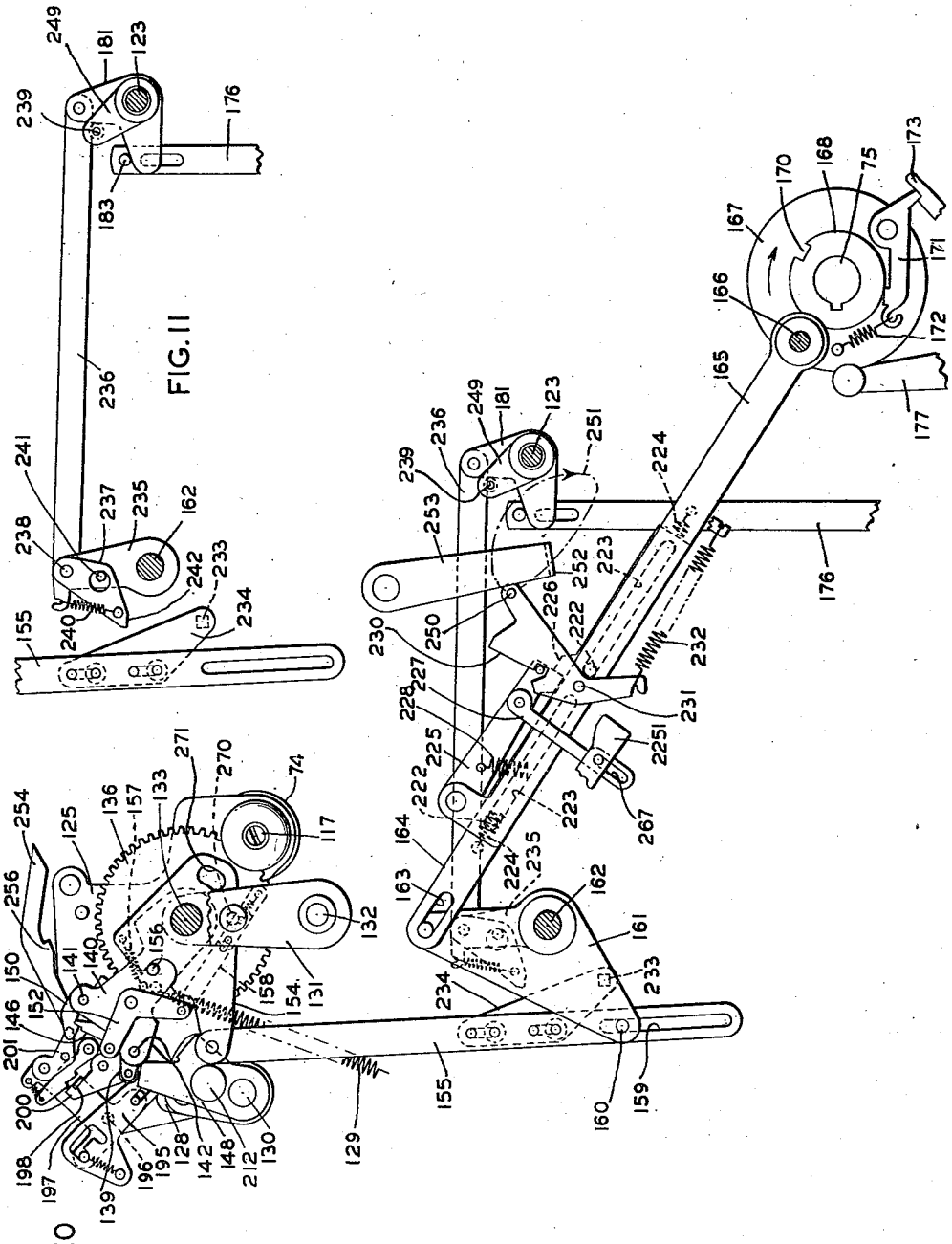

FIG. 10

FIG. 11

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PAPER FEED MECHANISM

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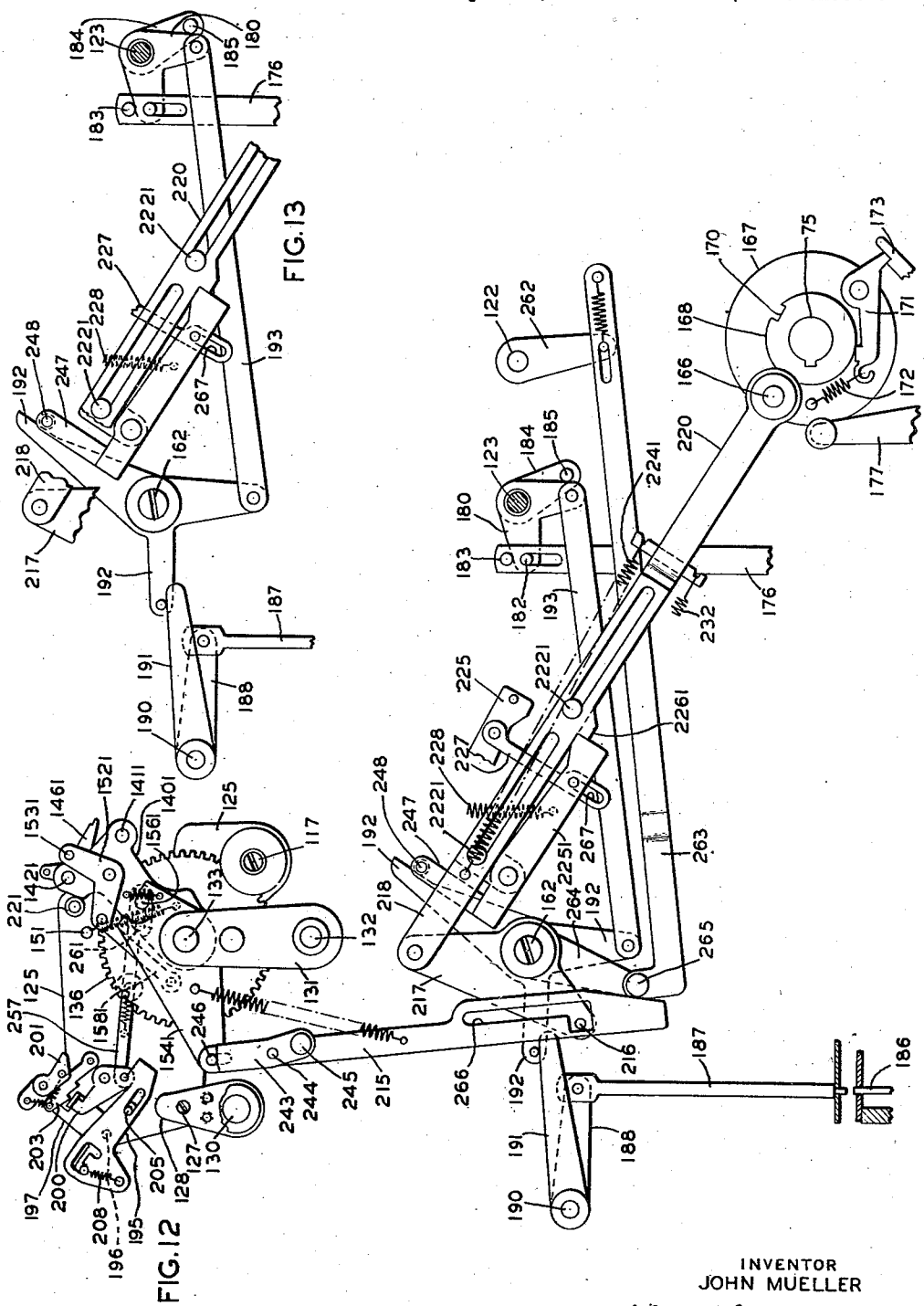

FIG. 12

FIG. 13

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FIG. 14.

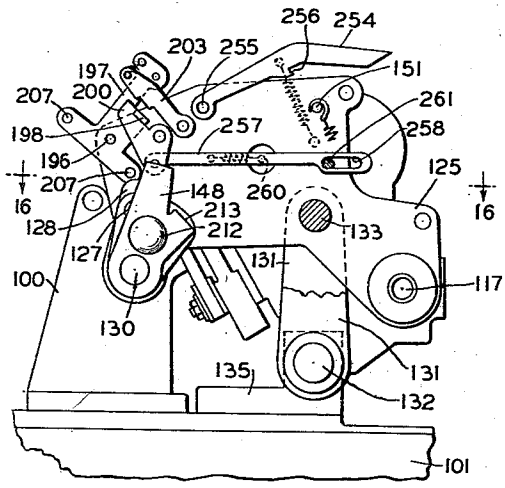
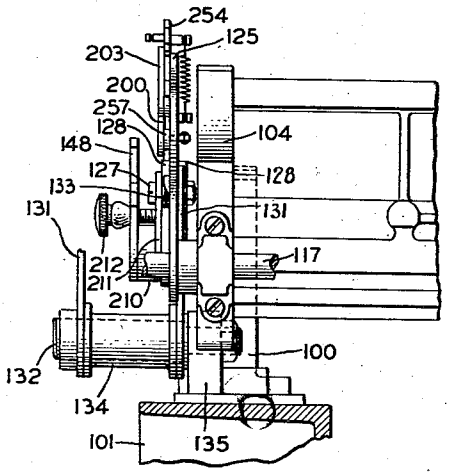


FIG. 15



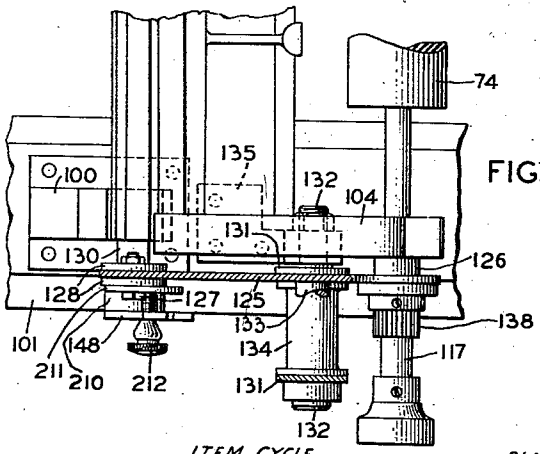


FIG. 16

FIG. 19

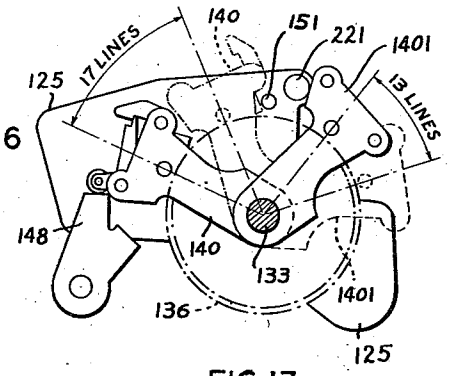
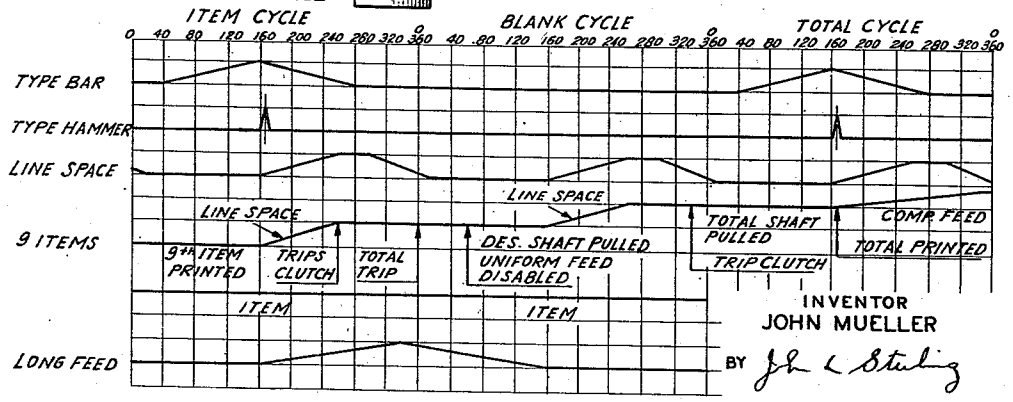


FIG. 17



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Patented Sept. 2, 1947 2,426,944

UNITED STATES PATENT OFFICE

2,426,944

PAPER FEED MECHANISM

John Mueller, North Bergen, N. J., assignor to Remington Rand Inc., Buffalo, N. Y., a corporation of Delaware

Application September 18, 1942, Serial No. 458,909

6 Claims. (Cl. 235—61.9)

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The invention relates to the paper feeding mechanism of office printing machines and more especially to that of record controlled tabulating machines. The mechanism herein specifically described is designed chiefly to supplement the ordinary line space device with means to execute the longer feeds of the paper that are required when printing on a web of paper predivided into forms, but it is also capable of other classes of work. The mechanism can be pre-set for different extents of feed and for various different programs of automatic operations as required by the work to be done. It may be used to print a single line on each form; to print a list of items with a long feed from the bottom of one form to a predetermined line of the next; to feed from the end of one group of items to a predetermined line of the next form; to feed from the end of one group of items to a heading line of the next form and then, after printing a heading, to feed to the first line; to feed from the bottom of one form to the first item line of the next, skipping the space reserved for the heading; to feed from the end of one group of items a pre-set uniform distance to the first line of the next group, where the web is not divided into forms; and in other ways. Long feed operations may be initiated by tripping a clutch, which may be done in various ways. In the instance described, this is done by the total taking control of the tabulator, by means controlled by a special hole in a record card, and by the paper feed mechanism itself after printing a certain number of lines.

The mechanism described comprises two reciprocatory feed members, one of which usually affords a uniform feed and the other a compensating feed; but the compensating feed member can be converted to give a uniform feed for certain uses. The compensating feed member may automatically have alternating excursions of different lengths, if needed, or this feature may be disabled when not needed; and the compensating feeding member may be disabled altogether when desired. The entire long feed mechanism may be disabled for jobs where it is not required.

It is an object of the invention to provide improved paper feed mechanism of the general kind outlined above.

The invention consists in certain features of construction and combinations and arrangements of parts, all of which, will be fully set forth herein and particularly pointed out in the claims.

In the drawing, in which one embodiment of the invention is illustrated:

Fig. 1 is a general vertical sectional view of the Powers tabulating machine to which the invention is shown applied;

Fig. 2 is a right hand side elevation of the upper portion of said machine;

Fig. 3 illustrates a sample of one form of printing done by the mechanism of the invention;

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Fig. 4 is a left hand side elevation of the paper feed mechanism of the present invention, in place on the machine;

Fig. 5 is a left hand side view of a certain stop and the means by which it is controlled;

Figs. 6 and 7 are respectively an elevation and a front view of a detail; partly broken away and partly in section;

Fig. 8 is an elevation as viewed from the left of some of the compensating feed mechanism shortly after the start of its return stroke;

Fig. 9 is a section on the line 9—9 of Fig. 8;

Figs. 8 and 9 are on a larger scale than other figures;

Fig. 10 is a left hand side view of the compensating feed mechanism, the uniform feed mechanism being mostly omitted;

Fig. 11 shows detached and on a larger scale, a portion of the mechanism shown in Fig. 10;

Fig. 12 is a view similar to Fig. 10, but showing the uniform feed mechanism with most of the compensating mechanism omitted;

Fig. 13 is a detached view of some of the parts of Fig. 12;

Figs. 14, 15, and 16 are respectively a left hand side elevation, a front elevation, and a top plan view of a portion of the carriage, the supporting framework and a few elements of the mechanism of the paper feed mechanism;

Fig. 17 is a time chart;

Fig. 18 is a section on line 18—18 of Fig. 9; and

Fig. 19 is a schematic view to illustrate the relative positions of two feed yokes.

For the purpose of illustration, the invention is shown applied to a Powers punched card controlled tabulating machine of the kind described and claimed in my prior application for Letters Patent S. N. 316,739, filed February 1, 1940, and in the patent of Lasker and Mueller, No. 2,323,816, issued July 6, 1943. The invention is, of course, applicable or adaptable to other machines.

The said Powers tabulator (Fig. 1) comprises a head section **50** mounted on a base section **51**, the latter constructed substantially as described in the patent of W. W. Lasker, No. 2,044,119, dated June 16, 1936. It is operated by a motor driven main drive shaft **52**. Punched cards are fed by a picker **53** from a hopper **54**, to feed rolls **55**, from which they pass through the sensing mechanism to rolls **56** and to a receptacle **57**. The cards are sensed by pins in a pin box **58** reciprocated by an eccentric **60** on shaft **52**, which pins raise set pins **61**, which, through Bowden wires **62**, displace permutation bars **63** in the head section **50**. Said permutation bars control stops **64** which arrest the upward movements of differential bars **66**, which bars carry types **67** and also actuate totalizers designated generally **68**. The bars **66** rise in the first half and are restored in the last half of each cycle, being urged upward by springs and returned by a restoring bar **70**.

The totalizers 68 are moved into engagement with the actuators 66 by rock arms 71 fast on rock shafts 72 which by means not shown are rocked in suitable timing for adding and for total taking. The types 67, of which there are 36 on each bar, are driven by hammers 73 against a platen 74.

The head section 50 has a front drive shaft 75 and a rear drive shaft 76, driven by suitable gearing from and in synchronism with the base drive shaft 52.

Fig. 3 shows an instance of the kinds of work that can be done automatically by the invention under one pre-setting of the mechanism. A web of paper 80 (usually of several thicknesses) is divided by tearing lines 85 into forms two of which appear in Fig. 3, the web being folded in "fanform" on said lines 85. For the purpose of specific illustration, these forms are shown each of a length of 22 line spaces. The lines are numbered at 91 only for the purposes of this description. Lines 1–5 are occupied by printed matter. Lines 6–10 are set aside for a "heading" consisting of the name and address of the particular account, and lines 11–20 for items, comprising designatory matter and amounts to be totalized. The heading may consist of from 2 to 5 lines, and the sheet will take a maximum of 10 items. These dimensions are, of course, merely by way of a specific example. The mechanism includes two feed members, one herein called the "compensating feed" and the other the "uniform feed," but this distinction might not necessarily apply to other instances of the invention. In operation, the compensating feed mechanism feeds the form to line 6, and the heading is printed from two or more cards, the last one of which has a special hole which causes the compensating mechanism to feed the paper to line 11. The items are printed, one from each card, until the sensing of the first card of the new group changes the designation, whereupon the machine automatically makes a blank stroke, feeding the paper one line, and then prints the total. This brings into operation the compensating feed to line 6 of the next form.

In case there are more than 10 item cards, the feed of the paper to line 20 sets into operation the "uniform feed" which feeds the paper directly to line 11 of the next form, skipping the heading. The balance of the items are then printed, followed by the total, and the paper is fed to line 6 of the next form. Variations in the printing and in the setting up of the mechanism, will be described hereinafter.

The carriage of the Powers machine is shown in Figs. 1 and 2, which are copied from the Mueller application, S. N. 316,739, and in Figs. 14, 15, and 16. Except in one immaterial respect which will be described hereinafter the carriage and platen and the manner in which they are mounted and controlled, are or may be identical with the disclosure in the patent to Lasker and Mueller, patented July 6, 1943, No. 2,323,816. Two brackets 100, mounted on the side frames 101 of the head 50, support a fixed rail 102 on which a main carriage member 103 is mounted by roller bearings. The platen 74 is journaled in end brackets 104 of an auxiliary carriage member including also a longitudinal bar 105. Said auxiliary member is mounted at each end on two parallel bell-cranks 106, connected together to rock in unison by a link 107. The lower bell-cranks 106 are fast on the ends of a transverse rock shaft 108 (Fig. 1) all as fully disclosed in Patent 2,323,816. The construction is such that a rocking motion of shaft 108 moves the platen horizontally a short distance toward and from the types 67, a spring 110 tending to move it toward the types. It is normally held retracted by a rock shaft 111 having arms 112 which carry rollers bearing against a flange 113 projecting from the shaft 108. Said shaft 111 has an arm 114 having a lug 119 engaged by a hook 115 which locks the parts in normal position. Said hook is released on each printing cycle to allow the platen to advance to printing position, and the shaft 111 is then rocked back to normal.

The Powers line space mechanism, at the right hand end of the carriage, is shown in Fig. 2. The line space wheel 116 on platen shaft 117 is operated by a pawl 118 oscillated by a rock shaft 120 through the linkage shown. The special feed mechanism of the present invention is at the left hand side of the machine.

The total taking control mechanism of the Powers machine of the hereinbefore mentioned patent and application is brought into action when the first card of a new group is sensed by the devices 58—61 (Fig. 1) by means of mechanism 121 which detects the change of designation. Said control mechanism acts to retain said first card in the sensing chamber, to lock the card picker 53 out of action, and to lock the stops 64 in their retracted or inactive positions shown in Fig. 1. Among numerous other things, the total taking mechanism controls four rock shafts in the upper part of the machine, two of which shafts have been found convenient for modifying the action of the present paper feed mechanism, viz., a "designation shaft" 122 and a "total shaft" 123.

According to the present invention, the paper is advanced by a feed unit at the left hand end of the paper carriage, which unit comprises a frame plate 125, the outline of which is best shown as viewed from the right in Fig. 8 and as viewed from the left in Fig. 14. In the specific instance illustrated, this frame plate and the balance of the unit are so mounted as to partake of the short front and back movement of the platen hereinbefore described; but on a machine whose platen does not have that movement, such mounting would not be necessary. Such movement is imparted to the plate 125 by the platen axle which passes through a sleeve 126 (Fig. 16) seated in said plate. At its rear end, the plate 125 is supported by a pivot 127 passing through an upright arm 128 which is built up of two plates which embrace the plate 125 (Figs. 12 and 16). The arm 128 is pivoted on a stud or post 130 projecting from the fixed bracket 100 (Figs. 9 and 12).

The frame plate 125 is further supported by two arms 131 (Figs. 9 and 14), which can swing on a fixed pivot 132 and whose upper ends carry a pivot rod or shaft 133 which passes through said plate. The arms 131 are parts of a structure comprising also a flanged sleeve 134 to which they are riveted and which has its bearing on the stud 132, which stud is secured to a bracket 135 bolted to the head frame 101. When the platen and the plate 125 move front and back, the arms 128 and 131 swing slightly on their pivots.

The platen is driven by a large gear 136 whose hub 137 (Figs. 8 and 9) is journaled on the shaft 133, and which meshes with a pinion 138 fast on the platen axle 117, said pinion having half the number of teeth of the line-space wheel 116. The drive mechanism is similar to and in several of its parts is identical with the compensating feed

mechanism described in my prior Patent No. 2,288,828, dated July 7, 1942. The wheel 136 is straddled by a swinging frame or yoke comprising plate-like arms 140 pivoted on the shaft 133, one at each end of the hub 137 (Fig. 9). These arms are not drawn in Fig. 8, but one of them is shown in Fig. 18. The outer ends of the arms 140 are rigidly connected together by posts 141 and 142 (Figs. 8 and 18). A shaft 143 passing through the arms 140, serves as a bearing for a pinion 144 meshing with the wheel 136 and having fast on its hub a detent wheel 145 having twice as many teeth as said pinion. The construction is such that the wheel 136 may be turned without affecting the yoke 140, or the latter may be rocked about shaft 133 without turning the gear, when the pinion 144 is free to revolve on its shaft; but if the detent wheel 145 be locked against such revolution, the yoke is locked to the wheel 136 and neither can turn about shaft 133 without carrying the other with it. Such locking is effected on occasion by a dog 146 whose hub is pivoted on the post 142 and which carries a diamond shaped stud 147 adapted to enter the notches in wheel 145. As these notches have half the angular pitch of the gear 144, this lock defines half tooth-spaces of the latter and of gears 136 and 138, which equal whole tooth spaces of the line space wheel 116.

In Fig. 8, the yoke and the pinion 144 are shown in full lines at the end of a forward stroke and in broken lines at the end of a return stroke, and the latter or normal position is shown also in Figs. 4, 5, and 10. At the end of the return stroke a stud 139 on an arm of dog 146 strikes a fixed stop 148 and forces the dog into engagement with the wheel (Fig. 5), where it is caught and locked by a latch 150, pivoted on the post 141. If now the platen be turned, as by the line space wheel in printing on a form, the wheel 136 will be turned step-by-step counterclockwise in Fig. 8 (clockwise in Fig. 10), carrying the pinion 144 and yoke 140 with it. If, after printing a few lines, the yoke be actuated in the same direction to the end of its throw, it will carry the wheel 136 with it and impart a long feed to the paper. At the limit of such motion the tail of the latch 150 strikes a post 151 fast on the frame plate 125, and is thereby rocked out of engagement with the dog 146, freeing the pinion 144, as shown in Fig. 8, so that the yoke makes its return stroke free of the wheel 136. A spring 149 tends to swing the dog 146 out of, and the latch 150 into engagement. The two stops 151 and 148 define a zone of travel corresponding to a definite number of line spaces of the paper. If, for example, the stop 148 be so positioned as to afford an excursion of eight and a half tooth spaces of the wheel 136, or seventeen lines of the paper, and if the yoke be restored at line 11 of one of the forms shown in Fig. 3 then several lines may be printed on that form, the yoke then operated, and the paper will be fed a total of 17 lines, which will be to line 6 of the next form, as described hereinbefore.

Additional means are provided to lock the dog 146 in engagement with wheel 145. Two arms 152 (Figs. 8 and 9) and a connecting post 153 constitute a yoke pivoted on the reduced ends of shaft 143. This post normally lies in a notch in the upper edge of the dog 146, but when swung counter-clockwise about axis 143, as presently to be described, it moves over a higher part of said dog, locking the latter down. This yoke bar 153

would force the dog down into engagement, even if it were not so moved by the stop 148.

The feed unit above described constitutes a paper feed operating member. As will presently appear, the mechanism includes two such members, and this one, for convenience, will be referred to as the "compensating feed member 140," is operated by the following means. A plate-like lever 154, whose outline can be traced in Fig. 18, is pivoted on the shaft 133 just outside the outer yoke arm 140, is influenced by a restoring spring 129 (Fig. 10), and on occasion, it is rocked about said shaft by a long power operated link 155. This lever operates said yoke, but with relative lost motion, through a stud 156 projecting from the yoke arm into a notch in the edge of the lever. A spring 157 stretched between posts on said lever and said yoke arm, normally holds the stud 156 against the left hand edge of the notch as viewed in Fig. 8 (the right hand edge in Fig. 10). When a long feed is produced by the upward motion of the link 155, the lever 154 first rocks counter-clockwise in Fig. 8 until the right hand edge of the notch reaches the stud 156, stretching the spring 157, after which the yoke 140 is swung to feed the paper. The purpose of the lost motion is to operate the locking yoke bar 153. One of the arms 152 is in bell-crank form, and its other branch is connected with the lever 154 by a link 158 which is pivoted to the lever 154 at 280. This link, during the said lost motion, swings the yoke 152, 153 counter-clockwise in Fig. 8 (clockwise in Fig. 10) until bar 153 locks the dog 146 down. The parts retain this relative position until the link 155 and lever 154 begin their return stroke, the first part of which moves part 153 to unlocking position; and it is at this instant of the return stroke that Fig. 8 is drawn. The link 158 may be made as shown in Fig. 18, with a sliding section 281 connected with piece 158 by pins and slots and a spring 282, which latter can yield in case the tooth 147 fails to enter a notch in the wheel 145. The pivot pin 280 passes through one of the slots in link 158.

The means for operating the compensating feed mechanisms from a power shaft of the machine is best shown in Fig. 10. The link 155 has in its lower part a longitudinal slot 159 in which plays a pin 160 on an operating angled lever 161 pivoted on a post 162 projecting from the head frame 101. Said lever is connected by pin and slot 163 with a compound link made up of two bars 164 and 165, but which, for the moment, may be treated as a solid pitman, which is operated by a wrist pin 166 on a crank disc 167, loose on the forward drive shaft 75 of the machine. Said crank disc is driven by a one-revolution clutch of ordinary construction and comprising a disc 168 fast on the shaft and having a notch 170 adapted to be engaged by a pawl 171 pivoted on the disc 167 and influenced by a spring 172. The clutch is opened by a shouldered dog 173 acting on a tail of the pawl 171, said dog being pivoted on a fixed pivot 174 (Fig. 4) and being one arm of a lever whose other arm 175 is operated by a vertical link 176. The dog 173 is arranged to stop the crank disc 167 in the dead center position shown, where it is yieldingly retained by a spring-pressed detent 177 having a roller engaging a notch in the disc. A momentary upward motion of the link 176 will release the pawl 171 and cause one oscillation of the compensating feed yoke 140. The link 155, measured from the top of the slot 159, is of such length

as to swing the yoke 140 to its extreme forward position shown in Fig. 8. The slot enables said yoke to be fed along as the paper is line spaced and also to be arrested on its return stroke at different positions appropriate to different extents of paper feed.

The clutch may be tripped by any means appropriate to the requirements of the work to be done. In the present instance the link 176 at its upper end lies between two bell-cranks 180 and 181, each loosely pivoted on the total shaft 123 (Figs. 6 and 7). The former (Figs. 12 and 13) has a stud 182 working in a slot in the link, and the latter (Figs. 10 and 11) lies beneath a stud 183 on the link, so that a clockwise rocking of either bell-crank will raise the link and trip the clutch. An arm 184 (Fig. 12) fast on the total shaft 123 has a stud 185 adapted, when said shaft is rocked clockwise, to rock bell-crank 180 and thus to trip the clutch in order to impart a long feed to the paper after printing a total.

The timing of the feed mechanism merits consideration. Figs. 4 and 10 show the stop position of shaft 75 from which degrees of the cycle are measured. Referring to them and to the time chart, Fig. 17, the type bars are at the tops of their strokes before 160°, the type hammers strike at 162°, line spacing occurs at 162°–260°, and the total shaft 123 is "pulled" by 340° of the idle or blank cycle preceding the total cycle. The notch 170 of the clutch picks up the pawl 171 and starts the crank disc into motion, at about 160° of one cycle and the rotation of said disc stops at the same point in the next cycle. Therefore, when, at 340° of the blank cycle, the total shaft trips off the pawl 171, the notch 170 is about 20° to the left of where it appears in Fig. 10, and the disc 167 will not begin to rotate until about 160° of the next or total cycle, just after the printing of the total. The upward motion of link 155 will first rock the lever 154 and afterwards the yoke 140 to feed the paper to line 6, of the next form, as described hereinbefore.

When the paper is fed to line 6 as just described, the machine prints two or more lines of heading from as many cards, the last one of which has therein a special hole which causes the compensating feed mechanism to feed the paper to line 11 of the same form, as will now be described. The special hole controls suitable means such, for example, as are described in the Mueller application 316,739 to actuate a Bowden wire 186 which pushes up a link 187 (Figs. 4, 12, and 13) inside the machine. Said link is pivoted to an arm 188 fast on a rock shaft 190 and having another arm 191 outside the machine frame and acting, when the wire is actuated, to rock clockwise a three-armed lever 192, pivoted on the post 162. The depending arm of said lever is connected by a link 193 with the depending arm of the bell-crank 180 and rocks the same to trip the clutch as above described. This occurs late in the cycle in which the last heading card is sensed and causes the compensating feed to operate in the next cycle just after the matter on said card is printed, in the same manner as above described.

In the operation of the compensating feed first above described, the dog 146 must be in locking position from line 11 of one form to line 6 of the next, a total of 17 line spaces, and the stop 48 is, therefore, located so as to limit the return stroke of the yoke 140 to 17 spaces. But in the operation now to be described, said locking dog must be in operation from line 6 to line 11 of the same

form, and a stop for said dog is, therefore, interposed to restrict to 5 spaces the return of said dog after said longer feed. These two extents of feed alternate with each other, so that the yoke returns 17 spaces and 5 spaces alternately, the two excursions together being equal to the length of a form.

The means for limiting the return motion of the compensating feed to 5 spaces, is best shown in Fig. 5. See also Fig. 12, where the compensating feed yoke is omitted. When said yoke returns to the initial position, shown in Figs. 5 and 10, a prolongation of the post 142, strikes one arm 195 of a bell-crank made of two relatively adjustable pieces 195 and 197, the latter of which is pivoted at 196 to the frame plate 125, and rocks said bell-crank clockwise from the position shown in Fig. 12 to that shown in Fig. 5. The other arm 197 of said bell-crank has a lug 198 which is caught and held down by a latch pawl 200 pivoted to the plate 125 and moved to latching position by a spring-urged link 257 (Fig. 14) whose operation will be described hereinafter. The free end of the arm 197 has a stop piece 201 pivoted thereto at 199 and which in Fig. 5 is in and in Fig. 12 is out of the path of movement of the stud 139 on the tail of the dog 146. A second pawl 203 pivoted to frame plate 125 is normally drawn by a spring 204 against the pivot 199. The stop 201 has a stud 205 connected by a spring 206 with the pawl 203, which spring presses the stud 205 against the edge of said pawl, and also serves as a restoring spring for the bell-crank 195, 197. When the yoke 140 is swung forward to feed the paper to line 6 of the next form, the stud 139 in passing the stop 201, momentarily swings the latter aside against the tension of the spring 206. When the yoke returns from the stroke just mentioned the stud 139 strikes and is arrested by said stop 201, which, however, swings clockwise, and the stud 205 swings the pawl 203 counterclockwise until arrested by the lug 198. The pawl 203 pushes the pawl 200 free of lug 198, allowing the latter to rise until arrested by the tooth of pawl 203, which is slightly higher than that of pawl 200, so that the latter cannot reengage the lug. When the compensating feed yoke again moves forward, the pawl 203 is drawn clockwise by the spring 204, out of engagement with lug 198, whereupon the spring 206 restores the bell-crank 195, 197, to the position of Fig. 12, leaving the yoke free to return to the position of Fig. 10. In short, after a total is printed, the yoke advances the balance of 17 spaces from the position of Fig. 12, and returns 5 spaces being arrested by stop 201. After printing the heading, it advances the balance of 5 spaces and returns 17 spaces.

The stop mechanism just described my be disabled in case statements are to be printed without headings. To this end the bell-crank arm 195 is made so that it can be shortened so as not to be struck by the stud 139, and the stop 201 will, therefore, remain in its inactive position shown in Fig. 12. The arm 197 is made of the T-shape shown in Fig. 14, where the arm 195 has been removed. It has two studs 207 which pass through slots in arm 195, the upper slot having two branches as shown in Fig. 5, and a spring 208 holds the upper pin seated in one or the other of these branches. By manipulation the piece 195 can be moved upward and the lower notch seated on the pin, thus withdrawing the lower end of the arm out of the path of the stud 139.

In case the work is such that no headings are

to be printed, the printing of items may begin at line 6 instead of line 11. The compensating paper feed should, therefore, have an excursion equal to the whole length of a form, that is to say, to 22 spaces, instead of 17, as before. To this end, the stop 148 is made settable to afford the additional 5 spaces. In the present instance it was found convenient to pivot it on the fixed stud 130, and to connect it to the supporting link 128 to rock with the latter when the auxiliary carriage moves slightly frontward just before and back just after printing as hereinbefore described. As shown in Figs. 14, 15, and 16, said stop is on the outer end of a hub 210 on the inner end of which is an arm 211. The pivot 127 is in the form of a bolt which passes through an arcuate slot in the arm 211, permitting the latter and the stop 148 to be rocked independently of link 128. A thumb screw 212 can be screwed into either of two holes in link 128, retaining stop 148 in the position where its upper end arrests the feed yoke at 17 spaces or where a step 213, five spaces lower, arrests it, at 22 spaces. It may be given the latter setting when printing forms without headings.

In connection with the settable stop 148, 213, it may be remarked that long paper feed mechanisms frequently have provision for universal settings, as in my prior Patent 2,288,828, and that is useful, as affording flexibility. But tabulating machines are more frequently employed to get out large numbers of statements, all of the same kind, and each user has only a limited number of kinds. For such users, it is preferable to build into the machine only the settings which the individual customer requires. This makes less complicated mechanism, and it is also better for the operator. The stop 148 can be made with any number of steps, but if so, at each change of jobs, the right one would have to be selected out of many. If the device is to be used on different forms, it is a simple matter to make another stop with the appropriate steps, or another link with a slot of different length, etc. Throughout the illustrated instance of the present invention, this principle has been applied, the settings provided being only those required by one user.

The described mechanism may be used to make lists from groups of cards where no totals are to be taken. For that use, the last item card of each group may be punched with the special control hole, which will initiate the longer compensating feed stroke the same as a total taking operation. In other words, the end of an item group may be signified to the apparatus either by total taking or by a special hole in the last item card, resulting in an operation of the compensating feed.

In order to print one item on each form (checks, public service statements, etc.) the stop 148, 213 may be set for an excursion of 22 spaces, and each item card be punched with the special hole. In this use, the feed member 1401, presently to be described, would not operate because nothing would ever be printed on the last line of a form.

It will be noted that the same compensating paper feed operating member (140, etc.) is used to accomplish two different compensating feeds, said two feeds of different lengths and automatically alternating with each other. As applied to the form shown in Fig. 3, said member first feeds the paper from any item line of one form to the first heading line of the next (a comparatively long feed) and then feeds it a shorter distance from any heading line to the first item line of the second form. This is accomplished by the feed operating member (140, etc.) having an advance stroke to the stop 151 and a return stroke measured by the stop 148, settable to measure different extents of return movement; the line space mechanism shown in Fig. 2 to feed the paper line by line as the data is printed; the lock 146, etc., to cause the paper feed operating member to move in advance direction as the paper is fed line by line, thus "compensating" for the line by line feed; the stop 201 to restrict the return movement and, therefore, the extent of compensating feed, to a shorter feed, and the means (lever 195, 197, escapement latches 200 and 203, etc. and spring 206), operated by the paper feed operating member to move said restricting stop into and out of the path of said member at alternating strokes. This affords alternating longer and shorter compensating feeds of the paper.

The "uniform feed" (Figs. 4, 9 and 12) feeds the paper automatically from the last item line of one form to the first item line of the next form, whether the forms are printed with headings as in Fig. 3 or without headings. This comprises a yoke similar to the yoke 140 already described, and in the drawings its corresponding parts are given the same reference numerals as those of the latter with a 1 added. The yoke arms 1401 are pivoted on the shaft 133 but (Figs. 9 and 19) farther apart so as to straddle those of yoke 140 and its lever 154. Its pinion 144 and locking disc 145 are not shown, but are the same as in the other yoke and they cooperate with the wheels 136 in front of those of yoke 140 (to the right of it in Fig. 19). The yoke 1401 is operated by a plate-like lever 1541 acting with lost motion on a pin 1561, the lost motion operating the locking yoke 1521 through link 1581, in substantially the manner already described. The locking latch 150 is omitted in the present instance. In the present instance, compensating feed is not required of this yoke, and its return motion is, therefore, limited by a stop 221 situated near the stop 151 which limits the forward movement of the yoke 140 (Fig. 19). Said stop 221 stands in the path of one of the yoke arms 1401 instead of the tail of the dog 1461, so that the lock 1461 is never applied to the gearing, except when the yoke is operated. The lever 1541 is operated by a long vertical link 215, pushed upward by a pin 216 on a lever 217 similar to the lever 161 and pivoted on the same post 162, which lever 217 is rocked by a pitman consisting of two parts 218 and 220, from the wrist pin 166. In Fig. 4, this pitman lies in front of the pitman 164, 165, and hides most of the latter. The feed unit just described constitutes a second paper feed operating member, which, for convenience, may be referred to as the uniform feed member.

The two feed members may be operated alternatively in various ways. In the present instance they are operated by the same crank 166, 167 and the two pitmans are made alternatively operative, by the following means (compare Figs. 4, 10, and 12). The two bars 164 and 165 have a sort of telescopic action. They lie face to face and are connected by headed studs 222 on bar 165 passing through long longitudinal slots 223 in bar 164, so that, when the wrist pin 166 makes its revolution, bar 165 may slide on bar 164, stretching a spring 224, without operating lever 161. A dog 225, pivoted to an ear of bar 165, may be swung down into engagement with a lug 226

on the bar 164 and thus lock the two bars together into an effective pitman. When said dog is released, the spring 224 holds the two bars yieldingly in normal relation.

The compound pitman 218, 220, is similarly constructed (Fig. 12), but the dog 225l is on the lower side of bar 218 and its lug 226l on the lower edge of bar 220. The two dogs 225 and 225l are connected together by a link 227 and spring 228, the former pivoted to one dog and having pin and slot connection with the other, so that the two dogs rock about their pivots together, one of them into and other out of active position. The spring 228 is disposed at such an angle that its lever arm on the lower dog 225l is much longer than on the upper dog, so that it normally holds the dogs up, making the pitman 218, 220 normally operative, and the pitman 164, 165 normally inoperative. When this condition is reversed, the dog 225 is latched down temporarily by a latch pawl 230 pivoted at 231 to bar 165 and influenced by a spring 232.

The uniform feed device is brought into operation by that step of the line space mechanism which feeds the paper to the last item line of a form (line 20 in the present instance). It will be recalled that when, on its shorter stroke, the compensating feed yoke feeds the paper to line 11 of a form, it is restored to the position of Fig. 5 where the locking dog 146 has been forced by the stop 148 into its locking position and the latch 150 has secured said dog in engagement. As the paper is then fed line by line, the compensating yoke is, therefore, carried along step-by-step toward the front of the machine and its operating link 155 steps upward, the slot 159 moving relative to the pin 160; and when this link reaches the point corresponding to line 20 on the paper, a lug 233 (Fig. 11) on a bracket 234 adjustably secured at the correct point on said link, trips the clutch 168, 171, as will now be described. Pivoted on the post 162 is an upright lever 235 connected by a link 236 with the bell-crank 181, so that if said lever be rocked clockwise in Fig. 11 the bell-crank 181 will also be rocked and trip the clutch. A dog 237, pivoted to lever 235 at 238, is swung clockwise by a spring 240 until arrested by a pin 241 on the lever lying in an opening in the dog. A shoulder 242 of said dog is acted on by the lug 233 to rock the lever 235 and trip the clutch at the time referred to above. The lug 233 moves upward guided by the pin 160 and slot 159, and it swings the shoulder 242 upward and frontward out of its path. When that has happened, then on the down stroke of the link 155 and lug 233, the dog 237 can swing out of the way about its pivot 238. When the feed mechanism is started in this way, the uniform feed will operate and not the compensating feed, the dogs 225 and 225l being in their upper positions. When, however, the compensating feed is operated by the crank 167, 166, the lever 161 moves the lower end of the link 155, including the lug 233, in a path curved to the left in Fig. 10, and said lug does not strike the shoulder 242. Counter-clockwise rocking of levers 181 and 235 is limited by a stud 239 on an arm 249 fast on the shaft 123.

The feeding of the paper to its 20th line trips the clutch in the latter half of the cycle in which the 19th line is printed and the 20th card is sensed. As hereinbefore explained, the crank disc 167 will be set into rotation at about 160° of the next cycle, just after the 20th line has been printed.

When the clutch is tripped for the uniform feed, the pitman 218, 220 rocks lever 217, which through link 215 rocks the lever 154l. The first part of the motion of said lever acts through the link 158l to rock the yoke 152l which acts the same as the yoke 152 hereinbefore described; that is to say, its cross bar 153l moves the locking dog 146l into engagement with the locking disc, and retains it locked until the beginning of the return stroke of the yoke 140l, when it releases it and allows the parts to return to normal. The parts are so proportioned that this feeds the paper the 13 spaces from line 20 to the next line, viz., line 11 of the next sheet, skipping the heading.

In the case of sheets where no headings are printed, however, the required feed is only 8 spaces, from line 20 to the next line 6. In order to decrease the throw of the yoke for this purpose (Fig. 12), the pin 246 may lie in a slot in the link 215 which link may have pivoted thereto at 244 a piece 243 which can be set in the active position shown or swung aside into an inactive position, being secured in either position by a plunger 245 on the piece 243 entering one or the other of two holes in the link 215. When the piece 243 is active as shown, it swings the lever 154l a distance of 13 spaces, but when said piece is set inactive, said slot affords to the link a lost motion equivalent to 5 spaces, so that the yoke 140l is swung only the 8 spaces required. Obviously, the extent of motion imparted to said yoke may be made variable in other instances according to the requirements of the work.

The operating movements of the yokes 140 and 140l are rapid, but they are harmonic in character, being stopped gently by the pitman 218, 220 coming to a dead center, and it is found in practice that the parts do not overthrow. It will be noted that the extent of throw imparted to the compensating yoke 140, is regulated by variably limiting the return stroke, whereas that of the uniform feed is regulated by varying the operating stroke.

In order to shift the dogs 225 and 225l from their upper posiitons where the uniform feed is operative, to their lower positions where the compensating feed is operative, the following means are provided. It will be recalled that the clutch is tripped for a compensating feed by two different means, viz., by a special hole in a card resulting in rocking the lever 192 (Fig. 13), which acts through link 193 to rock bell-crank 180 and thus to lift releasing link 176; and by a clockwise rocking of the total shaft 123, which, through arm 184 and pin 185, also rocks said bell-crank 180. In the last operation, the rocking of bell-crank 180 is communicated by link 193 to lever 192, which, therefore, is rocked clockwise every time the clutch is tripped for a compensating feed. The lower dog 225l has an upstanding arm 247 (Figs. 12 and 13) having a stud 248 standing in front of the third or upstanding arm of the lever 192. When the latter is rocked, it rocks the dog 225l down to inoperative position, and the dog 225 is rocked down to operative position under control of the spring 228 and link 227, and it is held down by the latch 230. Said latch has a stud 250, which, when the pitman is operated, describes an orbit 251; and a ledge 252, formed off from a fixed bracket 253, and standing in the return lap of said orbit, deflects said stud and releases the latch, and allows the dogs 225 and 225l to return to their normal setting.

At the time when the uniform feed comes into

action, the stop 201, on the swinging frame 195, 197, is in its lower, operative position, held down by the latch 200, and ready to arrest the compensating feed for its short or heading stroke. But the mechanism is now skipping the heading and going directly to line 11. Means are, therefore, provided for releasing said latch 200 so that the compensating feed yoke returns fully to the position of Fig. 10. Said latch 200 (Figs. 12 and 14) has a depending arm to which is pivoted a horizontal link 257 having a slot 258 in its front end. A pin 260 projects from said link through a hole in the frame plate 125 where it is connected to a spring which controls the link and the latch 200. A pin 261 (Fig. 12) on the yoke 1401, runs in the slot 258, and acts, when said yoke is operated, to pull on the link 257 and release the latch, so that the compensating feed yoke will return to its longer feed position.

In the present instance, the uniform feed operates only when, in the course of printing items, the paper reaches the last line. At this time the compensating feed yoke is locked to and is traveling with the large gear 136, and it has already completed 10 of the 17 spaces of its travel. Its latch 150 strikes and is arrested by the fixed stop 151 (Fig. 8) at line 6 of the next form, releasing the yoke from the wheel in the midst of the uniform feed, which extends to line 11. Unless means to the contrary were provided, the yoke 140, when so released, might jump back to its return position against stop 201 and become relocked to the wheel before the uniform feed was completed. A spring-controlled latch lever 254 (Fig. 14) pivoted at 255 to the frame plate 125, has a tooth 256 in position to engage the prolonged inner end of the post 141 of the compensating yoke when the latter is near its extreme advanced position, and to prevent the return motion of said yoke. Said latch is normally held up out of the path of said post, however, (Fig. 4) by the inclined free end of the latch resting on a lug on the uniform yoke. When the latter is operated as above described, the latch 254 drops down to operative position and catches the compensating yoke. At the last part of its return motion the lug on the uniform yoke again raises the latch and permits the compensating yoke to return.

When there are exactly 10 cards in a group, and, therefore, 10 items to be printed, the last item comes on line 20, and when this is printed the first heading card is in the sensing chamber and effects a change of designation. Thus, a total taking operation is initiated, and at the same time an operation of the uniform feed is brought about. The latter feeds the paper to line 11 of the next form for the blank stroke of the total taking operation, in which the line space mechanism feeds the paper to line 12, where on the total stroke, the total is printed. The pulling of the total shaft initiates an operation of the compensating feed to line 6 of the next succeeding form, as above described. The result is, that the total appears alone on the second sheet.

A peculiar condition arises when there are exactly 9 items in a group. The last item is printed on line 19 and a total taking operation results, feeding the paper to line 20 on the blank stroke. This trips the clutch for a uniform feed to line 11 of the next sheet, where the total would be printed somewhat like the action when there are 10 items. This is unnecessary, as there is room on the first form for the total. Means are, therefore, provided automatically to prevent the uniform stroke, whereupon the total is printed on line 21 of the first form. For this purpose the designation shaft 122 is utilized. In the machine to which the invention is shown applied, this shaft is "pulled" (rocked clockwise in Fig. 12) early in the blank stroke and is held rocked until near the end of the total stroke. An arm 262 on said shaft, is connected by pin and slot and spring with a link 263 whose rear end is pivoted at 265 to a guide link 264 pivoted on the post 162. The pivot 265 is prolonged into a stud which is in the plane of the link 215 which operates the uniform feed yoke. The pin 216 on the lever 217 normally occupies a horizontal off-set in a long vertical slot 266 in said link, forming a shoulder against which said pin acts to operate the link. When, however, the designation shaft 122 is rocked as above described, the stud 265 swings the link rearward so that, when the clutch is tripped, the pin 216 moves idly in the slot 266 without operating the feed. This occurs in the second half of the blank cycle, in the latter part of which the total shaft 123 is pulled holding the arresting dog 173 of the clutch mechanism out of action and causing a second rotation of the crank. At the same time, the dogs 225 and 2251 are shifted, so that this second rotation of the crank operates the compensating feed to line 6 of the next form. A slot 267 in the link 227, allows the depression of dog 225 to be delayed until, in the first rotation of the crank, the pitman bar 165 and its lug 226 return to normal.

It is sometimes desirable to prevent the compensating yoke 140 from returning to such a point as that the stud 139 (Fig. 5) on the locking dog 146 strikes a stop and locks the dog to the toothed wheel 145. A simple means for this purpose is best shown in Figs. 9 and 10. A plunger 270 of ordinary construction is mounted on the outer supporting arm 131 and it has a finger button by which it can be retracted or advanced to enter an opening 271 in the plate lever 154 to limit the return motion of said lever. The effect will depend on the dimensions of said opening. In Fig. 10 this opening is shown of such dimensions as to hold the lever at or near the extreme of its forward throw, which would disable the compensating feed altogether. This is sometimes needed, as where the machine is simply printing a long list of items on a succession of forms. On that setting, the uniform feed will feed the paper from the bottom of one form to the top of the next, which is all that is required. If any totals are taken, the link 155 will be at the top of its throw and the pin 160 will move idly up and down in the slot 159.

If, on the other hand, the opening 271 is of the dimensions shown in broken lines in Fig. 8, i. e., such that the plunger 270 arrests the lever 154 after, say, 6 line spaces of return motion, then the yoke 140 and its adjuncts will be converted into a uniform feed, because the dog 146 is not locked down by the return motion of the yoke. The effect of this setting would be that the paper would be advanced to a uniform extent, say, six line spaces, after every total, which is a mode of operation frequently wanted. Also, a special hole in a card may at any time cause the paper to be advanced six line spaces, if such a mode of operation is desired.

It will be perceived that the "compensating feed" is "compensating" only because, on the return stroke of the yoke 140, the locking lever 146 is locked down by the latch 150, and that the other feed is "uniform" only because its lever

1461 is not so locked; and the the former feed is rendered "uniform" when the yoke is arrested by means which do not lock the gearing. Obviously, the feed yoke 1401 can readily be made "compensating" if the work to be done makes that desirable.

In order to disable the long feed mechanism altogether any suitable means may be provided. In the present instance (Fig. 4) the stud 272 projecting from the end of the arm 175, passes through a round hole in a bar 273 and thence through a slot in the link 176. Said bar is slidably mounted on said link by said stud and by a second headed stud 274 riveted in said bar and playing in a slot in the link. Relative motion of said link and bar is prevented by a plunger 275 mounted in the bar 273 and adapted either to enter a hole in the link, or to be withdrawn therefrom, after a familiar fashion. When said pin is so withdrawn, and the link is given its upward motion, it slides idly on the bar 273 without tripping the clutch. When the clutch is thus disabled, the compensating feed yoke should be held forward by inserting the pin 270 in the opening 271 as above described, so as to prevent the feed yoke from becoming locked to the gear wheel 136, and having unnecessary movements imparted to it during line spacing.

Various changes may be made in the details of construction and arrangement without departing from the invention.

What I claim as new, and desire to secure, by Letters Patent, is:

1. In a machine of the class described and in means for feeding record forms each to a heading line and to the first item line of a form, the combination with a paper feed operating member having an advance movement to feed the paper and a measure return movement preparatory to a long feed of the paper, and a stop settable to restrict the return movement preparatory to a shorter feed, of means operated by said member on one stroke thereof to set said stop in restricting position and means operated by said member on the next stroke thereof to set said stop in non-restricting position, whereby the successive strokes of said member are caused to be of alternating longer and shorter extents.

2. In mechanism for feeding a web of paper and comprising a paper feed roller, line space mechanism, a drive wheel geared to the paper feed roller, and two oscillatory yokes pivoted coaxially with said wheel, the combination of means to lock one only of said yokes to said wheel at the end of its return stroke thus constituting said one yoke a compensating feed member, means to lock the second said yoke to said wheel on an operating stroke of said second yoke, and means to impart long strokes to one or the other of said yokes selectively.

3. In a printing machine and in mechanism for feeding a web of paper divided into forms, each having a space in which to print headings and a space in which to print items, said mechanism comprising a compensating paper feed operating means and a uniform paper feed operating means to feed the paper from the last line of one form to the first item line of the next, means for imparting to said compensating means advance and return strokes, means operated by said compensating means to limit every other return stroke thus causing alternating longer and shorter strokes of said means, the longer stroke feeding the paper to the first heading line and the shorter stroke feeding the paper to the first item line, means to initiate an operation of said uniform means, and means controlled by said uniform means to disable said limiting means.

4. In mechanism for feeding a web of paper divided into forms and comprising a long paper feed operating member having operating strokes and return strokes, means to advance said member when the paper is fed by other means, a uniform paper feed operating member, and means operated by said advancing means to bring said uniform feed member into operation at the bottom of a form, the combination of a latching means brought into operation by the uniform feed operating member upon its advance movement to delay the return stroke of said long paper feed operating member, said latching means being rendered ineffective by said uniform feed operating member upon the return stroke thereof to permit said return stroke of the long paper feed operating member.

5. In a machine of the class described and in means for feeding record forms each to a heading line and to the first item line of a form and comprising a paper feed operating member having an advance movement to feed the paper and a measured return movement preparatory to a long feed of the paper and a second paper feed operating member to skip the heading on said form, the combination of a stop settable to restrict the return movement of the first said member preparatory to a shorter feed, means operated by the first said member on the longer stroke thereof to set said stop to active position, means operated by the first said member on the shorter stroke thereof to reset said stop to inactive position, and means controlled by said second member to reset said stop and thus to interrupt the alternation of long and short strokes of the first member.

6. In a machine of the class described and in means for feeding record forms each to a heading line and to the first item line of a form, the combination of a line space device to feed the paper line by line, a paper feed operating member having an advance movement to feed the paper through several line spaces and a measured return movement preparatory to a long feed of the paper, means to cause said member to move in advance direction as the paper is fed line by line, a stop settable to restrict the return movement of said member preparatory to a shorter feed, and means operated by said member to move said restricting stop into and out of the path of said member sequentially whereby alternating longer and shorter compensating feeds of the paper are afforded.

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