

R. E. BENNER.
 ADDING AND LISTING MACHINE.
 APPLICATION FILED MAR. 31, 1908.

1,013,923.

Patented Jan. 9, 1912.

5 SHEETS-SHEET 1.

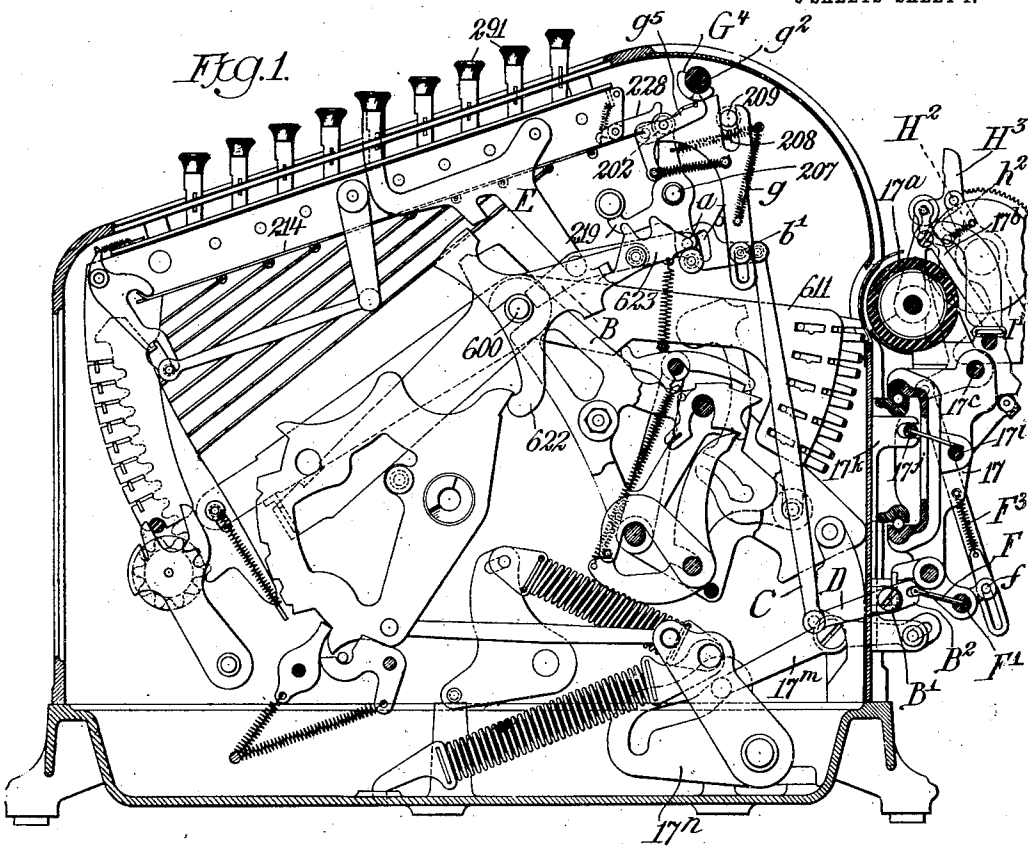


Fig. 2.

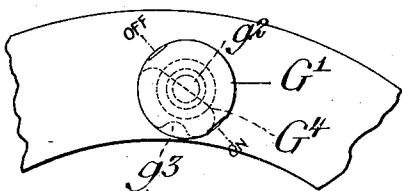
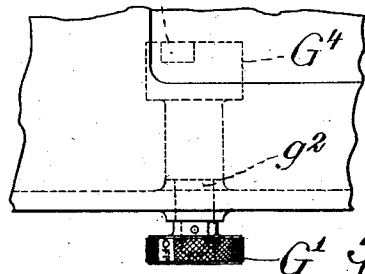


Fig. 3.



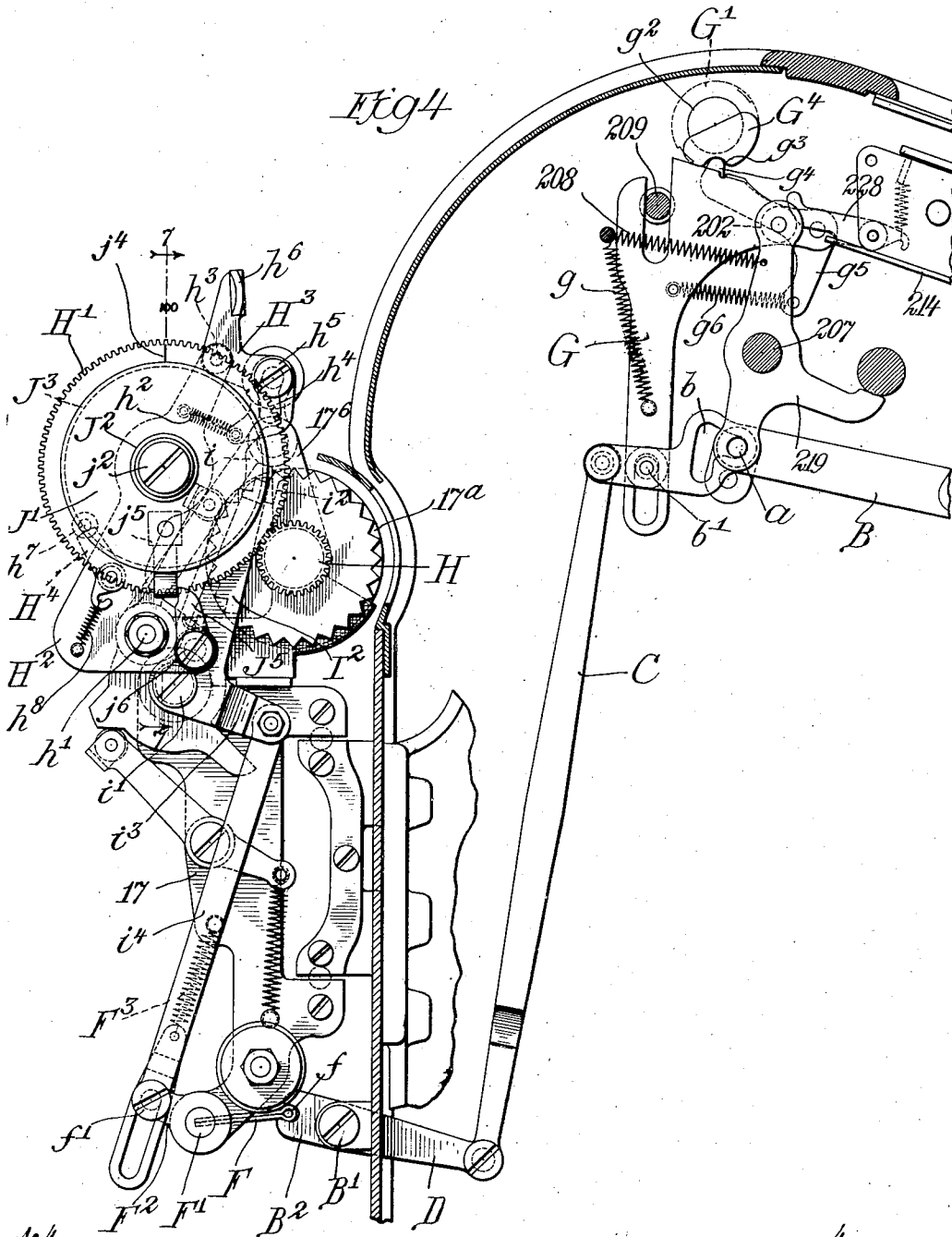
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5 SHEETS—SHEET 2.



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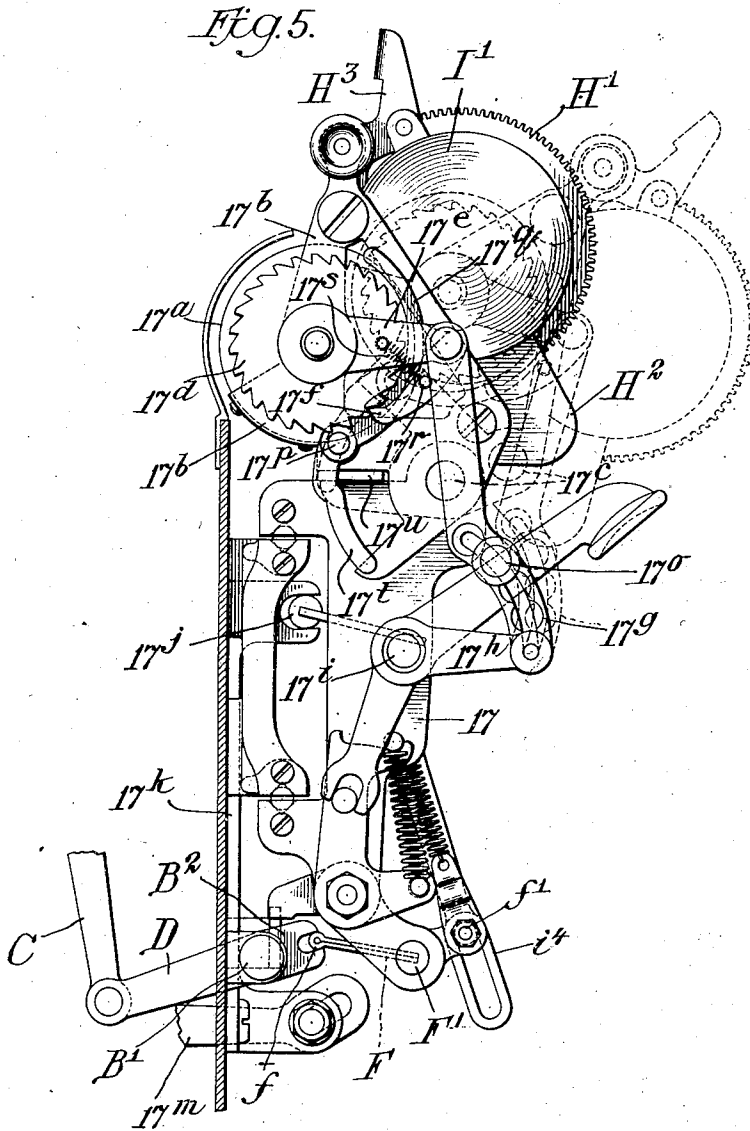
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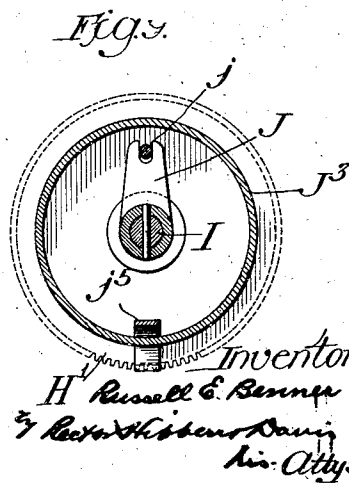
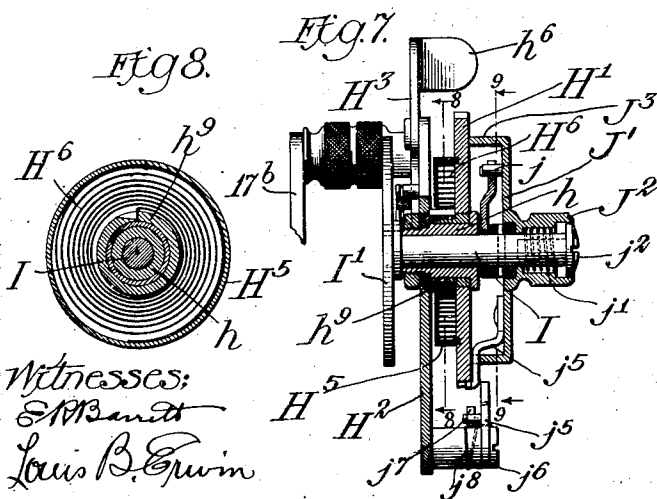
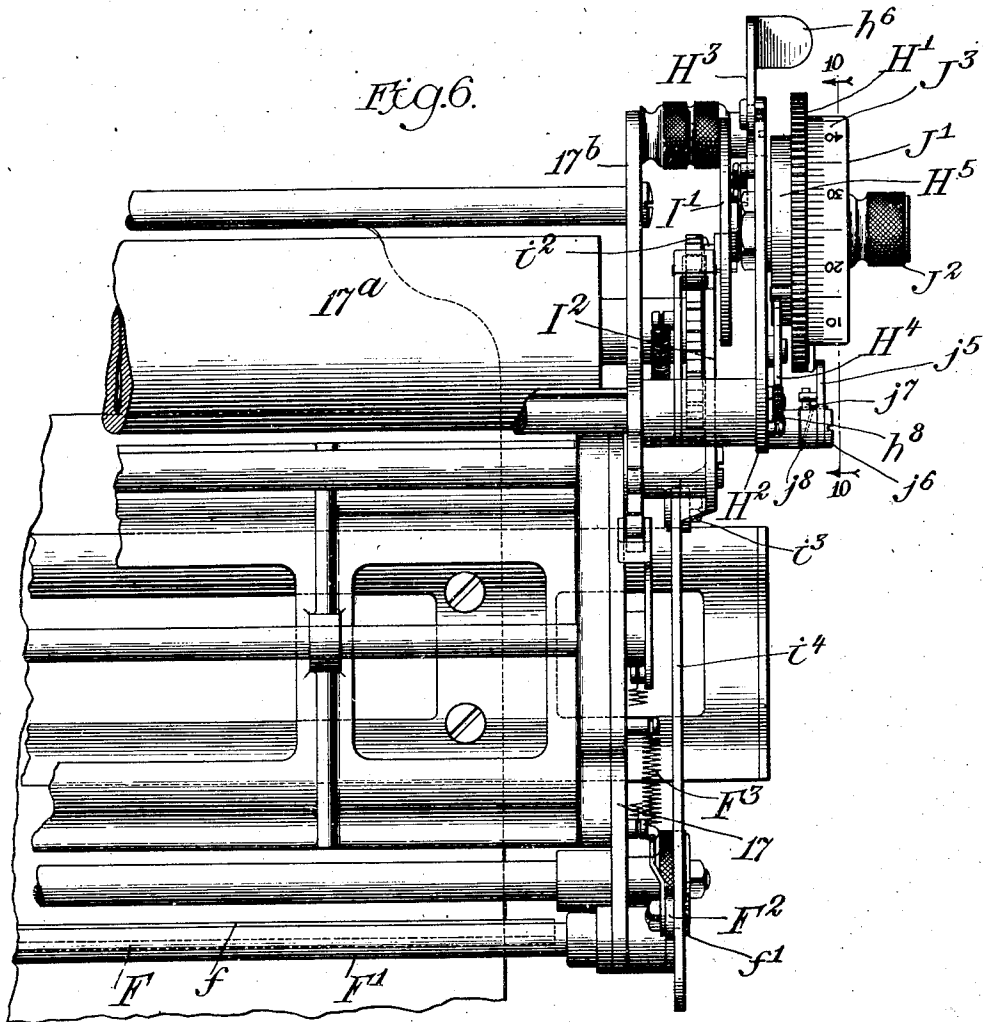


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5 SHEETS--SHEET 4.

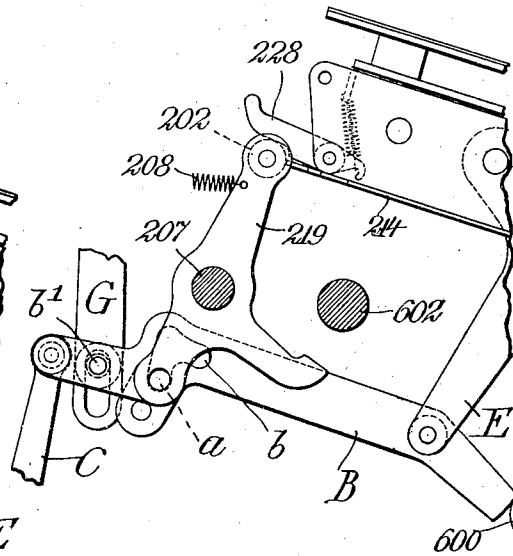
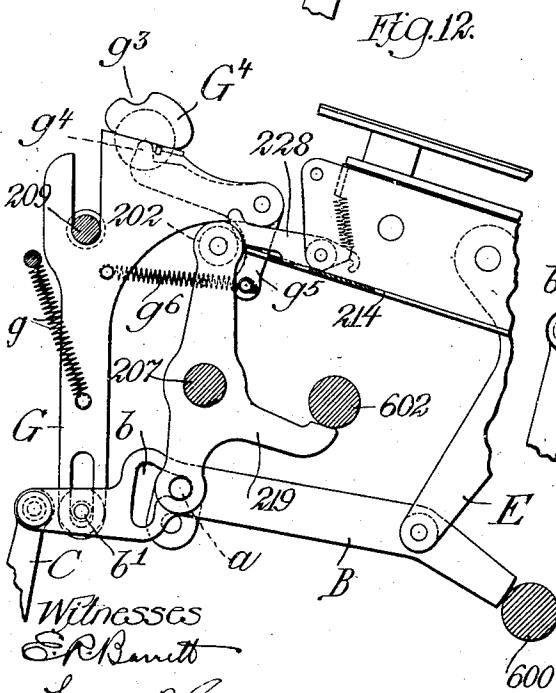
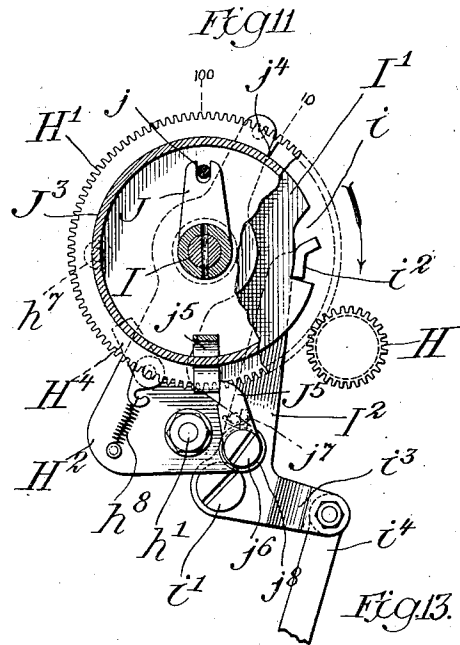
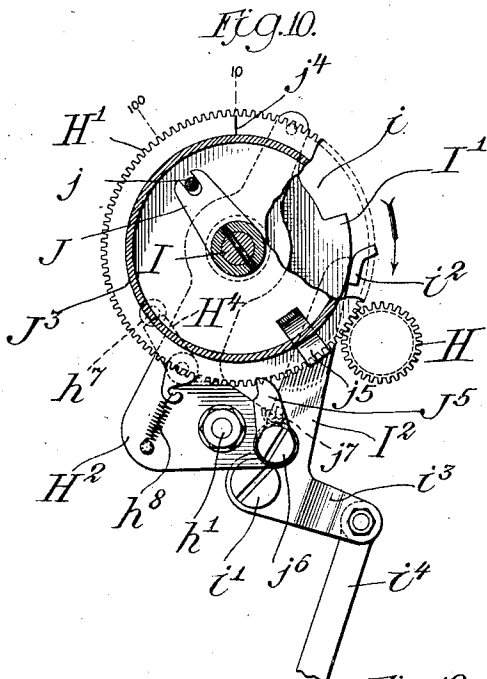


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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

RUSSELL E. BENNER, OF DETROIT, MICHIGAN, ASSIGNOR TO BURROUGHS ADDING MACHINE COMPANY, OF DETROIT, MICHIGAN, A CORPORATION OF MICHIGAN.

ADDING AND LISTING MACHINE.

1,013,923.

Specification of Letters Patent.

Patented Jan. 9, 1912.

Application filed March 31, 1908. Serial No. 424,333.

To all whom it may concern:

Be it known that I, RUSSELL E. BENNER, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a certain new and useful Improvement in Adding and Listing Machines, of which the following is a specification.

The principal object of the present invention is to provide an improved arrangement for regulating the listing of items or amounts so that where a wide sheet of paper is being employed and the length of lists of items must be limited on account of the limited length of the sheet of paper or where it is desired to definitely limit the length of a list for any reason, the operator will be relieved of the necessity of closely watching the printing as it progresses or counting the operations of the machine but will be automatically notified when the maximum number of items for a single list has been printed. In machines of this character it is customary to provide mechanism which operates to automatically advance the paper step by step as the machine is operated and it is further customary in machines where a roller platen is employed to provide for discontinuing the automatic advance of the paper when such platen is moved from printing position.

In Patent No. 595,864, issued December 21, 1897, on the invention of William H. Pike, Jr., there is shown and described a printing attachment for an adding and listing machine of the well-known Burroughs type, this attachment comprising a laterally shiftable paper carriage supporting a roller platen in a rocking frame. When said frame is swung forward the platen is brought to printing position and into frictional engagement with one or more driving rollers on a shaft turned step by step through ratchet-and-pawl mechanism, the latter actuated by suitable connections with the moving parts of the machine proper. This patent furthermore illustrates an alarm mechanism geared to such shaft and capable of being set to provide for the sounding of the alarm after a predetermined number of operations of the machine. Such devices as shown in said Pike patent and

above referred to have been in use quite extensively for a considerable time in Burroughs adding and listing machines. In a more recent type the method of automatically advancing the paper step by step has been somewhat modified by eliminating the friction drive and applying the ratchet-and-pawl mechanism directly to the journal of the roller platen and instead of discontinuing the automatic paper feed by separation of the roller platen from driving rollers it is accomplished by disengaging the pawl from the ratchet automatically by the act of throwing back the platen. In either case when the platen is thrown back it can be turned by hand in either direction. In the Pike construction any backward turning of the platen roller necessarily takes place when such roller is entirely disconnected from the alarm mechanism. Consequently the stop devices of the latter which serve to reestablish the normal condition under any desired adjustment cannot be availed of to set a limit to backward turning of the platen.

One feature of the present invention is the provision of stop devices which may not only serve to reestablish a normal condition of mechanism which measures the advance of the paper under different adjustments but also serve to measure backward movement of the paper as is highly desirable when several parallel vertical columns of amounts are to be printed, each containing the same number of items. Thus having arranged the paper to receive the first item of a list and having adjusted the measuring devices so as to provide for the printing of a predetermined number of items, and such number of items having been printed, the paper can be turned backward without the operator's having to watch the column of amounts or items already printed or the top edge of the paper but simply until the stop devices take effect when the paper will be positioned for starting a new column along the same horizontal line as the first item of the column already printed, it being of course assumed that the paper is shifted laterally.

Another feature of the present invention is the arrangement of the measuring mecha-

nism so as to always be "in step", so to speak, with the paper feed whether the paper is in printing position or not and therefore whether the paper is being advanced automatically by operations of the machine or by hand while the automatic feed is discontinued. Thus if in running a column of figures on a sheet of limited length under an adjustment which provides for notifying the operator when the end of the sheet has been reached, the operator should for any reason after listing a number of items advance the paper by hand to line space before continuing the listing of items, the measuring mechanism would be in operation both during the listing of items and during the spacing. Consequently, the operator would be notified when the end of the sheet of paper had been reached just the same as though the listing of items had gone on continuously without any such spacing as referred to. It will be obvious that this would not be true if, when the paper was moved back from printing position for the purpose of spacing, the measuring mechanism was disconnected as for instance in a construction such as that shown in said Pike patent.

While the present invention as to the above-specified features may be considered as broad enough to embrace constructions providing merely for the sounding of an alarm when the predetermined number of items have been listed, another feature of the invention relates to a different mode of notifying the operator when the list is complete as by causing the numbered keys or other manipulative amount-determining or setting-up devices to become locked. Thus having set the indexing or measuring devices to provide for the listing of a certain number of items, when that number of items has been listed the depressible amount keys will no longer yield to finger pressure and so the operator will be notified that the limit has been reached and that the paper must be run back to the starting point before further listing can be done.

While, as above indicated, the measuring mechanism can be utilized by adjusting the paper at the starting point and adjusting an index according to the number of items to be listed, the present invention provides for otherwise utilizing this mechanism which obviates the necessity of consulting the index. Thus starting with the stop devices at normal and advancing the paper by hand until the point is reached where the list should end, the indexing device need simply be brought up against its own stop, the paper then run back and brought to printing position and the machine operated.

Under either mode of utilizing the meas-

uring mechanism the notification to the operator will occur at the proper time and when the paper is moved out of printing position and run back it will be stopped at the proper point to begin a new list and that new list can be started without any readjustment of the measuring or indexing mechanism.

The invention further provides for conveniently restoring the measuring or indexing mechanism to normal when a different adjustment is desired in preparation for a different length of list. Provision is also made for conveniently disabling the measuring mechanism altogether when the machine is to be operated without limit as to the length of list as for example when listing amounts on a strip of paper drawn from a roll.

The invention is here shown and described in detail as applied to a machine of the above-mentioned Burroughs type and reference may be had for an understanding of the principles on which machines of this type are constructed, to Patents Nos. 504,963 and 505,078, issued September 12, 1893, on the inventions of William S. Burroughs. However, it is to be understood that the invention is not necessarily limited to the form of embodiment here shown which especially adapts it for use as an attachment to or improvement upon a machine of this Burroughs type, but the principles of the present invention may be applied to adding and listing or like machines of other types, the form of adaptation being modified to suit different conditions.

Of the accompanying drawings which form part of this specification and illustrate one form of adaptation of the present invention as applied to a machine of the Burroughs type, Figure 1 represents in right side sectional elevation an adding and listing machine of this type having the improvements of the present invention applied thereto; Figs. 2 and 3 are detail views, one being a right side elevation and the other a top plan view of a manipulative device whereby the measuring mechanism may be rendered operative or inoperative; Fig. 4 represents in left side sectional elevation the rear portion of the machine where the attachment of the present invention is located, the said manipulative device being shown positioned to disable the measuring mechanism; Fig. 5 represents a right side elevation of that portion of the machine which comprises the laterally shiftable paper carriage and the automatic paper feed mechanism; Fig. 6 represents in rear elevation the parts which appear in Fig. 4 excepting those which lie within or extend into the inclosing casing of the machine, they being at the opposite side of the machine;

Fig. 7 is a longitudinal vertical section of parts appearing at the upper right-hand portion of Fig. 6; Figs. 8 and 9 are cross-sections respectively on lines 8—8 and 9—9 of Fig. 7; Fig. 10 is a cross-section taken substantially on the line 10—10 of Fig. 6 with parts broken away to disclose others beyond; Fig. 11 is a view similar to Fig. 10 but illustrating a different relative positioning of parts; Fig. 12 is a sectional elevation similar to the upper right-hand portion of Fig. 4 but showing the manipulative device positioned to enable the measuring mechanism, also illustrating the effect of depressing amount keys of the machine; and Fig. 13 is a somewhat similar elevation illustrating the release of depressed amount keys which ensues after the printing of the last item of a list and the locking of amount keys against further depression.

As the Burroughs machine is so well known on account of its extensive commercial use and also by reason of the issuance of the before-mentioned patents and many others it will not be necessary to enter into a detailed description of the same and for the purpose of a thorough understanding of the present invention it will suffice to refer only to so much of the Burroughs mechanism as intimately associated with the devices applied to the machine for the purpose of carrying out the present invention. The depressible keys 291 arranged in rows and those of each row numbered from 1 to 9 operate to thrust rearwardly the usual sliding detent strips 214 and spring-held pivoted detents 228 engage in apertures of said strips to hold the same in positions to which they are moved by the keys. The usual key-releasing bail is employed, the same comprising a cross-rod 202 to act upon the detents 228 and side plates 219 secured to a rock shaft 207. The bail is normally drawn rearward by a spring 208 and swung forwardly against the stress of such spring by the familiar wipe-pawl or cam plate 623 which takes effect at the close of the machine's operation. When the bail is so rocked forward its cross-rod 202 not only lifts the detents 228 but also acts against the rear ends of the strips 214. Therefore if the bail should be locked in its forward position no amount keys could be depressed. The present invention provides for so locking this bail. The depending arm of the right-hand side-piece 219 of the said bail, which arm carries the usual roll for co-action with the wipe-pawl 623, also carries a stud *a* which normally occupies the upper portion of a substantially right-angled slot *b* in a link B jointed to the usual error key lever E and normally abutting the central rock-shaft 600 of the machine. This link may thus serve the usual function of a con-

nection from the error key to the key-releasing bail for effecting release of erroneously depressed keys. In the present instance this link serves an additional function in that by elevating its rear end when the key-releasing bail is rocked forward otherwise than by depression of the error key, the substantially vertical portion of the said right-angled slot *b* will be caused to engage the stud *a* and thus lock the bail against return movement and thereby prevent depression of the amount keys. The two branches of the slot are curved, one to accord with the arc movement of the stud *a* when the bail is oscillated with the link in its lowered position and the other to accord with the arc movement of the link when it rises to lock the bail or lowers to release the same. This horizontally extending link B is jointed at its rear extremity to a vertically-extending link C and the latter at its lower end is jointed to an arm D secured to the right-hand end of a short rock-shaft B' journaled in bearings on the back of the machine and which has secured to its opposite end a bifurcated arm B² embracing a bead *f* on a plate F which extends longitudinally of and is secured to a rock shaft F' in bearings on the laterally shiftable paper carriage 17. The left-hand end of this rock shaft F' (Fig. 4) has secured to it a short arm F², and a spring F³ connects said arm with an upper portion of said paper carriage. This spring tends to rock the plate F downward and thus lift the arm D and the link B but is normally restrained from so doing by mechanism hereinafter described which measures the advance of the paper and counts the listed items. It will be seen that an operative connection is preserved between the above-specified parts on the laterally shifting carriage and the bail-locking parts in the machine proper by reason of the sliding connection between the bifurcated arm D² and the elongated plate F.

In order to provide for preventing a locking of the bail even though the above-mentioned spring F³ might be permitted to act so far as the measuring or item-counting mechanism is concerned, (as when indefinitely listing items on roll paper), a plate G (Figs. 1, 4 and 12) is slidably mounted in the machine, being slotted to embrace a cross shaft 209 and also slotted to embrace a stud *b'* on the link B. This plate is drawn upward by a spring *g* and when in its uppermost position as shown in Fig. 12 said stud *b'* is at the bottom of the slot and the plate therefore does not interfere with a rise of the link B to lock the key-releasing bail. However, when the said plate is depressed so that the stud *b'* is in the upper end of the slot it will be obvious that said link cannot rise and lock the bail. The adjustment of

the plate is controlled by a manipulative device illustrated in detail in Figs. 2 and 3 and comprising a knurled knob G' on the exterior of the casing and preferably inscribed at diametrically opposite points with the words "On" and "Off," said knob being secured to a short shaft or arbor g^2 journaled in a suitable bearing on the machine casing and having on its inner end a substantially semi-circular head G^4 overlying the upper edge of the plate G . When the said knob is turned to a position where the inscription Off is uppermost said head occupies such a position as that shown in Fig. 4 where its rounded periphery is in contact with the upper edge of said plate holding the latter depressed. The said head is rounded off so as to operate with an easy camming effect upon the edge of the plate and it will be obvious that in turning it will act to depress the latter.

In order to prevent accidental displacement of the head G^4 it is formed with a detaining notch g^3 adapted to be engaged by the nose g^4 of a catch lever g^5 pivoted to a forward extension of the plate G and connected by a spring g^6 with the rear portion of the plate. It will be seen that as the head G^4 is turned it will displace said catch lever and when the head is turned to a position where the nose of said lever may enter the notch g^3 there will be yielding resistance to displacement of the said head. When the knob G' is turned to a position where the inscription On is uppermost the flat portion of the head G^4 lies in contact with the upper edge of the plate G so that the latter may occupy its upper position and present no obstruction to rise of the link B . Such a condition is represented in Fig. 12 and in Fig. 13 the link B is illustrated as having swung upward and locked the bail in its forward position. In Figs. 1 and 4 the plate G is illustrated in its lowered position, the knob being turned to the off position and the link B therefore obstructed so that the bail may swing back and forth indefinitely.

Passing now to the paper-carrying portion of the machine the reference numeral 50 17^a designates the usual roller platen which is journaled in a rocking frame on the carriage 17, said frame comprising side-pieces 17^b secured to a rock shaft 17^c . On the right-hand end of the roller platen journal there is secured a ratchet wheel 17^d (Fig. 5) and there is loosely mounted upon said journal an arm 17^e carrying a pawl 17^f spring-drawn into engagement with said ratchet. A link 17^g is connected to said pawl-carrying arm and slotted at its lower end for engagement with a stud on an arm 17^h secured to a rock shaft 17^i , said rock shaft carrying a bail 17^j which has sliding engagement with jaws of a vertical slide bar 17^k on the back of the machine.

Said slide bar is engaged by a lever 17^m (Fig. 1) which is vibrated by a cam 17^n oscillating in every operation of the machine. The vertical reciprocations of the slide bar 17^k thus produced cause up and down vibrations of the bail 17^j and the arm 17^h and this movement is transmitted to the pawl 17^f to first retract the same and then cause it to turn the roller platen. An abutment piece 17^o (Fig. 5) may be engaged with one or another of a series of sockets in the link 17^g to vary the amount of movement imparted to the roller platen, it being understood that the stud of the arm 17^h moves said link upward by acting against said abutment piece and downward by acting against the lower end of the slot of the link.

The throwing back of the platen by rocking its supporting frame about the axis of the rock shaft 17^c as a center, has the effect of disengaging the pawl 17^f from the ratchet wheel 17^d . The construction employed for such purpose is of the following description: There is pivoted to the right-hand side-piece 17^b of the roller platen cradle or rocking frame at the point 17^p a lever having a curved upwardly-projecting arm 17^q extending in front of a stud 17^r on the pawl 17^f which is drawn into engagement with the ratchet wheel 17^d by a spring 17^s . The lever has a downwardly-extending arm 17^t bearing against a lateral projection 17^u of the carriage 17 and formed with a cam portion normally just below said lateral projection. When the platen is thrown back the said lever is of course carried with it. The cam portion of the lever coacting with the lateral projection on the carriage causes the lever to be rocked sufficiently to disengage the pawl from the ratchet wheel by the action of the curved upper arm 17^q of said lever against the pawl-stud 17^r as illustrated in dotted lines in Fig. 5.

It will be seen that when the platen is forward or in printing position the engagement of the pawl with the ratchet will prevent backward turning of the platen but when the platen is thrown back and the pawl disengaged from the ratchet in the manner already described the platen may be rotated backward by means of the usual knob on the end of the platen journal. The paper is as usual introduced from the rear on the underside of the platen between the same and suitable pressure rollers and the turning of the platen in either direction carries the paper with it.

Coming now to the mechanism for measuring the paper feeding and retracting movements of the platen there is secured to the left-hand end of the platen journal a small gear wheel H (Fig. 4) which normally meshes with a larger gear wheel H'

loose on a sleeve h (Fig. 7), the latter secured to a plate or arm H^2 which is pivotally mounted on the left-hand side-piece of the platen cradle or rocking frame, said plate or arm having a limited movement about the center h' sufficient to carry the gear wheel H' into and out of engagement with the small gear wheel H . The large gear wheel is normally held in engagement with the small gear wheel both by the preponderance of weight on the right-hand side of the center h' as the parts are seen in Fig. 4 and by the action of a spiral spring h^2 which connects the upper part of the arm or plate H^2 with the lower rearwardly-projecting end of a cam lever H^3 of double bell crank outline pivoted at its upper angle to the upper extremity of said plate or arm H^2 as shown at h^3 . In the forward substantially vertical portion of this lever there is formed an angular slot h^4 which engages a screw stud h^5 on the platen rock frame or cradle. The spring h^2 tends to draw this slotted portion of the lever downward and engage the upper end of the slot with said stud which has the effect of locking the arm H^2 in its forward position with the gears in mesh. The lever H^3 , however, has a finger piece H^6 to be pressed back when the gears are to be disengaged. The first effect of rearward finger pressure on this lever is to rock the same on its pivot causing the upper branch of the slot h^4 to traverse the stud h^5 , such portion of the slot being concentric with the lever. Continued pressure on the lever will then rock the arm H^2 back both by reason of the fact that the above-mentioned travel of the upper branch of the slot has unlocked said arm and the finger pressure can therefore take effect to rock the gear-carrying arm and also by reason of a camming effect of the lower branch of the slot against the stud h^5 . This lower branch of the slot extends at an angle to the upper portion and the rocking of the lever H^3 after this lower branch of the slot has reached the stud h^5 necessarily causes a displacement of the arm or plate H^2 as the slot continues to traverse the stud. The engagement between the stud h^5 and the rear edge of the lower branch of the slot will obviously have the effect of camming the arm or plate H^2 rearwardly. When the lever H^3 is relieved of finger pressure the spring h^2 causes the forward edge of the lower branch of the slot to act upon the stud with a camming effect which draws the arm or plate forwardly, reengaging the gears.

Turning of the gear wheel H' by the gear wheel H in a direction opposite that in which the parts move when the paper is being advanced, is stopped at a uniform point by the abutment of a stud h^7 on the gear

H' against the end of a pass-by pawl H^4 which is pivotally mounted on the plate H^2 and held forward by a spring h^8 as illustrated in Fig. 4. In forward rotation the gear H' will not be stopped by this pawl because the stud h^7 may then wipe over the pawl, the spring h^8 yielding, but as soon as the stud has passed this spring restores the pawl to position for stopping the reverse rotation of the gear. This gear H' is employed for advancing a measuring device a distance predetermined according to the number of items to be listed in one column, and the size of the gear is such as to provide for the maximum number of items which would be listed when there would be any occasion for setting a limit. Therefore so far as operation of the machine under any such limitation might be concerned there need be no such provisions as above described for permitting the gear to turn beyond a single rotation, *i. e.* the abutment piece for the stud h^7 need not be of the pass-by variety. However, as before explained, the application of the present invention to a machine of the character referred to at the outset of this specification provides for the ordinary use of the machine for indefinitely listing items on a strip of paper drawn from a roll and this would call for indefinite turning of the said gear wheel H' which it will have been seen is provided for by the above-described pass-by pawl construction.

When the machine is being operated under an adjustment for limiting the number of items included in a single column it is highly desirable that the backward turning of the platen shall bring the paper to the same starting point each time and it will be obvious that the stop devices above described will serve this purpose inasmuch as the gear H' will always be stopped at the same point by the abutment of the stud h^7 against the pass-by pawl H^4 , and inasmuch as said gear turns with the platen. These stop devices also come into play when the gear wheel H' is disengaged from the gear wheel H after limited columns of items have been printed and it is desired to change the adjustment. The gear wheel H' (Fig. 7) carries on its inner side a spring barrel H^5 and a volute spring H^6 within said barrel has frictional engagement at its outer end with the same and at its inner end is secured to the sleeve h through the medium of a collar h^9 secured to said sleeve and loosely surrounding a hub of the gear wheel. This spring serves to return the latter when disengaged from the platen gear, the rotation of the gear by the paper-advancing movement of the platen being in opposition to the spring so as to wind up the latter. Of course the action of the

spring in returning the gear is limited by the abutment of the stud h^7 against the pass-by pawl H^4 .

Referring now to the indexing devices by which the number of items to be listed may be determined a shaft I extends through the sleeve h which supplies a bearing for the shaft and on the inner end of the latter there is secured a disk I' which is formed in its periphery with a notch i (dotted lines Fig. 4 and full lines Figs. 10 and 11), said notch being of substantially segmental outline abrupt at one end and beveled or sloped at the other end. A finger I^2 pivoted at i' on the carriage 17 is formed at its upper end with a lateral angular lip i^2 overlying the periphery of the notched disk. This finger has an extension i^3 forward of its pivot, which extension has jointed to it a link i^4 slotted at its lower end to embrace a stud f' on the arm F^2 . When the finger is upon the unbroken periphery of the disk said link is lowered, bringing the upper end of its slot upon the stud f' . Upward movement of the arm F^2 by the spring F^3 , which it will be remembered has the effect of locking the key-releasing bail and preventing depression of the keys, cannot take place so long as rearward movement of the finger I^2 is obstructed by the notched disk but when the notch of the disk comes opposite the lateral lip i^2 of said finger obstruction to rearward movement of the latter is no longer presented by the disk and so the spring F^3 is not thereby prevented from acting.

There is secured to the shaft I outwardly beyond the gear H' (Figs. 7 and 9) a radial arm J bifurcated at its outer end and there is slidably mounted upon the shaft outwardly beyond this arm a disk J' having a stud j occupying the bifurcation of said radial arm so that the disk J' and the shaft I will always be rotatively engaged though said disk may be moved longitudinally of the shaft. The disk is formed with a knurled knob J^2 by which to manipulate it, the said knob being in the nature of a hub surrounding the shaft. It is recessed to accommodate a spiral spring j' which is confined by a screw j^2 entering the shaft I (Fig. 7). Said spring serves to thrust the disk inwardly against the outer side of the gear H' . The disk has a peripheral flange J^3 to bear against said gear and this flange is graduated and suitably inscribed to correspond with the feed movements of the platen. The gear H' has a radial mark j^4 (Fig. 4) with which any one of the graduations on the flange J^3 may be made to register, thus determining how far the paper may be advanced before the amount keys will be locked. Of course when the indexing disk has been adjusted to register the desired graduation mark with the mark on the gear wheel it should be so engaged with the gear

wheel as to rotate as a part thereof. To this end there is secured to the disk J' (Fig. 7) a dog j^5 which preferably is in the form of an angular piece secured to the inner side of the disk and projecting through a notch in the flange and formed at its outer extremity with a number of laterally projecting teeth to engage the teeth of the gear wheel, being withdrawn laterally therefrom when the disk is moved outwardly on the shaft and of course thrust laterally into the teeth of the gear when the disk is released and the spring j' moves the disk against the side of the gear. Turning of the disk backwardly when withdrawn from engagement with the gear wheel is limited by the abutment of said dog against a pass-by pawl J^5 mounted on a stud j^6 carried by a forward projection of the rocking plate or arm H^2 . When the disk is interlocked with the gear wheel said pass-by pawl does not stand in the path of the dog but when the disk is withdrawn from engagement with the gear the dog will encounter the pass-by pawl when the disk is turned backward. This pawl will yield under forward turning of the disk, being held against a suitable stop pin j^7 by a spring j^8 (Fig. 4). It should be noted that the gear wheel H' is wider than the platen gear wheel and that the teeth of the dog can only project half-way across the teeth of the gear wheel H' (Fig. 7). Consequently, the intermeshing of the gear wheels is not affected by the engagement of the dog with the teeth of the larger wheel.

As the notched disk I' is secured to the same shaft with which the flanged disk J' is always rotatively engaged it follows that the relation between the notch of the disk I' and the line-spacing scale made up of graduations on the flange J^3 of the disk J' never varies. Consequently, the setting of the flanged disk at different positions will vary the point at which the notch of the disk I' will arrive opposite the lip of the finger I^2 . The normal position of the measuring gear H' , being the position to which it is brought by its spring H^6 as before explained, is such that the indexing mark j^4 is at the upper side of the wheel where it can be conveniently viewed when adjusting the indexing disk. It will be obvious that the adjustment of the latter with relation to said mark will determine the point at which the notch of the disk I' will permit the locking of the amount keys to take place. Thus if the column of items is to be limited to ten the indexing disk will be disengaged from the gear wheel and turned until the graduation mark opposite the inscription "10" registers with the mark j^4 (as shown in Fig. 10) and said disk then reengaged with the gear. The latter being at normal when the work begins the amount

keys will be locked after the printing of the tenth item (as indicated in Fig. 11), assuming of course that the automatic line-spacing mechanism is adjusted to correspond with the graduations on the index disk. These graduations will preferably be made to correspond with single spacing, *i. e.*, advance of the platen a distance of a single tooth of the ratchet wheel. It will be noted that in Fig. 5 the tappet-piece 17° is positioned to provide for this single spacing.

It will be seen that with the above construction applied to a machine of the character indicated it will only be necessary when the length of columns is to be limited on account of limited length of paper, for example, to start with the measuring gear wheel at normal and set the indexing disk according to the number of items to be included in one column, then proceeding with the listing in the ordinary way. The locking of the amount keys upon the printing of the last item notifies the operator that the limit has been reached. Assuming that columns of items are to be printed side by side as will ordinarily be the case when there is occasion to use devices such as those provided by the present invention, the operator will then shift the carriage to the left, throw back the platen and then rotate it backward as far as it will go. The stop devices before described limit such backward rotation to the point where the first column of items started. If the work being done includes continuous addition of items or amounts then it will usually be desirable to print a sub-total at the bottom of the first column which can be done after the amount keys have become locked. The locking of such keys does not affect the sub-total or total keys or prevent movement of the operating handle and parts connected therewith. Consequently, when the amount keys become locked, indicating completion of the column, the usual spacing stroke can thereupon be taken and then the sub-total or total key depressed and the handle again operated to print a total or sub-total. Where a total is to be carried to the next column it is preferable, when the platen has been turned backward as above described, to first again print the sub-total before proceeding with the listing. This sub-total will appear on the same horizontal line as the first item of the column already printed, or it may be opposite the imprint of a special character denoting a clear condition of the machine before the starting of the work. Then following items will appear opposite items of the first column respectively down to the last added one thereof when the keys again become locked. If the addition is to continue with the total carried to a third column then a spacing stroke will be taken as before and a second sub-total printed. The operation already

described can be continued for as many columns as desired and all sub-totals at the top of columns will be in the same horizontal line and all sub-totals at the foot of columns will also be in the same horizontal line. Of course the total printed at the foot of the last column will ordinarily be a grand total and not a sub-total but it would be in line with the sub-total footings.

The above mode of utilizing the measuring and stop mechanisms of the present invention need not necessarily be followed in order to secure the desired column regulation. Having caused the measuring gear to assume normal position, which as before explained can be done at any time by simply pressing back the lever H^a, and having thrown back the platen, the latter may be advanced by hand until the paper is advanced to the point where the columns should end. Then the indexing disk may be drawn out disengaging it from the gear and turned backward as far as it will go, *i. e.* until the dog J^s comes up against the pass-by pawl J^s (Fig. 4). This brings the notch *i* of the disk I' opposite the lip *i*² of the finger I² as shown in dotted lines in Fig. 4. The gear H' has, however, been turned by the turning forward of the platen so that the stop stud *h*^r is not at normal as in Fig. 4 but advanced a distance corresponding with the advance of the platen. The latter will now be turned backward as far as it will go, *i. e.* until the said stop stud *h*^r comes up against the pass-by pawl H^a. This of course means that the platen is turned backward exactly the same distance it had previously been turned forward. The indexing disk being at this time interlocked with the measuring gear, (this having taken place upon the release of the disk after its being turned back as above described) the backward turning of the gears carries the notch *i* away from the lip *i*² of the finger I² a distance corresponding with the extent to which the platen has been turned backward. Consequently, when the listing thereupon ensues the notch will again be brought opposite the lip of the finger when the platen has advanced to the same extent it was previously turned by hand and the locking of the amount keys will therefore take place at the point previously determined upon when the platen was turned forward by hand. Further columnar printing will be carried on the same as already described in connection with the other method of using the measuring mechanism.

While as before stated backward turning of the index disk is limited by the abutment of the dog against the pass-by pawl J^s, the latter will yield to the turning of the disk in the opposite direction and so if for example the index disk is to be shifted from an adjustment for twenty items to an adjust-

ment for ten items it can be moved directly from the one position to the other, the dog displacing the pass-by pawl. Otherwise it would be necessary to turn the disk nine times as far in the opposite direction.

As before stated the locking of the amount keys does not lock the machine against operation but the operating handle can still be worked and of course when the handle is pulled with the platen in printing position the line-spacing will take effect whether amount keys are depressed or not. The notch in the disk I' is sufficiently long to allow for several strokes of the operating handle after the amount keys have been locked, thus providing for the spacing and total-printing above referred to, without affecting the locking connections. Of course it is to be assumed that the operator, having run a column of items and printed a total at the foot of the same, will have no occasion to further operate the handle of the machine until the paper has been run back for the starting of a new column. But if the handle is pulled more times than the length of the notch in the disk I' provides for no disastrous results will ensue for as before explained one edge or side of said notch is beveled and the lip of the finger I² is angular so that such excessive operation of the handle would simply result in the finger being cammed out of the notch and the key-releasing bail unlocked. This might be availed of where for some reason a certain amount of spacing was desired between groups of items in the same column. Thus the measuring mechanism might be set for the printing of a predetermined number of items and then instead of turning the platen backward and shifting the paper carriage when the amount keys became locked, the operating handle could be pulled until the amount keys became unlocked and the listing could then be resumed. However, ordinarily when items are to be listed in a column of unlimited length the amount key locking mechanism would be disabled altogether by the use of the knob G'.

It will be noted that when the platen is thrown back the finger I² will be rocked rearward by the platen journal and the link I⁴ thus elevated so that it no longer obstructs the arm F². Hence with the platen thrown back the amount keys will become locked as a result of a single stroke of the operating handle. But upon bringing the platen forward again the keys would be unlocked by reason of the action of the link I⁴ upon the stud f', unless of course the notch of the disk I' was opposite the lip of the finger I² in which case the amount keys should of course remain locked. This locking of the amount keys as a result of throwing back the platen is in fact a desirable feature inasmuch as it prevents repeated operation of the machine

in such manner as to project the type rearwardly with the platen out of printing position, which sometimes results in injury to the type-plates in machines of this kind.

What I claim is:

1. In a machine of the class described, the combination of manipulative amount-determining devices, paper feeding devices, and means controlled by the latter for automatically locking said amount-determining devices against manipulation after a predetermined number of successive operations of the feeding devices.

2. In a machine of the character described, the combination of setting-up devices, paper feeding devices, and means controlled by the latter for automatically locking the setting-up devices after a predetermined number of successive operations of the feeding devices with provisions for disabling said means at will.

3. In a machine of the character described, the combination of manipulatively depressible amount keys, paper feeding devices, and means controlled by the latter for automatically locking the keys against manipulative depression after a predetermined number of successive operations of the feeding devices.

4. In a machine of the character described, the combination of depressible amount keys, paper feeding devices, and means controlled by the latter for automatically locking the keys against depression after a predetermined number of successive operations of the feeding devices with provisions for disabling said means at will.

5. In a machine of the character described, the combination of depressible amount keys, detents for holding the keys depressed, means for displacing the detents to release the keys, said means capable of blocking further depression of keys, paper feeding devices, and means controlled thereby for holding said detent-displacing means in key-blocking position.

6. In a machine of the character described, the combination of depressible amount keys, detents for holding the keys depressed, means for displacing the detents to release the keys, said means capable of blocking further depression of keys, paper feeding devices, and means controlled thereby for holding said detent-displacing means in key-blocking position with provisions for disabling said last-mentioned means at will.

7. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, paper feeding devices and means controlled thereby to lock said bail against retraction.

8. In a machine of the character described, the combination of depressible keys, detent

strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, paper feeding devices, and means controlled thereby to lock said bail against retraction with provisions for disabling said means at will.

9. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; paper feeding devices and means controlled thereby for in turn controlling said pivoted arm.

10. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; paper feeding devices and means controlled thereby for in turn controlling said pivoted arm with provisions for disabling said means at will.

11. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; means tending to shift said arm to locking position; and paper feeding devices controlling said means.

12. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; means tending to shift said arm to locking position;

tion, and paper feeding devices controlling said means to permit shifting of the arm after the feeding devices have operated a predetermined number of times; and means operable at will to prevent such shifting notwithstanding permitted by the feeding devices.

13. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; means tending to shift said arm to locking position; a slotted spring-held slide piece engaging said arm; and a finger piece for moving said slide piece against its spring and thus preventing the shifting of the arm notwithstanding permitted by the feeding devices.

14. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; means tending to shift said arm to locking position; a slotted spring-held slide piece engaging said arm and carrying a spring-held catch; and an on-and-off knob carrying a cam-piece engaging said slide and notched for engagement with the said catch.

15. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; means tending to shift said arm to locking position; paper feeding devices; a notched disk moved thereby; and a member engaging the disk and the aforesaid means tending to shift the bail-locking arm.

16. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips,

said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; spring-actuated link-and-lever connections tending to shift said arm to locking position; paper feeding devices; a notched disk moved thereby; a pivoted finger engaging the periphery of said disk; and connections between said finger and the said link-and-lever connections for restraining the latter except when the finger is opposite the notch in the disk.

17. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; means tending to shift said arm to locking position; paper feeding devices; a notched disk moved thereby and variously adjustable with relation thereto; and a member engaging said disk and the aforesaid means tending to shift the bail-locking arm.

18. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; means tending to shift said arm to locking position; paper feeding devices including a roller platen, gearing turning therewith, a notched disk moved by said gearing, and a member engaging said disk and the aforesaid means tending to shift the bail-locking arm.

19. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; means

tending to shift said arm to locking position; paper feeding devices including a roller platen, gearing turning therewith, a notched disk moved by said gearing and variously adjustable with relation thereto, and a member engaging said disk and the aforesaid means tending to shift the bail-locking arm.

20. In a machine of the character described, the combination of setting up devices, a laterally shiftable paper carriage, paper feeding devices thereon, and means controlled by the latter for automatically locking the setting-up devices after a predetermined number of successive operations of the feeding devices.

21. In a machine of the character described, the combination of depressible amount keys, a laterally shiftable paper carriage, paper feeding devices thereon, and means controlled by the latter for automatically locking the keys against depression after a predetermined number of successive operations of the feeding devices.

22. In a machine of the character described, the combination of depressible amount keys, detents for holding the keys depressed, means for displacing the detents to release the keys, said means capable of blocking further depression of keys, a laterally shiftable paper carriage, paper feeding devices thereon, and means controlled by said feeding devices for holding said detent-displacing means in key-blocking position.

23. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, a laterally shiftable paper carriage, paper feeding devices thereon, and means controlled by said feeding devices to lock said bail against retraction.

24. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; a laterally shiftable paper carriage, paper feeding devices thereon, and means controlled by said feeding devices for in turn controlling said pivoted arm.

25. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and abut the strips,

said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; means tending to shift said arm to locking position; a laterally shiftable paper carriage, and paper feeding devices thereon controlling said means.

26. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and about the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; means tending to shift said arm to locking position; a laterally shiftable paper carriage; paper feeding devices thereon; a notched disk moved by said feeding devices; and a member engaging the disk and the aforesaid means tending to shift the bail-locking arm.

27. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and about the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; spring-actuated link-and-lever connections tending to shift said arm to locking position; a laterally shiftable paper carriage; paper feeding devices thereon; a notched disk moved by said feeding devices; a pivoted finger engaging the periphery of said disk; and connections between said finger and the said link-and-lever connections for restraining the latter except when the finger is opposite the notch in the disk.

28. In a machine of the character described, the combination of depressible keys, detent strips moved thereby, detents for engaging said strips, a spring-retracted bail to displace the detents and about the strips, said bail having a stud, a pivoted arm angularly slotted to engage said stud, the latter normally traversing one branch of the slot which permits the bail to advance and retract but the other branch of the slot adapted to engage the stud when the bail is advanced and prevent its retraction; a link coupled to said arm, a lever coupled to said link and bifurcated at the opposite end, an

elongated rocking member slidably socketed in said bifurcated lever-end, a laterally shiftable paper carriage, paper feeding devices thereon, a notched disk moved by said feeding devices, a pivoted finger engaging said disk, and a link connecting said finger with the elongated rocking member.

29. In a machine of the character described, the combination with a paper feeding roller, means for advancing the same step by step and means for disabling said roller-advancing means to permit backward rotation of the roller; of a back stop for uniformly limiting such backward rotation, and a device adapted to turn with the roller but adjustable relatively thereto for variously measuring the advance thereof.

30. In a machine of the character described, the combination with a paper-carrying frame movable into and out of position for presenting the paper to be printed upon, a paper feeding roller mounted in said frame, and means for advancing said roller step by step with provisions for disabling said means by movement of said frame out of printing position to permit backward turning of the roller; of a back stop for uniformly limiting such backward rotation, and a device adapted to turn with the roller but adjustable relatively thereto for variously measuring the advance thereof.

31. In a machine of the character described, the combination of a paper feeding roller having a gear, a second gear meshing with the latter, a spring applied to said second gear to resist its turning by advance of said roller, a member adapted to turn with said second gear and adjustable relatively thereto, means for advancing the paper feeding roller step by step, means controlled by said member to signalize the advance of the feed roller a predetermined extent, means for disabling the roller-advancing means while the gears remain in mesh, and a stop to limit the turning of the second gear by its spring.

32. In a machine of the character described, the combination of a paper feeding roller having a gear, a second gear movable into and out of engagement with the latter, a spring applied to said second gear to resist its turning by advance of said roller, a member adapted to turn with said second gear and adjustable relatively thereto, means for advancing the feed roller step by step, means controlled by said member to signalize the advance of the feed roller a predetermined extent, means for disabling the roller-advancing means while the gears remain in mesh, and a stop to limit the turning of the second gear by its spring.

33. In a machine of the character described, the combination with a paper-carrying frame movable into and out of position for presenting the paper to be printed

upon, a paper feeding roller mounted in said frame and having a gear, and means for advancing said roller step by step with provisions for disabling said means by movement of said frame out of printing position to permit backward turning of the roller; of a second gear meshing with that on the paper-feeding roller and mounted on the paper-carrying frame, a spring applied to said second gear to resist its turning by advance of the roller, a member adapted to turn with said second gear and adjustable relatively thereto, means controlled by said member to signalize advance of the roller a predetermined extent, and a stop to limit turning of the second gear by its spring.

34. In a machine of the character described, the combination with a paper-carrying frame movable into and out of position for presenting the paper to be printed upon, a paper feeding roller mounted in said frame and having a gear, and means for advancing said roller step by step with provisions for disabling said means by movement of said frame out of printing position to permit backward turning of the roller; of a second gear mounted on the paper-carrying frame but movable into and out of engagement with the gear on the paper-feeding roller, a spring applied to said second gear to resist its turning by advance of the roller, a member adapted to turn with said second gear and adjustable relatively thereto, means controlled by said member to signalize advance of the roller a predetermined extent, and a stop to limit turning of the second gear by its spring.

35. In a machine of the character described, the combination of a paper-feeding roller, means for advancing the same step by step, a device adapted to turn with said roller and adjustable to variously measure the advance thereof, and a stop to limit the independent backward turning of said device.

36. In a machine of the character described, the combination with a paper-feeding roller, means for advancing the same step by step and means for disabling said roller-advancing means to permit backward rotation of the roller; of a back stop for uniformly limiting such backward rotation, a device adapted to turn with the roller but adjustable relatively thereto for variously measuring the advance thereof, and a stop to limit backward turning of said device.

37. In a machine of the character described, the combination with a paper-carrying frame movable into and out of position for presenting the paper to be printed upon, a paper feeding roller mounted in said frame, and means for advancing said roller step by step with provisions for disabling said means by movement of said frame out

of printing position to permit backward turning of the roller; of a back stop for uniformly limiting such backward rotation, a device adapted to turn with the roller but adjustable relatively thereto for variously measuring the advance thereof, and a stop to limit backward turning of said device.

38. In a machine of the character described, the combination of a paper feeding roller having a gear, a second gear meshing with the latter, a spring applied to said second gear to resist its turning by advance of said roller, a member adapted to turn with said second gear and adjustable relatively thereto, means for advancing the feed roller step by step, means controlled by said member to signalize the advance of the feed roller a predetermined extent, means for disabling the roller-advancing means, a stop to limit the turning of the second gear by its spring, and a stop to limit backward turning of said member.

39. In a machine of the character described, the combination of a paper feeding roller having a gear, a second gear movable into and out of engagement with the latter, a spring applied to said second gear to resist its turning by advance of said roller, a member adapted to turn with said second gear and adjustable relatively thereto, means for advancing the feed roller step by step, means controlled by said member to signalize the advance of the feed roller a predetermined extent, means for disabling the roller-advancing means, a stop to limit the turning of the second gear by its spring, and a stop to limit backward turning of said member.

40. In a machine of the character described, the combination with a paper-carrying frame movable into and out of position for presenting the paper to be printed upon, a paper feeding roller mounted in said frame and having a gear, and means for advancing said roller step by step with provisions for disabling said means by movement of said frame out of printing position to permit backward turning of the roller; of a second gear meshing with that on the paper-feeding roller, a spring applied to said second gear to resist its turning by advance of the roller, a timing member adapted to turn with said second gear and adjustable relatively thereto, means controlled by said timing member to signalize advance of the roller a predetermined extent, a stop to limit turning of the second gear by its spring, and a stop to limit backward turning of said timing member.

41. In a machine of the character described, the combination with a paper-carrying frame movable into and out of position for presenting the paper to be printed upon, a paper feeding roller mounted in said frame and having a gear, and means for advancing said roller step by step with

provisions for disabling said means by movement of said frame out of printing position to permit backward turning of the roller; of a second gear movable into and out of engagement with that on the paper-feeding roller, a spring applied to said second gear to resist its turning by advance of the roller, a member adapted to turn with said second gear and adjustable relatively thereto, means controlled by said member to signalize advance of the roller a predetermined extent, a stop to limit turning of the second gear by its spring, and a stop to limit backward turning of said member.

42. In a machine of the character described, the combination of a rocking frame or cradle, a paper feed roller carried thereby and moved into and out of printing position by the rocking of said frame, said roller having a gear, a support pivotally mounted on said frame, a gear carried by said support and moved into and out of mesh with the gear on the roller by the swinging of the support, a spring resisting turning of the gears by the roller in advancing the paper, a stop to limit return movement of the second gear, and a member movable with the latter and adjustable relatively thereto for variously measuring advance movement of the roller.

43. In a machine of the character described, the combination of a rocking frame

or cradle, a paper feed roller carried thereby and moved into and out of printing position by the rocking of said frame, said roller having a gear, a support pivotally mounted on said frame, a gear carried by said support and moved into and out of mesh with the gear on the roller by the swinging of the support, a spring resisting turning of the gears by the roller in advancing the paper, a stop to limit return movement of the second gear, a member movable with the latter and adjustable relatively thereto for variously measuring advance movement of the roller, and a cam-slotted finger piece pivoted on said support and engaging the frame and spring-drawn in a direction to intermesh the gears.

44. In a machine of the character described, the combination of a paper-feeding roller, a gear wheel turned thereby and having an indexing mark, an indexing disk rotarily adjustable relatively to said gear and adapted to be turned therewith, said disk having a flange with indexing graduations to register with said mark on the gear, and means controlled by said disk for measuring the advance of the roller.

RUSSELL E. BENNER.

Witnesses:

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