Feb. 24, 1942. J. MUELLER 2,274,088

TABULATOR

Filed Aug. 17, 1940 8 Sheets-Sheet 1

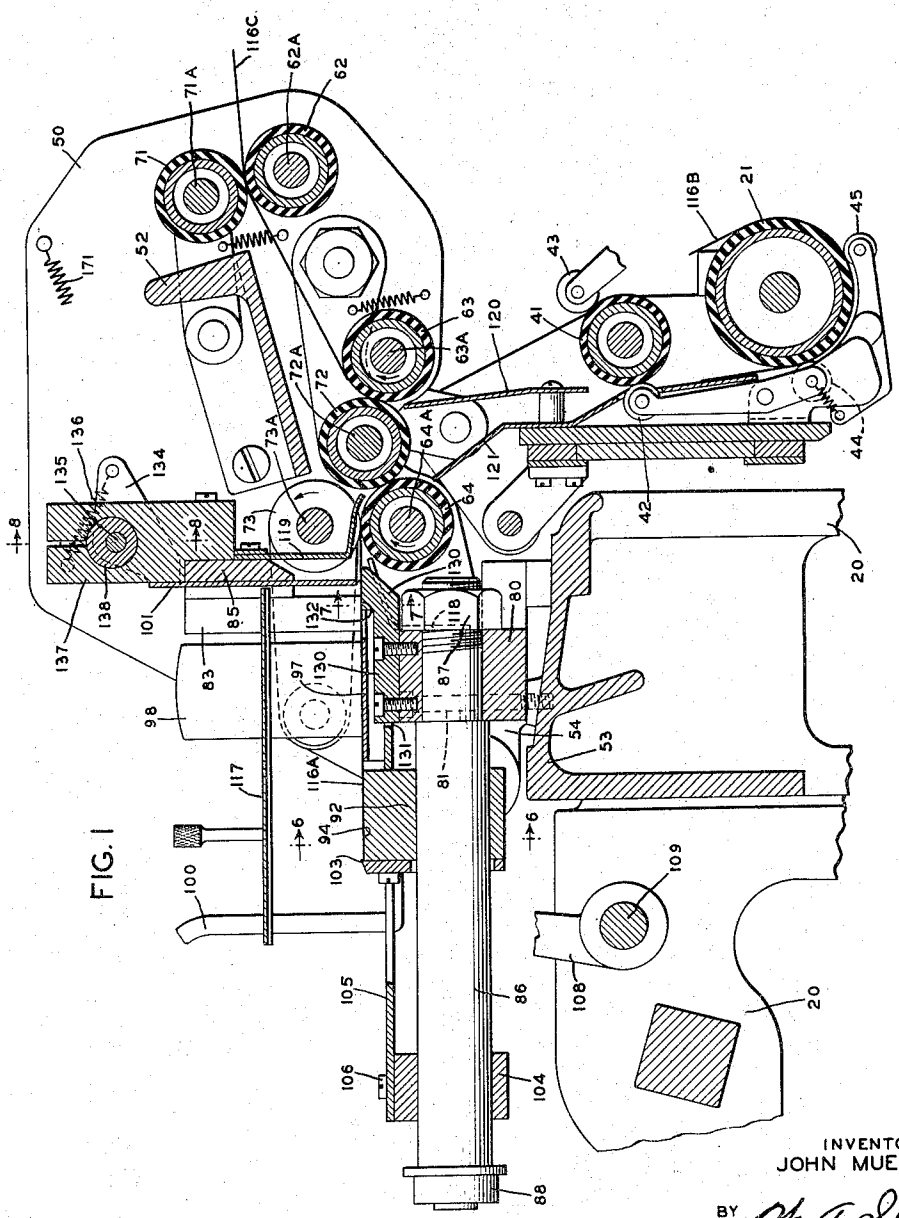


FIG. 1

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BY H. A. Sparks

ATTORNEY

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TABULATOR

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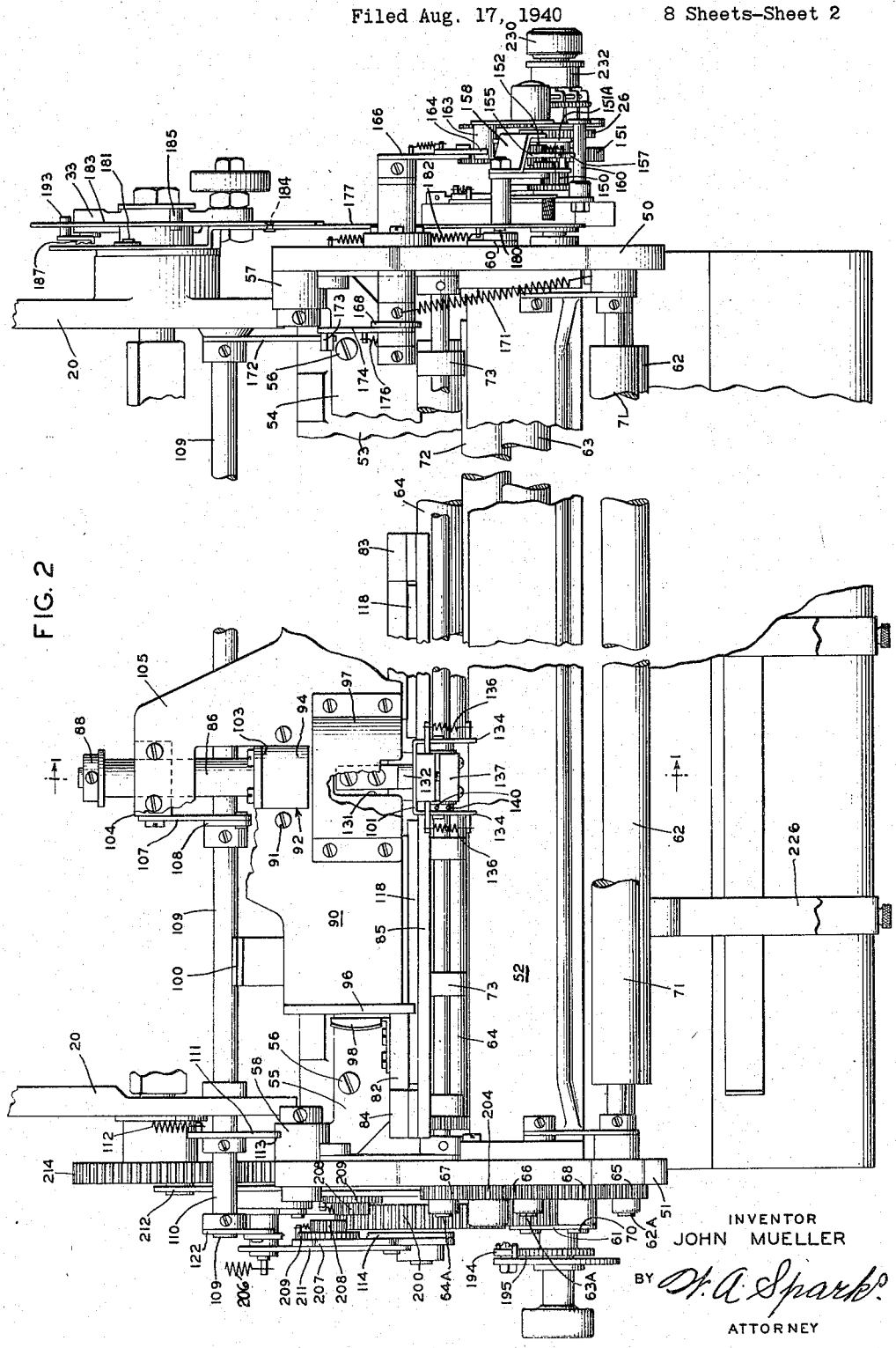


FIG. 2

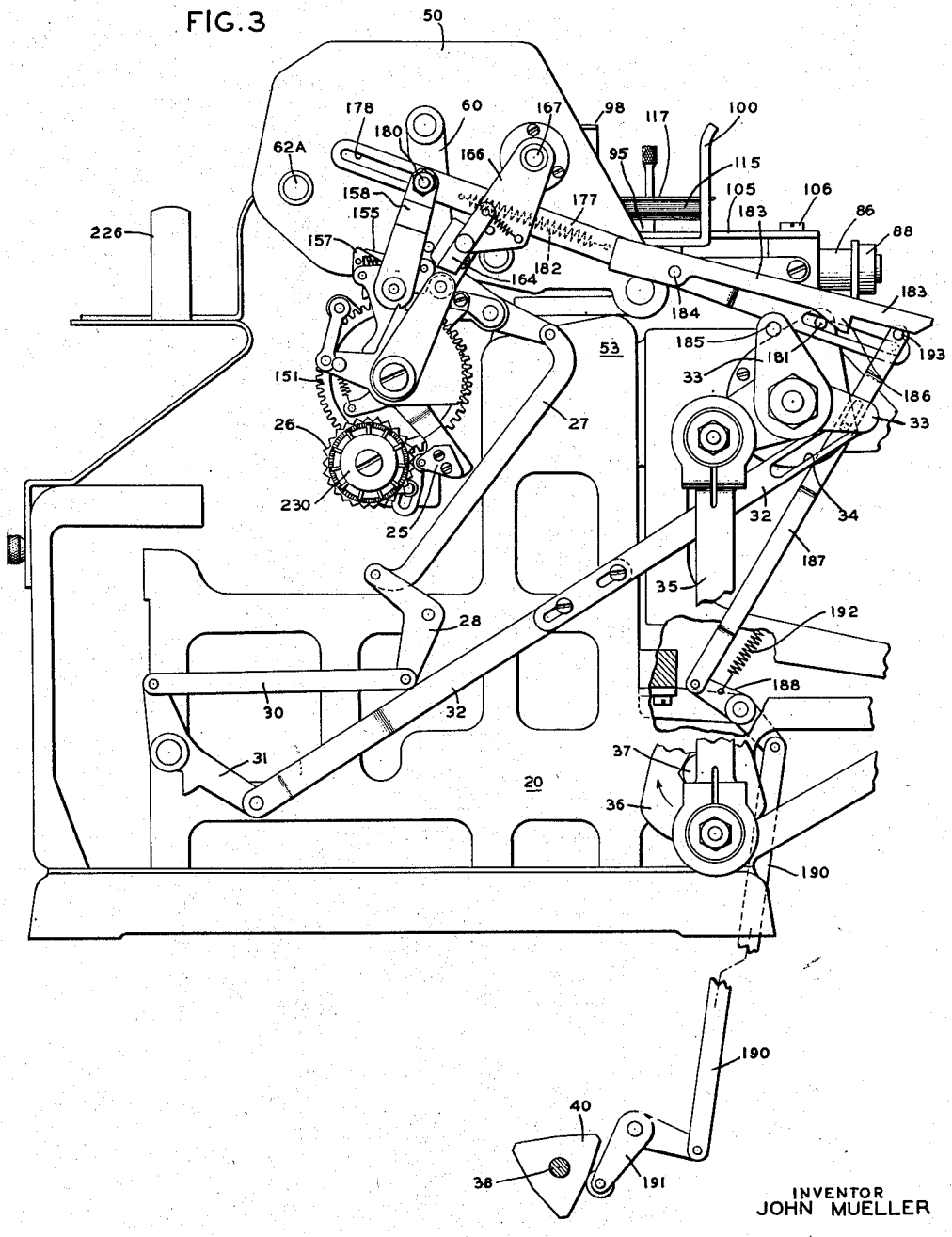
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TABULATOR

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FIG. 3



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FIG. 4

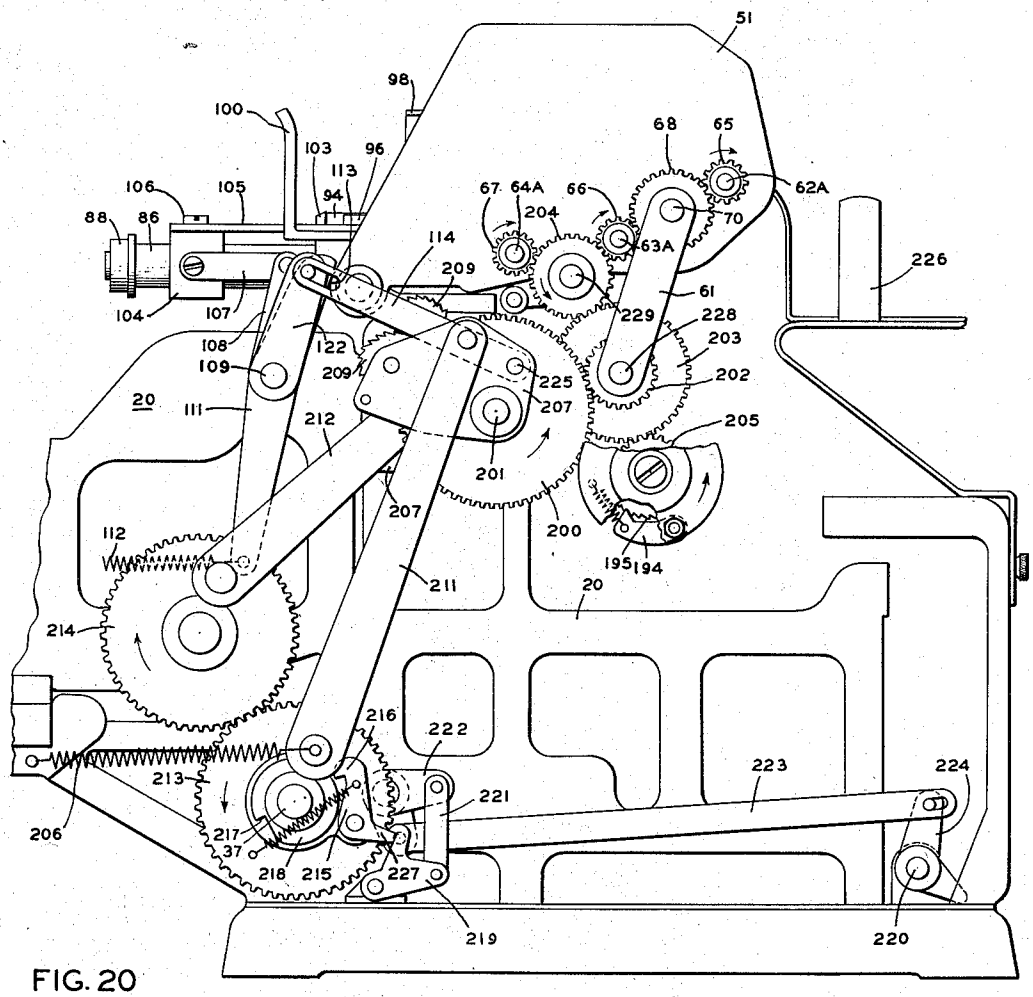


FIG. 20

METER READINGS	AMOUNTS DUE	
	5.70	A
	7.80	B
	5.68	C
	19.18	T

AMOUNTS DUE	
5.70	A
7.80	B
5.68	C
19.18	T

MR. JOHN DOE
718 E 412 TH. ST.
NEW YORK. N.Y.

DUE DATE. JULY 15 1940

116

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TABULATOR

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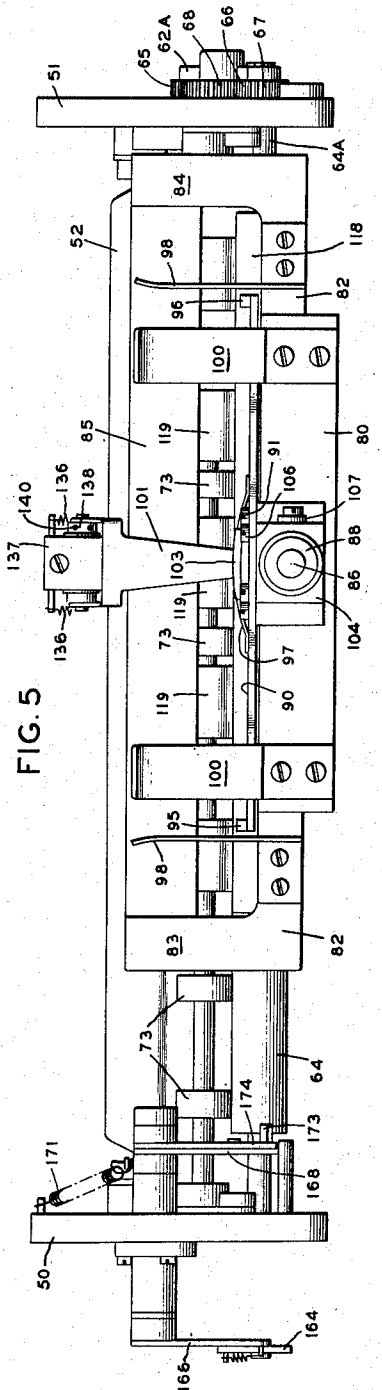


FIG. 5

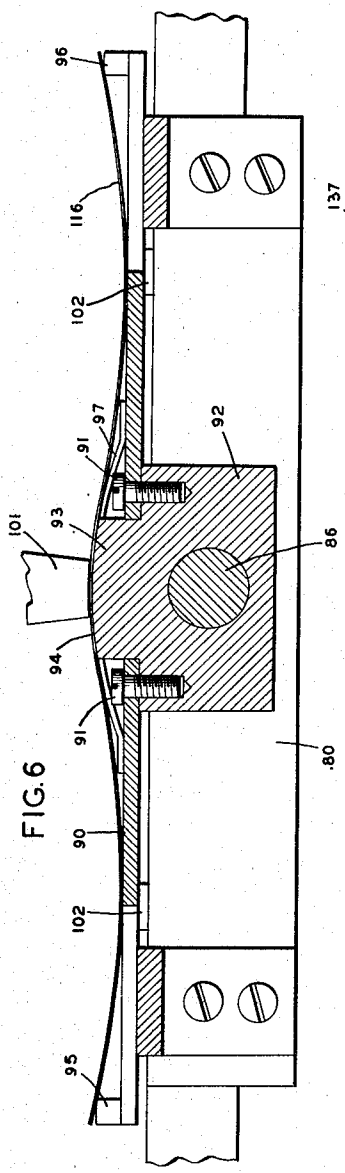


FIG. 6

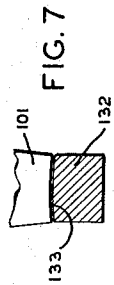


FIG. 7

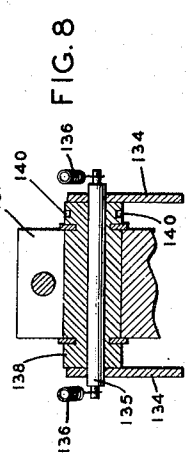


FIG. 8

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TABULATOR

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FIG. 9

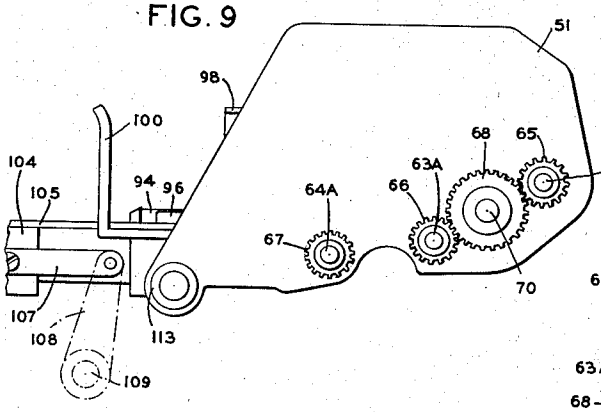


FIG. 10

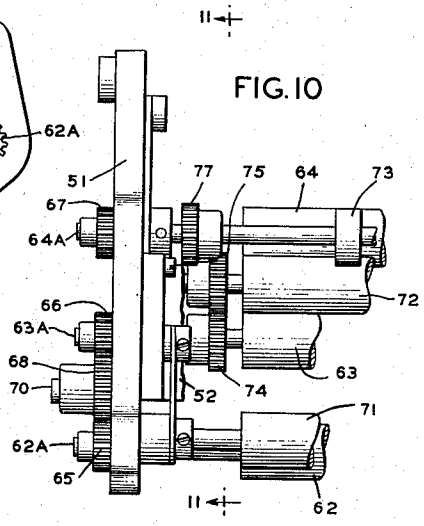


FIG. 11

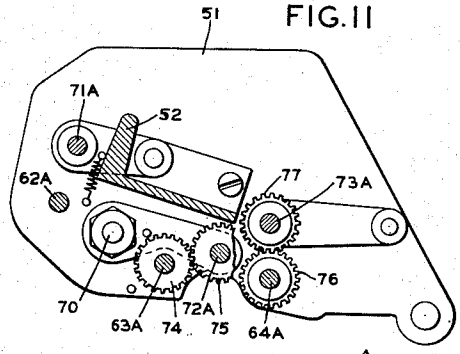


FIG. 13

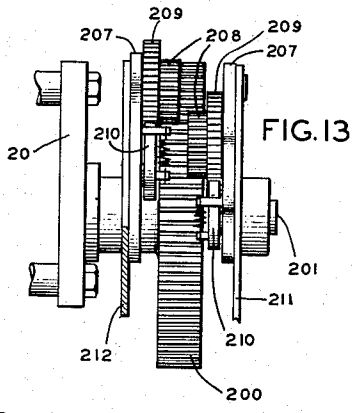
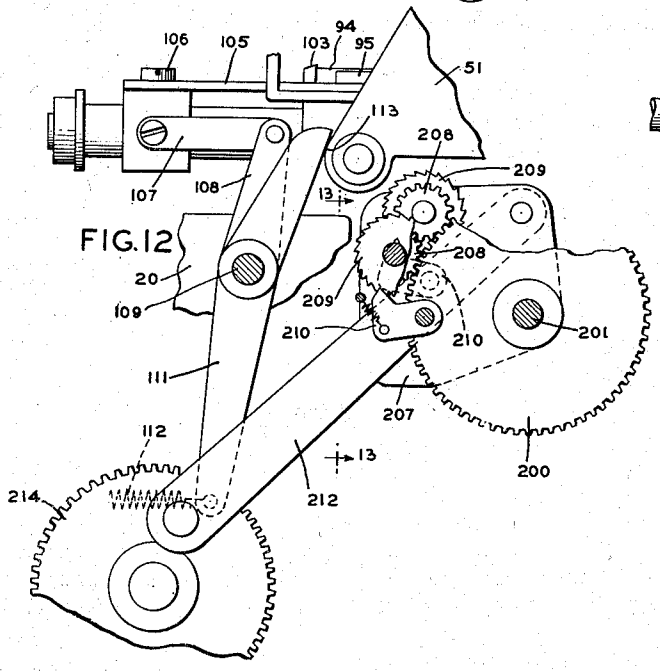


FIG. 12



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FIG. 14

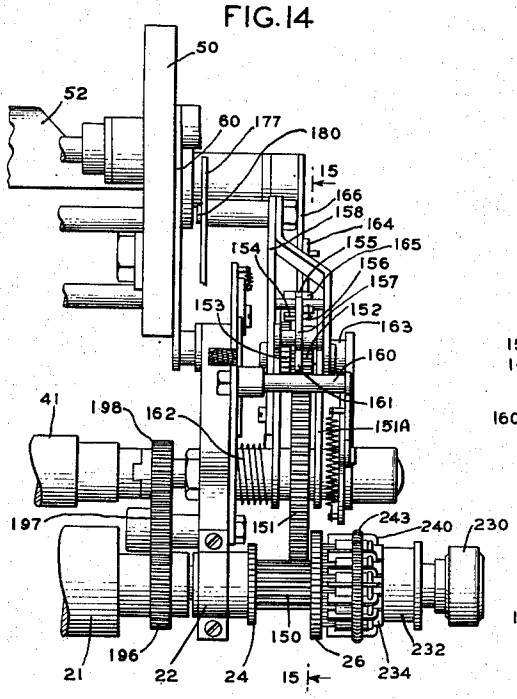


FIG. 15

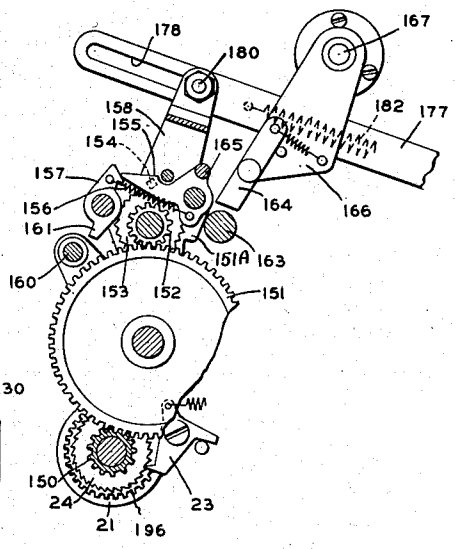
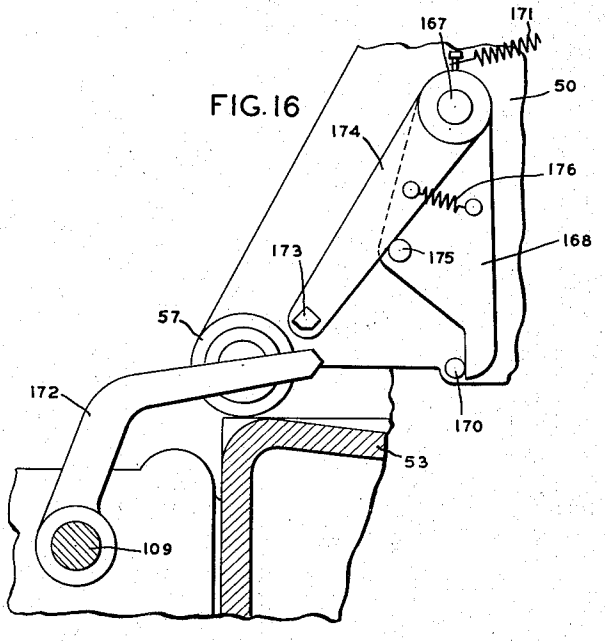


FIG. 16



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TABULATOR

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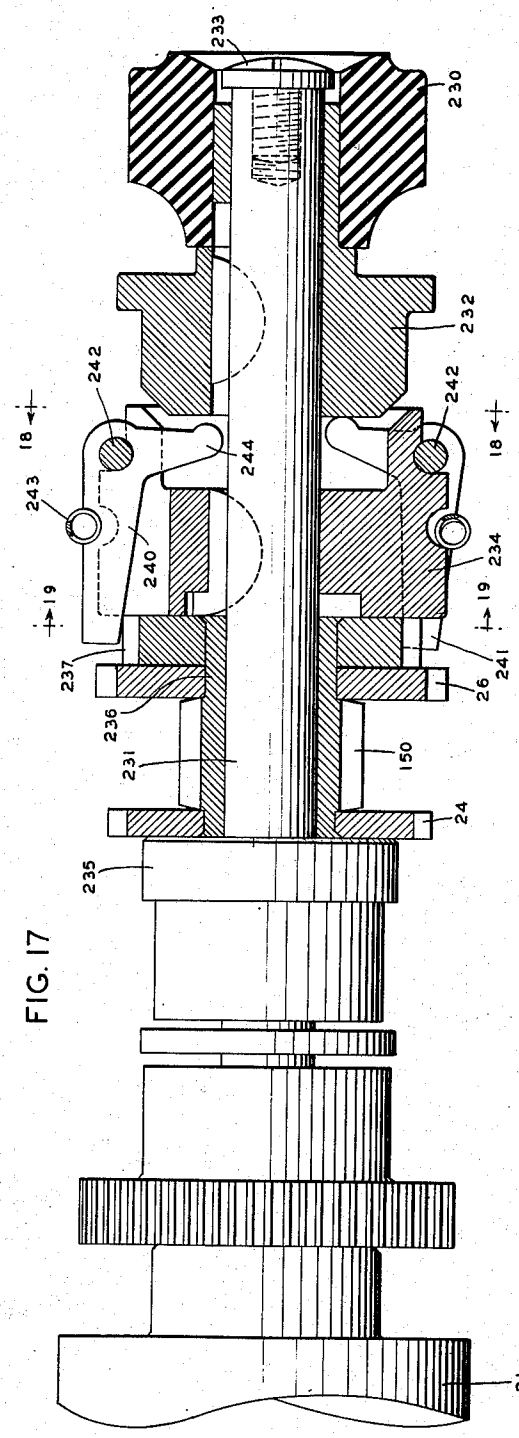


FIG. 17

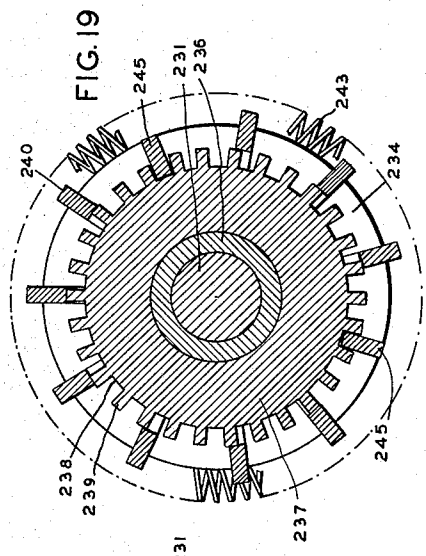


FIG. 19

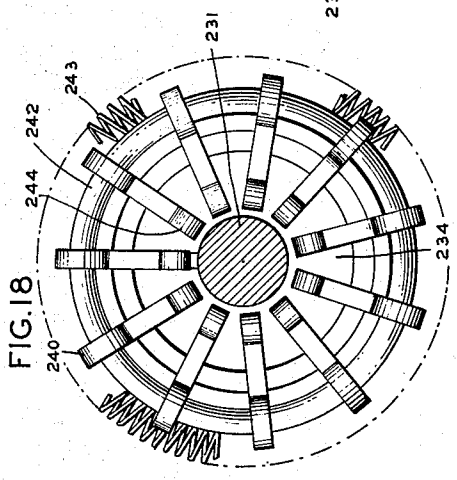


FIG. 18

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Patented Feb. 24, 1942 2,274,088

UNITED STATES PATENT OFFICE

2,274,088

TABULATOR

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

Application August 17, 1940, Serial No. 353,029

6 Claims. (Cl. 271—44)

This invention relates to paper feed mechanisms and particularly to cooperative mechanisms adapted to controllably position separate sheets of paper for automatic feeding of the same in recording accounting and statistical machines.

In the present illustrative embodiment of the invention, the feed mechanisms are incorporated for use with a well known form of Powers tabulating machine to facilitate preparation of the monthly statements or bills of a public utility company. The separate preprinted entry designating forms handled in the machine, in the instant case, are adapted to receive a columnar listing of a maximum of five printed entries therein, at the respective line spaces of the form containing such designations. The first printing line position of the individual forms corresponds with the monthly service charge designation. In line space relation thereto, other designating items included on the form are service arrears, appliance cost and appliance cost arrears, a total of five line spaces being provided for such individual entries, one of the spaces containing no designation. Also, in the sixth line space position on the forms is included a total designation at which uniform line position on the paper sheets the mechanisms provided situate the forms, as the same pass through the machine, to receive a printed total entry of whatever previous entries were made thereon. By way of illustration only, the feed mechanisms herewith shown and described are designed to handle a specific size of individual paper sheets, as noted, in the disclosed type of accounting machine.

The separate loose forms, retained in suitable stacked or superposed relationship, are initially fed to the machine one at a time at evenly spaced intervals for successive desired handling by the associated feed control mechanisms provided, as will hereinafter be described.

Particularly, provision is made by the present invention for the initial handling of the separate stacked loose paper forms utilized to obviate the normal tendency of the same to curl or bend in varying degrees on both sides of their longitudinal axes and thus because of the irregularities encountered in the location of the feeding edges of successive sheets make it difficult to feed the same in a desired manner. One of the primary objects of the invention is to overcome such a tendency on the part of the paper sheets handled in the machine and thereby positively prevent failure of a proper initial feeding movement of the paper.

Another object of the invention is to form the stacked paper sheets in a curved or arched condition to thereby provide a definite feeding edge for each of the sheets.

A primary feature of the invention is to provide structure for supporting the stacked paper sheets in a curved manner to obtain an exact feeding edge for the sheets.

Another object of the invention is to strengthen the feedably retained paper sheet of the stack along the body of the same upon which the force for accomplishing a feeding movement is applied.

Still a further feature of the invention is contained in the provision of a reciprocatively mounted base for the paper stack depository upon which the sheets are retained in a uniform feedable condition.

Additional features of novelty include a curved edge picker knife and feed throat construction through means of which the curvedly supported individual sheets of paper are fed from the depository one at a time.

Another feature of the invention resides in the construction employed in the curved feed throat forming parts of the depository so that the same are readily adjustable.

A further feature is provided in the utilization of the picker knife to retain the edge of the respective sheets of paper fed from the depository in tightly pressed relation against stationarily positioned feed rollers of, and controlled by, the long feed mechanism and thereby positively insure subsequent feeding movement of the sheets.

Another feature of the invention in connection with the compensating feed mechanism for the accounting machine consists in the provision of means operable through influence of the machine to obtain automatic restoration of the compensating feed mechanism to effective condition after each operation thereof.

Still a further feature of the invention resides in employing means for automatically operating the compensating feed mechanism by mechanism of the accounting machine at the proper interval in the operation of the machine, and otherwise, through other instrumentalities render such operating means ineffective.

Another feature of the invention is contained in the provision of novel long feed mechanism controlling devices and instrumentalities for initiating operation of the same.

A further feature of the invention resides in the means provided through which the various

feed mechanisms employed with the depicted accounting machine are associated for conditioning and operation thereof in synchronized relationship.

Other objects, features, and structural details of the invention will be apparent from the following description when read in connection with the accompanying drawings, wherein

Fig. 1 is a fragmentary, vertical, front to rear sectional view of the paper handling mechanism of a tabulating machine showing a sufficient number of parts to illustrate an embodiment of my invention therein, the section being taken on line 1—1 of Fig. 2;

Fig. 2 is a fragmentary plan view of the paper handling mechanism, as illustrated in Fig. 1, with various parts broken away for the purpose of clarifying the construction;

Fig. 3 is a right-hand side elevation of a tabulator head in which the present inventive concepts are embodied;

Fig. 4 is a left-hand side elevation of a tabulator;

Fig. 5 is a detail rear end view of the preferred form of two of the improved paper feed attachments, shown removed from position on the tabulating machine;

Fig. 6 is an enlarged section taken on line 6—6, in Fig. 1;

Fig. 7 is a section taken on line 7—7, in Fig. 1, of a portion of the paper sheet dispensing depository of the feed attachment showing the curvature of the parts defining the feed throat;

Fig. 8 is a section taken on line 8—8, in Fig. 1;

Fig. 9 is a side elevation of the detached related feed attachments;

Fig. 10 is a partial plan view illustrating the arrangement of the rollers in one of the attachments;

Fig. 11 is a section taken on line 11—11, in Fig. 10;

Fig. 12 is a side elevation particularly showing a portion of the long feed control mechanism;

Fig. 13 is a section taken on line 13—13, in Fig. 12;

Fig. 14 is a detail front elevation of a part of the compensating feed mechanism;

Fig. 15 is a section taken on line 15—15, in Fig. 14;

Fig. 16 is a detail view of a form of trip instrumentality, herewith employed, through which the compensating feed mechanism is conditioned for effective operation;

Fig. 17 is a detail longitudinal section of the righthand end of the platen structure showing the improved clutch by which the same is adjustably positioned;

Fig. 18 is a section taken on line 18—18, in Fig. 17;

Fig. 19 is a section taken on line 19—19, in Fig. 17, and

Fig. 20 shows a representative type of the preprinted bill sheet employed herewith.

With reference particularly to Figs. 1, 2, 3, 4, 14, and 15, the invention herewith shown and described is embodied for practical use with one form of the well known Powers tabulating machine, such utilization being illustrative only and not to be considered in any limiting sense. The respective side frames of the head unit of this accounting machine are designated at 20. The machine provides suitable differentially settable type carrier (not shown) adapted to operate in the usual manner with respect to the platen 21, thereof, which is rotatably mounted in bearing members, such as shown at 22 in Fig. 14, situated in extending portions of the respective side frames 20 of the tabulator head unit.

The platen 21 is line spaced by a mechanism including the pawl 23 and ratchet 24, Fig. 15, in a manner well known in the art, and is yieldingly held by the customary spring-pressed detent 25, shown in Fig. 3, acting on a toothed wheel 26. The line spacing mechanism includes the connecting linkage shown in Fig. 3, the same being link 27, bell-crank 28, link 30, pivoted member 31 and long link 32. This linkage is actuated to attain its purpose by the cooperating pin of the rock member 33, which engages the slotted portion 34 of the link 32 and is effective to move the linkage just prior to the return of the member 33 to its initial or normal operating position, in which the same is shown in Fig. 3. This portion of the machine is of customary construction, the member 33 being oscillated through the influence of the connecting arm 35 driven by the crank forming hub member 36, mounted for rotative movement, at the right-hand end of the main operating shaft 37 of the form of tabulating machine herein illustrated.

The total taking cam shaft 38 of the accounting machine shown is employed in the present instance to condition the mechanisms embodying one feature of the invention for automatic operation, as will hereinafter be more particularly described, this shaft and one of the cams 40 thereon being indicated in Fig. 3.

The patent to W. W. Lasker, 2,044,119, issued June 16, 1936, discloses and describes a tabulator having a substantially similar total taking mechanism.

A feed roller 41 (Figs. 1 and 14) arranged in spaced parallel relationship to the platen 21 is rotatably mounted in bearings provided in the same frames adapted to hold the platen. Suitable accessory rollers 42 and 43 cooperating with roller 41 are also provided, these rollers being a necessary addition to the feed mechanism of the tabulator when the attachments embodying the present invention are employed. The usual feed rollers directly associated with the platen 21 are indicated at 44 and 45.

Paper feed attachments (Figs. 1, 2, 3, 4, 5, 6, 9, 10 and 11)

The feeding attachments embodying the invention are shown herein separated into two independently functioning, though related mechanisms for the cooperative handling of the paper. The first of these mechanisms, in order of sequence of operation in the feeding of the paper, is designed to move individual sheets of the paper from a stack of similarly sized superposed sheets located in a suitable stationary retaining table or depository. The second mechanism is provided to positively receive the sheets as the same are fed from the first mechanism, to feed the separate sheets to a printing position and then to facilitate movement of the printed sheets to discharge the same to a suitable receptacle. In the description, the second mechanism of the attachment will be initially considered.

The frame for this portion of the paper feed attachment includes a right-hand side plate 50, a left-hand side plate 51 and a cross member 52 which secures the respective plates in parallel relationship. This frame is suitably mounted upon the top rear part of the upper framework of the tabulator head unit, indicated at 53, (Figs. 1 and 3), through means of the sidewise extend-

ing bracket holding members 54 and 55 which are fastened in position by screws as indicated at 56. Actual contact of the parts is accomplished in the present instance by the cooperating pin and hub construction illustrated, as designed in Fig. 2, at the right and left-hand portions of the machine respectively, at 57 and 58. The forward portion of this removable feed attachment is reinforced in fixed relation to the tabulator head unit by means of the stationary supporting arms 60 and 61, respectively, at the right and left-hand sides of the machine.

With particular reference to Figs. 1, 9, 10, and 11, in the frame 50, 51, and 52, are rotatably mounted, in parallel relation to roller 41 and platen 21, the positively driven rollers 62, 63, and 64. These rollers secured to shafts 62A, 63A, and 64A, respectively, are actuated through means of the associated pinions 65, 66, and 67, which are fastened to the respective shafts of the rollers, the same being situated exteriorly of the frame plate 51. Roller 41 is driven from the platen 21 by gears 196, 197, and 198 (Fig. 14). Gear 68, mounted for free movement on the stub shaft 70 projecting from the side plate 51, connects the pinions 65 and 66. Pivotally mounted on extending arms within the side frames are situated the spring pressed rollers 71, 72, and 73, the same respectively cooperating with rollers 62, 63 and 64. Frictional contact only is utilized to provide cooperation between the forward positioned rollers 62 and 71. The centrally disposed spring pressed roller 72 is urged against both roller 63 and 64 and is positively driven by means of pinion 66 on roller shaft 63A, through the meshing gears 74 and 75 which are interiorly situated with relation to side plate 51 in the frame. The rearward set of cooperating rollers 73 and 64 are so arranged that the respective centers thereof are in the same approximate vertical plane, the paper fed by the mechanism of the first attachment being pressed into feedable relationship with these noted rollers. The upper roller 73 is also positively driven by pinion 67 through the connecting gears 76 and 77 (Fig. 11) within the frame. The shafts of rollers 71, 72, and 73 are indicated at 71A, 72A, and 73A, respectively.

With reference to Figs. 1, 2, 5, 6, in particular, the first mechanism of the feed attachments is shown mounted to the rear of the frame 50, 51, 52, and suitably spaced a desired distance from the rollers 73 and 64, the same having a frame composed of a rectangular shaped mounting base member 80 which is removably secured in position upon the upper portion of the tabulator head frame 53 in a desirable manner such as indicated at 81, in Fig. 1. To the front of the mounting member 80 is secured a U-shaped bracket piece 82 (Fig. 5), the arms 83 and 84 of which extend vertically and suitably support, therebetween, a cross member 85. A central horizontally positioned rod 86 extends from the rear of mounting 80, being bolted, or otherwise secured, thereto, as shown at 87. A limit defining collar 88 is fixed to the end of the rod 86. The rod 86 provides a fixed mounting on which is located a reciprocated base forming member, indicated generally at 90 (Fig. 2), for the paper retaining table or depository.

The reciprocatively mounted base 90 is secured by screws 91, or otherwise (Fig. 6) to a slide member 92 engaged on the rod 86. An upwardly extending portion of the member 92 projects above the horizontal level of the paper table, the same being designated at 93, the surface of this portion of the base of the depository being curved or arcuately shaped, as indicated at 94, in order to form the paper sheets in a curved condition to provide a definite feeding edge for the same. Besides the central transversely extending curved paper supporting surface 94, end supporting members 95 and 96 are also provided for the paper on the movable base 90. A curved plate 97 is screwed or otherwise fastened to the base 90, the same forming, in essence, a continuation of the curved surface 94 of the projecting portion 93 of the slide member 92.

The fixed elements of the paper table or depository by which the individual sheets of paper are held in stacked superposed relationship include side brackets 98 mounted upon the U-bracket 82, rear brackets 100 fixed to the base 80 and a throat member 101 which is secured in a manner hereinafter described to the cross member 85. The movable base 90 upon which the paper stack rests in a uniform arched position is situated for reciprocative movement away from and towards the throat member 101 and within the confines of the fixed elements of the depository. Lugs 102, at the bottom of the slidable depository base 90 cooperate with the upper surface of the fixed base 80 to obviate any tendency on the part of the base to rock about the rod 86.

Means for picking the lowermost of the individual stacked paper sheets from the depository is provided in the form of the picker knife 103, the same being suitably mounted on the projecting portion of the movable base 90 and having the same curvature as the surface 94 upon which the sheets are supported or rest. In its normal or inactive position the picker knife 103 is positioned as shown in Fig. 1.

A slide member 104, also mounted on the rod 86, is suitably secured to a rearwardly extending portion 105 of the reciprocative base 90, as indicated at 106. The base 90 is reciprocated through the slide member 104, in the present construction (Figs. 2 and 4), the same being accomplished by means of a link 107, an oscillating arm 108 fixed upon a rock shaft 109, which is mounted in the side frames 20 at the rear of the tabulator head unit and extends exteriorly of the frame 20 at the left-hand side of the machine as designated at 110. Affixed to the portion 110 of the rock shaft 109 (Fig. 4) is an arm 11, the lower extension of which is continuously urged in a clockwise direction by means of a spring 112, secured to the end of the arm and to a suitable position (not shown) on the side frame of the tabulator head unit. The upper extension of the arm 111 limits the forward position of the reciprocatively mounted base 90 by contact of the same against the surface of the hub portion situated on the rear of the left hand side plate 51, as designated at 113.

The feeding movement of the base 90 is obtained by influence of the spring 112, which holds the parts in an advanced normal or inactive position, as shown in Fig. 1, in which the arm 111 limits against the hub, at 113, and the shaft 109 is secured in a position which through arm 108 and link 107 locates the reciprocative base 90, so that the picker knife 103 is situated under the stack of paper sheets in the depository. A feeding movement of the base 90 of the depository or table is accomplished as hereinafter described by a driving connection comprising a slotted link 114 which engages a pin on an arm 122 (Figs. 2 and 4), fixed in position on the extending por-

tion of rock shaft 109. By means of this arrangement the picker knife 103 is moved rearwardly of the stacked sheets of paper which then rest directly upon and in conformity with (see Fig. 6) the central curved supporting elements 94 and 97 in the base, whereby the lowermost positioned sheet of the stack is always definitely formed to provide a uniform feeding edge. The respective ends of the paper stack preferably rest upon the end supports 95 and 96 in the depository base 90. In this portion the individual feedable sheets are so positioned that their ends and center are approximately in the same horizontal plane as the point of contact of the feed rollers 73 and 64. Upon rendering link 114 ineffective in a manner hereinafter described, actual feeding movement is obtained by the return of the parts to inactive position under the influence of the spring 112, the picker knife 103 engaging the defined edge of the lowermost of the paper sheets as the base 90 moves forward to arrive at its forward limiting normal position, the sheets thereby being moved or fed from the stack one at a time.

The stacked sheets are shown in the depository in Fig. 3, the same being designated at 115. Individual sheets of the paper fed from the stack are indicated in the drawings at 116. In Fig. 1 the respective locations of the individual sheets in the machine are designated by 116A, 116B, and 116C, 116A indicating the position of a sheet after the first feeding operation; 116B, the location of a sheet after operation of the long feed mechanism, at the first entry printing line position and 116C, the position to which the sheet is advanced by operation of the long feed mechanism prior to the discharge of the same into a suitable receptacle. A suitable loose plate 117 may also be employed to form a paper weight for the stack of superposed paper sheets located in the depository.

The construction described by which a defined uniform feeding edge for each of the individual sheets of paper is obtained, by reason of the provided arch in the paper, also stiffens or strengthens the body of the same in that portion thereof upon which the picker knife is applied to obtain a feeding movement. The paper sheet is strengthened along the depth of the arch or curve since it is supported on the base 90 during its feeding movement, the force of the picker knife contacting the curved feeding edge of the sheet being exerted in the direction of the depth of the arch.

A forwardly extending lower paper guide member 118 (Figs. 1 and 2) of a width corresponding to that of the depository is provided to direct the paper sheets to insure proper engagement of the same between the rollers 73 and 64 of the second feed mechanism attachment, this member being suitably connected to the front portion of frame 80. A number of curved upper guide members 119, fastened to the front of the cross member 85, serve a like function to that of guide 118 and further insure the proper initial positioning of the sheets with relation to the second feed attachment. Other curved paper guides, as designated at 120 and 121, (Fig. 1) are employed in directing the sheets, the same being suitably mounted in a fixed position on the front frame of the tabulator head unit.

The respective feed attachments may be either separately constructed, as herein shown, or constituted in a single unit, the same being situated with regard to one another on the tabulator head unit to obtain a cooperative relationship in the handling of the individual sheets of paper during operation of the machine. The attachments are so spaced and the degree of feeding movement of the first mechanism so controlled that, when the picker knife of this mechanism feeds or moves individual sheets of paper from the stack in the depository, the same comes to rest in a normal inactive position, as hereinbefore described, in which the individual sheets are tightly pressed between and against the feed rollers 73 and 64 of the second mechanism, which rollers are, at that time, stationary. To accomplish this purpose, the distance between the normal position of the picker knife 103 and the line contact of the rollers 73 and 64 is arranged slightly less than the length of the paper sheets being handled in the machine.

Feed throat (Figs. 1, 2, 5, 7, and 8)

The feed throat permits only single sheets of paper in the stack to be removed therefrom, the same forming a portion of the first feed attachment in the present instance. The throat is constructed by a central forwardly extending stationary member 130 (Fig. 1) suitably mounted upon the top portion of the frame 80 of the first attachment. Inasmuch as this member projects above the horizontal level of the base or table 90, a slot 131 is provided in the forward body of the base in order to accommodate the same. The curved top surface of the front projecting portion indicated at 132 (Fig. 7) of the stationary member 130 forms the lower piece or base of the feed throat, the same being in a position in approximate alignment with the elevated curved surface 94 on the central supporting members of the movable table or depository base. The throat forming member 101 is shaped to have an arcuate lower end indicated at 133 and is adjustably mounted with respect to and above the portion 132 of the stationary member 130, these parts being spaced, slightly more than the thickness of a paper sheet, to provide a curved feed throat, insuring individual removal of the paper sheets supported in the manner hereinbefore described from the depository or retaining table of the attachment. The opposite end of the member 101 is constructed to include perpendicularly extending arms 134 by means of which the same is pivotally mounted on shaft 135. Springs 136 secured between a stationary mounting 137, fixed to the front portion of the cross member 85, and the arms 134 of the member 101 normally secure the same in vertical relation to the portion 132 of member 130 to form the feed throat. The feed throat may be readily cleared of stoppage by lifting the throat member 101 out of its normal position after the paper sheets have been removed from the depository. The shaft 135 which provides the pivotal axis, through which adjustment of the member 101 is effected, is eccentrically positioned in a settable tightly retained rotatable cylindrical member 138 located in the mounting 137. Radial openings 140 in the cylindrical member 138 form a means whereby the operator through use of a suitable tool, fitting the same, may set the member 138 to radially adjust the shaft 135 to obtain the required spacing adjustment for the parts defining the feed throat.

Compensating feed control mechanism (Figs. 3, 14, 15, and 16)

Reference is particularly made to my copending application S. N. 323,137 for a detail disclosure of the principal mechanism herewith

utilized for effecting a compensating movement of the paper feed control devices so that each individual form paper sheet is properly positioned at the required line space on the form to receive a printed total entry thereon of the previously noted separate entries. The novelty expressed in the present disclosure with regard to this portion of the feed devices illustrated, primarily is contained in the associated mechanisms included therewith by which the same is automatically operated and restored to an effective position.

The feed mechanism as shown in the identified application includes a pinion 150 (Figs. 14 and 15) mounted to effect movement of the platen 21, meshing with a large gear 151. A yoke piece or carrier 151A journaled on a stud shaft extending from the side frame of the tabulator head unit, straddles the gear 151, the same providing a mounting for a further rotatable pinion 152 in constant mesh with gear 151. A notched locking wheel 153 fixed to the side of the pinion 152 is engaged by a lock consisting of a square stud 154 projecting from a latch lever 155 suitably pivoted to one of the arms of the yoke piece or carrier. A spring 156 tends to lift the square stud 154 out of engagement with the notched wheel 153. The latch lever 155 is adapted to be positively locked in engagement by a pawl 157 which is pivoted to the yoke or carrier 151A and is yieldably held in engagement by means of the spring 156.

The carrier 151A is urged forward in a counter-clockwise direction as viewed in Fig. 15 to obtain a feeding movement of the paper by a lever 158, corresponding to the handle lever in the identified application for Letters Patent, and mounted as disclosed in detail therein. As the lever 158 is moved forward, the locked wheel 153 and pinion 152, restored and positioned in this manner in accordance with the present disclosure, force the gear 151 to turn with its carrier, which through pinion 150 and corresponding rotation of the platen 21 accomplishes a compensating feed movement of the paper.

The forward stroke of the lever 158 and the yoke or carrier 151A is limited by a post 160 suitably mounted and extending from the side frame of the tabulator head unit. At the end of the forward stroke, the post 160 is first struck by the tail 161 of the pawl 157, thereby releasing the same, after which the arms of the carrier limit against the post. With the pinion 152 in an unlocked condition the carrier 151A and the lever 158 are then swung rearwardly in a clockwise direction as viewed in Fig. 15 to a normal initial position by a restoring spring 162 (Fig. 14) the gear 151 remaining stationary and the pinion 152 freely rolling over the same.

In the present instance, the parts are arrested on the return stroke by a rearwardly positioned limiting post 163, the latch lever 155 remaining in an unlocked position until operation of instrumentalities herewith provided. Until restoration of the locking lever 155, the compensating feed mechanism is rendered inactive.

Inasmuch as the form of the paper sheets employed herewith provides only for the printed entry of four separate line spaced items and a single printed total entry, the first of the separate item positions and the total entry position always being in a given preprinted line thereon, the limiting posts of the compensating feed mechanism are herein shown set to permit a maximum movement of the same to feed the paper five line spaces. With such effective maximum compensating feed mechanism movement, data is only entered by the machine in the first and last designated line spaces on the forms. The invention is obviously not limited to the degree of compensating feed movement of the paper sheets herewith described.

The means employed for restoring the latch lever 155 to locking position and thus condition the compensating mechanism for operation, includes a pivotally mounted spring-pressed finger piece 164, the side of which abuts a lug 165 on the lever to positively urge the same into this position. The finger piece is situated on a plate 166 fixed to a rock shaft 167, journaled in the right-hand side plate 50 of the second feed mechanism attachment. Inwardly disposed with respect to the plate 50 is a further plate 168 (Fig. 16), also fixed to the shaft 167 and normally retained in a limiting position against a stud 170 through means of the influence of a spring 171. These associated parts normally retain the finger piece 164 in the position shown in Fig. 15, from which it is moved clockwise to fulfill its purpose. This is accomplished by a pointed member 172 mounted to oscillate with the rock shaft 109, the same being located on the right-hand side of the machine (Fig. 2). The member 172 cooperates with a lug 173 on the loosely retained arm 174 on shaft 167, movement of the arm being transmitted to the plate 168 through a limit pin 175 on the plate against which the arm is yieldably held by a spring 176. When the member 172 is oscillated clockwise by shaft 109 the end thereof contacts lug 173 rocking the arm 174 and plate 168 counter-clockwise (Fig. 16) which results in the clockwise rotation in Fig. 15 of the plate 166, thus causing finger 164 to rock latch 155 into locked position to restore the compensating feed mechanism to effective condition.

A long paper feeding movement of the compensating mechanism is automatically effected in the present disclosure through means of a slide link 177 (Figs. 3 and 15), the position of the lever 158 with respect to this link at the time of operation of the link determining the extent of the feeding movement of the mechanism, the same being sufficient in each instance within the capacity of the present machine to feed the paper to the printing line of the total entry position on the respective forms. The forward end of the link 177 has a longitudinally extending slot indicated at 178, the size of which is sufficient to attain the present compensating feed action, the same slidably receiving a pin 180 suitably fastened to and projecting from the upper end of the lever 158. The opposite end of the link 177 (Figs. 2 and 3) includes an offset portion extending in the same direction as the main body of the link, the same also being slidably retained by a pin and slot connection 181 on an extension upon the right-hand side rear of the tabulating frame. Link 177 is yieldingly held in a rearward position by means of a spring 182 (Fig. 3). An arm 183 is pivotally connected to the side of link 177, as indicated at 184, the same extending rearwardly parallel to the offset portion of the main body of the link. When arm 183 is in alignment with the link 177, the same is effective to cause movement of the lever 158 of the compensating mechanism, through said link, by the contact and cooperative movement of a projecting pin 185 on the tabulator rock member 33 with a lug 186 situated on the arm, this action being capable of taking place only during the return movement

of the oscillating member 33 in the last part of each operating cycle of the tabulating machine. A linkage arrangement consisting of a slide link 187, rock member 188, long link 190 and bell-crank 191, is normally held in a raised position by spring 192, in which position an underlying pin 193 on the end of link 187 lifts the arm 183 so that it is out of the path of movement of the pin 185 on the oscillating member 33. This linkage provides means for disabling the operating link 177 of the compensating mechanism, the same also being controlled and rendered effective through operation of the total taking cam 40 on shaft 38 of the tabulator which actuates the linkage, as shown, to lower pin 193 permitting arm 183 to drop to a cooperative position with respect to pin 185.

The arm 183 is conditioned to effect a compensating feed movement of the paper sheets, by means of the linkage set forth, during the first forty degree travel of the entire one hundred and twenty degree travel of the cam 40 on the total taking cam shaft. This action occurs in the early part of a blank stroke cycle of a machine of this type which precedes the total taking cycle. Movement of the parts effecting the compensating feed operation takes place during the last part of the blank stroke cycle of the tabulator as the oscillating member 33 returns to its normal position. The last line space step of movement of both the compensating feed mechanism and the single line space mechanism occurs under the joint influence of member 33, in the instant case, at the very last of the blank stroke cycle.

Long feed mechanism (Figs. 1, 2, 4, 12, and 13)

The long feed mechanism is adapted to effect a constant travel of the paper sheets from their position of line contact with rollers 73 and 64 of the second feed mechanism attachment to a position with respect to the platen 21 in which the first line to be printed on in the preprinted form is properly located to receive the first entry to be made by the machine. This mechanism includes a main operating gear 200 (Fig. 4) rotatably mounted on a stub shaft 201 secured to the left-hand side frame of the head tabulator unit. Concentric pinions 202 and 203 are rotatably mounted on a suitable stub shaft 228 (Fig. 4) fixed to the left-hand frame of the head unit of the tabulator, pinion 202 meshing with gear 200 and pinion 203 meshing with a further gear 204 which is mounted on a similarly situated suitable stub shaft 229. Gear 204 also meshes with pinions 66 and 67 secured to shafts 63A and 64A, respectively, on the left-hand side of frame plate 51 of the second feed mechanism attachment, this gear forming the direct driving means for causing rotation of the respective roller elements 63 and 64 contained in the attachment. The platen 21 is also driven by the long feed mechanism by means of gear 205 which meshes with a pinion 205 secured to the sleeve that provides the mounting for a ratchet 195, this movement of the platen being exerted through a pawl 194. Gear 200 is actuated at the proper interval during operation of the machine by the long feed control mechanism to effect this desired feed of the respective paper sheets.

Feeding of the paper sheet while in printing position is effected by either the compensating feed mechanism or the line space mechanism without influencing the long feed mechanism. This is accomplished by the pawl 194 and ratchet 195 connection (Fig. 4) associated with the platen 21. In the cases specified, the pawl rides idly over the ratchet permitting movement of the platen in a counter-clockwise direction as viewed in this figure without disturbing the mesh of gears 203 and 205 of the long feed device.

The cooperating parts of the long feed control mechanism are normally retained in the position in which the same are shown in Fig. 4, through the influence of a spring 206. The long feed is accomplished by rotating gear 200, and consequently the associated feed controlling gears in meshed relation therewith, through a constant determined distance to attain the desired purpose for the size of the sheets utilized with the machine. In accordance with the present disclosure gear 200 is operated by driving connections comprising two similar trains of mechanism brought into effective operation with relation to the gear in such a manner as to lengthen the degree of movement of the same over that obtainable if only one of the mechanisms were employed. The similar parts of these mechanisms are designated by like reference numbers, one of the mechanisms being arranged to operate from the outwardly disposed side of the gear 200 and the other from the inwardly disposed side thereof, as clearly shown in Fig. 13. The parts include plates 207 pivotally mounted on the stub shaft 201 and suitably located in spaced relation to and on opposite sides of the gear 200. The plates 207 each carry rotatably mounted pinions 208 located so that the same continuously mesh with different portions of the gear 200, (Figs. 12 and 13). Associated with each pinion 208 is a ratchet 209, for controlling the direction of the rotation of the same, and spring-pressed pawl 210 pivotally connected to the side of the respective plates 207 towards the gear 200. The arrangement is such that when the plates are moved to rotate the pinions 208 in a counter-clockwise direction, as viewed in Fig. 12, the same are locked by the respective cooperating pawl and ratchet members and a resultant movement of the gear 200 is obtained. When, however, the plates are moved in a direction to rotate the pinions in a clockwise direction, the same are free to ride upon the gear 200, the ratchet moving over its associated pawl permitting rotation of the pinions 208 which in this event exercise no influence upon the gear. In the instant case, to obtain the desired degree of travel of the driven gear 200, the influence thereon of the plates 207 is necessarily exerted at different intervals.

The pitman for the plate 207 located to the outwardly disposed side of the gear 200 is indicated by the reference number 211 and the corresponding pitman for the inwardly disposed plate is indicated by the number 212. The pitman 211 is urged to oscillate the plate 207 about its axis 201 by means of a gear 213 (Fig. 4) which is loosely mounted on the left-hand end of the main shaft 37 of the disclosed tabulating machine. Pitman 212 is moved through means of a further gear 214, rotatably situated on a suitable stub shaft projecting from the side of the frame 20 toward the rear of the head unit of the tabulator, this gear meshing with the driving gear 213. In order to transmit the motion of the tabulator shaft 37 to drive the long feed mechanism, the gear 213 is provided with a hub upon which is pivotally mounted a spring-pressed dog 215 having a connecting toothed portion 216 adapted to engage a notch 217 located in a clutch

disc sleeve 218 fixed upon the shaft 37. The dog 215 is normally positioned against the influence of its associated spring by means of a pivotally mounted latch member 219 which engages the tail 227 thereof, the normal positions of these parts being clearly shown in Fig. 4.

Latch member 219 is suitably located upon the tabulator head frame and is rendered ineffective by means of linkage connections receiving actuation from the front totalizer shaft 220 of the tabulator. This linkage includes link 221, bell-crank 222, long link 223 and arm 224. After each tripping of the latch 219 to release the dog 215, the linkage returns to a normal position to engage the tail 227 of the dog to prevent continuation of the movement of the long feed mechanism for more than a single revolution of the driving gear 213. Actuation of the totalizer shaft 220 of the tabulator is effected in a manner well known in the art, through means of the total taking cam shaft 38, and occurs at the start of a total taking cycle of the machine. To allow for the printing of the total taken on this machine cycle before operation of the long feed mechanism, the notch 217 of the disc 218 does not pick up the unlatched dog 215 until the completion of slightly more than one-half of the accounting machine cycle. Then, upon rotation of the gear 213, the pitman 211 is first effective to pull the outer plate 207 in a counter-clockwise direction (Fig. 4), thereby moving gear 200 to start the long feed of the paper as heretofore described between rollers 73 and 64, 64 and 72, guides 120 and 121, rollers 41 and 42, 44 and 21, and 45 and 21 to bring the same to the first line position on the form adapted to receive a printed entry. After gear 214 has rotated sufficiently to bring the pitman 212 into effective feeding position, its associated plate 207 and pinion 208, when moving at the same speed as the plate controlled by pitman 211, also pick up the gear 200 and continue to rotate the same. After gear 213 has passed through the one-hundred and eighty degrees of effective travel, the gear 214 still continues to advance the feed gear 200 to thereby attain the required movement of the paper necessary under the present conditions. On the return stroke of the pitmans 211 and 212, there is no feeding action of the gear 200, the roller controlling gear portions of the mechanism being at rest. The operation of the long feed mechanism takes place during the latter half of each total cycle of the machine and extends into the early part of each following normal, machine cycle.

Slotted arm 114, through which arm 122 of the operating mechanism of the first feed mechanism is controlled, is pivotally connected to the exterior plate 207, as designated at 225.

A suitable frame receptacle indicated in part at 226 is mounted at the front of the machine to receive the paper sheets as the same are discharged from the front feed rollers 62—71.

By means of a clutch, shown in Figs. 14, 17, 18, and 19, the platen may be adjusted to move a sheet of paper under manual control and irrespective of the other feeding mechanisms. In order to obtain two way movement, however, it is first necessary to disable the pawl 194 and ratchet 195 connection by which the platen is effectively joined to the long feed mechanism.

Manual adjustment of the platen is controlled by a knob 230 (Fig. 17) slidably mounted on platen shaft 231. Adjacent the knob and similarly mounted is a clutch disengaging sleeve 232, movable with the knob as one piece and retained with it on the platen shaft by a limiting screw 233. A clutch driven member 234 is keyed on shaft 231 to the left of sleeve 232, and between it and a limit piece 235 is a sleeve 236 loose on the shaft and carrying the line space ratchet 24, pinion 150 of the compensating feed mechanism, and toothed wheel 26 of the detent mechanism. A clutch driving member 237 (Fig. 18) is also fixed on sleeve 236 and has about its periphery a number of grooves 238, in the present case thirty, defined by teeth 239. Clutch driven member 234 is provided with a number of finger pieces 240, in this instance eleven, spaced about its periphery and having projecting ends 241 which overlie and are adapted to engage the grooves 238. The finger pieces 240 are pivotally connected to member 234 at 242 and are yieldingly urged into engagement with grooves 238 by an annular spring 243. Perpendicular to the main portion of finger pieces 240, end pieces 244 extend inwardly within the open end of member 234 and contact the disengaging sleeve 232, which ordinarily is held retracted by spring 243 acting through finger pieces 240. Movement of the platen 21 by the line space and compensating feed mechanisms is made possible through the engagement of finger pieces 240 with grooves 238.

In order to provide movement of the platen by means of the hand knob 230, the knob 230 and disengaging sleeve 232 are pressed inwardly so that the latter rocks the finger pieces 240 out of engagement wtih grooves 238 against the pressure of spring 243. The finger pieces 240 and grooves 238 are arranged in such a way that one or more of the finger pieces will always be in engagement with one of the grooves 238 when the knob 230 is released, no matter how their relative positions may have been changed. In Fig. 19, for example, two of the finger pieces 240 are shown in engagement at 245.

Operation (Figs. 1, 3, 4, 15, and 16)

The handling of the individual paper sheets by the associated mechanisms herewith provided to feed the same from the stack, through the machine, and to the receptacle 226 will be considered from a point of view of the sequential treatment of one of the sheets of the stack.

The first position of this sheet is one in stacked relation with a plurality of other sheets maintained in the depository or feed table as noted at 115, Fig. 3.

After the sheets below the considered sheet in the stack are fed from the depository, its second position is one of rest in a definitely maintained curved manner upon the surface of the picker knife 103, and upon the surface of the preceding paper sheet situated upon the projecting arch piece 93 and the curved plate 97.

The third position of the sheet is indicated at 116A (Fig. 1) in which the same is tightly pressed against the feed rollers 73 and 64 by the feeding edge of the picker knife 103. This feeding operation is effected in the following manner. Upon operation of the long feed mechanism, the slotted link 114, Fig. 4, is urged to move the reciprocative base 90 so that the picker knife 103 is clear of the defined depository, permitting the sheet to rest directly upon the provided arch paper supporting members inasmuch as the preceding sheet has been removed by rollers 73 and 64, the slotted link conditioning the feed mechanism for effective operation. This means also simultaneously conditions the pointed arm 172

(Fig. 16) for effective operation by moving the same above the cooperating lug 173 of the restoring instrumentalities of the compensating feed mechanism. Then, upon completion of the long feed operation and the return of the mechanism to normal under influence of spring 206, slotted link 114 is withdrawn and spring 112 forms the means by which the conditioned parts are urged through an effective operation to return the arm 111 to its normal limiting hub contacting position 113. In this position, the edge of the considered sheet fed through the curved feed throat is positively positioned to facilitate further feeding movement of the sheet.

The fourth position of the considered paper sheet is shown at 116B (Fig. 1), in which the same is located at the uniform first entry designating position on the forms. This feeding movement is also accomplished by the operation of the long feed mechanism which, through gear 200 as heretofore described, causes rotation of the rollers 73 and 64, 72 and 64, 41 and platen 21 to obtain the desired constant distance of travel of the sheets in the machine.

The sheet is then line-spaced by movement of the platen under control of the usual line-space mechanism of the tabulator, such movement occurring after each printing of the form designated items of entry on this particular sheet. For purposes of illustration, the particular sheet may be considered the representative bill shown in Fig. 20 which indicates that, in the instant case, three such separate line-spaced items A, B, and C were printed thereon by the machine. By each line-spacing movement of the platen 21, through pinion 150 and gear 151, the lever 158 of the effectively conditioned compensating feed mechanism is urged correspondingly towards its forward limiting post 160, this action taking place without influencing the position of the mechanisms operating link 177. After operation of the machine to print the individual itemized entries for a given account, the same is conditioned to pass through a blank stroke cycle of operation prior to the initiation of a total taking cycle, at which time a total of the individual entries is also printed at the uniformly located sixth line-space position (T) on the sheets which contain a corresponding designation. The compensating feed mechanism is effective, during the end of the blank stroke cycle of the machine as hereinbefore described, to urge the platen 21 by operation of the mechanism through link 177, then conditioned for operation by the machine, so that the paper sheet is fed to this uniform total designation location by movement of the lever 158 to its forward limiting position 160. In the case of the example chosen, this action is effected by movement of lever 158 through the remaining distance to its stop 160, which is equivalent in extent to two normal line-space operations of the platen 21. The compensating feed control mechanism is then restored to normal position in inactive condition against its rear limiting post 163 by influence of the spring 162, the same remaining in this position until after the completion of an operation of the long feed mechanism which takes place during the following or total taking cycle of the machine. At that time, the restoring instrumentalities including finger piece 164 are urged by the pointed arm member 172 so that the finger 164 strikes against lug 165 to move the latch lever 155 to its locked position thus conditioning the compensating feed control mechanism for effective operation. The compensating feed control mechanism is consequently in inactive condition during each operation of the long feed mechanism. The line-space locations of the given paper sheet may be considered the fifth position thereof, while the location to which the sheet is advanced by the compensating feed mechanism, at the completion of its operation, may be considered the sixth position of the sheet.

The seventh position of the considered paper sheet is shown at 116C (Fig. 1), to which the same has been advanced by the usual operations of the long feed mechanism, through rotation of rollers 41, 72 and 63, and 71 and 62.

In the eighth position, the sheet is moved, by further operation of the long feed mechanism, through means of rollers 71 and 62 so that it is projected into the receptacle 226 at the front of the machine.

The respective attachments and controlling instrumentalities forming the embodiment of the present invention, as well as the required accessory rollers and guide members, may be readily dismantled from the tabulator head unit to restore the machine to normal condition.

While I have described what I consider to be highly desirable embodiments of my invention, it is obvious that many changes in form could be made without departing from the spirit of my invention, and I, therefore, do not limit myself to the exact form herein shown and described, nor to anything less than the whole of my invention as hereinbefore set forth, and as hereinafter claimed.

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

1. A device of the character described comprising a depository for a stack of individual sheets of paper from which the sheets are capable of being fed one at a time, intermittently operated feed rollers associated with said depository, a picker knife for feeding individual sheets of paper from the depository, said knife being situated with relation to the feed rollers to retain the edge of the sheet fed from the depository tightly pressed against the stationarily positioned feed rollers when the knife is inactively positioned, and means for rotating said feed rollers to feed the thusly positioned paper sheets.

2. In a cyclically operable paper feeding device comprising a magazine for storing paper forms, a form feeding mechanism to convey said forms to a printing position, and a picker mechanism to convey said forms from the magazine to the form feeding mechanism, the combination of common operating means for the picker mechanism and the form feeding mechanism, a driving connection between the operating means and the form feeding mechanism effective during the first portion of a cycle, and a driving connection between the operating means and the picker mechanism rendered effective after the beginning of the operation of the form feeding mechanism and rendered ineffective after the operation of the form feeding mechanism is completed.

3. In a cyclically operable paper feeding device comprising a magazine for storing paper forms, a form feeding mechanism to convey said forms to a printing position, and a picker mechanism to convey said forms from the magazine to the form feeding mechanism, the combination of common operating means for the picker mechanism and the form feeding mechanism, a driving connection between the operating means

and the form feeding mechanism effective during the first portion of a cycle, a driving connection between the operating means and the picker mechanism effective to complete operation of the latter to convey a form to the feeding mechanism after the feeding mechanism is stopped, and a lost motion connection in said last recited driving connection whereby the operation of the picker mechanism is started after the beginning of the operation of the form feeding mechanism.

4. In a cyclically operable paper feeding device comprising a magazine for storing paper forms, a form feeding mechanism to convey said forms to a printing position, and a picker mechanism to convey said forms from the magazine to the form feeding mechanism, the combination of means to operate the form feeding mechanism during the first portion of a cycle, means to operate the picker mechanism and complete such operation after the form feeding mechanism is stopped, and a lost motion connection in the picker mechanism operating means whereby the operation of the picker mechanism is started after the beginning of the operation of the form feeding mechanism.

5. In a cyclically operable paper feeding device comprising a magazine for storing paper forms, a form feeding mechanism to convey said forms to a printing position, and a picker mechanism to convey said forms from the magazine to the form feeding mechanism, the combination of common operating means for the picker mechanism and the form feeding mechanism, said operating means having a reciprocating motion completed during a cycle of machine operation, a driving connection between the operating means and the form feeding mechanism whereby the form feeding mechanism is actuated during movement of the operating means in one direction in the first part of a cycle, a driving connection between the operating means and the picker mechanism whereby the picker mechanism is operable during movement of the operating means in both directions, and a lost motion connection in said last recited driving connection whereby operation of the picker mechanism is started after the beginning of operation of the form feeding mechanism.

6. In a cyclically operable paper feeding device comprising a magazine for storing paper forms, a form feeding mechanism to convey said forms to a printing position, and a picker mechanism to convey said forms from the magazine to the form feeding mechanism, the combination of a cyclically oscillating member, a driving gear for the feed roll mechanism, a pinion mounted on said oscillating member engaging with and rotatable about said gear, a ratchet fixed to said pinion, and a pawl pivoted on said oscillating member and cooperating with said ratchet, the construction and arrangement being such that said driving gear is only rotated during the movement of said oscillating member in one direction in the first portion of a cycle, means operated by said oscillating member during its movement in both directions to actuate said picker mechanism, and a lost motion connection in said last recited means whereby operation of the picker mechanism is started after the beginning of the operation of the form feeding mechanism.

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