Jan. 28, 1947. C. J. HUEBER 2,414,813

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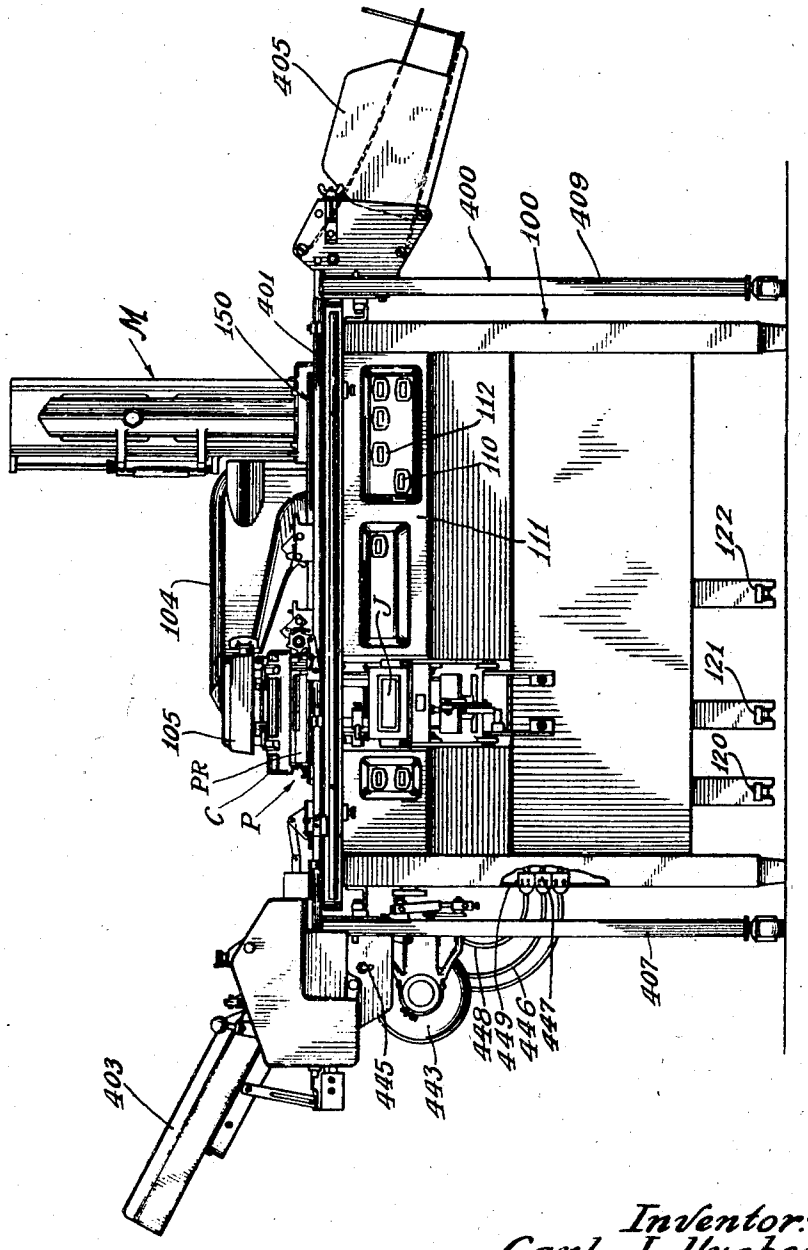


FIG. 1.

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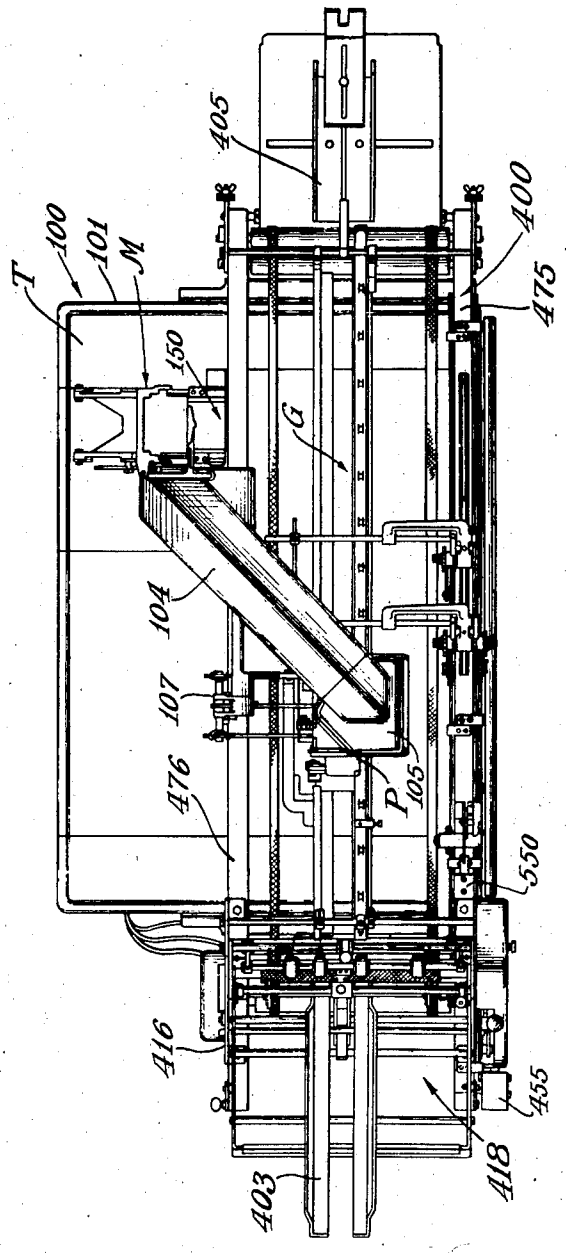


FIG. 2.

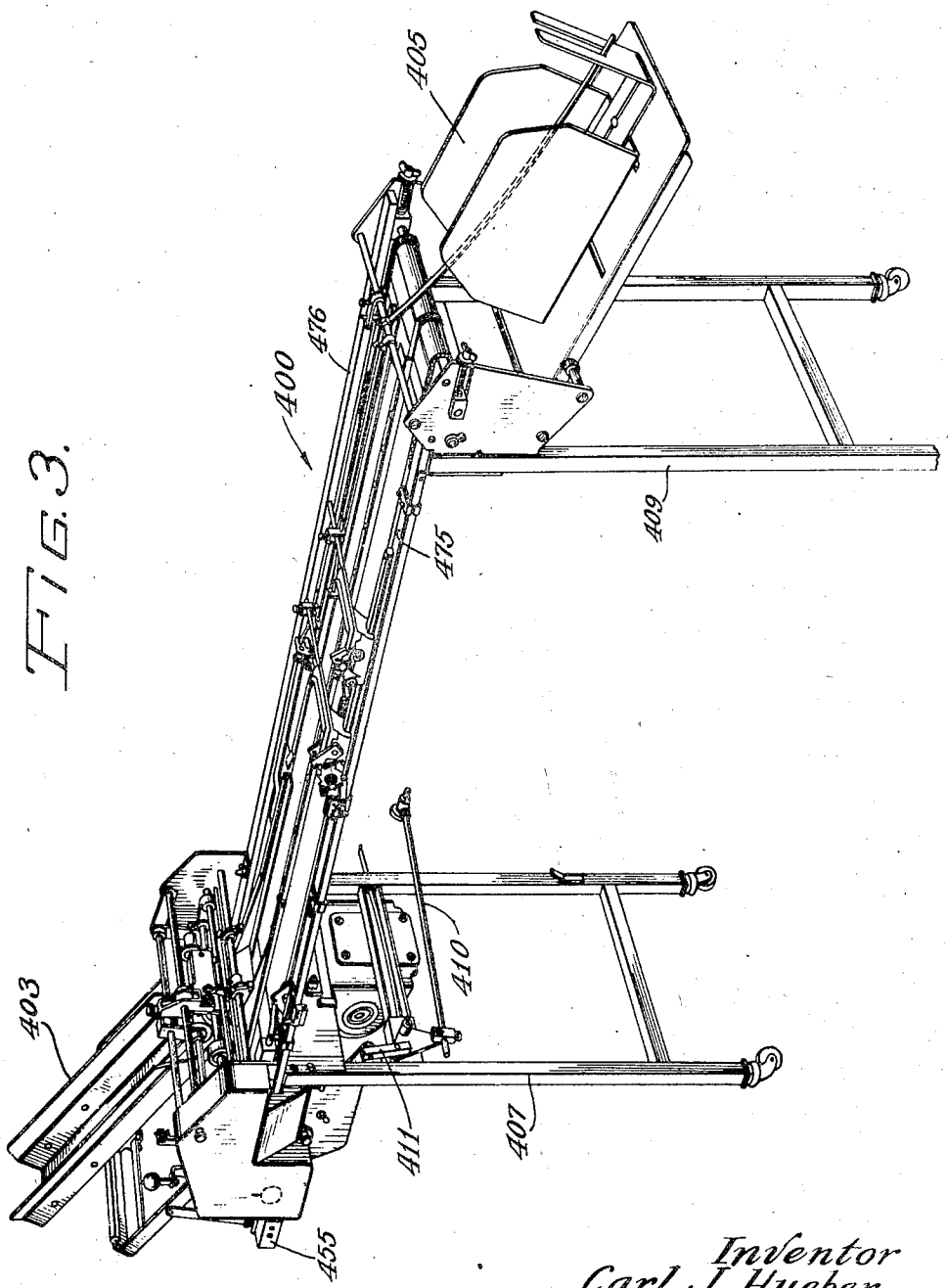
Inventor:
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FIG. 3.



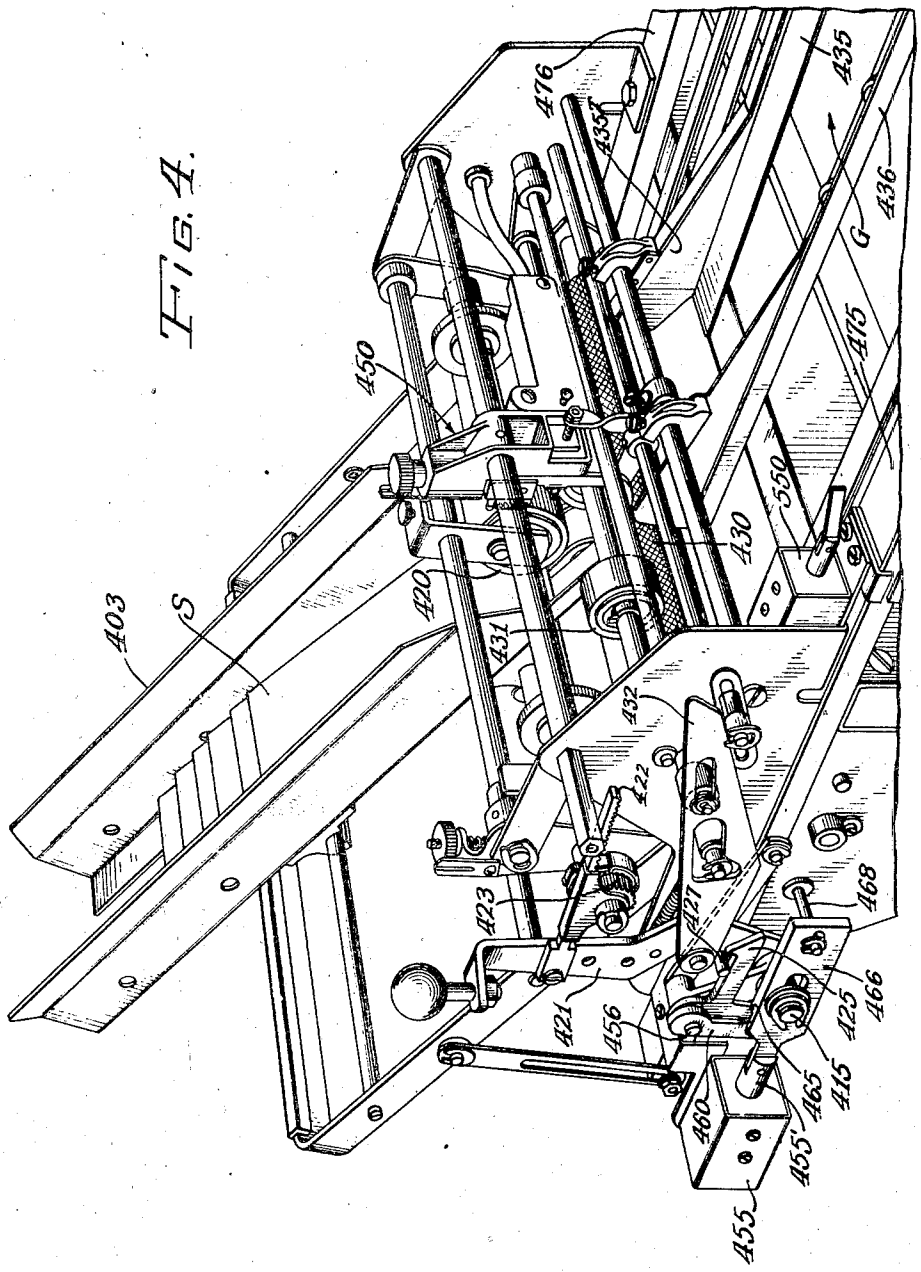
Inventor
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FIG. 4.



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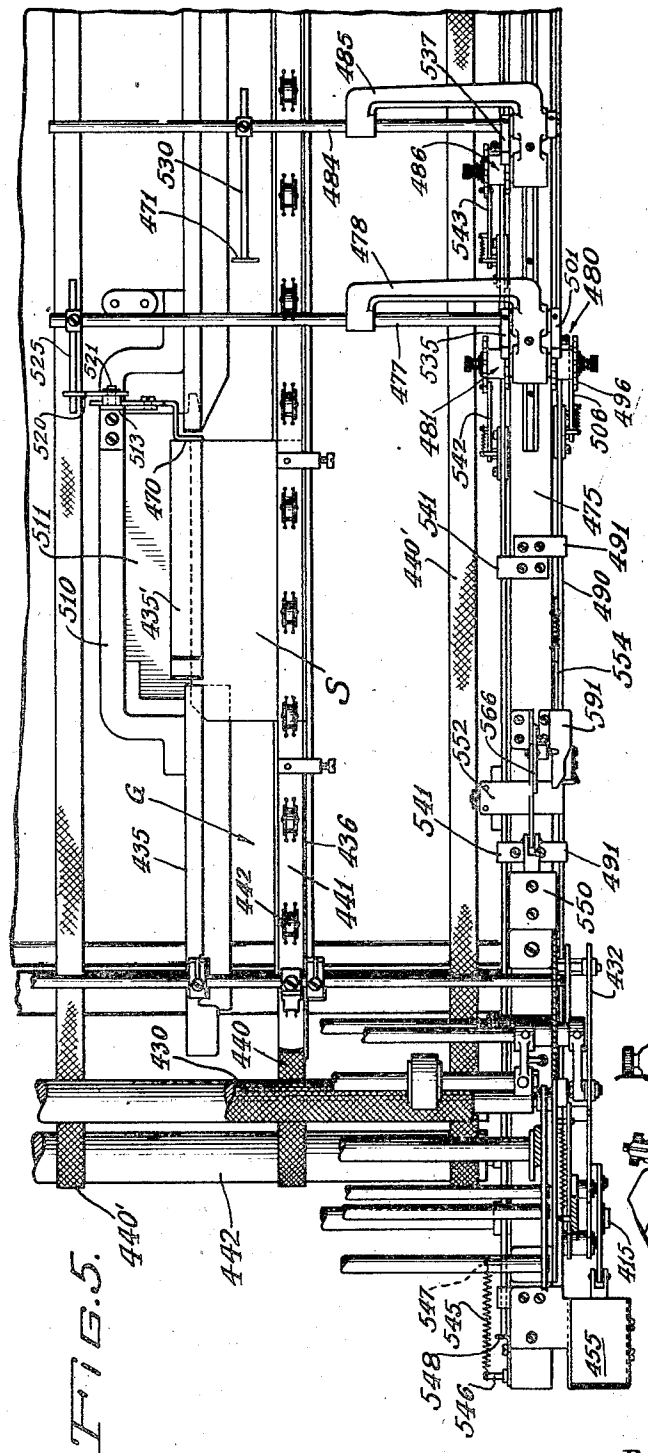


FIG. 5.

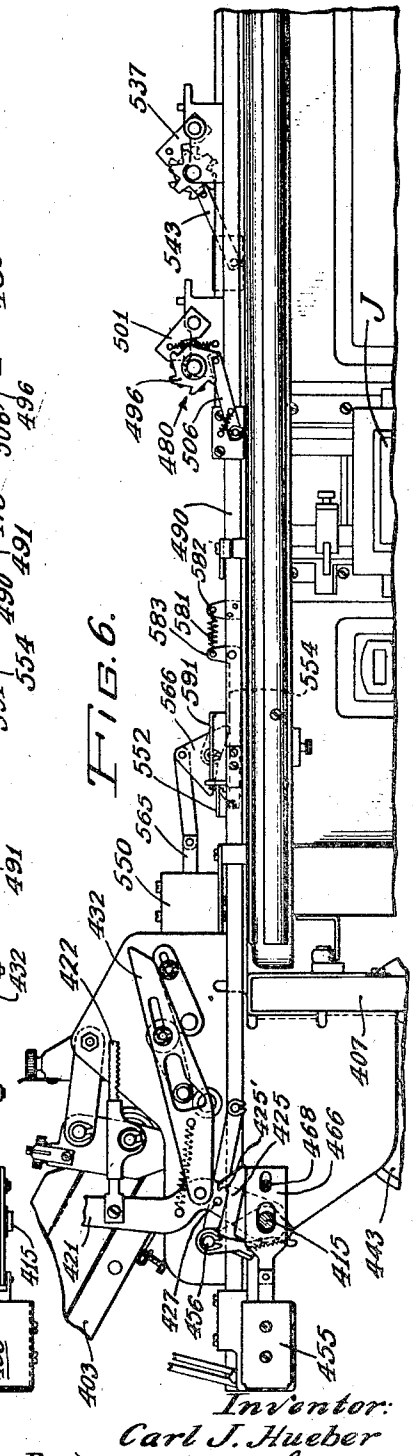


FIG. 6.

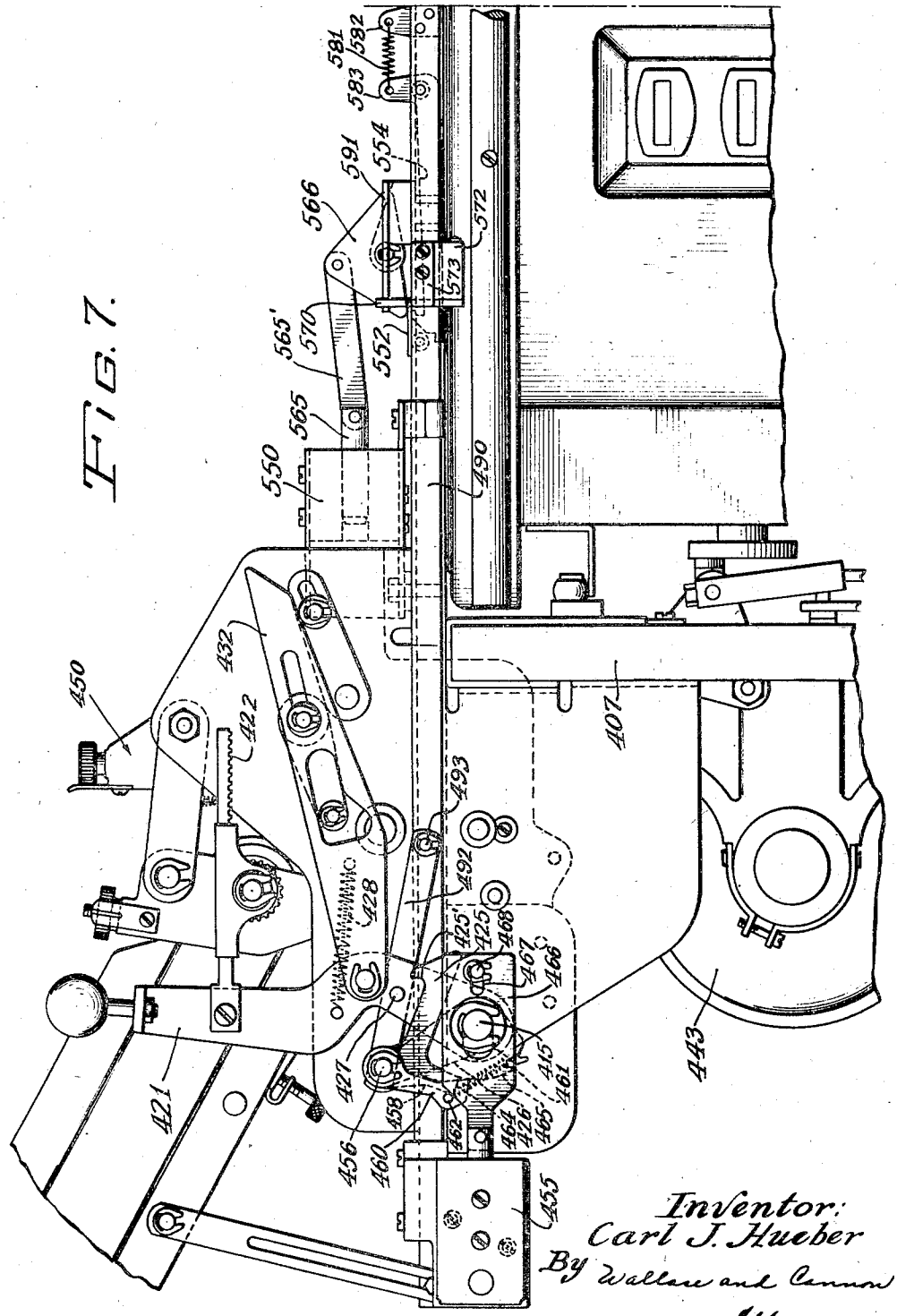
Inventor:
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FIG. 7.



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Fig. 8.

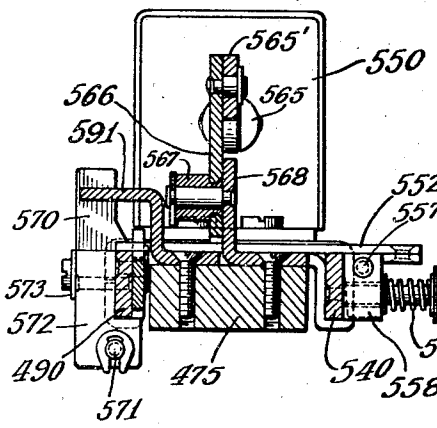


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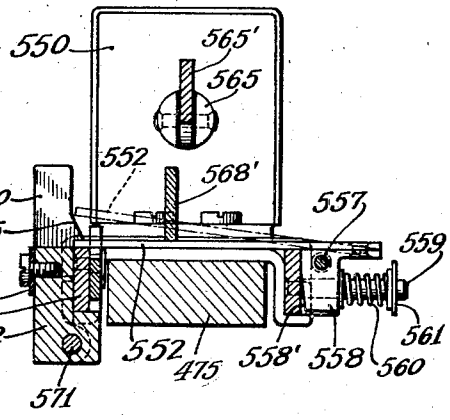


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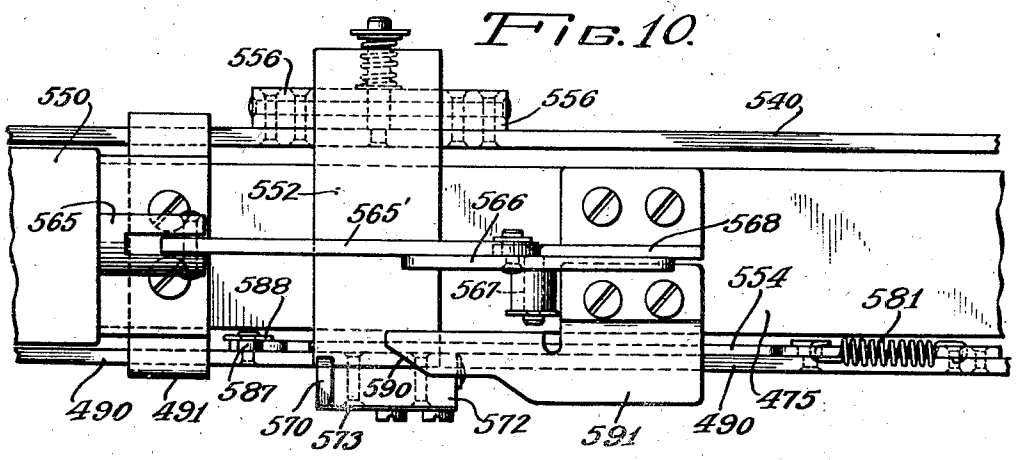
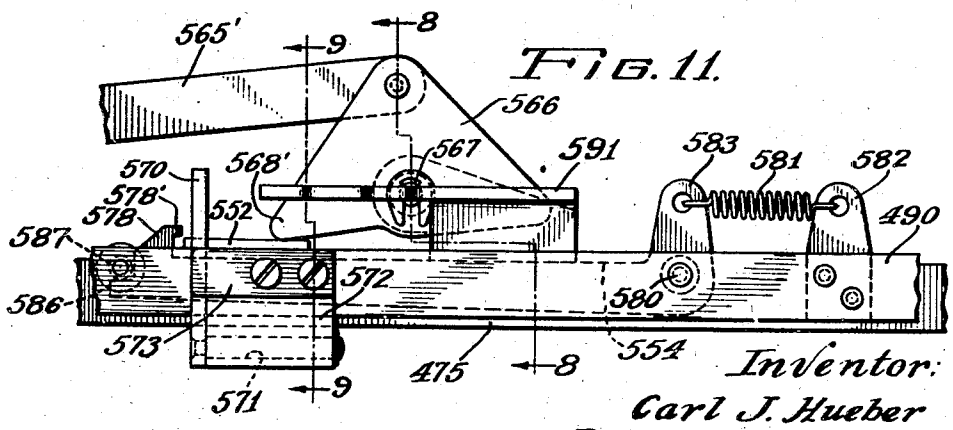


Fig. 11.



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Fig. 12

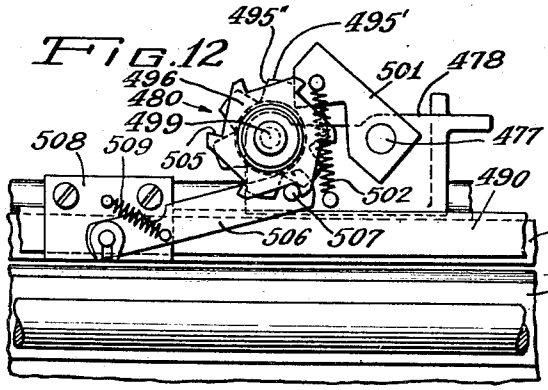


Fig. 13.

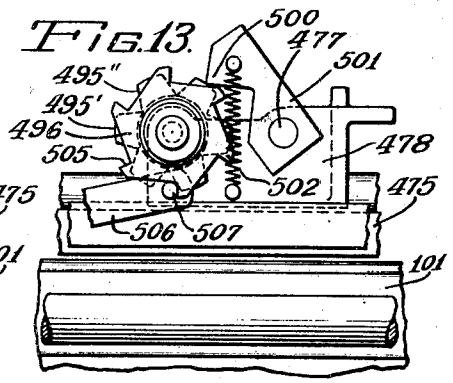


Fig. 14.

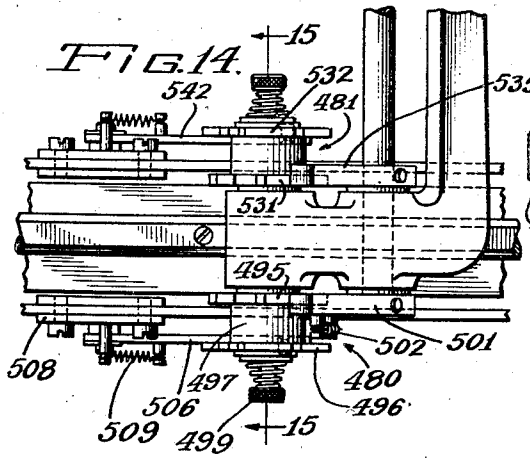


Fig. 15.

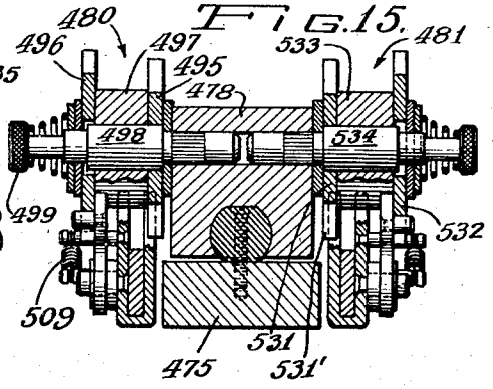
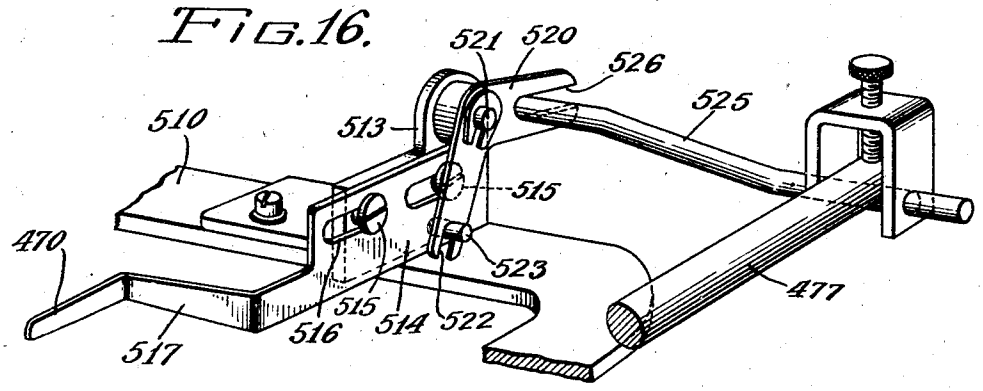


Fig. 16.



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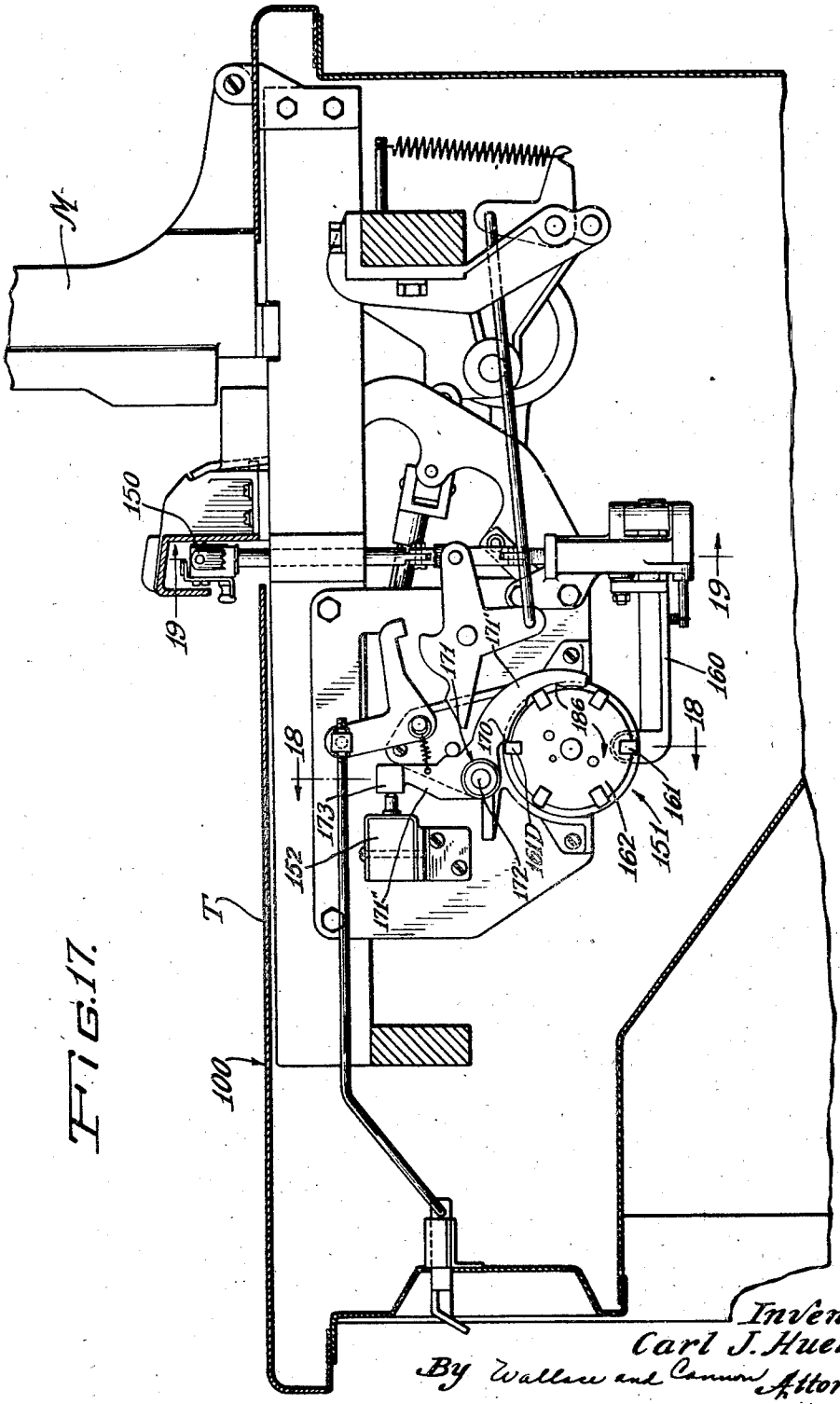


Fig. 17.

Inventor:
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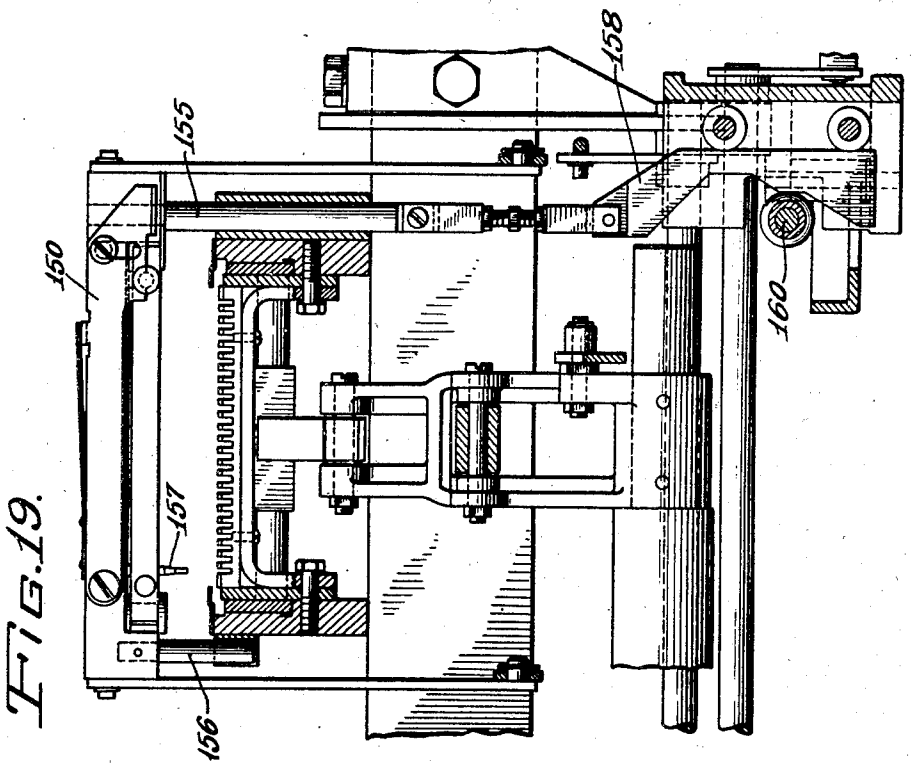


FIG. 19.

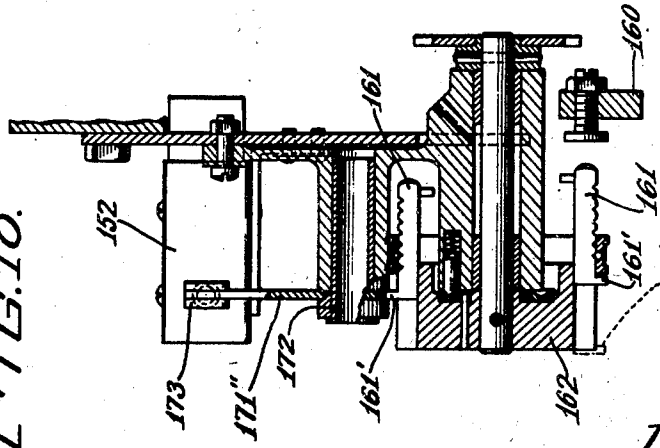


FIG. 18.

Inventor:
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FIG. 20.

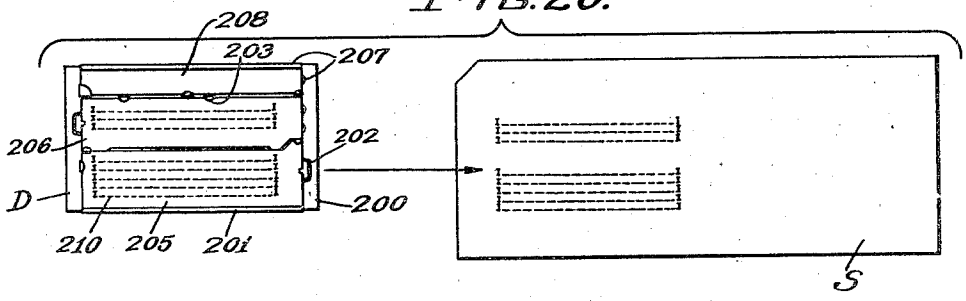


FIG. 21.

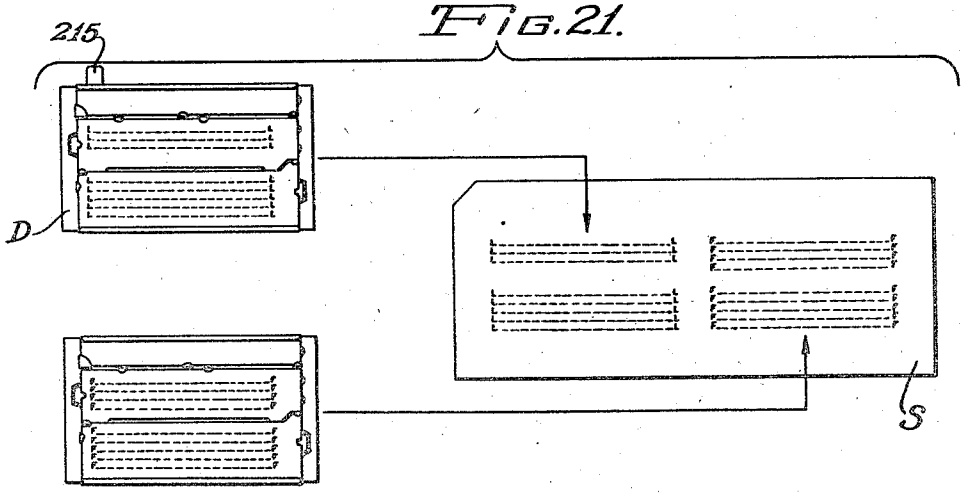
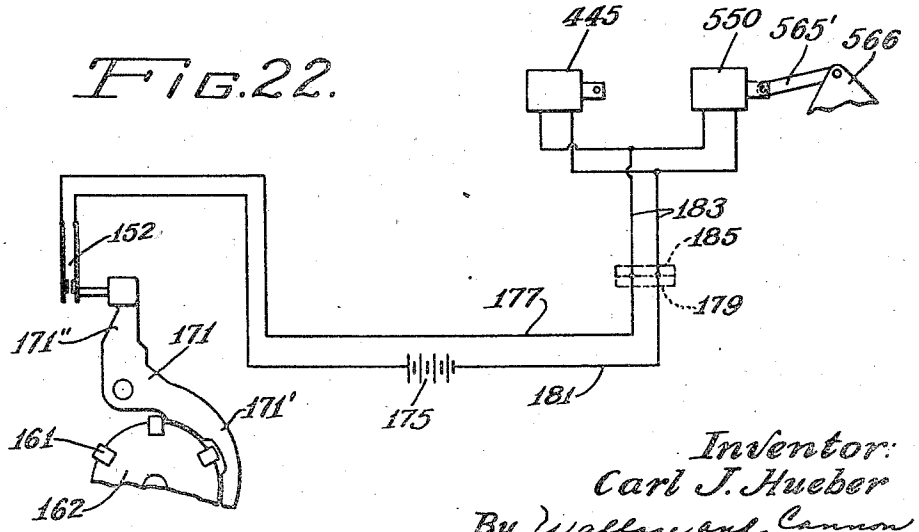


FIG. 22.



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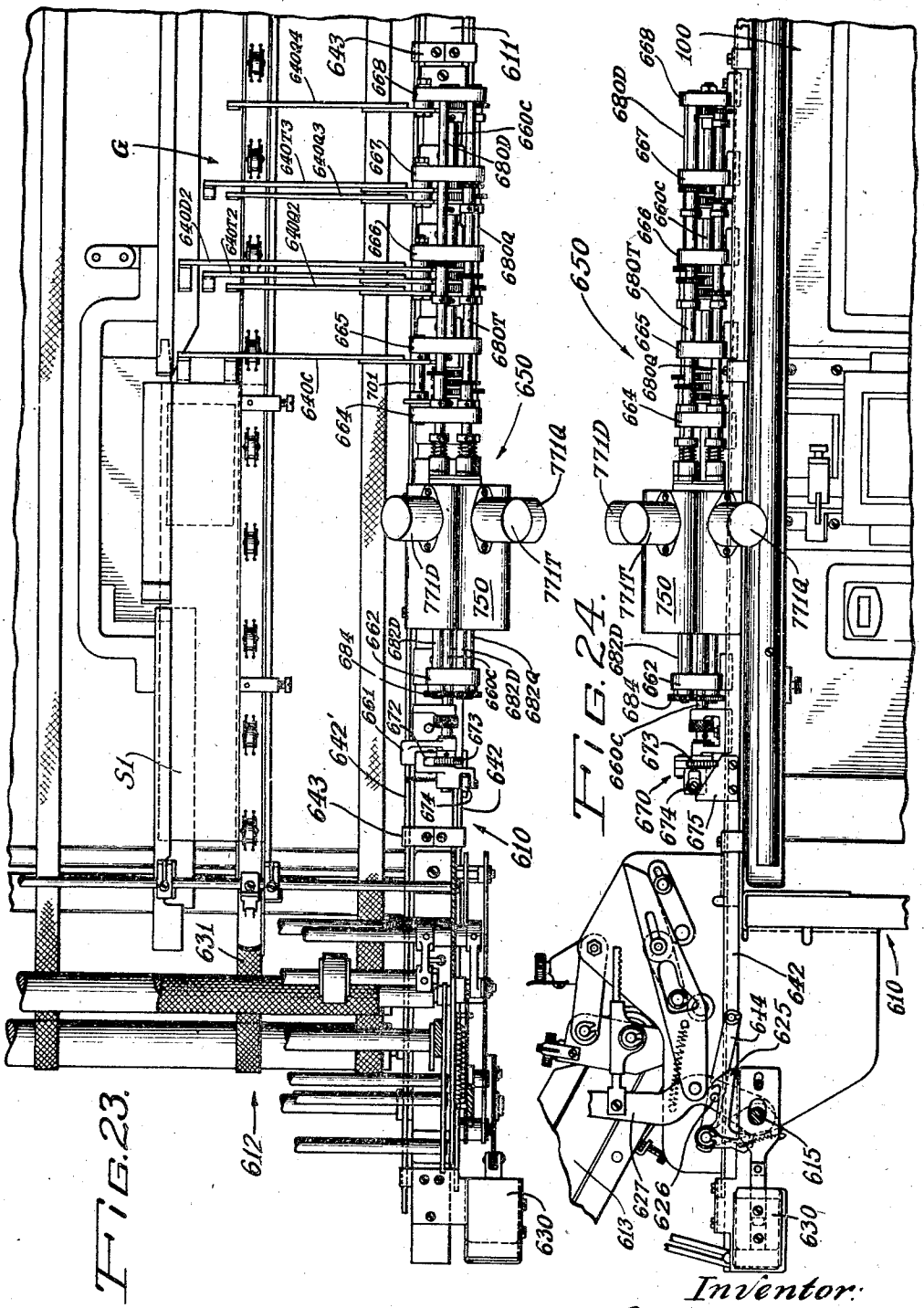


FIG. 23.

FIG. 24.

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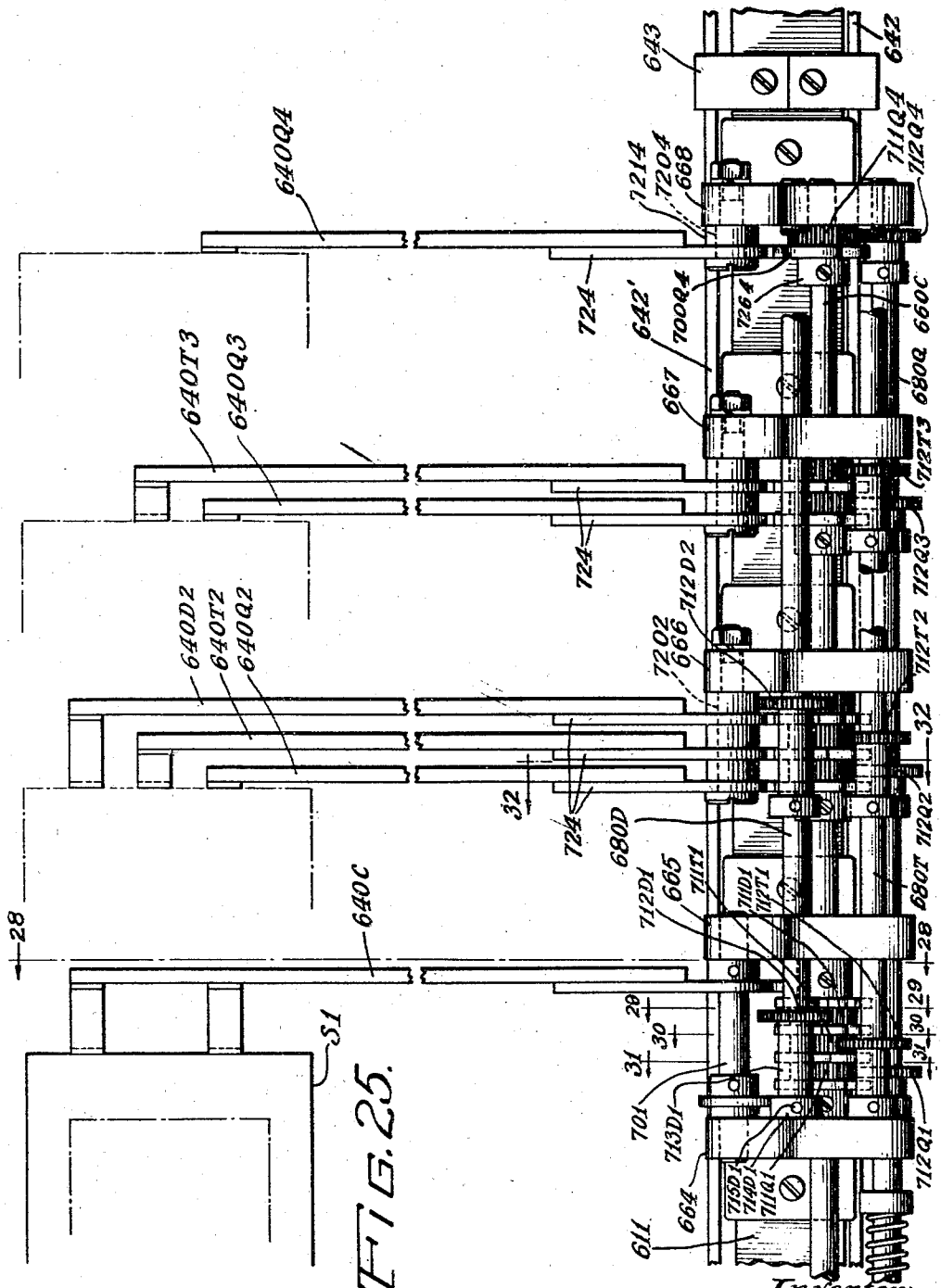


FIG. 25.

Inventor:
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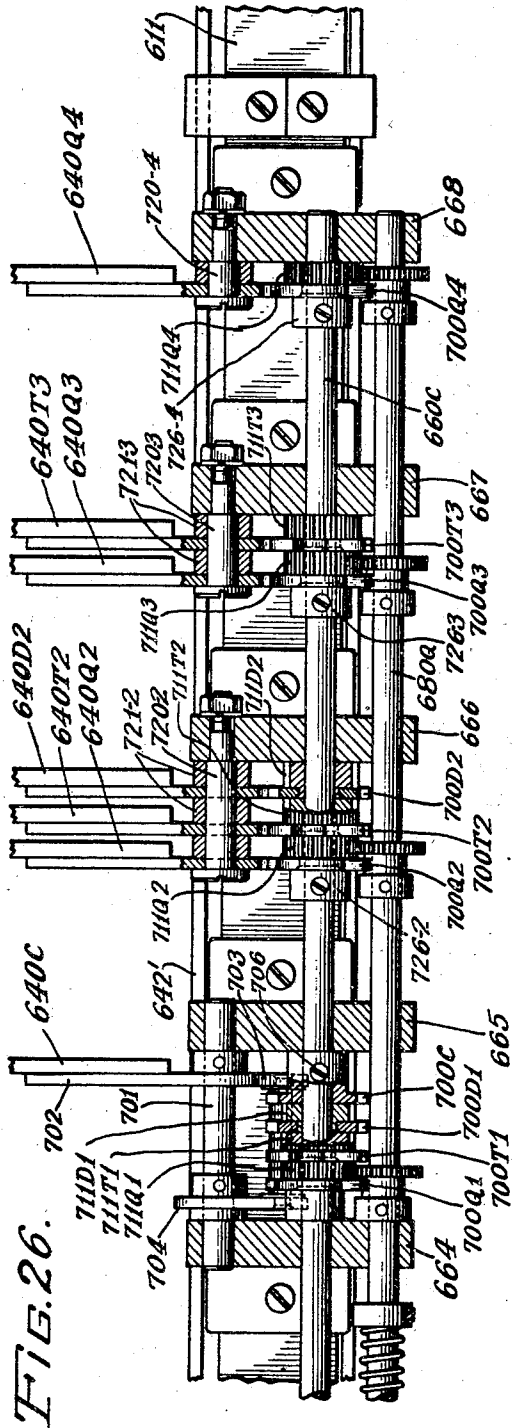


FIG. 26.

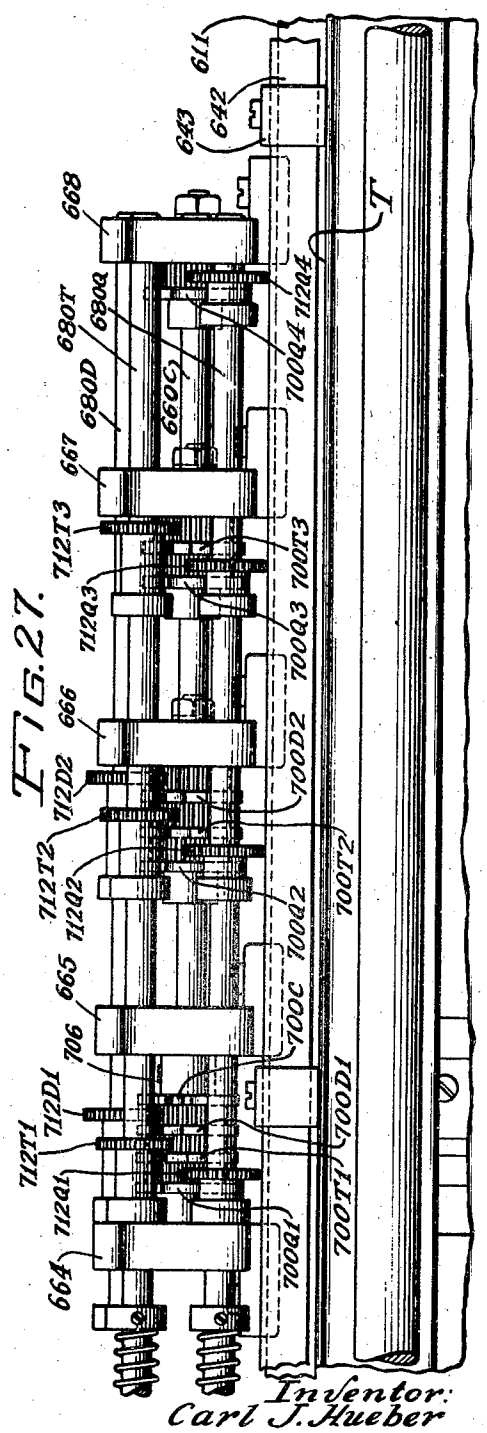


FIG. 27.

Inventor:
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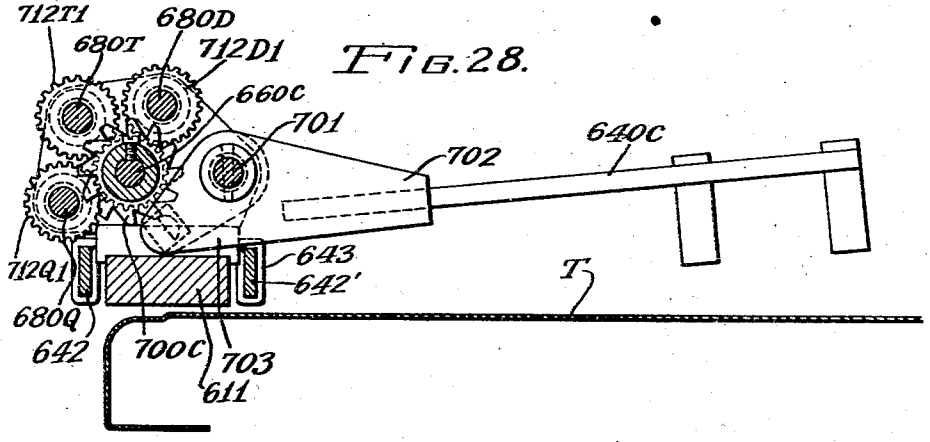


FIG. 28.

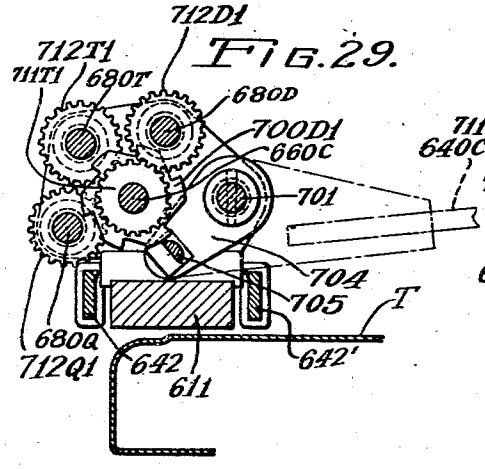


FIG. 29.

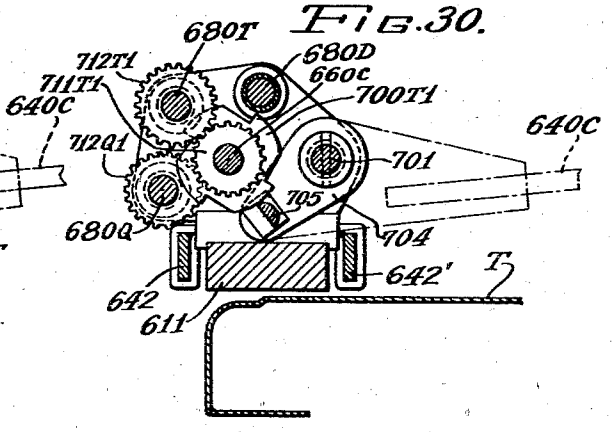


FIG. 30.

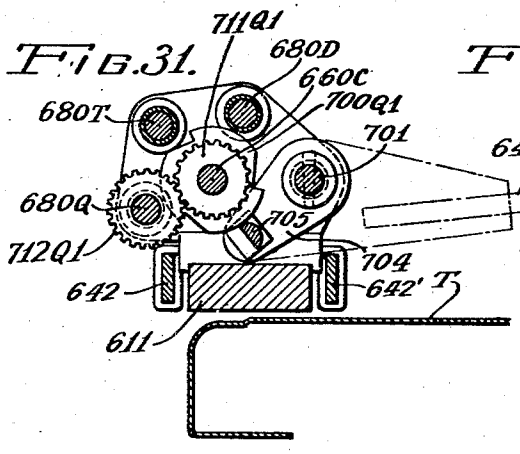


FIG. 31.

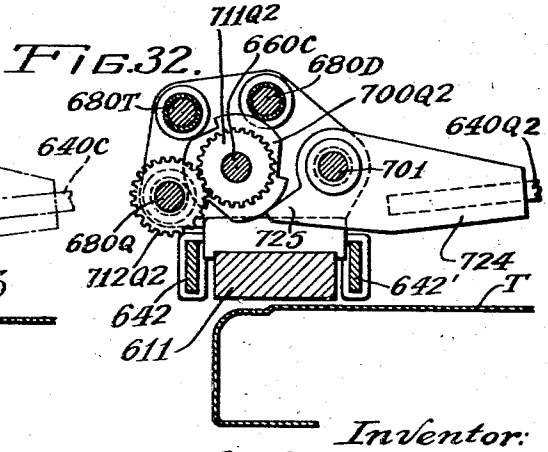


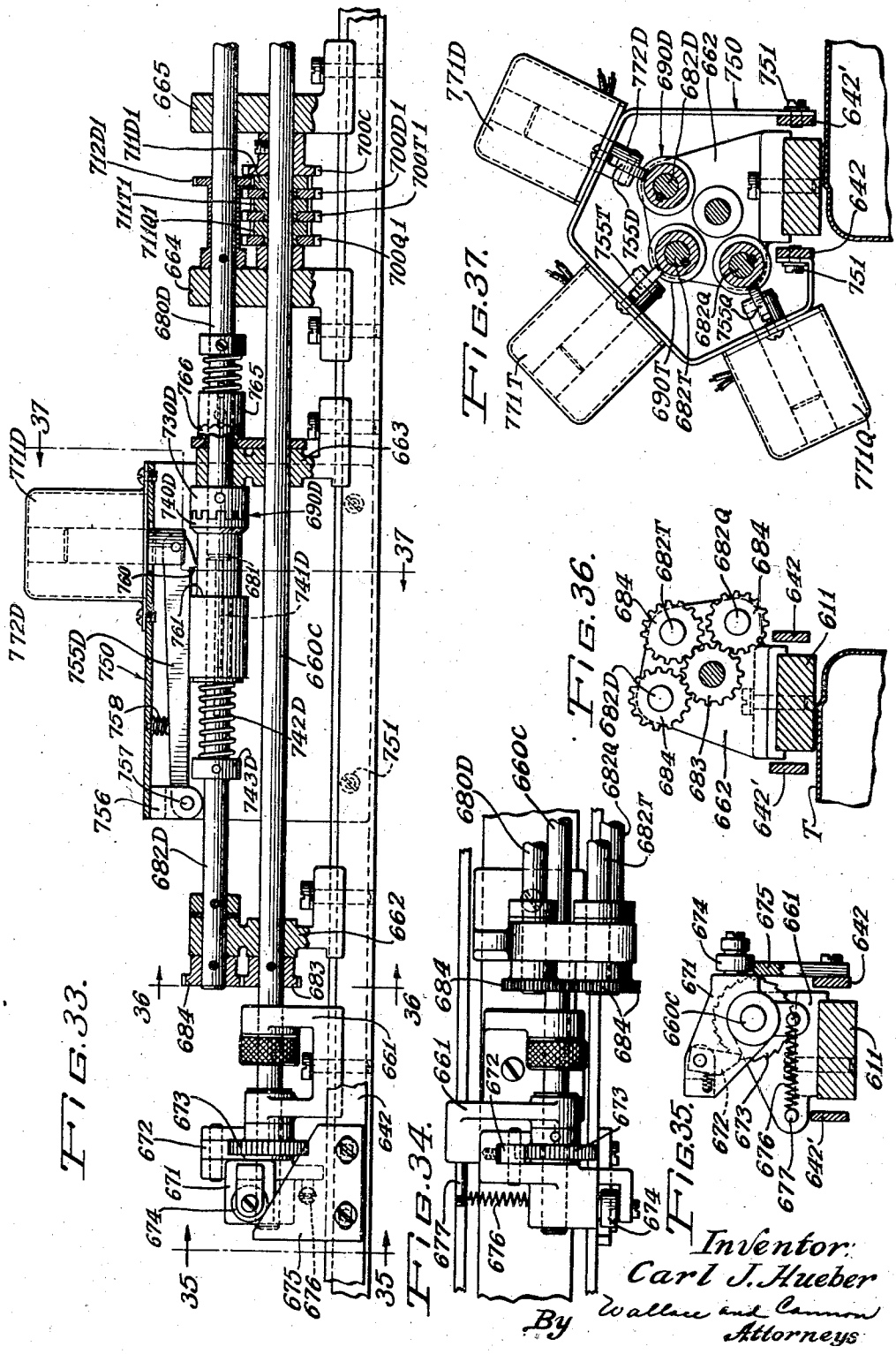
FIG. 32.

Inventor:
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FIG. 38.

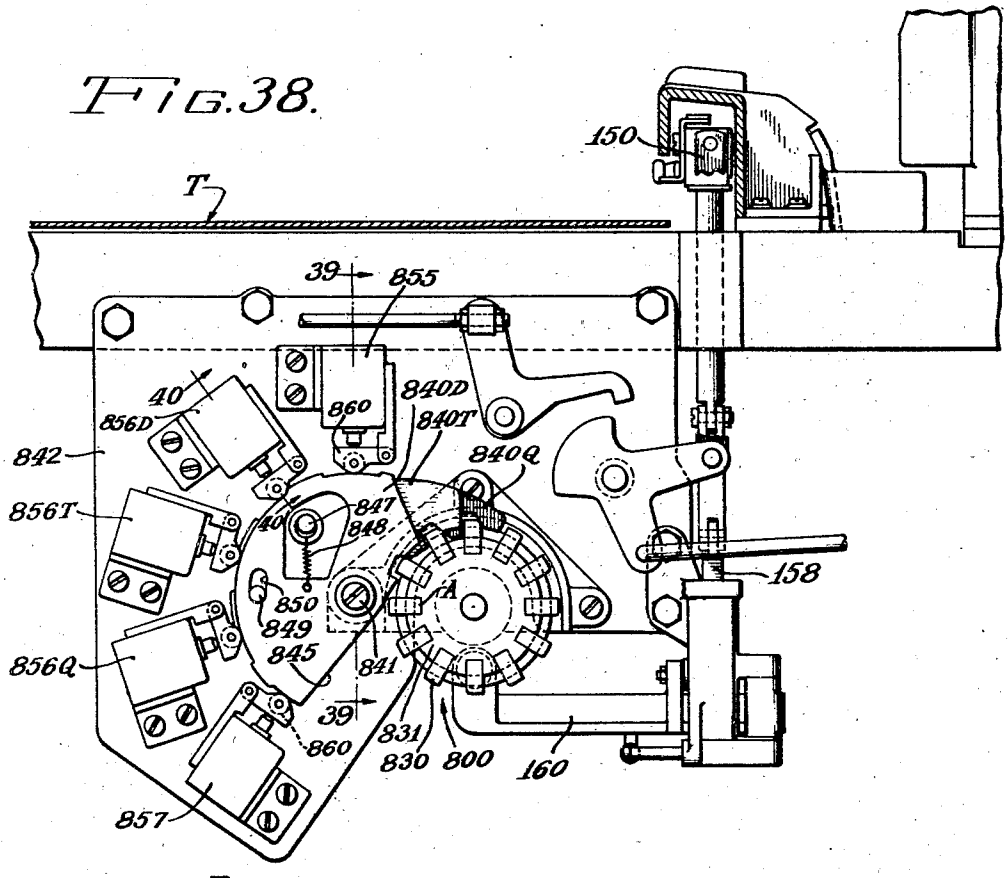


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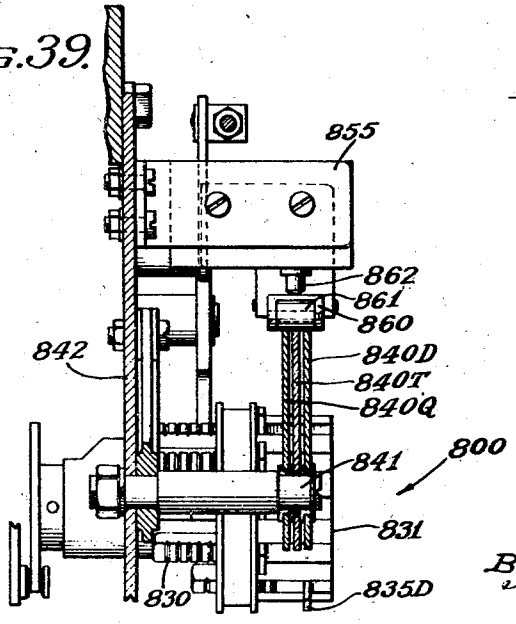
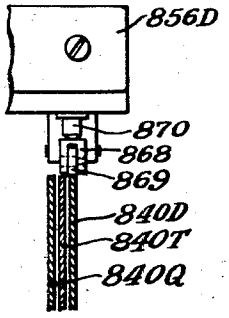


FIG. 40.



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Fig. 41.

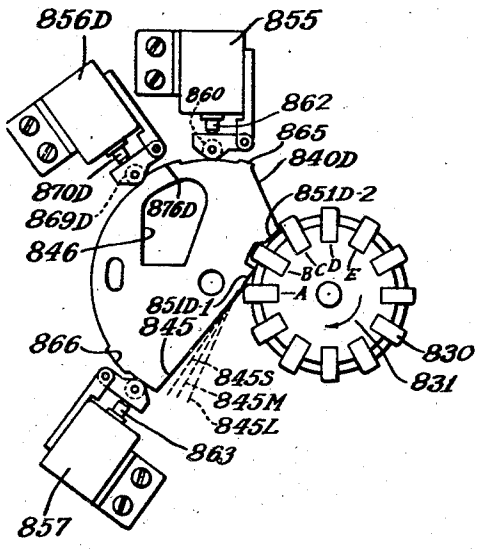


Fig. 42.

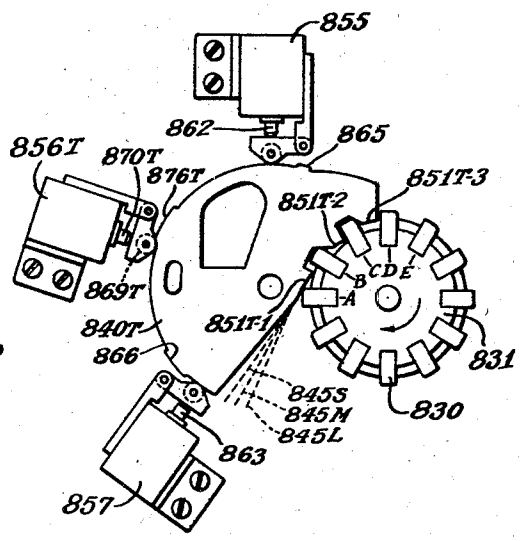
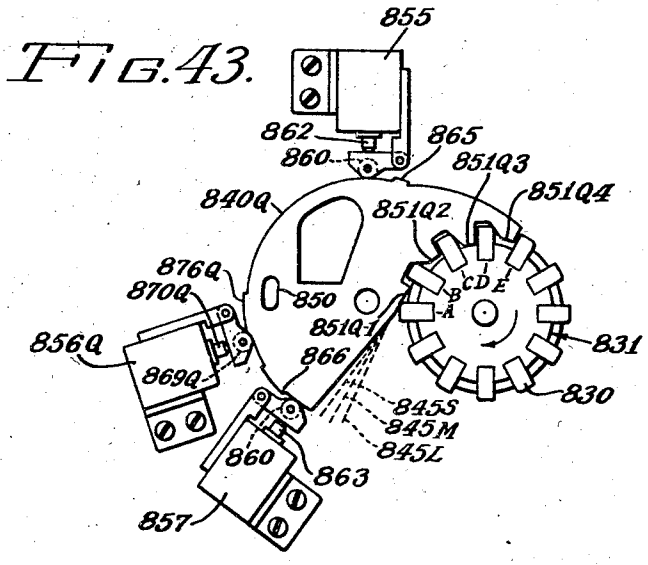


Fig. 43.



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Fig. 44.

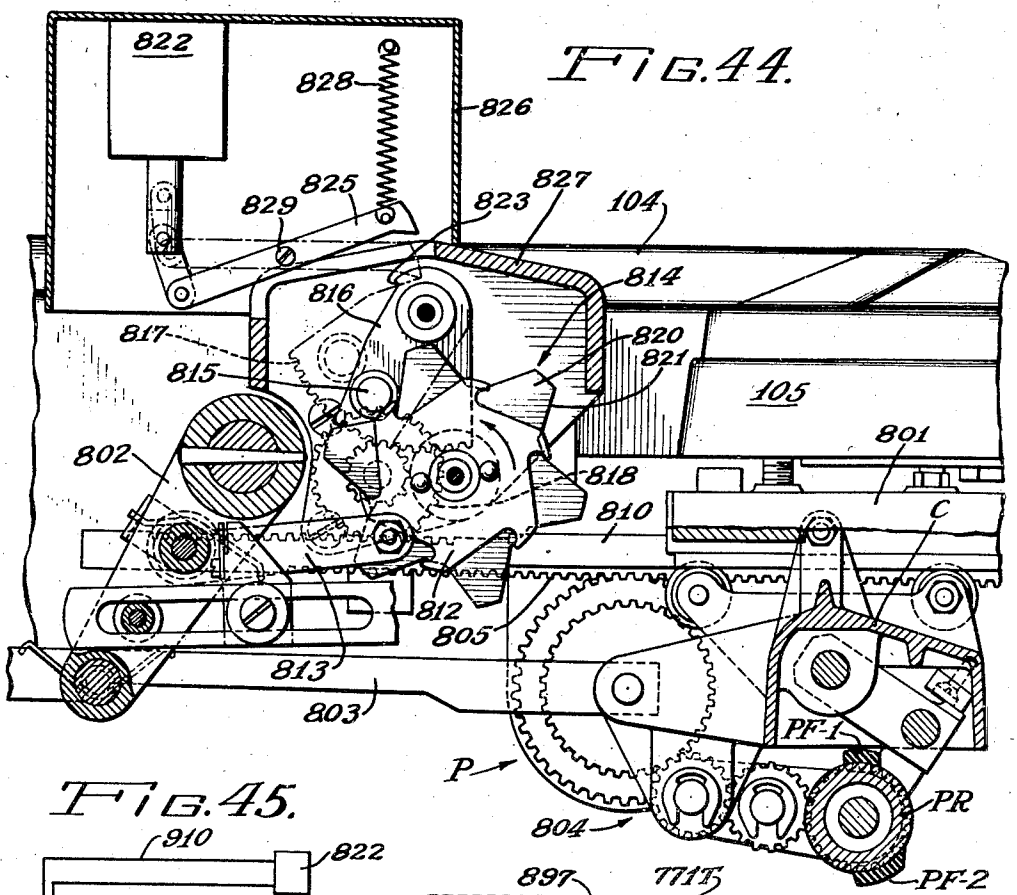
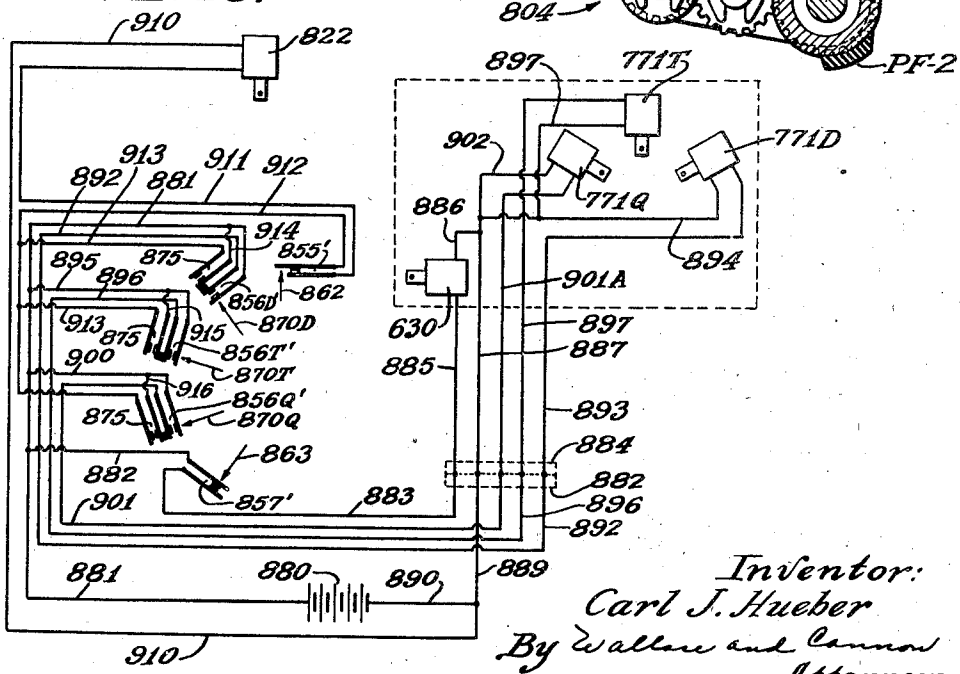


Fig. 45.



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Fig. 46.

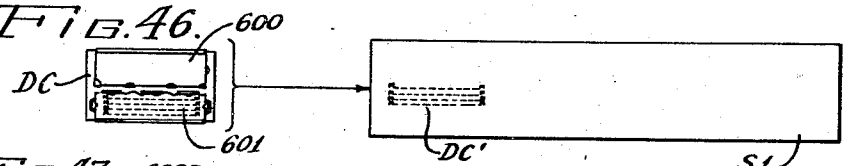


Fig. 47.

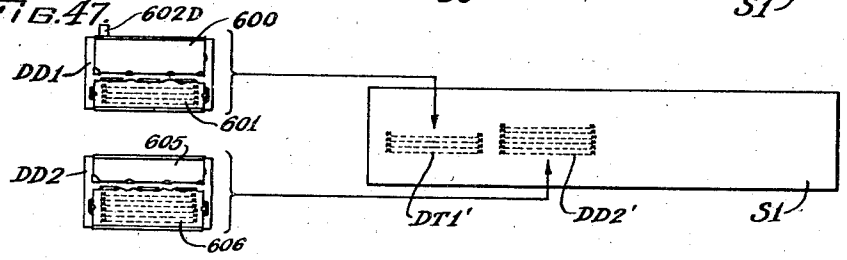


Fig. 48.

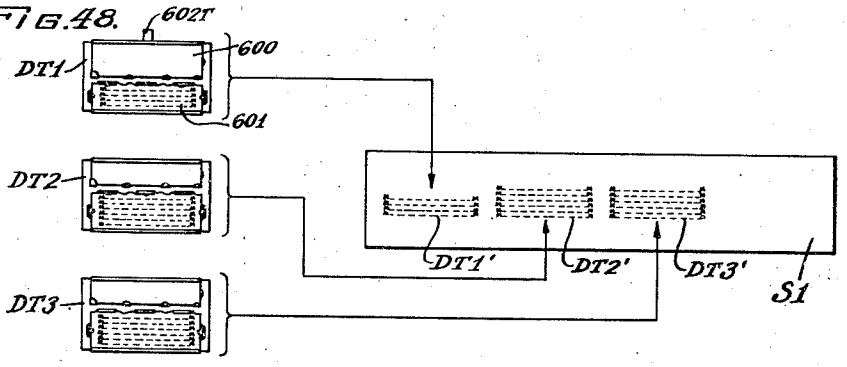
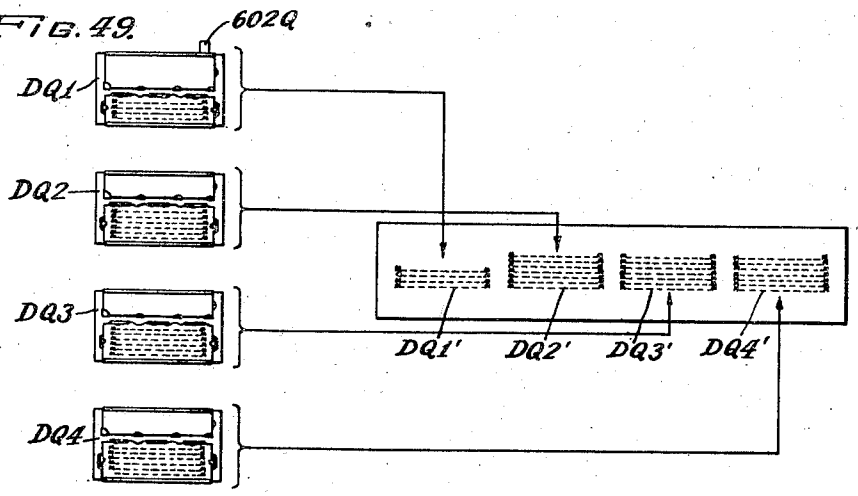


Fig. 49.



Inventor:
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FIG. 50.

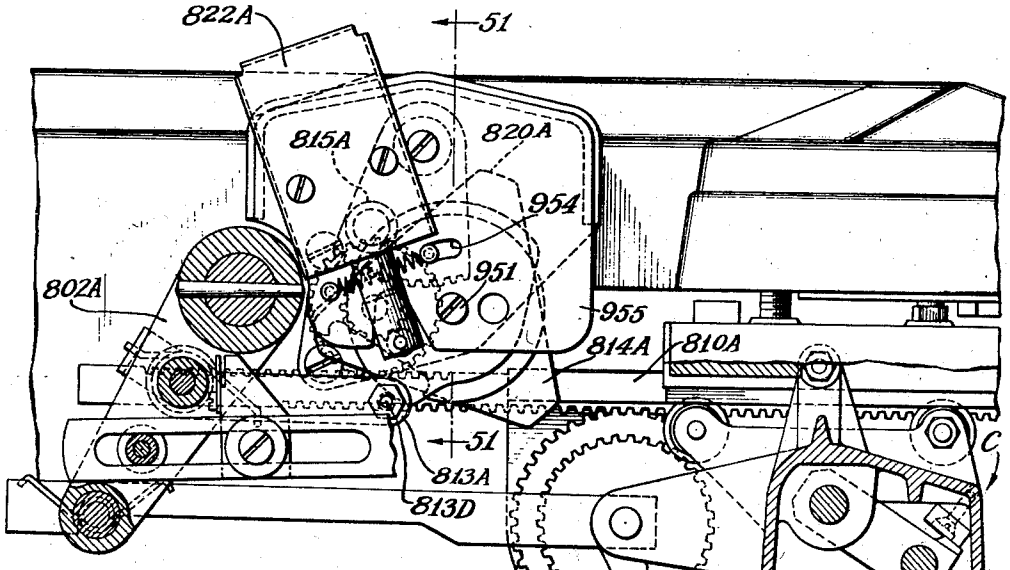


FIG. 53.

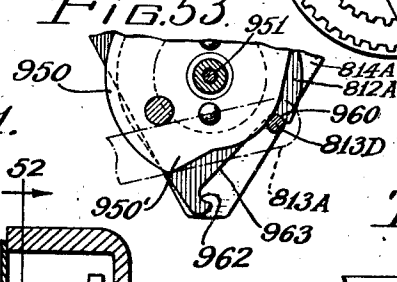


FIG. 51.

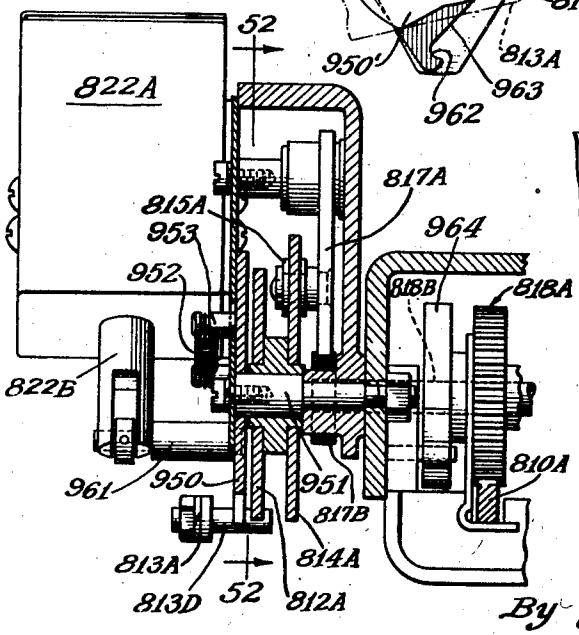
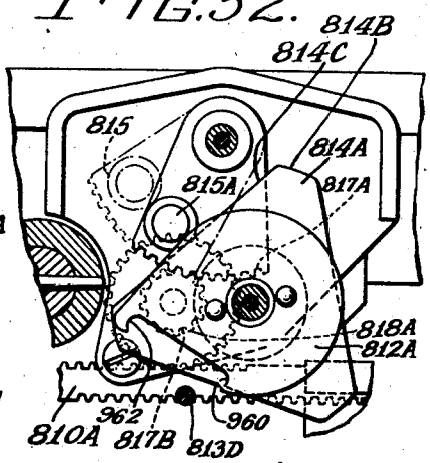


FIG. 52.



Inventor:
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FIG. 54.

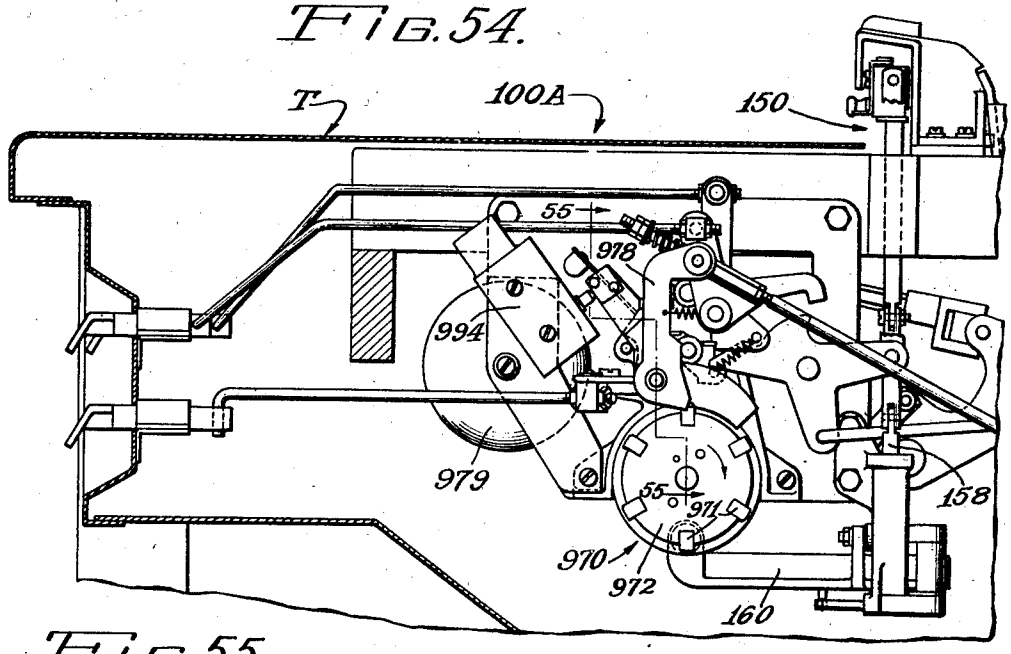


FIG. 55.

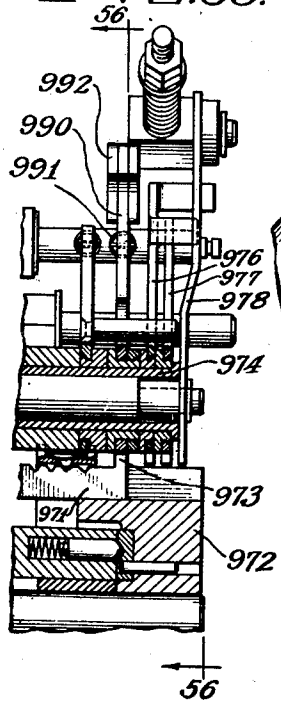
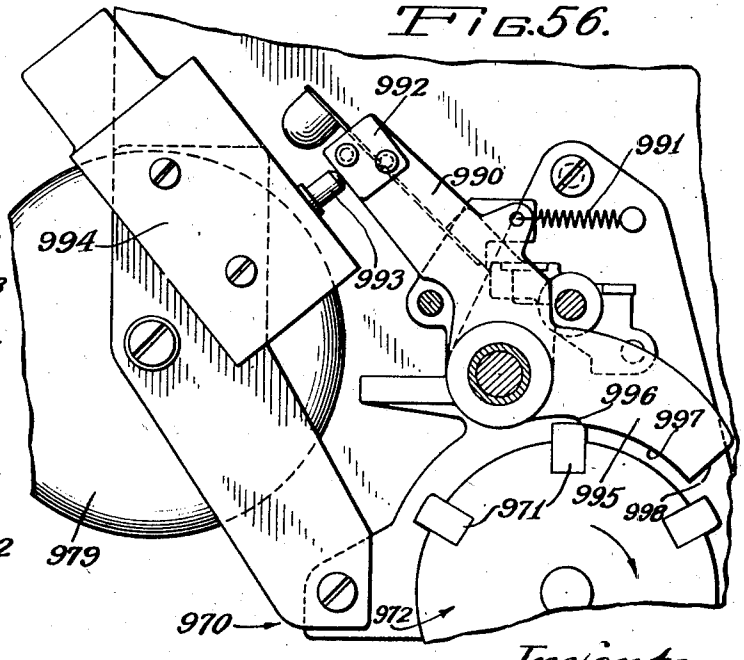


FIG. 56.



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UNITED STATES PATENT OFFICE

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PRINTING MACHINE

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45 Claims. (Cl. 101—47)

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This invention relates to printing machines and particularly to such machines in which printing impressions are made from printing devices passed sequentially therethrough.

Printing machines of the aforesaid character are adapted for rapid operation to print impressions from at least selected printing devices as they reach printing position, and to attain maximum production it is customary to provide an automatic sheet feeding mechanism arranged to feed sheets to printing position to receive impressions from the printing devices. Such printing machines in many instances also embody automatic control means, conventionally termed selector mechanism, whereby identifying means at one or more selected identifying positions on the printing devices may be rendered effective to control operation of one or more of the various mechanisms of the printing machine. Thus the selector mechanism of such printing machines has been employed to render the impression mechanism such as a platen operative or inoperative in respect to selected printing devices in accordance with the sensed presence or absence of such identifying means at one or more selected identifying positions thereon, or in other words, to control the print-skip operation of the machine. In other instances the selector mechanism has been employed to control mechanisms for separating or segregating selected of the printing devices, or to govern a supplemental printing means such as a numbering machine. While the aforesaid and other controlling operations have been attained by prior selector mechanisms under the control of identifying means on the printing devices, the selector control mechanism of prior printing machines has embodied inherent limitations which have in some applications reduced the output of the machine and in other uses have rendered it necessary to segregate printing devices or groups thereof from their usual filing or storage positions in order to produce impressions or printed sheets of the kind required. An important object of this invention is therefore to overcome the limitations inherent in prior selector mechanisms and to thereby enable the field of usefulness of selector mechanisms in printing machines to be materially enlarged; and objects related to the foregoing are to enable work having different amounts or areas of printed matter thereon to be automatically produced in printing machines of the type to which this invention pertains; and to enable the variations in the amount or area of printed matter to be produced on each sheet or form to be automatically governed by selector mechanism in

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accordance with identifying means carried by or embodied in at least selected of the printing devices.

One situation in which it is desirable to attain such automatic variation in the amount of printed matter to be produced on a sheet is found in the production of tax bills, stock cards, inventory records, shop instruction and routing cards and the like where the amount of information or data required for the different documents may vary over a relatively wide range. Under such circumstances it may be necessary to employ two or more printing devices to carry the printing means or characters for printing the data pertaining to a particular subject, and in such instances the number of printing impressions to be made upon a sheet will vary with the number of related printing devices required to embody the data pertaining to each subject. A further object of this invention, therefore, is to enable such variation in the number of impressions made on a sheet to be accomplished automatically, and to enable this to be done rapidly and in a simple and expeditious manner.

A specific example of the kind of work to which the present invention pertains is found in the production of factory work cards. Under some systems of factory management such a work card is prepared for each part which is to be produced, and in addition to a printed name or code number or other identification of the part to which the card pertains, such a work card usually embodies a departmental routing list and other related data such as a sequential listing of the various job operations involved in the production of the particular part. Where a part requires but a few operations the printing characters or text included in such data may be placed upon but a single printing device, but when production of a particular part involves the performance of a large number of job operations, it may be necessary to use two or more printing devices to set forth all the operations and other data pertaining thereto. Thus, as to such a part, the printing of the work card will involve two, three and perhaps four printing operations from the individual printing devices pertaining to the part, thereby requiring that the card or sheet be positioned successively in two or more different relations to the printing position of the machine. The related printing devices of such a group have been identified in this art as lead and follower printing devices, as for example, in the patents to Walter T. Gollwitzer, No. 1,982,380 patented November 27, 1934, and No. 2,002,772, patented May 28, 1935, and where such groups

of lead and follower printing devices are interspersed with other printing devices which pertain each to a different work card or subject, these additional printing devices may be termed individual printing devices to distinguish the same from those printing devices which fall in a group of lead and follower printing devices. One of the important objects of the present invention is to enable such groups of lead and follower printing devices of varying numbers, even when interspersed with individual printing devices, to be utilized with greater facility than has heretofore been possible, and a further object is to enable varying numbers of impressions to be made automatically in a side by side or other similar relationship on a sheet, work card or the like as determined by the number of follower printing devices included in each group.

In prior printing machines, such as those disclosed in the aforesaid Gollwitzer patents it has been necessary to identify each printing device as either a lead or a follower printing device, this being accomplished by identifying means such as tabs disposed at different identifying positions along the upper edges of the printing devices. Thus each lead printing device was provided with a tab located in one predetermined identifying position thereon, while each follower printing device had a similar tab located in another predetermined identifying position thereon, and by sensing each such identifying tab the machines of the aforesaid Gollwitzer patents were controlled so as to attain the desired sequence of machine functions. The employment of an identifying tab on each lead and each follower printing device has, in many instances, been considered objectionable, and an important object of the present invention is to enable a simplified arrangement of tabs or other identifying means to control the machine and attain the desired sequence of functions therein. Objects related to the foregoing are to enable varying groups of lead and follower printing devices to control the sequence of machine functions through the use of identifying means upon but one printing device of each group; to employ identifying means on the lead prihting device of each group to indicate the number of printing devices in such group; to establish a proper and related cycle of machine functions for each group of printing devices as the identifying means of the lead printing device is sensed; and to govern and properly time the feeding of the next sheet to printing position through the controlling action of identifying means carried by the lead printing device of each group.

In feeding sheets to the printing position of such a printing machine it is customary to impart the desired rectilinear feeding movement to the sheets by frictionally acting means and to stop and properly locate the sheet in the desired relation to printing position by means such as a retractible stop finger. After a printing impression has been made on the sheet the stop finger is retracted, and if but a single impression is desired upon the sheet, the sheet is discharged from the machine by the frictional sheet feeding means. In the event that the first such printing device constitutes the lead printing device of a group thereof so that another printing impression is to be made upon the sheet, another stop finger is disposed ahead of the sheet to stop the same in another and further advanced relation with respect to the printing position, thereby to enable another printing impression to be made on the

sheet beside the first impression. Additional impressions may be made by providing additional stop fingers for controlling the further feeding movements of the sheets, suitable means such as cams being employed to actuate the stop fingers in the required timed sequence.

Under prior practice each sheet of a series of sheets fed into the machine has been acted upon by all the stop fingers thus to stop each sheet in the same number of printing positions, and in order to vary the number of stops made by the sheets it has been necessary to change the set-up of the stop fingers and the related control means such as the control cams associated with the stop fingers. An important object of this invention is to enable a plurality of sheet stop fingers in a printing machine to be variantly actuated so as to produce different cycles of sheet feeding movement of the successive sheets of a series in accordance with the number of printing impressions to be made thereon, and an object related to the foregoing is to enable the sequence and manner of operation of such a series of sheet stop fingers to be varied and controlled automatically in accordance with identifying means carried by certain of the printing devices.

In printing machines of the aforesaid character the printing impressions are made from groups of lines of printing characters embodied in the printing devices, and the printing impressions are produced by effecting printing cooperation between the paper and desired portion of the text of the printing device. The printing devices may, of course, vary as to the size or dimensions of the area in which such text or printing characters may be included, and in such instances the impression means is correspondingly set-up or arranged so as to cooperate with the printing device in the area in which printing characters may appear, for by this procedure, proper impressions are obtained when printing devices of different or smaller sizes are employed. This is known in the art as variation of the cut-off of the impression means, and it may be effected by variation of the size or location of the shield between the impression means and the paper, or by variation in the effective area of an element of the impression means such as a platen. In other cases the printing devices may embody text or printing characters from which impressions are not to be made in every instance, and where such portions of the text are to be excluded in a printing operation, this may be accomplished by similar variation in the shield or the effective area of an element of the impression means as aforesaid, or in other words, the cut-off of the printing machines may be varied to print the desired portions of the text while avoiding printing of the undesired portions thereof. While such variations of the cut-off of the printing machine may be effected manually through adjustment or replacement of the appropriate portions of the mechanism, such procedure is not feasible where the variations in cut-off are to be attained for but a portion of the printing devices passed through the printing machine in a particular run thereof. In view of the foregoing, it is an important object of this invention to enable the cut-off in a printing machine of the aforesaid character to be automatically varied during operation of the printing machine; and other objects related to the foregoing are to enable such automatic variation of the cut-off to be accomplished under the control of identifying means carried on or embodied in the print-

ing devices at one or more selected identifying positions thereon; to enable the control of the automatic cut-off in respect to a plurality of successive printing devices to be effected by identifying means carried on or embodied in a printing device or the like which forms part of or precede such a group of printing devices through the machine; and to enable such automatic control of the cut-off in respect to groups of printing to be attained even though the number of printing devices in such groups may vary in the course of a run of the printing machine.

Printing devices of the kind employed in printing machines of the character to which this invention pertains are usually provided with an index area or index card upon which at least a portion of the text or data included in the printing device is printed or otherwise formed to facilitate indexing and visual identification or selection of the printing devices, and such index data is in many instances formed by making printing impressions from all or at least a portion of the printing characters embodied in the printing device. Where the printing devices are employed in groups of lead and follower printing devices, the amount of index data desired upon the lead printing devices may in many instances be relatively great, while the amount of index data desired on the follower printing devices may be relatively small, and under such circumstances a substantially larger area is available for the formation of printing characters on the follower printing devices than is available on the lead printing devices. A further and more specific object, therefore, of this invention is to enable printing areas of different sizes to be employed on lead and follower printing devices; and other objects related to the foregoing are to prevent imperfect impressions where such variation is present in the size of the printing areas of lead and follower printing devices; to automatically control and vary the cut-off of the printing machine where lead and follower printing devices are employed; to enable such cut-off to be governed automatically by identifying means carried by or embodied in the printing devices; and to enable the identifying means of the lead printing device of a group thereof to govern the automatic cut-off adjustment for all of the printing devices of the group.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show preferred embodiments and the principle thereof and what I now consider to be the best mode in which I have contemplated applying that principle. Other embodiments of the invention embodying the same or equivalent principle may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Fig. 1 is a front elevational view of printing apparatus embodying the features of the invention;

Fig. 2 is a plan view of the printing apparatus shown in Fig. 1;

Fig. 3 is a perspective view of the sheet feeder forming a part of the printing apparatus of Figs. 1 and 2;

Fig. 4 is an enlarged perspective view showing a part of the sheet feeder of Fig. 3;

Fig. 5 is an enlarged fragmental plan view

illustrating a portion of the printing mechanism of Fig. 1;

Fig. 6 is an enlarged front elevational view of the printing mechanism of Fig. 1;

Fig. 7 is a front elevational view showing a portion of Fig. 6 at an enlarged scale;

Fig. 8 is a transverse cross sectional view taken substantially along the line 8—8 in Fig. 11;

Fig. 9 is an enlarged cross sectional view taken substantially along the line 9—9 in Fig. 11;

Fig. 10 is an enlarged plan view showing a portion of the mechanism included in Fig. 5;

Fig. 11 is a fragmental elevational view of the mechanism shown in Fig. 10;

Figs. 12 and 13 are fragmental front elevational views of a portion of the sheet stop mechanism;

Fig. 14 is a fragmental plan view showing a portion of a sheet stop mechanism;

Fig. 15 is a fragmental cross sectional view taken along the line 15—15 in Fig. 14;

Fig. 16 is a perspective view illustrating one of the stop fingers and a part of the actuating mechanism therefore;

Fig. 17 is a fragmental vertical sectional view taken from front to rear of the printing machine and illustrating the selector mechanism;

Fig. 18 is a fragmental sectional view taken along the line 18—18 of Fig. 17;

Fig. 19 is a fragmental vertical sectional view taken along the line 19—19 of Fig. 17;

Fig. 20 is a schematic view illustrating an individual printing device and the printed sheet which is produced therefrom;

Fig. 21 is a schematic view illustrating a lead printing device and a follower printing device which, when taken together, constitute a group of printing devices from which the sheet illustrated in this figure may be produced;

Fig. 22 is a schematic wiring diagram showing the electrical circuits which are provided in the printing apparatus of Fig. 1;

Fig. 23 is a fragmental plan view illustrating printing apparatus embodying a modified form of the invention and with which the groups of printing devices may include a relatively large number of follower printing devices;

Fig. 24 is a fragmental front elevational view of the printing apparatus shown in Fig. 23;

Fig. 25 is a plan view illustrating a portion of the mechanism of Fig. 23 at a larger scale;

Fig. 26 is a fragmental plan view taken partially in section and illustrating the mechanism shown in Fig. 25;

Fig. 27 is a front elevational view illustrating the mechanism shown in Fig. 26;

Fig. 28 is a fragmental vertical sectional view taken substantially along the line 28—28 in Fig. 25;

Figs. 29, 30 and 31 are fragmental vertical sectional views taken respectively along the lines 29—29, 30—30 and 31—31 in Fig. 25;

Fig. 32 is a fragmental vertical sectional view taken substantially along the line 32—32 in Fig. 25 and illustrating other elements of the sheet stop mechanism;

Fig. 33 is a vertical sectional view taken longitudinally of the main drive shaft of the sheet stop mechanism;

Fig. 34 is a fragmental plan view of a portion of the mechanism shown in Fig. 33;

Fig. 35 is a cross sectional view taken along the line 35—35 of Fig. 33;

Fig. 36 is a vertical sectional view taken along the line 36—36 of Fig. 33;

Fig. 37 is a sectional view taken along the line 37—37 of Fig. 33;

Fig. 38 is a fragmental vertical sectional view illustrating the selector mechanism which is utilized in the printing apparatus of Fig. 23;

Fig. 39 is a vertical sectional view taken substantially along the line 39—39 of Fig. 38;

Fig. 40 is a fragmental sectional view taken substantially along the line 40—40 of Fig. 38;

Figs. 41, 42 and 43 are elevational views which show in a schematic manner the form of the various cam plates of the selector mechanism and the way in which these cam plates are associated with the switch mechanism;

Fig. 44 is a vertical sectional view illustrating the structural features of the automatically controlled platen mechanism included in the printing apparatus of Fig. 23;

Fig. 45 is a schematic wiring diagram showing the manner in which the elements of the printing apparatus of Fig. 23 are controlled;

Fig. 46 is a schematic view illustrating an individual printing device and the printed sheet which may be produced therefrom;

Fig. 47 is a schematic view illustrating a group of printing devices which includes one lead printing device and one follower printing device together with the printed sheet which may be produced therefrom;

Fig. 48 is a schematic view illustrating a group of printing devices which includes one lead printing device and two follower printing devices together with the printed sheet which may be produced therefrom;

Fig. 49 is a schematic view illustrating a group of printing devices which includes one lead printing device and three follower printing devices together with the printed sheet which may be produced therefrom;

Fig. 50 is a vertical sectional view illustrating the platen mechanism of another embodiment of the invention whereby automatic control of the line cut-off is attained under the governing action of identifying means carried on the printing devices;

Fig. 51 is a sectional view taken along the line 51—51 of Fig. 50;

Fig. 52 is a fragmental sectional view taken along the line 52—52 of Fig. 51;

Fig. 53 is a view showing some of the parts from Fig. 50 in a different relationship;

Fig. 54 is a vertical sectional view illustrating the selector mechanism which is utilized with the structure of Fig. 50;

Fig. 55 is a vertical sectional view taken along the line 55—55 in Fig. 54; and

Fig. 56 is a sectional view taken along the line 56—56 of Fig. 55.

For purposes of disclosure three embodiments of the present invention are illustrated herein, and in all three of these embodiments provision has been made whereby the area of printed matter produced upon a sheet may be varied automatically under the control of identifying means such as tabs carried on the printing devices. In the embodiment of the invention illustrated in Figs. 1 to 22 inclusive of the drawings such automatic variation of the amount or area of the printed matter produced upon each of the sheets is attained through the use of individual printing devices and groups of lead and follower printing devices, and the arrangement is such that a single tab or other identifying means carried on the leading printing device of a group controls the sheet feeding means to produce more than one impression upon a sheet when this is required and to produce but a single impression where the quantity of printed matter or text relating to a particular subject is such that it may be incorporated upon a single or individual printing device. In the embodiment of the invention shown in Figs. 1 to 22 the machine is adapted for use where groups of lead and follower printing devices include but one follower printing device, but in the embodiment of the invention shown in Figs. 23 to 49, inclusive, the machine is so arranged that the groups of lead and follower printing devices may include varying numbers of follower printing devices. The particular arrangement shown in Figs. 23 to 49 is such that three follower printing devices constitutes the maximum number of such follower printing devices in a particular group, but this embodiment is merely illustrative.

In Figs. 50 to 56, inclusive, the desired variation in the amount of printed matter produced upon a sheet is also controlled by identifying means such as tabs carried on the printing devices, but in this embodiment of the invention the variation is attained solely through automatic variation in the cut-off adjustment of the machine, this being attained in the present instance through adjustment or variation of the effective area of the platen or impression mechanism.

Thus, in the form of the invention illustrated in Figs. 1 to 22, inclusive, of the drawings, the invention is incorporated in a printing apparatus embodying a printing machine 100 of the flat bed type having an automatic sheet feeding mechanism 400 operatively associated therewith for feeding sheets S to printing position in the machine. The printing machine 100 comprises a desk-like frame 101 having a table top T over which the sheets S may be moved and positioned in the course of a printing operation. The printing machine 100 as herein shown is adapted to make printing impressions from printing devices D, Figs. 20 and 21, which are initially placed in a supply magazine M. These printing devices are withdrawn one by one from the bottom of the magazine M and are advanced in a step-by-step manner to a printing position, defined in part by a platen mechanism P, and located forwardly and laterally of the magazine M. The printing device advancing means whereby the printing devices are advanced to the printing position is illustrated and described in detail in my copending application Serial No. 388,998 filed April 17, 1941, now issued as Patent No. 2,359,850, patented October 10, 1944, and reference may be had to this application for details of construction and operation.

The platen mechanism P as herein shown is of the geared roller type and the particular construction herein shown is fully illustrated and described in my copending application, Serial No. 361,530, filed October 17, 1940, now issued as Patent No. 2,359,859, patented October 10, 1944, and reference may be had to this application for further details of construction and operation thereof. The platen mechanism P is supported on or beneath the forward end of a relatively rigid printing frame 104, and while the construction of the printing frame 104 might be varied, I prefer to employ a rigid printing frame such as that shown in my United States Patent No. 2,275,439, patented March 10, 1942. It will be observed that the printing frame 104 extends upwardly from the table top T at a point adjacent to the magazine M and extends forwardly and laterally at an

angle of substantially 45 degrees with respect to the forward edge of the printing machine to a point adjacent to the front of the machine, and at its forward end the printing frame 104 carries a head 105 beneath which the platen mechanism P is supported.

The platen mechanism P includes a platen roller PR which is carried upon and beneath a carriage C, the carriage C being mounted on the head 105 for reciprocating movement in a direction from front to rear of the machine. Such reciprocating movement is imparted to the carriage C through means including a rocking arm 107, Fig. 2, and the rocking arm 107 is driven through a rocking movement each time a printing operation is to be performed. The platen roller PR is supported beneath the carriage C for movement in a generally vertical direction between an upper inactive position and a lower or active position, and as described in detail in my aforesaid copending application Serial No. 361,530, the arrangement is such that the platen roller is in its elevated inactive position when the carriage is in its rearward or at rest position shown in Fig. 2. In the first half of the machine cycle the carriage C is moved in a forward direction, and during this forward stroke the platen roller PR is lowered to its active position. When the movement of the carriage is reversed the platen roller PR has a rolling action imparted thereto through a controlled geared connection so that a resilient platen face PF on the platen roller engages the sheet to press the same downwardly into printing cooperation with printing device D which is then located at printing position. It will be understood, of course, that an inked ribbon (not shown) is interposed between the printing device and the sheet S during such production of the impression on the sheet.

As described in my aforesaid copending application Serial No. 388,998, the printing machine 100 is adapted under some circumstances to be operated under control of a plurality of foot pedals 120, 121 and 122 which may be selectively depressed to initiate the type of cycle which is to be performed by the machine. The foot pedal 120 is normally termed the "skip pedal" of the machine since momentary depression of this pedal initiates a cycle of operation of the printing device advancing means and during such cycle the platen mechanism P remains inactive. The foot pedal 121 is conventionally termed the "repeat pedal" for momentary depression of this pedal initiates operation of the platen mechanism P while the printing device advancing means remains inactive. The foot pedal 122 is normally termed the "consecutive" or operating pedal for by momentary depression of this pedal the operator may initiate concurrent cycles of operation of the printing device advancing means and the platen mechanism P. When the machine is operated through the use of the consecutive pedal 122, the printing device which has been utilized in the preceding cycle of operation is discharged into a collecting drawer J during the first half of the machine cycle and a new printing device D is advanced to printing position. The printing impression from this new printing device is made during the last half of the machine cycle, or in other words, during the rearward stroke of the carriage C of the platen mechanism.

During the use of the machine the power source such as a motor is constantly driven, the motor being controlled by a switch actuating plunger 110 mounted in a forward control panel 111 of the printing machine frame. In many instances, as where an automatic sheet feeding mechanism 400 is associated with the printing machine, it is desirable to operate the machine constantly and automatically, and this may be accomplished through the use of auto-stop mechanism which is controlled by a plunger 112 mounted in the control panel 111 of the machine. Such auto-stop mechanism is fully illustrated and described in my aforesaid copending application Serial No. 388,998, and such mechanism is operable to cause the continuous and automatic operation of the machine and to automatically stop the machine when an undesired condition such as exhaustion of the supply of printing devices or sheets S is detected. The automatic sheet feeder 400, as illustrated herein, is constructed and arranged so as to embody the primary elements of the automatic sheet feeder shown in the copending application of Morse, Serial No. 403,282, filed July 21, 1941, now issued as Patent No. 2,359,852, patented October 10, 1944, and as disclosed in said Morse application, the sheet feeder 400 includes an open-top bridge structure 401 extending across the table top T of the printing machine 100 so that sheets, as S, may be fed one by one from a supply magazine 403 and along a sheet guideway G to printing position, and after coming to rest at printing position for the formation of one impression thereon, such sheets are discharged from the opposite end of the sheet guideway G into a collecting hopper 405. As herein shown the bridge structure 401 is carried on spaced upstanding leg structures 407 and 409 which are so spaced that they may extend downwardly past opposite ends of the table top T. The sheet feeder 400 is, in the present instance, arranged so as to be adapted for convenient mounting in or removal from the desired operative relation with respect to the printing machine 100, and when the printing machine is in such operative relationship, the drive mechanism of the printing machine is utilized to operate the sheet feeder in timed relation to the operation of the printing machine. This is accomplished through means which are fully described in the aforesaid Morse application, and these means include a connecting rod 410, Fig. 3, which, through an intermediate connecting linkage 411, serves to impart a rocking movement to a rock shaft 415, Figs. 4, 6 and 7. The rock shaft 415 is mounted in a supporting framework 416 which serves as a support for the supply magazine 403 and the various elements of the sheet separating mechanism 418 which is associated with this supply magazine.

The rocking movement of the shaft 415 is utilized to actuate the sheet separating means 418 and to operate sheet stop mechanism located along the sheet guideway G, and as herein shown the sheet separating means includes a sheet separating roller 420, Fig. 4. When such operating movement is to be imparted to the sheet separating roller 420, an operating arm 421 which is loosely mounted on the shaft 415 must be rocked in a counterclockwise direction as viewed in Figs. 4, 6 and 7, such rocking movement of the arm 421 being effective through a rack 422 and a one-way driving connection 423 to drive the shaft upon which the roller 420 is mounted. The lever 421 may of course be manually actuated, but in the normal use of the machine the rocking movement of the shaft 415 is utilized to obtain this driving action. As shown in Figs. 4, 6 and 7 the desired connection between the rock shaft

415 and the lever 421 is attained by a hook-like connecting pawl 425 which is carried on an arm 426 fixed on the rock shaft 415. The hook-like pawl 425 is normally arranged to engage a pin 427 carried on the arm 421 so that when a rock shaft 415 rocks in a counterclockwise direction from the normal at rest position of Fig. 6, the hook 425' of the pawl 425 will engage the pin 427 to thereby rock the arm 421 in a counterclockwise direction. Such counterclockwise rocking movement operates the separating roller 420 through a sheet separating movement, and during the return or clockwise rocking movement of the rock shaft 415, a spring 428 serves to return the lever 421 to its at rest position of Figs. 6 and 7. The sheet which is thus separated from the pack thereof in the magazine 403 is advanced between a constantly rotating feed roller 430 and opposed pressure rollers 431 which are at this time separated from the feed roller 430 by a cam mechanism including a cam plate 432 connected to and actuated by the rocking arm 426. As the lever 421 returns in a clockwise direction the pressure rollers 431 are lowered and the constantly rotating feed roller 430 advances the sheet into the sheet guideway G.

The sheet guideway G, in the present instance, includes a channel guide 435 and an angle guide 436 which are so supported and spaced on the bridge structure 401 of the sheet feeder that the sheet which has thus been separated will be fed into the throat 435T of the guideway. The sheet S which is thus deposited in the throat of the guideway G is engaged by a constantly driven feed means which frictionally engages the sheet so as to tend to drive the same along the guideway and toward the collecting hopper 405. As herein shown this constantly driven feed means includes at least one belt 440 which is disposed within the guideway G. Several other belts 440' are illustrated in the present case but such belts 440' are intended for use where the sheet or form is relatively wide and are not employed where the sheets are quite narrow as in the present case. Sheets S which are thus advanced into the sheet guideway G are held downwardly against the belt 440 by means such as a skid 441 which preferably includes a plurality of space rollers 442, this construction and arrangement being fully described in the aforesaid Morse application. The belt 440 is constantly driven through means including a roller 442 and a motor 443, the motor 443 being mounted on the leg structure 407 immediately beneath the sheet separating mechanism 418. The motor 443 has an energizing circuit which includes a switch 445, Fig. 1, and a connecting cord 446 which has a plug connection 447 in one end wall of the printing machine frame so that power initially connected to the printing machine may be supplied to the motor 443 of the sheet feeder 400. As shown in Fig. 1, a similar electrical connection is formed by a cord 448 and a plug connection 449 and this electrical connection serves to associate the auto-stop mechanism of the printing machine with a detector 450 of the sheet feeder. This detector 450 is responsive to failure or improper operation of the sheet-separating mechanism 418, as for example, when two or more sheets are fed, or, when no sheet is fed to the detecting mechanism 450.

The printing machine 100 as herein illustrated is adapted particularly for the use of printing devices D constructed and arranged in the manner shown in Figs. 20 and 21. Such printing devices D embody a carrier or frame 200 having retaining devices 201, 202 and 203 whereby one or more printing plates such as the printing plates 205 and 206 may be removably secured in position on one face of the frame. Additional retaining devices as 207 are also provided near the upper edge of the frame 200 whereby an index card 208 may be held in position on the frame, and such an index card may carry a printed impression taken from a portion of the type matter or text 210 which is formed as by embossing upon the printing plates 205 and 206. Such embossed type characters may be formed on the printing plates by a machine such as that shown in the patent to Duncan No. 1,518,904, patented December 9, 1924.

In many instances the area available on the printing plates 205 and 206 is sufficient to carry the text or information related to a particular subject or to a particular person, but in other instances the amount of such text or information may be such that one or more additional printing devices are required to carry such text or information. In such instances the several printing devices which relate to a particular subject or person are ordinarily termed a group, and in the art such a group is said to contain one lead printing device and one or more follower printing devices. The printing apparatus shown in Figs. 1 to 22 inclusive is arranged to care for such groups of lead and follower printing devices wherein not more than one follower printing device is included in any one group, but it will be evident that instances will arise in practice where more than one follower printing device will be required, and in accordance with the present invention such a circumstance may be taken care of through the use of printing apparatus illustrated in Figs. 23 to 49 in the drawings.

In most instances it will be recognized that in a collection of printing devices it will be unnecessary to use groups of lead and follower printing devices with respect to each subject or person, and hence in such a collection there will be groups of lead and follower printing devices with interspersed independent or individual printing devices. In accordance with the present invention such a collection of groups and interspersed individual printing devices may be run through a printing machine, and the feeding of the sheets S to printing position will be so controlled that each individual printing device will be used to form a printing impression on an individual sheet and the groups of printing devices will be so utilized that the printing impressions from all of the printing devices of each group will be formed upon an individual sheet. The sheets upon which such impressions are made are, of course, of the same size in order to facilitate handling and filing of such sheets, and in some instances the sheets may constitute cards adapted for use in manual sorting or in automatic sorting machines, accounting machines, posting machines or the like. In accordance with the present invention means is provided on the lead printing device of each group to indicate that the impression from one or more follower printing device should be made upon the same sheet S, and this means is effective to so control the sheet feeder 400 that this will be accomplished. The means whereby this is accomplished is such that the individual printing device and the follower printing devices need not bear identifying means or tabs. In the embodiment of the invention shown in Figs. 1 to 22, an identifying means such as a tab 215 is disposed in a particular position

along the upper edge of each lead printing device D, and sensing means which form a part of the printing machine 100 are arranged to sense the printing devices to determine when such a tab 215 is present upon such printing devices as they are advanced from the magazine and toward the printing position.

Such sensing means are disposed just forwardly of the magazine M, as indicated at 150 in Figs. 1, 2, 17 and 19, of the drawings and such sensing means form a part of a selector mechanism which is illustrated and described in detail in my copending application Serial No. 392,151, filed May 6, 1941, now issued as Patent No. 2,359,851, patented October 10, 1944. This selector mechanism is partially illustrated in Figs. 17 to 19 of the drawings and is of such a character that the presence or absence of a tab on a printing device is effective when this printing device reaches printing position to control the functioning of the sheet feeder 400. In the forms of the invention shown herein in Figs. 1 to 22 and in Figs. 23 to 49, the machine normally operates to make but one impression from each printing device, and the sheet feeder 400 is so arranged as to normally tend to feed a new sheet for each printing device which is fed to the printing position, and the selector mechanism is utilized to modify the action of the sheet feeder when a lead printing device is advanced to print a position. The arrangement is such that when such a lead printing device is fed to printing position the sheet separating means 403 is, in effect, disabled, and the sheet stop mechanism is operated in a different manner such that the sheet which is located at the printing position is advanced to a second location or relation so that a second impression may be made thereon from the follower printing device which is to be advanced into printing position in the next cycle of the machine operation. In this succeeding cycle of operation, in the event that the group of printing devices contains but one follower printing device, the operation of the sheet stop mechanism of the sheet feeder is again modified by the action of a selector mechanism so as to in effect return the sheet separating means and stop mechanism to their normal relation or condition, and this results in the next sheet S being separated, advanced and stopped at what may be termed the first printing relation with respect to printing position.

In the embodiment of the invention illustrated in Figs. 1 to 22 this operation is attained through timed closure of a control switch 152, Figs. 17 and 19, and this, in turn, is accomplished through the action of the selector mechanism 151, Figs. 17 to 19. Such closure of the control switch 152 serves to energize electrically operable actuating means associated with the sheet separating means 418 and with the sheet stop mechanism.

The electrically operated actuating means which is associated with the sheet separating means 418 is herein shown as comprising a solenoid 455 mounted adjacent to the hook-like pawl 425 and arranged when energized at the proper time in the machine cycle to prevent engagement of the hook 425' with the pin 427. Thus, to prevent operation of the sheet separating means, the hook-like pawl 425 is mounted, as shown in Figs. 4 to 7, on the arm 426 by means of a transversely extending pin 456, and the pawl 425 is in the form of a bell crank, one arm of which provides the hook-like member 425' and the other arm 458 of which extends in a downward direction. The pawl 425 is loosely mounted on the pin 456 so that it normally tends to drop to the inactive position shown in Fig. 7, but this tendency is normally overcome by a downwardly extending pawl 460 which is also loosely mounted on the pin 456 and which is urged in a counterclockwise direction, Fig. 7, by a spring 461 so that a cross pin 462 projecting rearwardly from the pawl 460 will engage the adjacent edge of the arm 458. This action of the pin 462 therefore tends to maintain the pawl 425 in the active position of Fig. 6. This active position of the pawl 425 is limited and determined by engagement of a nose 464 on the pawl 460 with an abutment surface 465 formed on a slide 466. The slide 466 is connected to the armature 455' of the solenoid 455 and has slots 467 therein whereby the slide 466 is slidably supported on the rock shaft 415 and a projecting guide pin 468.

With the construction just described it will be evident that when the solenoid 455 is energized so that the plate 466 is drawn from the position of Fig. 6 to the position of Fig. 7, the shoulder 465 will act on the nose 464 to pivot the pawl 460 to the position of Fig. 7, and under most circumstances the pawl 425 will drop by gravity to its inactive position to Fig. 7. When, however, the energization of the solenoid 455 is delayed until the hook 425' has engaged the pin 427, the pawl 425 will remain in its engaged position and will complete the sheet separating operation thereof which has been started. Thus, as will be hereinafter described in detail, the time in the machine cycle at which the solenoid 455 is energized has a controlling relation to the effectiveness of the solenoid 455.

As herein before pointed out, the closure of the control switch 152 also governs the functioning of the sheet stop means of the sheet feeder 400, and the arrangement is such as when but a single impression is to be made upon a sheet S, the sheet which has been fed to the sheet guideway G will be stopped in a first relation to the printing position of the printing machine by a first stop finger 470, while in the event that two impressions are to be made upon the sheet S, the first stop finger 470 will stop the sheet S in the first location, and will then be elevated so that a second stop finger 471 may become active to stop the sheet S in a second relation to the printing position for the formation of a second impression on the sheet. The first stop finger 470 is normally operative so as to be lowered immediately after a sheet S has been discharged from printing position, but where a second impression is to be made on a sheet S, the stop finger 470 is maintained in its elevated position while the second stop finger 471 is lowered. To attain such selective operation of the two stop fingers, two actuating means are provided, one of which is normally operative to actuate the stop finger 470 for the production of a single impression on each sheet, and the other of which is rendered operative under the control of the control switch 152 when two impressions are to be made upon a sheet S. These two actuating means are in the present instance mounted along and upon the front rail 475 of the bridge structure 401, it being noted that this bridge structure includes the front rail 475 and a rear rail 476 which are preferably formed from heavy steel bars of rectangular cross section. The first stop finger 470 is operated, as will hereinafter be described, from a rock shaft 477 which extends rearwardly from and transversely of the front rail 475 and is carried in the bearing bracket 478

secured on the top of the front rail. The rock shaft 477 is, in turn adapted to be actuated selectively by a cam and ratchet assembly 480 disposed adjacent the front edge of the rail 475 or by a somewhat similar cam and ratchet assembly 481 disposed adjacent to the rear edge of the rail 475, the assembly 480 being operable to actuate the rock shaft 477 in those cycles of machine operation where but a single impression is to be made upon a sheet, while the cam and ratchet assembly 481 is operable to actuate the rock shaft 477 in those cycles of operation where two impressions are to be made upon a sheet S. The second stop finger 471 is arranged for actuation by a rock shaft 484 which extends across the guideway G parallel to the rock shaft 477 and spaced to the right therefrom, Fig. 5, and the shaft 484 is mounted in a bearing bracket 485 mounted on the upper face of the rail 475. The rock shaft 484 is adapted for actuation by a cam and ratchet assembly 486 which is operated in timed relation to the cam and ratchet assembly 481 in those cycles of machine operations where two impressions are to be made upon a sheet S.

The cam and ratchet assembly 480 is arranged for actuation by a slide bar 490 mounted for reciprocation upon the forward edge of the rail 475 by means such as guide clips 491. The slide bar 490 is reciprocated in each rocking movement of the rock shaft 415 and this is accomplished through a connection link 492 pivoted at one end by a pin 493 to the slide bar 490 and connected at its other end to the cross pin 456. Thus when the rock shaft 415 is rocked in a clockwise direction, Fig. 7, the slide bar 490 is shifted to the right, and when the rock shaft 415 is returned to its at rest position of Fig. 7, the slide bar is returned in a left-hand direction. Such reciprocating movement of the slide bar 490 is utilized to impart step-by-step rotary movement to the cam and ratchet assembly 480. Thus, as shown in Figs. 12 to 15, the cam and ratchet assembly 480 includes a cam 495 and a ratchet 496 which are fixed on opposite ends of a mounting sleeve 497, and a bearing stud 498 is extended forwardly from the bearing bracket 478 so that the cam and ratchet assembly may be secured on the stud 498 by a resilient fastening device 499. As shown in Figs. 12 and 13, the cam 495 has six lobes 495' between which recesses 495'' are formed, and the cam 495 is engaged by a nose 500 formed on an arm 501 fixed to the rock shaft 477. A spring 502 acts on the arm 501 to urge the nose 500 into engagement with the cam 495. The ratchet 496 has six teeth 505, and such teeth are adapted to be engaged by a pawl 506, the pawl 506 having a laterally projecting pin 507 near the end thereof, and it is this pin 507 which engages the teeth 505. The pawl 506 is mounted, by means of an adjustable bracket 508, upon the slide bar 490 and a spring 509 acting between the bracket 508 and the pawl 506 urges the pawl toward its active relation with respect to the ratchet 496. At the end of a cycle of operation of the machine the pawl 506 is located in the position shown in Fig. 12, and in the first part of the next cycle of operation the slide bar 490 is drawn to the left in Fig. 12 until the pin 507 is engaged with the next tooth of the ratchet 496. The movement of the slide bar 490 is then reversed so that the cam and ratchet assembly 480 is advanced in a counterclockwise direction to the position shown in Fig. 13 and back to the relationship shown in Fig. 12. When the cam and ratchet assembly is in the position shown in Fig. 13 the nose 500 on the arm 501 is engaged with a lobe 495' on the cam 495, and hence it will be clear that the rock shaft 477 will have been rocked in a clockwise direction so as to impart a sheet-releasing movement to the stop finger 470. When the cam and ratchet assembly again reaches the relationship shown in Fig. 12, the rock shaft 477 will have been returned in a counterclockwise direction to its original position so as to return the stop finger 470 to its active sheet-stopping position. Thus, such rocking movement of the shaft 477 is operable to shift the first stop finger 470 from its active relation to an inactive relation and then back to an active relation.

In the form of the invention herein shown in Figs. 1 to 22, it will be observed that the stop finger 470 is located in a position relatively close to the path of movement of the platen P, and in order that this may be accomplished the stop finger 470 is slidable in character and is located at the rear side of the sheet guideway G so that it may be moved forwardly into the guideway when a sheet is to be stopped at the first relation with respect to the printing position. In the present instance the stop finger 470 is arranged to move or extend between two separately formed sections of the channel guideway 435, it being noted that the channels of the channel guide member 435 are relatively deep in most portions of the sheet guideway, but that in the portion of the sheet guideway which is opposite to the path of movement of the platen roller PR, a relatively thin channel guideway 435' is employed, thereby to assure that the platen roller PR will not come into contact with the channel guideway. In mounting the channel guideway section 435', the two spaced main sections of the channel guideway are connected by a relatively rigid tie bracket 510. A sheet metal mounting plate 511 extends forwardly from the cross member of the tie bracket 510 and the channel guide section 435' is carried and formed in part by the plate 511.

The stop finger 470 is, in the present instance, carried on the tie bracket 510 by means such as an upstanding bracket 513, and as shown in Fig. 16, the stop finger 470 is formed on the forward end of a slide plate 514 mounted on the bracket 513 by means such as headed studs 515 and slots 516 for sliding movement relative to the bracket 513 in a direction from front to rear of the machine. In order that proper clearance may be provided for the parts of the platen mechanism, the bracket 513 is disposed considerably to the right of the position at which the stop finger 470 is to be located, and for this reason the stop finger 470 is connected to the slide plate 514 by a laterally projecting arm 517 which is preferably formed integrally with the stop finger 470 and the side plate 514.

To produce the desired movement of the stop finger 470, a bell crank 520 is mounted on a pivot pin 521 on the bracket 513 somewhat above the upper edge of the slide plate 514, and the lower end of one arm of the bell crank 520 has a slot 522 therein which embraces a pin 523 extending from the slide plate 514. Thus by rocking movement of the bell crank 520, the slide plate 514 and the associated stop finger 470 may be reciprocated. Such rocking movement is imparted to the bell crank 520 from the rock shaft 477 and this is accomplished by an arm 525 which extends from the rock shaft 477 and rides in a longitudinal slot 526 formed in the other arm of the bell crank 520, it being noted that this arm of the bell crank 520 extends in a rearward direction from

the pivot pin 521. When the rock shaft 477 is in the relation shown in Fig. 12, this relationship corresponds to that shown in Fig. 16 and the stop finger 470 is located in its forward or active position. When the rock shaft 477 is actuated in a clockwise direction to the position shown in Fig. 13, the arm 525 acts upon the bell crank 520 to rock the same in a counterclockwise direction as viewed in Fig. 16, thereby to withdraw the stop finger 470 to its inactive position.

It has been stated hereinbefore that the slide bar 490 is actuated in the manner just described in each cycle of operation of the rock shaft 415, so that the cam and ratchet assembly 480 tends to impart the operative movements which have just been described to the stop finger 470. When, however, the sheet which is located at printing position is to have two impressions made thereon, this operation of the cam and ratchet assembly 480 is superceded by the cam and ratchet assembly 481, and when this occurs the cam and ratchet assembly 486 is also effective to produce operation of the stop finger 471 in timed relation to the operation of the stop finger 470. The stop finger 471 is of a different character than stop finger 470 in that the stop finger 471 is carried by an arm 530 extended radially from the rock shaft 484, and the stop finger 471 is so related to the rock shaft 484 that rocking movement of the shaft 484 merely serves to raise and lower the stop finger 471.

The cam and ratchet assembly 481 comprises a cam 531 and a ratchet 532 fixed on opposite ends of a sleeve 533 and mounted on a stud 534 which projects rearwardly from the mounting bracket 478 in a coaxial relation to the stud 498. An arm 535, which is similar to the arm 501, is fixed on the rock shaft 477 so as to ride upon the cam 531, but the cam 531 has but three teeth 531', as contrasted with the six teeth or lobes 495' afforded on the cam 495. Thus when one of the recesses between these three teeth is in alignment with the nose formed on the arm 535, the rock shaft 477 may be actuated and controlled solely by the cam and ratchet assembly 480. When, however, the two cam and ratchet assemblies 480 and 481 are actuated in unison, one of the relatively large teeth 531' of the cam 531 will come to rest in engagement with the nose of the arm 535 with the result that the stop finger 470 will be maintained in its retracted position at the end of such an advancing or indexing movement of the two cam and ratchet assemblies 480 and 481.

The cam and ratchet assembly 486 is formed substantially in the same manner as in the cam and ratchet assembly 481, that is, the cam thereof has three teeth, but after the cam and ratchet assembly 486 has been placed in position on the mounting bracket 485, the cam and ratchet assembly 486 is displaced rotatively through an angular distance of 60 degrees thereby to cause alternate effectiveness of the two stop fingers 470 and 471. In this connection it will be observed that the rock shaft 484 has an arm 537 thereon which rides on the cam of the cam assembly 486 in substantially the same manner as the arm 535 rides upon the cam of the assembly 481.

As hereinbefore pointed out, the two cam and ratchet assemblies 481 and 486 are actuated in unison when two impressions are to be made upon a sheet S, and such actuation is attained by means of a slide bar 540 which is mounted by guide means 541 for sliding movement along the rear edge of the front rail 575. The slide bar 540 has a pair of pawls 542 and 543 mounted thereon for operative engagement respectively with the ratchets of the assemblies 481 and 486, and the construction and relation of the pawls 542 and 543 is substantially the same as the pawl 506. The slide bar 540 is normally positioned in an at rest position at the left hand end of its stroke, as shown in Figs. 5 and 6 and this is attained by a spring 545 acting between a pair of anchoring pins 546 and 547 mounted respectively on the rail 475 and the slide bar 540, and the spring 545 tends to maintain the slide bar with its left hand end in engagement with a stop lug 548 mounted on the rail 475. Thus the pawls 542 and 543 are normally related to the associated ratchets in the manner shown in Fig. 6 and advancing or indexing movements may be imparted to the assemblies 481 and 486 merely be movement of the slide bar 540 in a right hand direction.

This movement of the slide bar 540 must, of course, be timed with relation to the movements of the other parts of the mechanism, and this is attained in the present instance by utilizing the front slide bar 490 as a driving means for the rear slide bar 540. For this purpose means are provided whereby the slide bar 540 may be connected to the slide bar 490 and these means are arranged for operative connection under the control of the control switch 152, there being a solenoid 550 which is energized each time the switch 153 is closed and which is operable when so energized to effect the desired movement-transmitting connection from the slide bar 490 to the slide bar 540. Thus, as shown in Figs. 5 to 11, a cross plate 552 is mounted on the slide bar 540 so as to extend forwardly therefrom and over the slide bar 490, and a latch pawl 554 is mounted on the slide bar 490 for engagement with the cross plate 552 to impart movement in a right-hand direction to the cross plate 552 and hence to the slide bar 540 upon which it is mounted. As shown in detail in Figs. 9 and 10, a pair of mounting lugs 556 are secured upon the rear face of the slide bar 540 to serve as a means for supporting the cross plate 552 thereon, and a shaft 557 is extended between the two mounting lugs 556 and through a downwardly extending arm 558 formed on the cross plate 552 to thereby form a pivotal mounting for the cross plate. A mounting pin 559 is fixed in the slide bar 540 and extends rearwardly therefrom through an opening in the arm 558, and a spring 560 acting between a fixed washer 561 on the pin 559 and the arm 558 urges the lower end of the arm 558 toward the slide bar, thereby to urge the cross plate 552 to the elevated position shown in dotted outline in Fig. 9. In this connection it will be observed that the side of the lug 558 is relieved as indicated at 558' in Fig. 9 and this permits and limits such movement by the spring 560.

When the slide bars 540 and 490 are to be connected, the cross plate 552 is depressed tc the full-line position of Fig. 9 so as to be positioned for engagement by the latch pawl 554, and such depression of the cross plate 552 is attained by means which are actuated by the solenoid 550. Thus the solenoid 550 is secured on the rail 475 adjacent to the normal location of the cross plate 552, and the armature 565 of the solenoid is connected by a link 566 to the upper corner of a triangular pressure member 566. The triangular pressure member 566 is pivoted adjacent to its lower edge on a pivot pin 567 which is carried on a bracket 568 secured to the rail 475 on the

other side of the cross plate 552, and when the solenoid 550 is energized, the plate 568 is rocked in a counterclockwise direction so that one corner 568' thereof presses downwardly upon the cross plate 552 to thereby move it to the full-line position of Figs. 9 and 11. When the cross plate 552 has been thus depressed, it is latched in this position by a latch 570 which is shown in Figs. 7 to 11. The latch 570 is pivoted on a horizontal pivot pin 571 mounted on the lower end of a mounting block 572 secured to the forward face of the slide bar 470, and a leaf spring 573 secured on the mounting block 572 urges the latch 570 to the active position shown in Figs. 8 to 10. When the cross plate 552 is depressed through energization of the solenoid 550, the end of the cross plate 552 rides downwardly along the sloping surface of a latch tooth 575 formed on the latch 570, and when the fully depressed position of the cross plate 552 is reached, the latch 570 snaps into its active position shown in Figs. 8 to 10. When the cross plate 552 is depressed through energization of the solenoid 550, the end of the cross plate 552 rides downwardly along the sloping surface of a latch tooth 575 formed on the latch 570, and when the fully depressed position of the cross plate 552 is reached, the latch 570 snaps into its active position with the latch tooth 575 thereof overlying the upper face of the cross plate 552.

At the time when the solenoid 550 is thus energized to depress the plate 552, the hook-like end 578 of the latch pawl 554 will be located beneath the cross plate 552 as indicated in Figs. 5 to 7 of the drawings, and the depression of the plate 552 will under such circumstances merely serve to depress the hook-like end 578, and to permit this to be done the pawl 554 is pivotally mounted on the slide bar 490 by a pivot pin 580. The latch pawl 554 has a spring 581 acting between a stationary anchor 582 on the slide rod 490 and an upstanding arm 583 formed on the latch pawl 580, and this spring acts to urge the hook-like end 578 of the pawl 554 upwardly toward its elevated position. Thus when the cross plate 552 is depressed, the hook-like end 578 of the latch pawl 554 is depressed, and as the movement of the slide bar 490 progresses in a left hand direction the hook-like end 578 finally rides off of the lower surface of the cross plate 552 and the spring 581 acts to raise the hook-like end 578 to the position shown in Fig. 11. The movement of the slide bar 490 is then reversed, and as the slide bar 490 moves to the right the hook-like end of the pawl 554 engages the left hand edge of the cross plate 552 to thereby act as a clutch and impart similar movement in a right-hand direction to the slide bar 540. Thus the clutch afforded by the pawl 554 and the cross plate 552 serves to operate the cam assemblies 481 and 486, which for those machine cycles where two impressions are made on a sheet, constitute a group of related and cooperating cams. It will be observed that when the hook-like end 578 is thus engaged with the cross plate 552, a tooth 578' which forms a part of the hook-like end 578 overlies the upper surface of the plate 552 but is in spaced relation thereto. This spaced relation is determined by a lug 586 formed on the end of the pawl 554 and underlying a shouldered stud 587 which acts as a stop and which also carries a guide washer 588 for maintaining the proper transverse positioning of this end of the pawl 554.

During the movement of the two slide bars in a right-hand direction, the plate 552 is maintained in its lower or latched position until the right-hand stroke is substantially complete, and at this time the upper end portion of the latch 570 moves into engagement with a cam surface 590 formed on a cam bracket 591 secured on the upper face of the rail 475 adjacent to the bracket 568. This acts to release the latch 570 so that the spring 560 may induce a slight upward movement of the cross plate 552, such upward displacement being limited by the tooth 578'. Such displacement is sufficient to place the end of the cross plate 552 in alignment with the pointed end of the latch tooth 575 and hence the latch 570 is maintained in an inactive position.

As the movement of the two slide bars 490 and 540 progresses to the right, the two pawls 542 and 543 are effective to impart indexing movement to the two cam and ratchet assemblies 481 and 486, and in the first such actuation of these assemblies the first stop finger 470 is withdrawn to its inactive position and the stop finger 471 is lowered to its active position. It will be recognized, of course, that the cam and ratchet assembly 480 is also actuated or indexed at the same time, but this cam and ratchet assembly 480 is immaterial and rendered ineffective by the actuation of the cam and ratchet assembly 481.

It will be clear that when the slide bar 540 is thus actuated in the course of a machine cycle when the first impression is being made upon a sheet S which is to bear two impressions, the slide bar 540 will not only be retained in its right-hand position but will also need to be actuated another time in order to release the stop finger 471 and render the stop finger 470 active after the completion of the second printing impression on the particular sheet. This second actuation of the slide bar 540 is automatically obtained in a manner which will hereinafter be described in detail, and this involves a second energization of the solenoid 550. Thus when the solenoid 550 is energized in the next cycle of machine operation, the pressure plate 556 will again return the cross plate 552 to its lower position and it will be recognized that this takes place at the time when the latch 570 has been moved away from the cam surface 590. The latch 570 therefore moves into its active position at this time and holds the cross plate 552 in its lower position. Thus as the slide bar 490 moves in a left-hand direction the spring 545 acts to move the slide bar 540 in a left-hand direction at a speed which is governed by the speed of movement of the slide bar 490. When the slide bar 540 reaches its left hand or at rest position, as determined by the stop 548, the slide bar 490 continues movement for a short distance so that the hook-like end 578' of the pawl 554 is, in effect, released from the cross plate 552 as shown in Fig. 11. However, at this time the latch 570 is effective so that the cross plate 552 is maintained in its lower or active position. As the direction of movement of the slide bar 490 is reversed and the cross bar 490 again starts in a right hand direction, the hook-like end 578' again engages the cross plate 552 and the slide bar 540 is again moved to the right so that the pawls 542 and 543 impart another indexing movement to the cam and ratchet assemblies 481 and 486. This causes the stop finger 471 to be elevated after the second impression on the sheet S has been completed, and this completed sheet is thus released for discharge into the collecting hopper 405. After the completed sheet has thus been

released, the stop finger 470 is returned to its forward or active position so as to be in condition to stop the next sheet S in the first position with relation to the printing position.

The right-hand movement of the two slide bars 490 and 540, of course, progresses in the manner hereinbefore described so that the latch 570 is released at the end of such right-hand movement. In the event that the next cycle of machine operation is one in which but a single impression is to be made upon the sheet S it will be clear that the solenoid 550 will not be energized, and hence, during the return movement of the two slide bars 490 and 540 to the left, the cross plate 552 will be held down only through the retaining action of the tooth 578' which is at this time located on top of the cross plate 552. At the end of the left-hand stroke, however, the movement of the slide bar 540 will be terminated by the stop 548, and as the left hand movement of the slide bar 490 continues, the hook-like tooth 578' will be moved off of the top of the cross plate 552 so that this plate will be released for movement to its inactive or elevated position shown in dotted outline in Fig. 9.

The energization of the solenoids 455 and 550 is attained under the present invention under control of the tabs as 215 which may be carried at a particularly identifying position on the lead printing devices D, and such control is made effective through the use of the selector mechanism of the printing machine. Thus, as shown in Figs. 17 and 18, the sensing head 150 is mounted for vertical reciprocation at what may be termed the sensing position of the printing machine, the head 150 being mounted on vertical guide rods 155 and 156. The sensing head 150 carries means such as a sensing pin 157 thereon in a location which corresponds with the identifying position at which the tabs 215 are to be mounted on the lead printing devices D, and as each printing device D is located at the sensing position, the sensing head 150 is lowered by a yielding force to determine whether or not a tab 215 is present at the selected identifying position upon the sensed printing device. When a tab 215 is not encountered by the sensing pin 157, the sensing head 150 continues movement to a particular lower level, but when a tab 215 is encountered or sensed, such downward movement is terminated at a somewhat higher level, and this difference in the levels to which the sensing head moves is utilized to set up storage mechanism which becomes active in subsequent cycles of the machine to cause timed closure of the switch 152. The setup of the storage mechanism is accomplished through the medium of a cam 158 and a cooperating setup arm 160 which serves to differentially set up storage plungers 161 in substantially the manner described in my aforesaid copending application Serial No. 392,151, and reference may also be had to said application for details of the manner in which the sensing head 150 is lowered in each cycle of machine operation.

The setup arm 160 is arranged to engage the plungers 161 to move these plungers to the left from the initial position shown by the lower plunger in Fig. 18, and the movement of such plunger to the left is differentially governed by the level to which the sensing head 150 and the cam 158 are lowered. When a tab 215 has been encountered by the sensing pin 157, the lowermost plunger in the storage drum 162 is set to the position shown by the upper plunger in Fig. 18, while when the sensing pin 157 has not engaged a tab 215, the plunger is set to the position indicated in dotted outline in Fig. 18. After a storage plunger 161 has been thus set up at the lower or set up position on the drum 162, the indexing movements of the drum 162 move the set up storage plunger to successive positions which in effect correspond with the successive advancing movements of the related printing device along the printing device guideway and toward the printing position. When the related printing device has reached such a position in the printing device guideway that it would be advanced into printing position in the next cycle of operation of the machine, the related and set up storage plunger 161 is located in the position indicated by the reference numeral 161D in Fig. 17. In this position the setup storage plunger has its cam lobe 161' located in alignment with and relatively close to a cam surface 170 formed on an arm 171' of a bell crank 171 so that in the next indexing movement of the storage drum 162, the cam lobe 161' of the storage plunger 161D will engage the cam surface 170 almost as soon as the cycle of machine operation has started. This will impart rocking movement to the bell crank 171 in a counterclockwise direction about its mounting axis 172, and in such movement a block 173 carried on the other arm 171'' of the bell crank will engage the plunger of the switch 152 to thereby close the switch 152. The closure of the switch 152 extends circuit from one side of a source of current such as a battery 175 through the switch 152 and a wire 177 to one terminal of an outlet socket 179 located in the end wall of the printing machine adjacent to the other plug connections, and a wire 181 extends from one side of the battery to the other side of the battery to the other side of the terminal of the plug connection. As shown in Fig. 22 the two solenoids 550 and 455 are connected in parallel by wires included in the cord 183 and a plug connector 185 which is inserted in the socket 179. Thus when the switch 152 is closed by the bell crank 171, both of the solenoids 455 and 550 are energized.

As hereinbefore pointed out, the cam surface 170 is so located and so formed that such closure of the switch 152 takes place almost immediately after initiation of a machine cycle, and hence such switch closure not only causes the solenoid 550 to establish a driving connection from the slide bar 490 to the slide bar 540, but also the solenoid 455 is energized before the hook-like end 425' has engaged the pin 427, and hence the sheet separating mechanism 418 is rendered ineffective in this cycle of machine operation. In the next machine cycle, however, it is desirable that the sheet separating mechanism 418 be allowed to operate, and the machine is arranged so that the solenoids will be energized at such a time that the solenoid 455 will not release or disable the sheet separating means. Thus, at the time when the next machine cycle is to be initiated, the plunger 161D will have moved to the position indicated at 161E in Fig. 17, and will be at rest at this position. When the next machine cycle is initiated, the clockwise advancing movement of the storage drum 162 will move this storage plunger toward a cam surface 186 which is formed on the arm 171 of the bell crank 170, but the surface 186 is spaced from the at rest plunger position 161E in such an amount that before the cam surface 186 is engaged, the hook-like end 425' of the pawl 425 will have engaged and hooked over the pin 427. Hence, when the cam surface 186 is engaged by the advancing plunger 161E,

the resulting rocking movement of the bell crank 171 will close the switch 152 at a time when the solenoid 455 cannot effect release or disabling of the pawl 425. The solenoid 550 will, of course, be energized, and will return the cross plate 552 to its latched relation with respect to the latch 570, thus causing the slide bar 540 to operate again in this machine cycle so as to cause appropriate actuation of the two stop fingers 470 and 471. The machine, at the end of such a cycle of operation, will, of course, be so conditioned that unless the switch 152 is again closed in the next machine cycle the machine will operate so as to produce but a single impression upon the next sheet S.

In the embodiment of the invention which has thus far been described, the machine has been adapted to automatically care for the printing of collections of individual printing devices and groups of printing devices where such groups of lead and follower printing devices did not contain more than one follower printing device. Many instances arise, however, where the amount of text or information pertaining to a particular person or subject requires a larger number of follower printing devices in at least certain of the groups, and in Figs. 23 to 49 inclusive I have illustrated another embodiment of the invention which is so arranged that the groups of printing devices may contain either one, two or three follower printing devices. In this embodiment of the invention, therefore, it is possible to attain a relatively wide variation in the amount of printed matter or text which is produced upon a sheet S, and this variation is attained under the control of identifying means such as tabs carried in selected of the different identifying positions on the lead printing devices. In addition to the variation in the amount of printed matter or text produced upon each sheet through variation in the number of follower printing devices included in the groups, this embodiment of the invention also varies the amount of printed matter or text through variation in the line cut-off, and this variation is also attained automatically under the control of identifying means such as tabs carried on the lead printing devices. With this arrangement it is possible to provide a greater index area upon the lead printing devices, and despite this, it is possible to use a smaller index area on the follower printing devices, thereby making a larger area available for type matter on the follower printing devices. Thus, an arrangement of printing devices and sheets which may be utilized with this embodiment of the invention is shown in Figs. 46 to 49 of the drawings. Fig. 46 shows what will be termed an individual or independent printing device DC which is in its major elements constructed and arranged in the same general manner as the printing device D illustrated in Fig. 20. The printing device DC, however, has a relatively large index card 600 and it is provided with a printing plate 601. Since the printing device DC is an individual printing device, it will be observed that this printing device is untabbed. When the printing device DC is passed through the machine an impression DC' is made on the sheet S1 in the location indicated in Fig. 46.

In Figs. 47 two printing devices DD1 and DD2 are illustrated, and it will be observed that the printing device DD1 constitutes a lead printing device having a tab 602D adjacent to the left hand end of the upper edge thereof. A tab in this particular location indicates that the printing device DD1 is the lead printing device of a group which includes one follower printing device DD2. The lead printing device DD1 in this group, and in each of the other groups which will be hereinafter described, includes a relatively large index card 600 and a relatively small printing plate 601, the relation of these parts being the same as in the individual printing devices DC. The follower printing device DD2, however, does not require such a large index card, and therefore this printing device has a somewhat smaller index card 605 and a relatively large printing plate 606. When these two printing devices are passed through the machine, the printing device DD1 makes an impression DD1' in the position indicated at Fig. 47 and which corresponds with the position of the impression DC' of Fig. 46, while the follower printing device DD2 makes an impression at DD2'.

In Fig. 48 there is shown a group of printing devices which includes a lead printing device DT1 having a tab 602T in a location which differs from the location of the tab 602D, thereby indicating that this lead printing device belongs in a group having two follower printing devices DT2 and DT3. The lead printing devices DT1 corresponds in its proportioning with the lead printing device DD1, while the follower printing devices of this group correspond in form with the follower printing device previously described. The printing impressions from this group of printing devices are formed on a sheet S1 in the relation indicated in Fig. 48.

In Fig. 49 there is illustrated a group of printing devices having a lead printing device DQ1 bearing a tab 602Q at still a different identifying position, thereby indicating that this lead printing device belongs to a group including three follower printing devices DQ2, DQ3 and DQ4, and impressions from printing devices of such a group are made in the position and relation shown in Fig. 49.

A collection of printing devices including individual printing devices variantly arranged among or between groups such as those shown in Figs. 46 to 49 may be passed through a printing machine 100 shown in Fig. 1, and in this embodiment of the invention a sheet feeder 610 similar to the sheet feeder 400 is associated with the printing machine 100 so that the sheet feeder will supply sheets S1 in accordance with the control means carried on the printing devices and will assure that where groups of printing devices are passed through the machine, the impressions from the related printing devices of each group will be made upon a single sheet in the predetermined relationship illustrated in Figs. 46 to 49. The sheet feeder 610 is in many respects similar to the sheet feeder 400 previously described, and this sheet feeder includes a bridge structure having a forward rail 611 and a sheet separating mechanism 612 which in each operation thereof withdraws a sheet from the supply magazine and advances the sheet into the sheet guideway G. The sheet separating mechanism 612 is operated by a rock shaft 615 which is operated each time an impression is made in the printing machine. Normally a hook-like member 625 acts on a pin 626 carried on a lever 627 to rock the lever 627 which causes operation of the sheet separating mechanism, but in those cycles where a sheet is not to be separated and fed, the operation of the sheet feeding means is suppressed through energization of a solenoid 630 which is related to the

hook-like pawl 625 in the manner described with relation to the solenoid 455.

As a sheet S1 is advanced along the sheet guideway G by the frictional belt 631, such a sheet is brought to rest at the proper relation with respect to printing position by means of a stop finger mechanism which may be very variantly and selectively actuated in accordance with the number of impressions which are to be made upon the particular sheet. The arrangement is such that this stop finger mechanism normally operates to stop each sheet in but one position so that but one impression will be made on the sheet, but when the presence of a tab 602D, 602T or 602Q is detected by the sensing mechanism of the printing machine, such selector mechanism, which will be hereinafter described in detail, is effective to modify the action of the stop finger mechanism to cause the sheet S1 to be stopped in the required number of positions along the sheet guideway. Thus, as shown in Figs. 23 and 25, a stop finger 640C is provided for stopping the sheet in position 1, and this stop finger 640C is variantly actuated in accordance with the number of impressions to be made on each sheet. To stop the sheet in position 2 there are three stop fingers 640D, of which the stop finger 640D2 serves to stop the sheet in the second position when but two impressions are to be made on the machine, the stop finger 640T2 serves to stop the sheet in position 2 when three impressions are to be made upon a sheet, and the stop finger 640Q2 serves to stop the sheet in position 2 when four impressions are to be made upon the sheet.

To stop the sheet in position 3, two stop fingers 640T are provided, the stop finger 640T3 serving to stop the sheet in position 3 when but three impressions are to be made on the sheet, and the stop finger 640Q3 serving to stop the sheet in position 3 when four impressions are to be made upon the sheet.

To stop the sheet in the fourth position, a single stop finger 640Q is provided, and this stop finger, of course, operates only when four impressions are to be made upon a particular sheet.

Automatically controlled means are provided for actuating the various stop fingers in different sequence in accordance with the number of impressions to be made upon a sheet, and this mechanism is actuated from the rock shaft 615 and is controlled by the selector mechanism of the printing machine. Thus, as shown in Figs. 23 and 24, the front rail 611 has front and rear slide bars 642 and 642' associated therewith by means such as guide members 643, and these two slide bars are connected together for reciprocated movement in unison in a manner which will hereinafter be described in detail. The actuating power for reciprocating the slide bars is applied from the rock shaft 615 through a link 644 which is similar in form and function to the link 492 of the first embodiment herein described. The reciprocating movement of the slide bar 642 is utilized to impart driving movement to the selected elements of a cam mechanism 650 which is mounted upon the front rail 611 and which serves to selectively actuate the stop fingers 640. The cam mechanism 650 includes a main drive shaft 660C which extends for a considerable distance along the rail 611 and is rotatably supported thereon at longitudinally spaced points by a series of mounting or bearing brackets 661, 662, 663, 664, 665, 666, 667 and 668. The shaft 660C is operated through an indexing movement each time the slide bar 642 is reciprocated and this is accomplished through a cam and ratchet mechanism 670 which is illustrated in some detail in Figs. 33 to 35 of the drawings. Thus, as shown in Fig. 35, the end of the shaft 660C has a pawl carrier 671 mounted thereon for rocking movement about the axis of the shaft, and a spring biased pawl 672 on the pawl carrier is arranged to engage a toothed ratchet 673 which is pinned upon the shaft 660C. The pawl carrier 671 has a cam roller 674 thereon which rides along the sloping surface of a cam plate 675 carried on the slide bar 642, and a spring 676 acting between the pawl carrier 671 and an anchoring pin 677 extended from the bracket 661 serves to maintain the cam roller 674 in engagement with the surface of the cam 675. At the end of a cycle of operation of a machine, the cam 675 is located in the position shown in Fig. 33 but when a new cycle of operation is initiated, the slide bar 642 is withdrawn to the left, thereby allowing the spring 676 to rock the pawl carrier 671 in a counterclockwise direction in Fig. 35. Since, as will hereinafter be described, the shaft 660C cannot turn in a rearward or clockwise direction, Fig. 35, the pawl 672 rides over one or more of the teeth of the ratchet, and upon reversal of the movement of the slide bar 642, the rocker 671 is rocked in a counterclockwise direction to impart similar indexing movement to the shaft 660C.

As hereinbefore pointed out, the step-by-step indexing movement of the shaft 660C is utilized to impart the desired movement to the stop fingers 640 which are to be effective with respect to a particular sheet, and in attaining this result it may be observed that for consecutive work, that is, when but a single impression is to be made upon each sheet S1, the shaft 660C serves directly to actuate the stop finger 640C. When two, three or four impressions are to be made on a sheet, the actuation of the proper stop fingers 640 in the proper sequence or relation is obtained indirectly from the shaft 660C through selectively operable means which are driven from the shaft 660C. To this end I have provided three transmission shafts which are mounted in the bearing brackets 663, 664, 665, 666, 667 and 668 parallel to and disposed about the main shaft 660C. The arrangement of these shafts is shown in Fig. 28 wherein a shaft 680D, a shaft 680T and a shaft 680Q are disposed parallel to and in equal spaced relation to each other and outwardly from the main shaft 660C. The shafts 680D, 680T and 680Q terminate just to the left of the bearing bracket 663, as indicated at 681, and aligned shafts 682D, 682T and 682Q are extended from the line of termination 681, through the bearing bracket 662, and means are provided whereby the shafts 682D, 682T and 682Q are driven in a one-to-one relation from the main shaft 660C at all times. This driving means comprises a pinion 683 fixed on the shaft 660C and similar pinions 684 meshed with the pinion 683 and fixed on the various shafts 682 as indicated in Figs. 33, 34, and 36. The shafts 680 are normally driven from the shafts 682 by clutch devices 690D, 690T and 690Q, and these clutch devices are arranged to be governed from the selector mechanism of the printing machine in such a way that when but a single impression is to be made upon a sheet S1, the clutches 690 will all be disengaged, and when two impressions are to be made upon a sheet the clutches 690T and 690Q will be disengaged, while the clutch 690D will be or remain

engaged and will drive means associated therewith which will cause proper timed operation of the stop finger 640 to cause the sheet to be stopped in the first and second position with relation to the printing position of the printing machine. Similarly when three impressions are to be made upon a sheet, the clutches 690 are so operated that the shaft 680T will be driven and means associated with this shaft will serve to produce proper timed operation of the stop fingers 640. In the event that four impressions are to be made on the sheet, the clutches 690 are so operated and controlled that the shaft 680Q will be driven, and the stop fingers 640 will be actuated by means associated with the shaft 680Q in such a manner that the sheet will be stopped in four different positions.

The means whereby the various stop fingers 640 are selectively actuated are provided in the present instance by cams 700 which are mounted upon the main shaft 660C, and these cams are driven in different groups or combinations in accordance with the control of the clutches 690. To afford the desired association of the stop fingers 640 with the cams 700, the stop fingers 640 are pivotally mounted upon appropriate ones of the bearing brackets carried on the rail 611. Thus, as to the stop fingers 640C, it will be observed that a mounting shaft 701 is extended between the two brackets 664 and 665 adjacent to the rear edges of these brackets and slightly above the level of the shaft 660C, as will be evident in Fig. 28 of the drawings. This shaft has an arm 702 fixed thereon and extending rearwardly therefrom, and the stop finger 640C is secured on the arm 702 as by welding. The arm 702 also extends downwardly and forwardly from the axis of the shaft 701 to afford an arm 703 and a somewhat similar arm 704 is extended downwardly and rearwardly from the mounting shaft 701 adjacent to the bracket 664 so that a cam follower bar 705 may be extended between the two arms 703 and 704 for cooperation with a plurality of cams 700 which are mounted on the shaft 660C between the two bearing brackets 664 and 665. The cams 700 which are thus disposed between the brackets 664 and 665 are identified as 700C, 700D1, 700T1 and 700Q1, and the cam 700C which operates to actuate the stop finger 640C when but one impression is to be made upon a sheet is secured as by a set screw 706 to the shaft 660C for constant rotation therewith. It will be observed in Fig. 28 of the drawings that the cam 700C has relatively narrow teeth, there being twelve such teeth or lobes formed thereon and the actuating mechanism for the shaft 660C is such that this shaft and the cam 700C are actuated through one-twelfth of a revolution in each cycle of operation of the machine. It may be observed that the other three cams 700D1, 700T1 and 700Q1 which are adjacent to the cam 700C are loosely mounted upon the shaft 660C, and when these other cams are not actuated, the cam 700C serves to raise and lower the stop finger 640C in each cycle of machine operation. These other cams, however, may be selectively actuated, and when this occurs the cam which is thus actuated is arranged to succeed or dominate the action of the cam 700C so that the stop finger 640C will remain in its elevated position for one or more cycles of machine operation in accordance with the cam which is thus driven. Thus, as shown in Fig. 29 of the drawings, the cam 700D1 has but six equally spaced lobes and when the cam 700D is driven, the stop finger 640C will be elevated near the end of the first cycle of machine operation by engagement of one of the lobes of the cam with the follower 705 as shown in Fig. 29. In the next cycle of machine operation the cam 700D1 will allow the stop finger 640C to be moved to its lower or active position.

Similarly the cam 700T1, Fig. 30, has but four equally spaced lobes and the arrangement is such that when this cam is driven, the stop finger 640C is elevated near the end of the first operation of the cam and is maintained in this elevated position through the second machine cycle and until relatively near the end of the third machine cycle at which time the cam follower 705 rides off of the end of one of the lobes of the cam 700T1 so as to allow the stop finger 640C to drop to its active position.

The cam 700Q1, Fig. 31, has but three equally spaced cam lobes and these lobes are so arranged that in the first cycle of machine operation in which the cam 700Q1 is driven, the stop finger 640C is elevated near the end of the first machine cycle. The lobes of the cam 700Q1 are of such length that the stop finger 640C is maintained elevated throughout the second and third machine cycles and throughout a substantial portion of the fourth machine cycle, at which time the cam follower 705 rides off of the lobe of the cam 700Q1 and allows the stop finger 640C to drop to its lower position.

It has been pointed out hereinabove that all the cams except the cam 700C are loosely mounted upon the shaft 660C, and the other cams have pinions 711 associated therewith whereby these cams may be individually driven from the appropriate one of the shafts 680. Thus, as shown in Fig. 26 of the drawings, the cam 700D1 has a pinion 711D1 associated therewith and fixed thereto, and this pinion is engaged by a pinion 712D1 which is fixed on the shaft 680D. As shown in Fig. 25 of the drawings, the pinion 712D1 is formed on one end of a sleeve 713D1 which has a collar 714D1 at its other end. The collars 714D1 is engaged with the adjacent face of the bearing bracket 664 and this serves to locate the pinion 712D1 in alignment with the pinion 711D1. The collar 714D1 has a pin 715D1 extended therethrough so that the pinion 712D1 is fixed to the shaft 680D for rotation therewith. The cam 700T1 has a pinion 711T1 fixed thereto and this pinion is meshed with a pinion 712T1 which is fixed on the shaft 680T in the manner above described. A pinion 711Q1 which is fixed to the cam 700Q1 has a pinion 712Q1 meshed therewith and this pinion 712Q1 is fixed on the shaft 680Q. Hence any one of the loosely mounted cams 700 which are associated with the stop finger 640C may be selectively actuated through the appropriate one of the shafts 680, and any cam which is thus actuated will succeed and dominate the consecutive cam 700C in the control and actuation of the stop finger 640C.

It will be observed in Fig. 25 of the drawings that the several stop fingers 640 which may serve to stop the sheet in the second position are mounted as a group upon a stud 720—2 which extends from the bearing bracket 666 in alignment with the bearing shaft 701. The stud 720—2 has suitable spacing washers 721—2 which maintain the associated stop fingers 640 in alignment with the cams 700 which are to selectively actuate these stop fingers. In securing such association of these stop fingers with the cams 700, I prefer to mount each stop finger upon a mount-

ing plate 724 which has rearwardly a projecting finger 725 as shown in Fig. 32 and this finger 725 acts as a cam follower which bears against the associated cam 700. Cams 700 are loosely mounted on the shaft 660C between the bearing bracket 666 and a collar 726—2, Fig. 26, secured on the shaft 660C. The cam 700D2 which serves as the actuating means for the stop finger 640D2 has a pinion 711D2 fixed thereto, and this pinion is engaged by a pinion 712D2 which is fixed on the shaft 680D. The cam 700T2 which serves as the actuating means for the stop finger 640T2 has a pinion 711T2 fixed thereto and this pinion is engaged by a pinion 712T2 which is fixed on the shaft 680T. The cam 700Q2 is arranged to actuate the stop finger 740Q2 and a pinion 711Q2 which is associated therewith is engaged by a pinion 712Q2 which is fixed on the shaft 680Q. Thus, the stop fingers 640 which are disposed at the second position along the sheet guideway may be selectively actuated by the associated cams 700D2, 700T2, or 700Q2 in accordance with the one of the shafts 680 which is selected for operation. The particular form of the cams associated with these stop fingers will be described in detail hereinafter, and the relation of the cams on the same shafts 680 will be explained.

The stop fingers 640 which are disposed opposite the third position along said guideway are similarly mounted on the bearing bracket 667 by a stud 720—3 and spacers 721—3, and the mounting of these stop fingers includes mounting plates 724 and arms 725 such as those hereinabove described. The cams 700T3 and 700Q3 are mounted loosely on the shaft 660C between the bearing bracket 667 and a collar 726—3 fixed on the shaft 660C. The cam 700T3 which actuates the stop finger 640T3 has a pinion 711T3 fixed thereto, and this pinion is engaged by a pinion 712T3 which is fixed on the shaft 680T. The cam 700Q3 which serves to actuate the stop finger 640Q3 has a pinion 711Q3 fixed thereto and this pinion is engaged by a pinion 712Q3 which is fixed on the shaft 680Q.

The single stop finger 640Q4 which is associated with the fourth position along the guideway G is mounted on the bracket 668 by a stud 720—4 and a spacing collar 721—4, and the stop finger 640Q4 includes a mounting plate 724 and a finger 725 which is engaged with a cam 700Q4. The cam 700Q4 is loosely mounted on the shaft 660C between the bearing bracket 668 and a collar 726—4 secured on the shaft 660C. The cam 700Q—4 has a pinion 711Q4 fixed thereto and this pinion is engaged by a pinion 712Q4 fixed on the shaft 680Q.

All of the cams 700 which are driven from a particular one of the shafts 680 may be said to constitute a group and are of the same form, and this form has been described hereinbefore by reference to Figs. 29, 30 and 31, but it will be recognized that such cams of a particular group are displaced angularly with relation to each other so as to produce actuation of the associated stop fingers in the desired sequence. For example, the cams 700Q are displaced angularly from each other in the amount of 30 degrees so that in a first actuation of the shaft 680Q from its normal rest position, the stop finger 640C will be elevated, the stop finger 640Q2 will be lowered and the two stop fingers 640Q3 and 640Q4 will be maintained in their elevated positions. In the next cycle of operation in which the shaft 680Q is actuated the stop finger 640Q2 will be elevated, the stop finger 640Q3 will be lowered, and the stop fingers 640C and 640Q4 will be maintained elevated. In the third such operation of the shaft 680Q, the stop finger 640Q3 will be elevated, the stop finger 640Q4 will be lowered, and stop fingers 640C and 640Q2 will be maintained elevated. In the fourth such actuation of the shaft 680Q, the stop finger 640Q will be elevated, the stop finger 640C will be lowered, and the stop fingers 640Q2 and 640Q3 will be retained in their elevated positions. A similar and successive angular displacement of the cams on the other two shafts 680 is also provided, and through this arrangement the desired sequence of operation of the stop fingers 640 is attained no matter which of the shafts 680 is selected for operation.

Such selection of the shaft 680 which is to be operated is effected through control of the clutches 690. These clutches 690 are similar in construction and operation, and the clutch 690D is illustrated in detail in Fig. 33 of the drawings. Thus the clutch 680D includes a driven member 730D pinned to the shaft 680D in abutment with the left hand face of the bearing bracket 663. The driven member 730D has relatively square teeth thereon which are adapted to be engaged by complemental teeth formed on a driven member 740D which is slidable upon the shaft 682D and has a splined connection 741D with the shaft 682D. The driven member 740D of the clutch is urged toward its engaged relation by a spring 742D which surrounds the shaft 682D and acts against a collar 743D pinned to the shaft 682D. With this construction in all of the clutches 690, the tendency would be to drive all of the shafts 680 in each cycle of machine operation, but means are provided for selectively disengaging the clutches 690 to attain a driving action only upon a selected one of the shafts 680, and in many instances, as where an individual printing device DC is being passed through the machine, all of the clutches 690 are disengaged so that only the cam 700C and the stop finger 640C are operated.

The desired selective control of the clutches 690 is in the present instance attained through the provision of a clutch operating carriage 750 which, as shown in Figs. 33 and 37 of the drawings, constitutes a sheet metal member built to form four angularly related sides and having the edges of the sheet metal member secured to the respective slide bars 642 and 642' by means such as screws 751. The clutch control carriage 750 is so disposed upon the two slide bars 642 and 642' that the three clutches 690 are enclosed within the housing formed by the sheet metal wall of the carriage 750, and the housing affords a connection between the two slide bars so that the two slide bars reciprocate in unison and afford a support for the carriage 750. This reciprocating movement of the carriage 650 is utilized to effect the desired control of the three clutches 690, and for this purpose a plurality of pawls 755, Figs. 33 and 37, are mounted within the housing afforded by the carriage 750. Thus, a bracket 756 is provided for each pawl 755 adjacent to the left hand end of the carriage and each pawl is pivoted on its bracket 756 by a pivot pin 757. A spring 758 acting between each pawl 755 and the wall of the housing urges the right hand end, Fig. 33, of the pawl toward the side of the driving member 740 of the associated clutch. Each pawl 755 has a tooth 760 which, in the left hand movement of the carriage 750, is arranged to engage a shoulder 761 formed on the mounting sleeve of the driving clutch member 740. Thus when a

pawl 755 is in its inward position, as shown in Fig. 33, the left hand movement of the carriage 750 will cause the associated clutch 690 to be disengaged as the carriage approaches the left hand limit of its stroke. As the movement of the carriage 750 is reversed the clutch member 740D is of course allowed to return toward its engaged position, but it will be observed that the engaging teeth on the clutch member 730D and 740D are formed with square faces and side edges and are of such a width that the two opposed members cannot become drivingly engaged until a particular indexing movement of the shaft 682 has been completed.

With such an arrangement it is of course necessary that the shafts 680 be retained accurately in each position to which they are moved, and for this purpose each shaft 680 has a spring pressed positioning collar 765 splined thereon so as to be urged into engagement with an opposed stationary collar 766 which is mounted on the bearing bracket 663. The two members 665 and 666 have rounded complemental teeth thereon which are so sized that these teeth are in registry whenever an indexing movement of the shaft 680 has been completed, and hence the cooperation of the two members 665 and 666 serves to maintain the associated shaft 680 against undesired movement.

The selective control of the clutches 690 is attained by actuation of the pawls 755 selectively, and it will be apparent that when a pawl 755 is withdrawn so that the tooth 760 will not engage the shoulder 761, the associated clutch 690 will be allowed to remain in its engaged relation. In order that the pawls 755 may be selectively withdrawn, the present embodiment of the invention provides a plurality of solenoids 771 which are mounted on the outer surface of the housing or carriage 750. The solenoid 771D has its armature 772D connected to the pawl 755D at the right hand end thereof, Fig. 33, and when the solenoid 772D is energized, the pawl 755D is withdrawn to its inactive position. The solenoids 771T and 771Q are similarly associated with the pawls 755T and 755Q respectively. The solenoids 771 are selectively energized under the control of the identifying means such as tabs 602 through the medium of the selector mechanism 800 illustrated in Figs. 38 to 43, and the details of construction and operation of this selector mechanism will be described hereinafter. However, it will be recalled that the variation in the amount of printed matter produced upon a particular sheet is, in this embodiment of the invention, attained in part through variation in the effective line cut-off, and since such variation in the line cut-off is also attained automatically under the control of the tabs 602 and selector mechanism 800, the details of structure of the mechanism which attains such variable cut-off will be described prior to the description of the selector mechanism.

The variation in the line cut-off as attained in this embodiment of the invention is accomplished through the use of a geared roller platen mechanism generally similar to that disclosed in my copending application Serial No. 361,530, filed October 17, 1940, and the particular mechanism which is employed herein is illustrated in Fig. 44 of the drawings. As there shown the platen mechanism P is supported beneath a rigid printing frame 104 which has a head 105 at its forward end as hereinbefore described. A mounting and leveling plate 801 is suspended beneath the head 105 and affords a track along which a platen carriage C may be reciprocated by means including a rocker arm 802 and connecting links 803. The platen roller P has a relatively narrow resilient face PF1 formed thereon which is of such a size or width that it is adapted for cooperation with a relatively narrow printing plate such as the plate 601 which is used upon the individual printing devices and upon the lead printing devices of each group. The platen roller PR also has a somewhat wider face PF2 which is of such a size that it is adapted for cooperation with the wider plates 606 which are utilized on the follower plates. The rotative position of the platen roller PR is controlled during movement of the carriage C by a gear train 804 the terminal gear of which meshes with teeth 805 formed on the lower edge of a rack bar 810. The rack bar 810 is adapted to be shifted longitudinally back and forth to different positions by means of a cam 814, and such shifting movement determines which one of the two platen faces will be effective. The cam 814 forms a part of a cam and ratchet assembly which as a toothed ratchet wheel 812 connected to the cam. The ratchet wheel 812 is indexed in a counterclockwise direction, Fig. 44, each time the platen mechanism is operated and this takes place in the forward or conditioning stroke of the carriage C. Such indexing is accomplished by means of a pawl 813 which is pivotally mounted on the arm 802 and which is spring biased into engagement with the edge of the ratchet wheel 812. In attaining the desired control of the rack 810, the cam 814 acts upon a roller 815 and this roller 815 is mounted on a rockable arm 816 which is connected to a gear segment 817 to impart rocking movement to the gear segment. The gear segment 817 is connected through gearing means to the rack 810 so that by actuation of the cam roller 815, the longitudinal position of the rack 810 may be varied.

The cam 814 has a plurality of projecting cam lobes 820 between which the cam is formed with recesses 821 and the arrangement is such that at the end of each forward stroke of the platen carriage C a cam recess 821 is aligned with the cam roller 815. When the cam roller 815 is in this position, that is in engagement with a cam recess 821, the platen mechanism is conditioned so that the small platen face PF—1 will be effective in the printing operation. Thus, in the normal operation of the platen mechanism shown in Fig. 44, the platen mechanism is conditioned for printing from a lead printing device, as DD1, or from an individual printing device, as DC which would of course be of the same size or type as the lead printing device.

In each forward or conditioning movement of the platen carriage C the cam 814 is advanced so that one of its projecting lobes 820 shifts the cam roller 815 to the dotted line position shown in Fig. 44, and this dotted line position of the cam follower is such that the platen mechanism is substantially conditioned for operation of the large platen face PF—2. In the event that the large platen face PF—2 is to be operative, means are effective to latch the arm 816 and the gear segment 817 in substantially the dotted line position shown in Fig. 44, thereby to prevent the cam roller 815 from returning in a counterclockwise direction into a cam recess 821 which will subsequently be aligned with the cam roller. In the present instance these means comprise a normally ineffective latch dog 825 mounted in a housing 826 above the housing 827 which encloses the cam

814 and its associated mechanism. The latch dog 825 is normally maintained in its ineffective position by a spring 828 which urges the latch dog 825 in an outward direction by about its central pivot 829. A solenoid 822 is operatively connected to the other end of the latch dog 825 so that when the solenoid is energized and nose of the latch dog 825 will be shifted downwardly into the path of a latching shoulder 823 formed on the arm 816. Thus when the solenoid 822 is energized, the gear segment 817 will be latched in its dotted line position which is such that the large platen face PF—2 will be effective in the return or operative stroke of the platen mechanism.

As hereinbefore pointed out the selector mechanism 800 operates under the control of the tabs 602 to govern the platen mechanism P, the stop finger mechanism, and the sheet separating mechanism 612 to thereby produce the proper number of impressions upon each of the sheets S1. The selector mechanism 800 includes the sensing mechanism 150 which operates or controls a cam 158 and a set up arm 160 in the same general manner as hereinbefore described in connection with the first embodiment of the invention. The set up arm 160 is, in the present instance, arranged to act upon storage plungers 830 which are mounted at spaced points about the periphery of a storage drum 831, and it will be noted that the storage drum 831 in this instance has a relatively large number of storage plungers 830, there being twelve such storage plungers as shown in Fig. 38. Sensing mechanism of the character shown herein are fully disclosed in my aforesaid copending application Serial No. 382,151, and as pointed out in that application, the sensing head may in a sensing stroke descend to any one of several different levels and to accomplish this, several different lengths of sensing pins are employed. Thus, what may be termed a short pin is mounted on the sensing head 150 in a position to cooperate with the tab 602D which indicates that there is but one follower plate. A sensing pin of intermediate length is mounted on the sensing head 150 in a position to cooperate with the tab 602T which indicates that there are two follower plates in the group, while a long pin is mounted in the sensing head in position to cooperate with the tab 602Q which indicates that there are three follower plates in the group.

With this arrangement, when an individual printing device DC is at sensing station, the sensing head will be set to what may be termed a first or lower level; when a short pin encounters the tab 602D on a printing device DD1, the sensing head will descend to a second and somewhat higher level; when a printing device DT1 is at sensing station, the intermediate length pin will engage the tab 602T to thereby stop the sensing head at a third level which is somewhat higher than the second level; and when a printing device DQ1 is at sensing station, the long pin will engage the tab 602Q and the movement of the sensing head will be stopped at a fourth level which is somewhat higher than the aforesaid third level. This action of the sensing head results in a differential actuation of the set-up arm 160, and since the set-up arm 160 acts upon the lowermost one of the storage plungers 830, this storage plunger will be moved to the right in Fig. 39 so that the storage plunger will be differentially set up in any one of four differential positions. Such differential set up of the storage plungers 830 is utilized to control the sheet separating means and the sheet stop means of the sheet feeder as well as the setting of the platen mechanism of the printing machine in accordance with the arrangement of the printing devices. Thus if a single or individual printing device DC has been sensed, the lobe 835 of the storage plunger which is being set up will be shifted to a position somewhat to the right of the lobe 835D indicated in Fig. 39, while if a tab 602D has been sensed, so as to indicate a group of printing devices including but one follower printing device, the lobe of the storage plunger will be set up in the position illustrated by the lobe 835D in Fig. 39. Sensing of a tab 602T indicating a group including two follower printing devices would result in setting the lobe 835 just to the left of the lobe 835D, while sensing of a tab 602Q indicating a group including three follower printing devices would set the lobe in still another position somewhat more to the left in Fig. 39.

After a storage plunger 830 has been set as aforesaid, the storage drum 831 is stepped around through an angular distance, equal to the spacing of the storage plungers, in each operation of the printing device feeding means, and this is accomplished in the general manner disclosed in my copending application Serial No. 361,530. When a printing device from which a particular storage plunger has been set has reached such a position in the printing device guideway that the next printing impression will be made from this printing device, the related plunger will have reached the position indicated at A in Fig. 38, and this plunger is thereafter effective to control the various machine functions. Such control of the machine functions is of course attained only in those instances where a tab has been sensed, or in other words, in those instances where the related printing device constitutes a lead printing device, and in such cases the controlling action of the set up storage plunger is exerted throughout two, three, or four cycles of machine operation, depending upon the number of follower printing devices which are included in the particular group of the printing devices.

Such controlling action is attained under the present invention through the use of a plurality of control or cam plates 840D, 840T, and 840Q which are pivotally supported adjacent to the storage drum 831 on a stud 841 which extends outwardly from a mounting plate 842. The cam plates 840 are so arranged that the cam plate 840D is aligned with the position which is assumed by the lobe 835 of a storage plunger when sensing of a tab 602D indicates that a group of printing devices having one follower printing devices has been sensed. The cam plate 840T is so positioned that it will be actuated by a plunger which has been set through the sensing of a tab 602T, while the cam plate 840Q is so located that it is aligned with and may be actuated by a cam lobe of a storage plunger 830 which has been set by the sensing of a tab 602Q.

The actuation of the cam plates 840 selectively in accordance with the size of the group of printing devices is utilized to control or modify the machine functions in a plurality of cycles of machine operation, and it will be evident that such control or modification of the functions of the machine for groups of different sizes will have certain common characteristics. Thus in the cycle of operation which pertains to a lead printing device the modification of the functioning of the machine will be the same in connection with groups of all different sizes. Similarly, the cycle

of machine operation which pertains to the last printing device of a group will be the same regardless of the number of printing devices included in the group. Finally, it will be clear that as to the intermediate printing device of such groups, the required modification of the machine functions would be the same. In view of the foregoing, the cam plates **840** are so formed and related to the cam lobes **835** that the cam lobe which acts upon any particular one of the cam plates **840** will actuate or rock the aligned cam plate through a rocking stroke of a different length for each of the three different situations or types of cycle above set forth.

Thus, one edge of each cam plate **840** is indicated by the reference numeral **845** and the different positions to which this edge may be shifted in the three different types of strokes are indicated in Figs. 41 to 43 by dotted lines bearing reference numerals **845S**, **845M** and **845L**. When the edge **845** of a cam plate has been moved to the line **845S** such movement will be termed a short stroke, while movement to the lines **845M** and **845L** will be termed medium and long strokes respectively, of the cam plate. The cam plates **840C** have openings **846** therein through which an anchor rod **847** extends, and springs **848** act individually between the cam plates and the anchor rod to urge the cam plates in a clockwise direction. This action of the springs **848** serves to maintain the cam plates with the lobes **850** thereof in initial positions wherein they are adapted to be engaged by the cam lobes **835** of the storage plungers, and such initial positions are determined by a stop rod **849** which extends through similarly located arcuate slots **850** formed in the several cam plates.

The cam plate **840D**, Fig. 41, has two lobes **851D1** and **851D2**; the cam plate **840T**, Fig. 42, has three lobes **851T1**, **851T2** and **851T3**; while the cam plate **840Q**, Fig. 43, has four such lobes **851Q1**, **851Q2**, **851Q3** and **851Q4**. The configuration of the various cam lobes **851** of the cam plates is so related to the location of such lobes on the respective cam plates that engagement of these lobes **851** in succession by a particular storage plunger will cause the cam plate to be operated through strokes which are of such a length as to attain the desired controlling action upon the functioning of the machine. Thus the cam lobe **851D1** is so formed that when it is engaged by a cam lobe **835** in the movement of a properly set up storage plunger from position A to position B in Fig. 41, the cam plate **840D** will be moved through a long rocking stroke, while the cam lobe **851D2** is so formed and related that a properly set up storage plunger moving from position B to position C will actuate this cam plate through a short rocking stroke.

The cam lobe **851T1** on the cam plate **840T** is such that a set up storage plunger moving from position A to position B in Fig. 42 will actuate the cam plate **840T** through a long rocking stroke, while movement of this storage plunger from position B to position C will engage the cam lobe **851T2** to move the cam plate **840T** through a medium length rocking stroke. The cam lobe **851T3** is so formed that when an aligned storage plunger moves from the position C to position D in Fig. 42, the cam plate **840T** will be rocked through a short stroke. The cam lobe **851Q1** is so arranged that movement of an aligned storage plunger from position A to position B in Fig. 43 will produce a long stroke of the cam plate **840Q**; the cam lobe **851Q2** is arranged so that the movement of an aligned storage plunger from the position B to the position C in Fig. 43 will produce a medium length rocking stroke, and the cam lobe **851Q3** is also arranged so that a similar rocking stroke of medium length will be produced when the aligned storage plunger moves from the position C to the position D in Fig. 43. The cam lobe **851Q4**, however, is so arranged that movement of an aligned storage plunger from the position D to the position E in Fig. 43 will produce a rocking stroke of short length.

Such differentially controlled rocking strokes of the various cam plates **840** are arranged to attain the desired control of the functioning of the machine through the medium of a plurality of switch devices which are arranged for differential actuation by the cam plates **840**. To this end a plurality of switch devices **855**, **856D**, **856T**, **856Q** and **857** are mounted on supporting plate **842** about the arcuate outer edges of the cam plates **840** so that these switch devices may be actuated by cam lobes formed along these arcuate edges of the cam plates. Since each of the cam plates **840** is to control the platen mechanism when such cam plate is actuated through a long stroke, the switching device **855** has an operating arm **860** carrying a roller **861** which as shown in Fig. 39, extends across the outer edges of all three of the cam plates **840** so as to bear against the arcuate edges of all of these plates. The arm **860** is arranged so that when the roller **860** is forced in an upward or outward radial direction, an operating plunger **862** of the switch device **855** will be engaged so as to open a normally closed switch **855'**, Fig. 45, which forms a part of the switch device **855**. The switch device **857** also has a relatively wide roller **860** associated therewith so that this roller bears against the arcuate edges of all of the cam plates **840**, and when the roller **860** of this switch device is forced in an outward radial direction, an actuating plunger **863** of the switch device **857** will be forced outwardly so as to close a normally open switch **857'**, Fig. 45, which forms a part of the switch device **857**.

It has been pointed out that the switch device **855** is to be actuated by the long stroke of any one of the cam plates **840**, and therefore similar cam lobes **865** are formed on all of the cam plates **840** in positions such that they will engage the roller **860** of the switch device **855** to open the switch **855'** in the long stroke of any one of the plates. The position of the cam lobe **865** on each plate **840** is, however, such that the cam lobes **865** will be ineffective in the medium or short strokes of the cam plates.

It will be recognized that the switch **857'** must be closed each time that the operation of the sheet separating mechanism is to be suppressed, and that such suppression of the sheet feeder must occur every cycle of machine operation which pertains to a group of printing devices with the exception of the last cycle of machine operation pertaining to such group. To attain this operation, each of the cam plates **840** has a cam lobe **866** thereon, and these lobes are so positioned that the associated cam roller **860** of the switch device **857** will be engaged by the lobe **866** in either the long stroke or the medium stroke of a cam plate, thereby to suppress the sheet separating mechanism in each machine cycle where a cam plate operates through such a long stroke or a medium stroke. The cam lobes **866**, however, are so formed and positioned

that in a short stroke of a cam plate, the switch device 857 will not be actuated, and since such a short stroke of the related cam plate 840 is utilized in each machine cycle which pertains to the last one of the printing devices in a group, this construction will result in normal operation of the sheet separating means in such last cycle and a new sheet will therefore be fed to printing position in such cycles.

In contrast to the switch devices 855 and 857, the switch devices 856D, 856T and 856Q are each associated with but one of the cam plates 840. Thus, as shown in Fig. 40, of the drawings, the switch device 856D has an arm 868 having a narrow cam roller 869 mounted thereon in alignment with and bearing against the arcuate outer edge of the cam plate 840D, and when this roller 869 is urged in an outward radial direction, an operating plunger 870D of the switch device 856D is forced inwardly to close a switch pile which includes normally open switches 856D' and 875. Such outward movement of the roller 869 is effected when the related cam plate 840D is operated through an appropriate rocking stroke, and this is accomplished by a cam lobe 876D which is so located that the roller 869D will be engaged in a short stroke, an intermediate stroke or a long stroke of the cam plate 840D.

The switch device 856T, Fig. 42, also has a cam roller 869T associated therewith so that outward movement of the cam roller will actuate a control plunger 870T to close a switch 856T' and another switch 875 which are included in the switch device 856T. This is accomplished by a cam lobe 876T which is so formed on the cam plate 840T that the cam roller 869T will be operated in a stroke of any one of the aforesaid three lengths.

The switch device 856Q, Fig. 43, also has an actuating roller 869Q which bears against the arcuate edge of the cam plate 840Q and is arranged to operate a control plunger 870Q. The plunger 870Q is adapted to close a normally opening switch 856Q' and another switch 875 which are included in the switch device 856Q. This is accomplished by a cam lobe 876Q which is so formed on the cam plate 840Q that such switch closure takes place in a stroke of any of the aforesaid three lengths.

The switch 857' has one of its contacts connected to one terminal of a source of current such as a battery 880, Fig. 45, by wires 881 and 882, while the other contact of the switch 857' is connected to one terminal of a plug outlet 882 by a wire 883. A plug connector 884 is adapted to be inserted in the plug outlet 882, and a wire 885 is connected from one contact of the connector 884, which engages the wire 883, to one terminal of the solenoid 630, and wires 886 and 887 connect the other terminal of the solenoid 630 to another contact of the plug connector 884. Wires 889 and 890, in series, extend from this contact to the other terminal of the battery 880. Thus when the switch 857' is closed in either a long or medium stroke of one of the cam plates 840, the solenoid 630 is energized and the operation of the sheet separating mechanism is suppressed.

When the switch 856D' is closed, it will be evident that the solenoid 771D should be energized so as to cause the clutch 690D to remain closed and cause actuation of the group of cams associated with the shaft 680D, and circuit means for effecting this are provided as follows:

The wire 881 extends, as shown in Fig. 45, from one terminal of the battery to one contact of the switch 856D', while another wire 892 extends from the other terminal of the switch to one contact of the plug outlet 882. A wire 893 which is connected to the wire 892 by the plug connector 884 is extended to one terminal of the solenoid 771D, while another wire 894 is extended from the other terminal of the solenoid 771D to the wire 887, thus to extend circuit through this wire and the wires 889 and 890 back to the other terminal of the battery 880.

A similar circuit for operatively connecting the switch 856T' to the solenoid 771T is afforded by the wire 881 and a branch lead 895 which extend in series from one terminal of the battery 880 to one contact of the switch 856T'. A wire 896 is extended from the other contact of the switch 856T' to one contact of the plug outlet 882, and a wire 897 is extended from this contact to one terminal of the solenoid 771T. A wire 897 is extended from the other terminal of the solenoid 771T to the wire 894, thereby to extend circuit through the wires 894, 887, 889 and 890 to the other terminal of the battery 880.

A similar control circuit is also formed from the switch 856Q to the solenoid 771Q, and this circuit includes the wire 881 and a branch lead 900 from one side of the battery to one terminal of the switch 856Q'. A wire 901 is extended from the other contact of the switch 856Q' to another contact of the plug outlet 882 from which a wire 901A is extended to one terminal of the solenoid 771Q. A wire 902 is connected from the other terminal of the solenoid 771Q to the wire 887, thereby to extend circuit through this wire and the wires 889 and 890 in series back to the other side of the battery 880.

The desired control of the platen mechanism P is attained by energization of the solenoid 822 in such a way that a pawl 825 will latch the roller 815 in its outer or dotted line position of Fig. 44 whenever the wide platen face PF2 is to be utilized. In attaining this result the switch 855' cooperates with the various switches 875, and this cooperation is afforded by the following circuit: a wire 910 is extended from the wire 890 and is connected to one terminal of the solenoid 822, while a wire 911 extends from the other terminal of the solenoid 822 to one contact of the switch 855'. The other contact of the switch 855' is connected by a wire 912 and branch leads 913 to corresponding contacts of the three switches 875. The other contact of one of the switches 875 is connected by a lead 914 to the wire 881, thereby to extend circuit back to the other side of the battery 880. A similar wire 915 connects the other contact of another switch 875 to the wire 895, thereby to extend circuit through the wire 895 and the wire 881 back to the other side of the battery 880. A wire 916 connects the other contact of the third one of the switches 875 to the wire 900 to thereby extend circuit through the wire 881 back to the other side of the battery 880.

Whenever one of the cam plates 840 is actuated through a short and intermediate or long stroke, the related one of the switches 875 will be closed, and this occurs very early in the machine cycle, and because at this time the switch 855' is still closed, the solenoid 822 will be energized. This serves to urge the pawl 825 downwardly and into contact with the arcuate upper surface of the arm 816, Fig. 44, and if such energization of the solenoid 822 continues until the shoulder 823 has been aligned with the nose of the pawl 825, the pawl will drop into engagement with the shoulder 822 so as to thereby latch the arm 816 and the

associated roller 815 in the dotted line position of Fig. 44. When such latching occurs, the wide platen face PF2 will be rendered effective as hereinbefore described. It will be apparent, however, that the wide platen face PF2 should not be effective in those cycles of machine operation where an impression is to be made from a lead printing device, and hence in such machine cycles the circuit to the solenoid 822 is broken prior to the time when the shoulder 823 moves into alignment with the nose of the pawl 825. Such breaking of the circuit to the solenoid 822 is accomplished by the cam 865 of the actuated cam plate, but it will be observed that this takes place only in those cycles of machine operation which relate to a lead printing device for it is only in such cycles that the cam plate is actuated through a long stroke. It will be remembered that in the short and intermediate length strokes, the cams 865 do not engage the associated roller 860. When a cam plate 840 operates through such a long stroke, the cam 865 thereof operates on the plunger 862 to open the normally closed switch 855' and hence the circuit to the solenoid 822 is broken so that the latch pawl 825 does not become effective and the cam roller 815 is allowed to return in an inward direction into the next recess 821. Hence, in such cycles of operation, the narrow platen face PF2 is utilized.

Thus, in the embodiment of the invention illustrated in Figs. 23 to 49 inclusive, the printing devices may be arranged in groups each consisting of a lead printing device and one, two or three follower printing devices, and individual printing devices may be interspersed as desired between such groups. Moreover, the arrangement of this embodiment of the invention is such that the lead printing devices as well as the individual printing devices may have index areas which are larger than the index areas of the follower printing devices, and through the use of but one index or identifying tab on each lead printing device, the functioning of the various mechanisms of the printing apparatus may be so controlled that the proper and unsmudged impressions are made therefrom in the proper position and relation on a sheet; and in the specific embodiment disclosed, the arrangement is such that a single printed sheet is automatically produced from each individual printing device and from each group of lead and follower printing devices.

More specifically considered, the printing apparatus of Figs. 23 to 49 operates normally to print one impression upon each sheet S1, and this impression is properly made from a printing device having a narrow printing plate such as those embodied in the individual printing devices DC and in the lead printing devices. Thus, when an individual printing device DC passes through the machine, the selector mechanism 800 is ineffective, for by reason of the absence of tabs or similar identifying means on such a printing device, the sensing means 150, the cam 158 and the set-up arm 160 operate to so locate or set the lowermost storage plunger 830 that this plunger is out of alignment with and ineffective upon the cam plates 840 as the storage plunger is indexed through the various control positions A to E.

When, however, the lead printing device of a group is passed into sensing position, the sensing head 150 will, in its downward sensing movement, determine how many follower printing devices are included in the group. Assuming for purposes of illustration that the sensing head 150 senses the presence of a tab 602T, thereby indicating that a printing device DT1 is at sensing position and that the next two printing devices are follower printing devices DT2 and DT3 forming part of the same group, the associated cam 158 and the set-up arm 160 will act to set the lowermost plunger 830 on the storage drum in such a position that the cam lobe 835D thereof will be aligned with the cam plate 840T. This storage plunger 830 will reach the control position A, Fig. 42, in that cycle of machine operation which immediately precedes that cycle in which an impression is to be made from the related printing device DT1, and hence this storage plunger is so located that it will exercise the desired controlling or actuating action upon the cam plate 840T in the next cycle of machine operation. At the conclusion of the cycle in which this storage plunger is moved into position A, Fig. 42, a new sheet S1 will be moved into the first position defined by the stop finger 840C, and the platen mechanism P will be in its normal condition or relation so as to tend to utilize the narrow platen face PF—1.

In the next cycle of machine operation, which is the cycle in which the printing device DT1 will be moved into printing position, the set up storage plunger 830, in its movement from position A to position B, will engage the cam lobe 851T—1 of the cam plate 840T, thereby to rock the cam plate 840T through a long stroke. In other words, the cam plate 840T will be rocked to such an extent that the edge 845 thereof will reach the position 845L, and somewhat before the end of the end of the first half of the machine cycle, the storage plunger will ride out of alignment with respect to the cam lobe 851T1 so that the cam plate 840T will return to its normal position. In this long stroke of the cam plate 840T, the cam lobe 876T acts to close the switch 856T' and the associated switch 875, the cam lobe 866 acts to close the switch 857', and the cam lobe 865 acts to open the normally closed switch 855'.

The closure of the switch 855' serves to energize the solenoid 630 which governs the sheet separating means of the sheet feeder, and since such energization takes place before the hook 625 has engaged the pin 626, the solenoid 630 serves to render the hook 625 inoperative, and hence the actuating lever 627 of the sheet separating means is not actuated. Thus the operation of the sheet separating means is suppressed in this cycle of machine operation.

The closure of one of the switches 875 serves to energize the platen control solenoid 822, but in this cycle of machine operation it will be recognized that the narrow platen face PF—1 should be used, for the lead printing device DT1 has a narrow printing plate which is of the same width as the printing plates employed on the individual printing devices. Hence, even though the solenoid 822 is energized in the first portion of the machine cycle, the detent pawl 825 is nevertheless ineffective to retain the roller 815 of the platen control mechanism in its dotted line position of Fig. 44, for prior to the time when the shoulder 823 is moved into alignment with the pawl 825, the cam 865 serves to open the switch 855' to thereby de-energize the solenoid 822. Hence the roller 815 returns to the normal position in a cam recess 821, and the platen mechanism is thereby set to effect the printing operation from the narrow platen face PF—1.

The closure of the switch 856T, as aforesaid, serves to energize the solenoid 771T of the sheet

feeder, and hence, as the slide bars 642 and 642' are drawn to the left, the associated pawl 755T is rendered ineffective, and clutch 690T is allowed to remain in its connected relation such that the shaft 682T is drivingly associated with the cam-actuating shaft 680T. The other pawls 755D and 755Q, of course, remain active so that the other two clutches 690D and 690Q are opened or disconnected. As the left hand movement of the slide bar 642 progresses, the driving pawl 672 is moved through its idling stroke, and upon reversal of the slide bar 642, the pawl 672 imparts an indexing movement to the shaft 660C. The gearing 683–684 serves to impart similar indexing movements to the three shafts 682D, 682T and 682Q, and by reason of the closed condition of the clutch 690T, such movement is transmitted to the cam-actuating shaft 680T.

In such indexing of the shaft 680T, the gears 712T which are carried on this shaft serve to drive the gears 711T and the associated group of cams 700T1, 700T2 and 700T3, and as a result, the stop fingers 640C, 640T2 and 640T3 will be actuated or controlled in such a manner that after the impression DT1' has been formed on the sheet S1 as shown in Fig. 48, the sheet will be advanced to the second position so as to be ready for the formation of the second impression DT2' in the next cycle of machine operation. Such actuation or control of the stop fingers involves raising of the stop finger 640C by the action of the cam 700T2, and maintaining the stop finger 640T3 in its elevated position by the action of the cam 700T3.

In the next or second related cycle of machine operation the follower printing device DT2 is advanced to printing position, and the related storage plunger 830 is advanced from position B to position C, Fig. 42. The storage plunger 830 therefore acts on the cam lobe 851T—2 of the cam plate 840T to actuate the cam plate through a medium length stroke. Such a medium length stroke of the cam plate 840T causes the cam lobe 866 to close the switch 857', thereby to energize the solenoid 630 and suppress the operation of the sheet separating mechanism of the sheet feeder in the manner described hereinbefore. Similarly, the medium length stroke of the cam plate 840T causes the cam lobe 876T to close the switch 856T and the associated switch 875. The closure of the switch 876T serves, of course, to energize the solenoid 771T, with the result that the clutch 690T remains engaged and the group of cams associated with and driven by the shaft 680T are again indexed or operated. This, of course, takes place in the last half of the machine cycle, so that the stop finger 640C is maintained elevated, the stop finger 640T2 is raised so as to release the sheet S1, and the stop finger 640T3 is lowered so as to stop the sheet in its third position to receive the impression DT3' in the next cycle of machine operation.

In the aforesaid second cycle of machine operation in which the impression DT2' is to be formed, the switch 875 is closed, as hereinabove stated, and this serves to energize the platen control solenoid 822. The pawl 825 is thus rendered active, and in this cycle, by reason of the fact that the cam plate 840T has been operated through a medium length stroke, the cam lobe 865 is ineffective, and the switch 855' remains closed. Hence the solenoid 822 remains energized until such a time that the shoulder 823 is disposed in alignment with the pawl 825, and the pawl therefore becomes latched into the shoulder 823 to maintain the segment 817 and the associated gearing in such a position that the large or wide platen face PF—2 is rendered effective.

In the third related cycle of machine operation when the last follower printing device DT3 is moved into printing position, the related storage plunger 830 is moved from position C to position D, Fig. 42, and the plunger 830 is therefore effective on the cam lobe 851T—3 to rock the cam plate 840T through a short stroke. In such a short stroke the cam lobe 876T operates to close the switch 856T' and the associated switch 875.

Such closure of the switch 875 causes the platen control solenoid 830 to be energized, and since the switch 855' is not opened in such a short cycle of the cam plate 840T, the solenoid 822 remains effective so as to cause the large platen face PF—2 to be effective in this cycle in the same manner as in the preceding cycle which has just been described. The closure of the switch 856T' as above described causes the control solenoid 771T to be energized, with the result that the clutch 690T remains engaged and the cams constituting the group associated with the shaft 680T are again driven or indexed. Such indexing of the cams associated with the shaft 680T causes the stop finger 640T2 to be maintained elevated, and causes the stop finger 640T3 to be raised so as to release the completed sheet for discharge into the collecting hopper, while the stop finger 640C is lowered to its active position to stop the next sheet in the desired relation for the formation of the first impression thereon.

In this third cycle of machine operation in which the last impression DT3' is formed on the sheet S1, the short stroke of the cam plate 840T results in the cam lobe 866 being ineffective to close the switch 857. Hence in this cycle of machine operation the solenoid 630 is not energized, and the hook-like pawl 625 is effective on the pin 626 to cause the desired operation of the sheet separating means. The sheet which is thus separated from the sheet pack is fed into the throat of the sheet guideway G so that, at the proper time in the cycle, this sheet is advanced into the positioned determined by the stop finger 640C which has just been lowered. Hence at the end of the cycle in which the last impression such as the impression DT3' is formed, the machine, with the exception of the platen mechanism, is conditioned for the performance of an operation on an individual printing device in the next cycle of operation. With respect to the platen mechanism it is to be observed that the segment 817 is still latched in its dotted line position of Fig. 44 by the pawl 825, but this is immaterial because in the next cycle of operation the cam 814 will act on the rocker 817 to release the pawl 825, and unless the solenoid 822 has been again energized, the further indexing of the cam 814 will allow the cam roller to enter a recess 821 and thereby cause the narrow platen face PF—1 to be effective in this next printing operation of the machine.

The operation of this embodiment of the invention in response to the sensing of a tab 602Q, indicating a group consisting of one lead printing device and three follower printing devices, is generally similar to that just described, but in such an instance the cam plate 840Q is rendered effective, and is operated through a long stroke, two medium strokes and a short stroke, in succession, in the four successive printing cycles,

pertaining to the group. In the first cycle of machine operation, in which the long stroke of the cam plate 640Q takes place, the small platen face PF—1 is utilized, the operation of the sheet separating means is suppressed, and the cam-actuating shaft 680Q is indexed so as to drive the group of cams 700Q which are associated with this shaft. In the second and third cycles of machine operation pertaining to such a group the cam plate 840Q is operated through a medium length stroke in each instance so that in each such cycle the operation of the sheet separating means is suppressed, the platen gearing is latched by the latch 825 so as to render the wide platen face PF—2 effective, and the cam-driving shaft 680Q is indexed. In the last or fourth machine cycle pertaining to this group, the cam plate 840Q operates through a short stroke, thereby causing the platen face PF—2 to be again employed; and the cam driving shaft 680Q is indexed so as to finally release the sheet S1 after the last impression has been formed thereon, and lower the first stop finger 640C. In this cycle of operation the normal sheet separating action takes place so as to cause a new sheet to be fed to the position determined by the finger 640C at the end of the cycle.

Where the sensing means senses a tab 602D, thereby indicating a group consisting of a lead printing device and a single follower printing device, the storage plunger 830 is set into a position wherein its cam lobe is aligned with the cam plate 840D. This cam plate is actuated but twice by such a storage plunger, the first stroke being a long stroke which causes the machine to function in substantially the same manner as in the first cycles described hereinabove with relation to the other groups. The second such stroke of the cam plate 640D which takes place in the second of the related machine cycles is a short stroke which causes the machine to function as in the last cycles pertaining to groups of other sizes, but it will be observed that in the two related cycles of operation which take place under the control of the cam plate 640D, the cam driving shaft 680D is the only such shaft which is effective, and this shaft operates, through the cams 700D1 and 700D2, to produce the desired controlled movements of the sheet S1 along the sheet guideway.

In the further embodiment of the invention illustrated in Figs. 50 to 56 of the drawings a printing machine 100A is illustrated which is also adapted to automatically vary the amount or area of printing made from the printing devices under the control of identifying means carried on the printing devices, and in this embodiment of the invention such automatic variation is attained solely through automatic control of the platen mechanism P of the machine. The need for such automatic variation of the amount of printing is encountered in practice in those instances where a part of the information contained on certain of the printing devices of a collection thereof is to be eliminated, as where such information is incorrect as to the particular run which is being made, or where such information should not be conveyed to the persons to whom the printed matter is to be directed or circulated. One such instance occurs on payroll lists where the last line or some other portion of the type matter on a printing device shows the normal wage of the worker to whom the printing device relates. In certain instances, as where a worker has additional pay due for overtime work, the printing of the normal pay-rate matter causes a mistake in the payroll, and it is therefore desirable to avoid printing of that portion of the type matter which sets forth the normal pay rate. To care for such a situation, an identifying means such as tab may be located in a particular position on those printing devices where the pay rate or other information is to be cut off so as to avoid printing thereof. A convenient way in which this may be done is through the use of a pivoted tab on the printing device as illustrated and described in the patent to Walter T. Gollwitzer, No. 2,080,417, patented May 18, 1937. To attain this result the printing machine 100A, which is similar to machine 100, has its platen mechanism P constructed and arranged substantially in the manner illustrated in Fig. 44, but the cam and ratchet mechanism in this embodiment of the invention has a cam 814A arranged to act upon a roller 815A to shift the roller from an inner position shown in full lines in Fig. 52 to an outer position which is shown in dotted outline in Fig. 52. When the roller 815A is in the inner position, shown in full lines in Fig. 52, the relatively wide platen face PF3 will be effective, thereby to print all or at least a relatively large portion of the text carried on a printing device. When, however, certain portions of the text carried on a printing device are to be cut off or eliminated from the printed impression, the cam 815A is actuated in a counterclockwise direction from the position of Fig. 52 so that the surface 814B of the cam engages the cam roller 815A. This positions the roller 815A in its dotted line position of Fig. 52, and through the action of the gear segment 817A the pinion 817B is driven in a counterclockwise direction, Fig. 52. The pinion 817B acts through a shaft 818B to similarly rotate the gear 818A which is meshed with the upper teeth on the rack 810A. The rack 810A is thus actuated in a forward longitudinal direction so that the narrow platen face PF4 will be rendered effective in the printing operation.

Such rotation of the cam 814A is accomplished by means of a pawl 813A which is similar to the pawl 813 and is rendered effective by means including a solenoid 822A in those cycles where the narrow platen face PF4 is to be utilized. Normally the cross pin 813D of the pawl 813A is rendered ineffective by the action of a shield or cam plate 950. The cam plate 950 is mounted on a stud 951 which forms the rotative axis from the cam and ratchet assembly, and a spring 952 acts on a pin 953 which projects from the cam plate 950 to urge the cam plate 950 toward its active position of Fig. 50. The pin 953 projects through an arcuate slot 954 in a cover plate 955 so as to limit the movement of the shield 950 in both directions. When the cam plate 950 is in its normal active position of Fig. 50, a projecting lobs 950' thereof extends to such a position that it engages the pin 813D and prevents entry of this pin into a rearward facing ratchet tooth 960 formed on a ratchet plate 812A which is connected to the cam 814A. When the shield 950 is in this position, the platen carriage C may be operated without effecting rotative or indexing movement of the ratchet plate 812A and the connected cam 814A. When the narrow or small platen face PF3 is to be rendered effective, the solenoid 822A is energized, and the armature 822B thereof is so connected to the shield or cam plate 850 by a projecting stud 961 that when the solenoid 822A is thus energized, the cam plate 950 will be rocked in a clockwise direction and the

ratchet tooth 960 will be exposed and will be engaged by the pin 813D as the pin moves forwardly. Such engagement serves to actuate the ratchet plate 812A and the associated cam 814A through a 60 degree movement in a counterclockwise direction to the position of Fig. 53 and this causes the face 814B of the cam 814A to become effective. As a result, the narrow or smaller platen face PF4 is rendered effective in this cycle of machine operation.

It is essential that in the last part of such a printing cycle the cam and ratchet assembly be returned to the normal relation of Figs. 50 and 52, and to accomplish this, the ratchet plate 812A has a forwardly facing tooth 962 formed thereon. This tooth 962 is arranged to be exposed at this time, as shown in Fig. 53, beyond the lobe 950' of the shield or cam plate 950 even though the shield has been returned to its active position. Thus, in the last half of the machine cycle when the platen carriage C is moving in a rearward direction, the pin 813D rides rearwardly and downwardly along a surface 963 which extends between the two ratchet teeth 960 and 962, and after the actual printing operation has been completed but before the rearward stroke of the carriage C has been completed, the pin 813D engages the tooth 962 so as to rock the cam and ratchet assembly in a clockwise direction, from the position of Fig. 53 back toward its normal position of Fig. 52. Before the rearward stroke of the platen mechanism has been completed, the engagement of the pin 813D with the tooth 962 moves the surface 814B out of alignment with the roller 815, and a sloping surface 814C of the cam 814A is moved into position beneath the roller 815. Thus, even though the rearward movement of the pawl 813A terminates, this return action or movement of the cam 814A is continued by the helical spring 964 which, as shown in Fig. 51 of the drawings, acts upon the shaft 818B to urge the same in a clockwise direction toward and to the position of Fig. 52. Hence the control cam 814A is returned to its normal position shown in Figs. 50 and 52 at the end of each cycle in which the narrow platen face PF4 is used, and thus the machine is conditioned for use of the wide or normal platen face PF3 in the next machine cycle.

The solenoid 822A is energized at the proper time and in the proper machine cycles under control of identifying means such as tabs disposed upon the printing devices as hereinbefore described, and such tabs are sensed by the sensing mechanism 150. This sensing mechanism is arranged to operate upon a storage mechanism 970 which in most respects is exactly similar to the storage mechanism which is illustrated and described in detail in my aforesaid copending application Serial No. 392,151.

The sensing mechanism or head 150 is guided for vertical movement in the same manner as that disclosed in my aforesaid copending application and serves to operate a cam device 158 which in turn controls a set up arm 160. The set up arm 160 is arranged when actuated to set up storage plungers 971 which are slidably mounted in spaced positions about the periphery of an indexing storage drum 972. The storage plungers 971 have cam lobes 973 thereon which are effective to operate control levers mounted in association with the storage drum on a supporting member 974. The storage plungers 971 are set up at the lowermost position on the drum 970, and the drum 972 is indexed with a step-by-step movement in a clockwise direction, Fig. 54, as an incident to the advancing movement of the printing devices from the magazine to the sensing station of the printing machine, and in the cycle of machine operation in which a printing device reaches the station just behind the printing station of the machine, the related storage plunger 971 reaches the uppermost or control position on the storage drum. It is when the storage plunger reaches this uppermost or control position that it asserts its controlling action upon the mechanism of the printing machine.

The set up arm 160 is operated, in accordance with the length of the sensing pin which is effective to control or limit the downward sensing movement of the sensing means 150, to set the lowermost storage plunger 971 in different positions longitudinally of the storage drum 972. In some instances the storage plunger 971 may be so located or set up that the cam lobe 973 thereof will operate to actuate one or the other of a plurality of control levers 976, 977, and 978, these levers being the ones which control the print-skip operation of the machine and the operation of the signal or bell 979. All of these control levers 976, 977 and 978 are mounted on the supporting member 974, and details of the function and operation of these levers may be found in my aforesaid copending application Serial No. 392,151. In addition to the aforesaid control levers, a further control lever 990 is also mounted on the supporting member 974, and this control lever is biased in a clockwise direction by a spring 991. At its upper end the lever 990 has an insulating block 992 which bears against the operating plunger 993 of a normally open switch mechanism 994, and this switch 994 is connected in circuit with a source of power and the solenoid 822A so that when the lever 990 is rocked in a counterclockwise direction in Fig. 54 to the position shown in Fig. 56, the switch 994 will be closed and the solenoid 822A will be energized.

In the use of the embodiment of the invention shown in Figs. 50 to 56, the selection of the platen face which is to be effective is governed by a selector pin which is mounted in the sensing mechanism 150 and which is of such a length that the sensing of a tab on a printing device by this pin will cause the related storage plunger 971 to be set in such a position that the cam lobe 973 thereof will be aligned with the downwardly projecting arm 995 which extends to the right from the lever 990 as shown in Figs. 54 and 56. Thus when a storage plunger has been set up by such a sensing pin to the position shown in Fig. 55, and this plunger, when it moves into its uppermost or control position, will engage a cam surface 996 on the arm 995 to rock the lever 990 in a counterclockwise direction to the position of Fig. 56, thereby to close the switch 994 and cause the solenoid 822A to be energized.

With the foregoing structure, and in the example of payroll work which has hereinabove been employed, the printing device pertaining to a worker entitled to overtime pay would be tabbed in such a position as to cause set up movement of the related storage plunger 971 to the position shown in Fig. 55. Thus when the printing device related to this particular worker reaches the position just behind the printing position in the machine, the arm 990 will be actuated and the switch 994 will be closed. This will cause the solenoid 822A to be energized so that the cam plate or shield 950

will be rotated to its inactive position, and hence in the next cycle of machine operation the pawl 813A will be effective on the ratchet tooth 960 to thereby shift the cam plate 814A through its 60 degree movement in a counterclockwise direction from the position shown in Fig. 52. As hereinabove described, this shifting of the cam plate 814A causes the rack 810A to be so positioned that the small platen face PF4 will be effective in this particular machine cycle, it being remembered that in this machine cycle the related printing device will be advanced to printing position and an impression will be made therefrom. Thus it will be clear that by reason of the special tabbing or identifying means on the particular printing device, the normal pay rate of the worker will not be printed and this will indicate to the user of the payroll sheet that special computation must be made with respect to this particular worker.

It will be recalled that during the first half of the machine cycle in which the aforesaid printing operation is performed, the storage drum 972 is further advanced in a clockwise direction through an additional indexing movement of 60 degrees and during such movement the cam lobe 973, which has been engaged with the cam surface 996 to initially actuate the arm 995, will ride along a dwell surface 997 of the arm 995, thereby maintaining the switch 994 closed until just prior to the completion of the first half of the machine cycle. At this time the lobe 973 will ride off of the end of the dwell surface 997, this end being defined by an end surface 998 on the arm 995. When this occurs the solenoid 830A is deenergized and the shield or cam plate 950 returns to its normal position of Figs. 50 and 53. Thus the cam plate 950 is in a position such that it will render the pawl 813A ineffective in the next cycle of machine operation unless the next storage plunger 971 again operates the control lever 990.

During the last half of the machine cycle, the pin 813D rides along the surface 963 of the ratchet plate 812A and at substantially the time when the printing impression has been completed, the pin engages the forwardly facing ratchet tooth 962 which is at this time positioned in the location shown in Fig. 53. This causes the pin 813D to initiate clockwise movement of the ratchet plate 812A and the associated cam plate 814A so that the elevated surface 820A is moved out of alignment with the roller 815A. As soon as this has occurred the spring 964 which acts, through the shaft 818B, the pinion 817B and the segment 817A, to complete the return or counterclockwise movement of the cam and ratchet assembly to the position shown in Figs. 50 and 52. This is caused by the camming force which is exerted by the roller 815A against the surface 814C of the cam plate 814A. Hence, at the end of the machine cycle, the rack 810A is located in its rearward position so that in the next machine cycle the wide platen face PF3 will normally be effective. Thus, unless the switch 994 has again been closed by a properly set up storage plunger 971, the machine will operate to print the complete information or text from the next printing device.

Thus, in view of the foregoing description, it will be apparent that the present invention enables work having different amounts or areas of printed matter to be automatically produced in printing machines which operate upon individual printing devices fed seriatum through the machine, and it will be evident that such automatical variation of the amount of printed matter on each sheet may under the present invention be governed automatically by a selector mechanism in accordance with identifying means carried by or embodied in at least selected of the printed devices.

It will also be evident that the present invention enables the amount of printed matter produced on a sheet to be varied automatically under the control of identifying means on the printing devices and such variation under this invention may be attained in several different ways. Thus the variation in the amount of printed matter produced on a sheet may be attained through variation in the line cut-off under control of the identifying means on the printing device, or it may be attained through variation in the number of impressions made upon a sheet from different printing devices, or in the alternative, the variation in the amount of printed matter produced upon a sheet may be attained through a combination of these two methods. Under the present invention the use of lead and follower printing devices is materially simplified, and the provision of the identifying means on the printing device is accomplished in a new and simplified manner such that it is necessary to provide identifying means only on the lead printing devices of the groups of lead and follower printing devices. Thus the present invention in a more specific sense enables identifying means on the lead printing device on a group thereof to indicate the number of follower printing devices in the group, and the invention enables this indication of the size of a group to control the sheet feeding means, as well as the line cut-off mechanism of the printing machine.

It will also be apparent that in a broad sense the present invention enables an identifying means on a single printing device to control the sequence of the machine operations in several cycles of operation of the machine, and in addition, several different controlling operations each involving two or more machine cycles may be differentially or selectively instituted under the control of variantly positioned identifying means each of which is located upon but a single printing device.

The present invention also enables the feeding of sheets to a printing machine to be materially simplified in respect to those situations where varying numbers of impressions are to be made upon the successive sheets, and such capabilities are imparted to the sheet-feeding means under the control of identifying means on at least certain of the printing devices fed through the machine. More specifically it will be observed that under the present invention the sheet feeding means may be operated through the exact number of sheet stopping operations with respect to each sheet fed through the sheet-feeding mechanism, thereby to avoid the necessity for idle feeding movements such as have been required in many prior sheet-feeding mechanism. The sheet feeding mechanism which forms a part of the present invention is such that a plurality of stop fingers are adapted for actuation in different sequence in accordance with the number of impressions to be formed upon a sheet, and such variations in the sequence of actuation sheet stop fingers is attained automatically under control of identifying means on selected of the printing devices.

Hence, while I have illustrated and described

preferred embodiments of my invention, it is to be understood that these are capable of variation and modification and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims:

I claim:

1. In a printing machine through which printing devices are adapted to be passed one by one to printing position in the machine, impression means at said printing position adapted to be set to either one of two different relationships wherein different sizes of impressions are made from the printing devices, setting means normally operable to set said impression means in one of said relationships in each cycle of operation of the machine, said setting means being operable in a portion of each cycle to set said impression means to its other relationship and then normally to return the same to said normal relationship, latching means adapted to be rendered active to latch said setting means to said other relationship, and means for rendering said latching means effective.

2. In a printing machine through which printing devices, each adapted to bear identifying means at one or more selected identifying positions thereon, are adapted to be passed one by one to sensing and printing positions in the machine, sensing means at said sensing position for sensing such identifying means, impression means at said printing position adapted to be set to either one of two different relationships wherein different sizes of impressions are made from the printing devices, setting means normally operable to set said impression means in one of said relationships in each cycle of operation of the machine, said setting means being operable in a portion of each cycle to set said impression means to its other relationship and then to return the same to said normal relationship, latching means adapted to be rendered active to latch said setting means to said other relationship, and means operable under control of said sensing means for rendering said latching means effective.

3. In a printing machine of the character described, a frame having a printing position at which a printing device may be positioned, means for supporting a sheet in an operative relationship to a printing device supported at said printing position, and platen means for effecting printing cooperation between such a sheet and such a printing device comprising a platen carriage, means providing a track along which said platen carriage may be reciprocated, a platen roller having a plurality of different faces disposed thereabout in different arcuate sectors of the periphery of the platen roller, said different platen faces having different impression-forming characteristics, means supporting said platen roller rotatably upon said platen carriage for shifting movement from a retracted inactive position to an advanced active position wherein one of said platen faces may be rolled across a sheet in printing cooperation therewith, means for initially determining the rotative position of said platen roller with relation to said printing position including gearing means having an initial member shiftable between a plurality of positions, said gearing means being operable in response to the location of said initial member in different ones of said positions to render different ones of said platen faces effective in a printing operation, and means governed by identifying means carried on the printing devices for automatically shifting said initial member to different positions.

4. In a printing machine of the character described, means defining a printing position at which a printing device may be supported, means for supporting a sheet in opposed relation to such a printing device located at said printing position, platen means for pressing such a sheet into printing cooperation with such a printing device, said platen means comprising a carriage mounted for reciprocatory movement across said printing position, a platen roller having a plurality of different platen faces disposed in different arcuate segments about its periphery with each of said platen faces having different impression-forming characteristics, means supporting said platen roller on said carriage for advancing movement from a retracted position to an active position adjacent said printing position, driving means for imparting rotative movement to said platen roller during reciprocation of said carriage, said driving means being adjustable to any one of a plurality of relationships with respect to said platen roller, in each of which relationships said driving means renders a different one of said platen faces effective in a printing operation, and means governed by identifying means carried on the printing devices for shifting said driving means.

5. In a printing machine of the character described through which printing devices having a plurality of lines of type matter are adapted to be sequentially passed, means defining a printing position at which such printing devices may be successively positioned for the performance of printing operation from such devices, platen mechanism for performing such a plurality of printing operations from each printing device comprising a platen carriage, a track supporting said carriage for reciprocatory movement across said printing position, a platen roller having a plurality of effective platen faces each formed to print a different portion of the type matter from a printing device, means supporting said platen rotatably upon said carriage for movement between an inactive retracted position and an advanced active position wherein said platen roller is operative to produce a printing impression, means including a gear train with the terminal member of which is rotatably interlocked with said platen roller for rotating said platen roller during a printing operation, said gear train including an initial member mounted for shifting movement between a plurality of positions, in each of which positions said initial member conditions said gear train to render a different one of said platen faces effective in a printing operation, and automatic means operable under control of and in accordance with identifying means on said printing devices to shift said initial member of said gear train to different ones of said positions in accordance with such identifying means.

6. In a printing machine through which printing devices at least some of which are adapted to bear identifying means at one or more selected identifying positions thereon are adapted to be passed to printing position, sensing means operable to sense such identifying means, impression means for producing impressions from said printing devices and constructed and arranged for selective adjustment to different relationships to print impressions from different areas of such printing devices, actuating means operable upon said impression means in a first portion of a machine cycle to adjust said impression means from a first one of said relationships to a second one

of said relationships for the formation of a printed impression by the impression means while adjusted to such second relationship, said actuating means being operable to re-adjust said impression to said first relationship prior to the formation of a succeeding impression by said impression means, and means controlled by said sensing means for governing the operation of said actuating means.

7. In a printing machine through which groups of related lead and follower printing devices and individual printing devices unrelated to but interspersed between such groups may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position and constructed and arranged for selective adjustment to different relationships wherein printing impressions are made from different areas of the printing devices, each of said lead printing devices of each of said groups thereof having identifying means positioned thereon in identifying positions indicative of the number of printing devices in its respective group, means for feeding sheets to printing position including selectively actuatable sheet stop members and stop actuating means therefor operable to actuate said stop members to position a sheet successively in different relations with respect to printing position, means operable to initiate feeding of each sheet by said sheet feeding means, selector mechanism embodying sensing means for sensing the identifying means of said printing devices, said selector means being constructed and arranged to control said stop actuating means to effect stopping of the sheet in a different relation to printing position for each printing device in a group and then to discharge such sheet from printing position, means controlled by said selector mechanism and operable upon said feed initiating means to initiate feeding of the next sheet in timed relation to the formation of the printing impression from the last follower printing device of a group, and means controlled by said selector mechanism and operable to selectively vary the relationship of said impression means in respect to at least certain of the printing devices of said groups.

8. In a printing machine through which groups of related lead and follower printing devices and individual printing devices unrelated to but interspersed between such groups may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position and constructed and arranged for selective adjustment to different relationships wherein printing impressions are made from different areas of the printing devices, each of said lead printing devices of each of said groups thereof having identifying means positioned thereon in identifying positions indicative of the number of printing devices in its respective group, means for feeding sheets to printing position including selectively actuatable sheet stop members and stop actuating means therefor operable to actuate said stop members to position a sheet successively in different relations with respect to printing position, means operable to initiate feeding of each sheet by said sheet feeding means, selector mechanism embodying sensing means for sensing the identifying means of said printing devices, said selector means being constructed and arranged to control said stop actuating means to effect stopping of the sheet in a different relation to printing position for each printing device in a group and then to discharge such sheet from printing position, means controlled by said selector mechanism and operable upon said feed initiating means to initiate feeding of the next sheet in timed relation to the formation of the printing impression from the last follower printing device of a group, and means controlled by said selector mechanism and operable to set said impression means in one of said relationships when impressions are to be made from follower printing devices and in another of said relationships when impressions are to be made from lead printing devices or from individual printing devices.

9. In a printing machine through which groups of related lead and follower printing devices and individual printing devices unrelated to but interspersed between such groups may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position and constructed and arranged for selective adjustment to different relationships wherein printing impressions are made from different areas of the printing devices, each of said lead printing devices of each of said groups thereof having identifying means positioned thereon in identifying positions indicative of the number of printing devices in its respective group, selector mechanism including sensing means operable to sense the identifying means of the printing devices, sheet separating, advancing and stopping means controlled by said selector mechanism to feed one sheet for each individual printing device and one sheet for each group and to effect stopping of such sheets in a different relation to printing position for each printing device from which an impression is to be made on a sheet and then to discharge the sheet, and means controlled by said selector mechanism and operable to selectively vary the relationship of said impression means in respect to at least certain of the printing devices of said groups.

10. In a printing machine through which groups of related lead and follower printing devices may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position and constructed and arranged for selective adjustment to different relationships wherein printing impressions are made from different areas of the printing devices, each of said lead printing devices of each of said groups thereof having identifying means positioned thereon in identifying positions indicative of the number of printing devices in its respective group, means for feeding sheets to printing position including selectively actuatable sheet stop members and stop actuating means therefor operable to actuate said stop members to position a sheet successively in different relations with respect to printing position and then to discharge the sheet from the machine, means operable to initiate feeding of each sheet by said sheet feeding means, selector mechanism embodying sensing means for sensing the identifying means of said printing devices, said selector means being constructed and arranged to control said stop actuating means to effect stopping of the sheet in a different re-

lation to printing position for each printing device in a group, means controlled by said selector mechanism and operable upon said feed initiating means to initiate feeding of the next sheet in timed relation to the formation of the printing impression from the last follower printing device of a group, and means controlled by said selector mechanism and operable to set said impression means in one of said relationships when impressions are to be made from follower printing devices and in another of said relationships when impressions are to be made from lead printing devices.

11. In a printing apparatus through which groups of varying numbers of related lead and follower printing devices may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position, the lead printing device of each of said groups thereof having identifying means positioned thereon in a selected identifying position indicative of the number of printing devices in its group, operable means for feeding sheets to printing position including sheet separating means operable to initiate feeding of each sheet by said sheet feeding means and selectively actuatable sheet positioning means whereby a sheet may be positioned successively in different relations with respect to printing position, a plurality of selectively operable actuating devices for said sheet positioning means each operable to actuate said sheet positioning means in a different relation such that the sheet comes to rest in different positions relative to said printing position and then to discharge such sheet from the machine, operative means for selecting the operating devices that are to be effective, independent cyclic control means for each size of group which may be passed through the printing apparatus, and each operable to control the apparatus for a number of machine cycles equal to the number of printing devices included in the size of group to which it is allocated, control means associating the respective cyclic control means with said operative means for governing operation thereof, operating means selectively settable to actuate any selected one of said cyclic control means, sensing means for sensing the identifying means on said printing devices, and means governed by said sensing means to set said operating means to operate the cyclic control means selectively in accordance with the identifying means sensed by said sensing means.

12. In a printing apparatus including a plurality of operative mechanisms and through which groups of varying numbers of lead and follower printing devices may be passed one by one to sensing and printing positions, a plurality of individual control means each allocated to a different one of said operative mechanisms and each adapted when actuated to control the operation of the operative mechanism to which it is allocated, a plurality of individually operative governing members each allocated to a different size of group of lead and follower printing devices, means acting between said governing members and said control means for governing said control means in accordance with the selective actuation of said governing members, said lead printing devices each having identifying means thereon indicative of the number of printing devices in the related group thereof, sensing means operable to sense such identifying means, and actuating means settable by said sensing means to actuate the governing members allocated to the size of group indicated by the sensing action of said sensing means.

13. In a printing apparatus having a plurality of operative mechanisms and through which groups of varying numbers of related lead and follower printing devices may be passed in a step by step manner to printing position in the machine, the lead printing device of each of said groups thereof having identifying means positioned thereon in a selected identifying position indicative of the number of printing devices in its groups, independent cyclic control means for each size of group which may be passed through the printing apparatus, and each operable to control said operative mechanisms of the apparatus for a number of machine cycles equal to the number of printing devices included in the size of group to which it is allocated, operating means selectively settable to actuate any one of said cyclic control means, sensing means for sensing the identifying means on said printing devices, and means governed by said sensing means to set said operating means to operate the cyclic control means selectively in accordance with the identifying means sensed by said sensing means.

14. In a printing machine through which groups of varying numbers of related lead and follower printing devices and individual printing devices unrelated to but interspersed between such groups may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position, the lead printing device of each of said groups thereof having identifying means positioned thereon in an identifying position indicative of the number of printing devices in its group, means for feeding sheets to printing position including sheet seperating means operable to initiate feeding of each sheet by said sheet feeding means, and selectively actuatable sheet stop members whereby a sheet may be stopped successively in different relations with respect to printing position, a plurality of selectively operable actuating devices for said sheet stop members each operable to actuate said stop members in a different relation such that the sheet comes to rest in a different number of successive positions and is then discharged from the machine, selector mechanism embodying sensing means for sensing the identifying means of said printing devices and operable to render said actuating devices effective selectively to effect stopping of the sheet in a different relation to printing position for each printing device in a group and then to discharge the sheet, and means controlled by said selector mechanism and operable upon said sheet separating means to initiate feeding of the next sheet in timed relation to the formation of the printing impression from the last follower printing device of a group.

15. In a printing machine through which groups of related lead and follower printing devices and individual printing devices unrelated to but interspersed between such groups may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position, the lead

printing devices of each of said groups having identifying means positioned thereon in identifying positions indicative of the number of printing devices in its group, means for feeding sheets to printing position and including selectively actuatable sheet stop members and stop actuating means operable to selectively actuate said stop members to position a sheet successively in a different number of different relations with respect to printing position and then to discharge these sheets from the machine, means operable to initiate feeding of each sheet by said sheet feeding means, selector mechanism embodying sensing means for sensing the identifying means of said lead printing devices and operable in response to such sensing of the identifying means of such lead printing devices to control said stop actuating means to effect stopping of the sheet in a different relation to printing position for each printing device in a group, and means controlled by said selector mechanism and operable upon said feed initiating means to initiate feeding of the next sheet in timed relation to the formation of the printing impression from the last follower printing device of a group.

16. In a printing machine through which groups of related lead and follower printing devices and individual printing devices unrelated to but interspersed between such groups may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position, the lead printing device of each of said groups having identifying means positioned thereon in an identifying position indicating that it is the lead printing device of a group, means for feeding sheets to printing position including sheet separating means operable to initiate feeding of each sheet by said sheet feeding means and selectively actuatable sheet stop members whereby a sheet may be stopped successively in different relations with respect to printing position and may then be discharged from the machine, selector means operable to sense the identifying means on the printing devices, a plurality of actuating devices for said sheet stop members rendered operable selectively under control of said selector means to actuate said stop members in different relations such that the sheet comes to rest in but a single position or in a number of successive positions corresponding to the number of printing devices in a group, and means controlled by said selector means and operable to govern operation of said sheet separating means.

17. In a printing machine through which groups of related lead and follower printing devices and individual printing devices unrelated to but interspersed between such groups may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position, the lead printing devices of each of said groups having identifying means positioned thereon in identifying positions indicative of the number of printing devices in its group, means for feeding sheets to printing position including selectively actuatable sheet stop members and stop actuating means operable to actuate said stop members to position a sheet successively in different relations with respect to printing position, means operable to initiate feeding of each sheet by said sheet feeding means, selector mechanism embodying sensing means for sensing the identifying means of said printing devices, said selector means being constructed and arranged to control said stop actuating means to effect stopping of the sheet in a different relation to printing position for each printing device in a group and then to discharge each sheet, and means governed by said selector mechanism and controlling said feed initiating means to initiate feeding of the next sheet in timed relation to the passage of the printing devices of a group through the machine.

18. In a printing machine through which groups of related lead and follower printing devices and individual printing devices unrelated to but interspersed between such groups may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position, a selected one of the printing devices of each of said groups having identifying means positioned thereon in an identifying position indicating the number of printing devices in its group, means for feeding sheets to printing position including sheet separating means operable to initiate feeding of each sheet by said sheet feeding means and selectively actuatable sheet stop members whereby a sheet may be stopped successively in different relations with respect to printing position, selector means operable to sense the identifying means on the printing devices, a plurality of actuating devices for said sheet stop members rendered operable selectively under control of said selector means to actuate said stop members in different relations such that the sheet comes to rest in but a single position or in a number of successive positions corresponding to the number of printing devices in a group, and means controlled by said selector means and operable to govern operation of said sheet separating means.

19. In a printing machine through which groups of related lead and follower printing devices and individual printing devices unrelated to but interspersed between such groups may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position, the lead printing devices of each of said groups having identifying means positioned thereon in identifying positions indicative of the number of printing devices in its group, means for feeding sheets to printing position including selectively actuatable sheet stop members and stop actuating means operable to actuate said stop members to position a sheet successively in different relations with respect to printing position and then to discharge the sheet, means operable to initiate feeding of each sheet by said sheet feeding means, selector mechanism embodying sensing means for sensing the identifying means of said printing devices to determine when a group of printing devices is being passed through the machine and how many printing devices are included in such group, said selector means being constructed and arranged under control of the sensed identifying means on said lead printing devices to conjointly control said stop actuating means and said feed initiating means to effect stopping of the sheet in a different relation to printing position for each printing device in a

group and then to discharge the sheet and to initiate feeding of the next sheet in timed relation to the formation of the printing impression from the last follower printing device of a group.

20. In a printing machine through which groups of varying numbers of related lead and follower printing devices and individual printing devices unrelated to but interspersed between such groups may be passed in a step by step manner such that the printing devices come to rest successively at printing position in the machine, impression means operable to produce printing impressions from printing devices at printing position, the lead printing device of each of said groups having identifying means positioned thereon in an identifying position indicative of the number of printing devices in its group, means for feeding sheets to and with relation to printing position including sheet separating means operable to initiate feeding of each sheet by said sheet feeding means and selectively actuatable sheet positioning means whereby a sheet may be positioned successively in different relations with respect to printing position, a plurality of selectively operable actuating devices for said sheet positioning means each operable to actuate said sheet positioning means in a different relation such that the sheet comes to rest in different positions relative to said printing position and is then discharged, and selector mechanism embodying sensing means for sensing the identifying means of said printing devices, and means operatively connecting said selector means to said actuating devices to render said actuating devices effective selectively to effect positioning of the sheet in different relations with respect to printing position for the different printing devices in a group and then to discharge the sheet, and means controlled by said selector mechanism and operable upon said sheet separating means to initiate feeding of the next sheet in timed relation to the formation of the printing impression from the last follower printing device of at least selected of such groups.

21. In a printing machine including a plurality of operative mechanisms and through which a series of printing devices, each adapted to bear identifying means at one or more positions thereon, are adapted to be passed one by one to sensing and printing positions, a shiftable control member shiftable from a normal position to different control positions and operatively associated with at least two of said operative mechanisms to control operation thereof differently in accordance with the control position to which said control member is shifted, settable actuating means for said control member, sensing means operable to sense identifying means on said printing devices and operative when a predetermined identifying means is sensed to set said actuating means for cooperation with said control member, and means operatively associating such a set-up actuating means with said control member to shift said control member to one control position in one predetermined cycle of operation of the machine and to another control position in another cycle of operation of the machine.

22. In a printing machine including a plurality of operative mechanisms and through which a series of printing devices, each adapted to bear identifying means at one or more positions thereon, are adapted to be passed one by one to sensing and printing positions, a control member shiftable from a normal position to different control positions and operatively associated with at least two of said operative mechanisms to control operation thereof differently in accordance with the control position to which said control member is shifted, sensing means operable to sense the identifying means on said printing devices, and means governed by said sensing means and operative when a predetermined identifying means is sensed to shift said control member to one control position in one predetermined cycle of operation of the machine and to another control position in another cycle of operation of the machine.

23. In a printing apparatus embodying a plurality of operative mechanisms, means for passing a series of printing devices through the apparatus and to printing position therein, each of said printing devices being adapted to bear identifying means at one or more selected identifying positions thereon, a plurality of normally inactive control members each shiftable to a plurality of different control positions, means operable when said control members are rendered active to shift said control members to different control positions, means governed by said control members in accordance with the control positions to which such control members are shifted for variantly controlling the operation of said operative mechanisms, sensing means for sensing identifying means on said printing devices and operable in accordance with such sensing operation to render said control members active selectively.

24. In a printing apparatus embodying a plurality of operative mechanisms, means for passing a series of printing devices through the apparatus and to printing position therein, each of said printing devices being adapted to bear identifying means at one or more selected identifying positions thereon, a plurality of normally inactive control members each shiftable to a plurality of different control positions, means operable when said control members are rendered active to shift said control members to different control positions, actuating means for rendering said control members active, means governed by said control members in accordance with the control positions to which such control members are shifted for variantly controlling the operation of said operative mechanisms, sensing means for sensing identifying means on said printing devices and operable in accordance with such sensing operation to render said actuating means effective selectively upon said control members to render a selected one of said control members active.

25. In a printing apparatus embodying a plurality of operative mechanisms, means for passing a series of printing devices through the apparatus and to printing position therein, each of said printing devices being adapted to bear identifying means at one or more selected identifying positions thereon, a plurality of normally inactive control members each shiftable to a plurality of different control positions, shifting means for said control members adapted to be rendered operative with respect to any selected one of said control members to render the same active and arranged when operative with respect to any selected control member to shift such control member to different control positions in predetermined sequence determined by the control member selected, means governed by said control members in accordance with the control positions to such control members are shifted for variantly controlling the operation of said operative mechanisms, sensing means for sensing identifying means on said printing devices and operable in accordance

with such sensing operation to render said shifting means operative with respect to said control members selectively.

26. In a printing machine including a plurality of operative mechanisms and through which a series of printing devices, including groups of varying numbers of related lead and follower printing devices, may be passed in a step by step manner to sensing and printing positions in the machine, the lead printing device of each of said groups thereof having identifying means positioned thereon in an identifying position indicative of the number of printing devices in its groups, a plurality of control members each allocated to a different size group of printing devices and shiftable to different control positions, means affording operative control connections from said control members to said plurality of operative mechanisms, said control connections being rendered operative in different predetermined combinations in accordance with the control position to which a selected control member is shifted, sensing means for sensing the identifying means of said lead printing devices to determine the size of the group of which each lead printing device is a part, actuating means for said control members selectively settable under control of said sensing means for actuating cooperation with the control member allocated to the size of groups indicated by the sensing operation of said sensing means, and means on said control members cooperating with said actuating means and operable in such actuation of the control members by said actuating means to determine and govern the control positions to which such control members are actuated.

27. In a printing machine including a plurality of operative mechanisms and through which a series of printing devices may be passed in a step by step manner to sensing and printing positions in the machine, said printing devices being adapted to bear identifying means positioned thereon in one or more selected identifying positions, a plurality of control members each shiftable to different control positions, means affording operative control connections from said control members to at least certain of said plurality of operative mechanisms, said control connections being rendered operative selectively in different predetermined combinations in accordance with the control position to which a selected control member is shifted, sensing means for sensing the identifying means of said printing devices, actuating means for said control members selectively settable under control of said sensing means for actuating cooperation with a selected control member determined by the sensing operation of said sensing means, and cooperating means on said control members cooperating with said actuating means and operable in such actuation of the control members by said actuating means to determine and govern the control positions to which such control members are actuated.

28. In a printing machine including a plurality of operative mechanisms and through which a series of printing devices may be passed in a step by step manner to sensing and printing positions in the machine, said printing devices being adapted to bear identifying means positioned thereon in one or more selected identifying positions, a plurality of control members each shiftable to different control positions, means affording operative control connections from said control members to at least certain of said plurality

of operative mechanisms, said control connections being rendered operative in different predetermined combinations in accordance with the control position to which a selected control member is shifted, sensing means for sensing the identifying means of said printing devices, actuating means for said control members selectively settable under control of said sensing means for actuating cooperation with a selected control member determined by the sensing operation of said sensing means, and means on said control members cooperating with said actuating means and operable in such actuation of the control members by said actuating means to determine and govern the control positions to which such control members are to be actuated and the sequence in which such actuation takes place.

29. In a printing machine including a plurality of operative mechanisms and through which a series of printing devices may be passed in a step by step manner to sensing and printing positions in the machine, said printing devices being adapted to bear identifying means positioned thereon in one or more selected identifying positions, a plurality of control members each shiftable to different control positions, individual control devices each adapted when actuated to control a different one of said plurality of operative mechanisms, individual cam means on each of said control members and operable selectively to actuate certain of said control devices in accordance with the control positions to which said control members are shifted, sensing means for sensing the identifying means of said printing devices, actuating means for said control members selectively settable under control of said sensing means for actuating cooperation with a selected control member determined by the sensing operation of said sensing means, and means on said control members cooperating with said actuating means and operable in such actuation of the control members by said actuating means to determine and govern the control positions to which such control members are actuated.

30. In a printing machine including a plurality of operative mechanisms and through which a series of printing devices may be passed in a step by step manner to sensing and printing positions in the machine, said printing devices being adapted to bear identifying means positioned thereon in one or more selected identifying positions, a plurality of control members each shiftable to different control positions, individual control devices each adapted when actuated to control a different one of said plurality of operative mechanisms, individual cam means on each of said control members operable selectively to actuate certain of said control devices in accordance with the control positions to which said control members are shifted, sensing means for sensing the identifying means of said printing devices, actuating means for said control members selectively settable under control of said sensing means for actuating cooperation with a selected control member determined by the sensing operation of said sensing means, and cam lobes disposed on said control members in positions to be engaged by said actuating means and arranged by their form and position to determine and govern the control positions to which such control members are actuated.

31. In a printing apparatus having a printing position and through which printing devices may be passed in series to said printing position, im-

pression means at said printing position, and means for separating and advancing sheets one by one to printing position, means including a pair of stop fingers operable selectively to stop a sheet at a first position or a second position with relation to the printing position of the machine, cam means operable in each cycle of operation of the machine to render a first one of said stop fingers inactive and then to render the same active to stop a sheet in said first position, cam means operable in unison to render said two stop fingers active and inactive alternately so as to stop a sheet in said first position and then in said second position, means normally operable to actuate said first cam means in each cycle of operation of the machine, normally inoperative means for actuating said second cam means, and means for connecting the actuating means of said first cam means to the actuating means of said second cam means for imparting actuating movement to said second cam actuating means.

32. In a sheet feeder adapted for use with a printing machine having a printing position and through which machine printing devices are advanced one by one to printing position, means for separating sheets and feeding the same one by one along a predetermined path to printing position, first and second stop fingers spaced along said path and each having operative and inoperative positions, a first cam means for operating said first stop finger to render the same operative in each cycle of machine operation, a second cam means for operating said first and second stop fingers to render said first and second stop fingers alternately operative in successive cycles of machine operation, means for actuating said first cam means in each cycle of machine operation, and means connectable to said actuating means for actuating said second cam means in those successive cycles of machine operation where two impressions are to be made upon a sheet.

33. In a sheet feeding mechanism adapted for use with a printing machine through which machine printing devices are adapted to be passed in series to a printing position, sheet separating and advancing means for advancing sheets to printing position, a pair of sheet stop devices positioned to stop a sheet at different positions with relation to the printing position, means for actuating one of said sheet stop devices in each cycle of machine operation, means for actuating said sheet stop devices alternately to cause a sheet to be stopped in different positions in two succeeding cycles of machine operation, means selectively operable to render said second actuating means operable when two impressions are to be made upon a sheet, and means for disabling said sheet separating means in one of two related cycles wherein two impressions are to be made on a sheet.

34. In a sheet feeding mechanism adapted for use with a printing machine having a printing position and through which machine printing devices may be passed one by one to printing position, an open top frame adapted to be extended across the top of such a printing machine and affording a sheet guideway along which sheets may be fed to printing position, sheet separating means for initiating such feeding movement of a sheet, a pair of stop devices each having operative and inoperative positions and disposed along said sheet guideway for stopping a sheet in different relations with respect to printing position, a cam and ratchet assembly operatively associated with a first one of said stop devices for rendering the same alternately operative and inoperative in each cycle of operation, a slide bar extended along said frame and operated through a reciprocating stroke in each cycle of machine operation, a pair of cam and ratchet assemblies associated one with each of said stop devices for rendering said stop devices alternately operative and inoperative, one of the cam and ratchet assemblies of said pair being arranged to supercede said first mentioned cam and ratchet assembly in the operation of said first stop device, a second slide bar mounted on said frame, means normally urging said second slide bar to a normal position, means for latching said second slide bar to said first slide bar to transmit actuating movement to said second slide bar from said first slide bar, means for rendering said latching means effective, and means for releasing said latching means at a predetermined point in the machine cycle.

35. In a sheet feeding mechanism adapted for use with a printing machine having a printing position and through which printing devices may be passed one by one to printing position, an open top frame adapted to be extended across the top of such a printing machine and affording a sheet guideway along which sheets may be fed to printing position, sheet separating means for initiating such feeding movement of a sheet, a pair of stop devices each having operative and inoperative positions and disposed along said sheet guideway for stopping a sheet in different relations with respect to printing position, a cam and ratchet assembly operatively associated with a first one of said stop devices for rendering the same operative and then inoperative in each cycle of operation, a slide bar extended along said frame and operated through a reciprocating stroke in each cycle of machine operation, a pair of cam and ratchet assemblies associated one with each of said stop devices for rendering said stop devices alternately operative and inoperative, one of the cam and ratchet assemblies of said pair being arranged to supercede said first mentioned cam and ratchet assembly in the operation of said first stop device, a second slide bar mounted on said frame, means normally urging said second slide bar to a normal position, means for latching said second slide bar to said first slide bar to transmit actuating movement to said second slide bar from said first slide bar, and means for controlling the latching and unlatching of said latching means.

36. In a sheet feeding mechanism adapted for use with a printing machine having a printing position and through which machine printing devices may be passed one by one to printing position, an open top frame adapted to be extended across the top of such a printing machine and affording a sheet guideway along which sheets may be fed to printing position, sheet separating means for initiating such feeding movement of a sheet, a pair of stop devices each having operative and inoperative positions and disposed along said sheet guideway for stopping a sheet in different relations with respect to printing position, a cam and ratchet assembly operatively associated with a first one of said stop devices for rendering the same operative and then inoperative in each cycle of operation, a first operating member extended along said frame and operated through an actuating movement in each cycle of machine operation, a pair of cam and ratchet assemblies associated one with each of said stop devices for ren-

dering said stop devices alternately operative and inoperative, one of the cam and ratchet assemblies of said pair being arranged to supercede said first mentioned cam and ratchet assembly in the operation of said first stop device, a second operating member mounted on said frame, and connecting means for connecting said second operating member to said first operating member to transmit actuating movement to said second operating member from said first operating member, and means for connecting and disconnecting said connecting means.

37. In a sheet feeder adapted for use with a printing machine having a printing position and through which machine printing devices may be passed to such printing position, said sheet feeder comprising an open top frame adapted to be extended across the top of said printing machine and providing a sheet guideway along which sheets may be advanced to printing position, sheet separating means for initiating such sheet feeding movement of a sheet along said sheet guideway, a plurality of sheet stop fingers each having active and inactive positions and disposed along said sheet guideway in such a relation as to define a plurality of sheet stop positions along the guideway and there being a plurality of such stop fingers disposed at certain of said sheet stop positions, cam means for controlling and actuating one of the stop fingers when a single impression is to be made upon the sheet, other cam means for controlling said sheet stop fingers and for operating such stop fingers at a plurality of sheet stop positions when such a plurality of impressions are to be made upon a sheet, and means for actuating said other cam means selectively and including a driven member which is operated in each cycle of machine operation and clutch means adapted to render said actuating means effective upon said cam means selectively in accordance with the number of impressions to be made upon a sheet.

38. In a sheet feeder adapted for use with a printing machine having a printing position and through which machine printing devices may be passed to such printing position, said sheet feeder comprising an open top frame adapted to be extended across the top of said printing machine and providing a sheet guideway along which sheets may be advanced to printing position, sheet separating means for initiating such sheet feeding movement of a sheet along said guideway, a plurality of sheet stop fingers each having active and inactive positions and disposed along said sheet guideway in such a relation as to define a plurality of sheet stop positions along the guideway and there being a plurality of such stop fingers disposed at certain of said sheet stop positions, a first cam for controlling and actuating one of the stop fingers when a single impression is to be made upon the sheet, a plurality of groups of cams each including a different number of cams and operatively associated with said sheet stop fingers for operating said stop fingers in different groups to stop a sheet at a different number of sheet stop positions in accordance with the number of impressions to be made upon a sheet, means for actuating said groups of cams selectively and including a driving member which is operated in each cycle of machine operation, individual driven members for said groups of cams, and clutch means adapted to connect said driving member to said driven members selectively in accordance with the number of impressions to be made upon a sheet.

39. In a sheet feeder adapted for use with a printing machine having a printing position and through which machine printing devices may be passed to such printing position, said sheet feeder comprising an open top frame adapted to be extended across the top of said printing machine and providing a sheet guideway along which sheets may be advanced to printing position, sheet separating means for initiating such sheet feeding movement of a sheet along said guideway, a plurality of sheet stop fingers each having active and inactive positions and disposed along said sheet guideway in such a relation as to define a plurality of sheet stop positions along the guideway, there being a plurality of such stop fingers disposed at certain of said sheet stop positions, cam means for controlling and actuating one of the stop fingers when a single impression is to be made upon the sheet, other cam means for controlling said sheet stop fingers and for operating such stop fingers at a plurality of sheet stop positions when such a plurality of impressions are to be made upon a sheet, means for actuating said other cam means selectively and including a driven member which is operated in each cycle of machine operation and clutch means adapted to render said actuating means effective upon said cam means selectedly in accordance with the number of impressions to be made upon a sheet, and means for rendering said sheet separating means inactive when a plurality of impressions are to be made upon a sheet.

40. In a printing apparatus, a printing machine through which printing devices each adapted to bear identifying means may be passed to sensing and printing positions in the machine, sensing means at said sensing position for sensing said identifying means, impression means at printing position, a sheet feeder comprising an open top frame extended across the top of said printing machine and providing a sheet guideway along which sheets may be advanced to printing position, sheet separating means for initiating such sheet feeding movement of a sheet along said guideway a plurality of sheet stop fingers aech having active and inactive positions and disposed along said sheet guideway in such a relation as to define a plurality of sheet stop positions along the guideway and there being a plurality of such stop fingers disposed at certain of said sheet stop positions, a first cam for controlling and actuating one of the stop fingers when a single impression is to be made upon the sheet, a plurality of groups of cams each including a different number of cams and operatively associated with said sheet stop fingers for operating said stop fingers in different groups to stop a sheet at a different number of sheet stop positions in accordance with the number of impressions to be made upon a sheet, means for actuating said groups of cams selectively and including a driving member which is operated in each cycle of machine operation, individual driven members for said groups of cams, clutch means adapted to connect said driving member to said driven members selectively in accordance with the number of impressions to be made upon a sheet, and means operating under control of said sensing means to govern the operative engagement of said clutch means.

41. In a printing machine having a plurality of operative mechanisms and through which machine a series of printing devices each adapted to bear identifying means at one or more selected

identifying positions thereon are adapted to be passed to a sensing station in the machine, sensing means at said sensing station for sensing such identifying means, a storage drum having a plurality of storage plungers mounted thereon in peripherally spaced relation and for longitudinal set-up movement from an initial position to any selected one of a plurality of set up positions, means for indexing said drum in each machine cycle, means operable under control of said sensing means to set said storage plungers one by one to set-up positions determined by said sensing means, a plurality of shiftable control members operatively associated with said operative mechanisms for controlling the operation of said operative mechanisms in accordance with shifting movements imparted to said control members, said control members being disposed in such positions as to be selectively actuated by said plungers in accordance with the positions to which said plungers are set, and arms on said control members extended partially about said drum and arranged for operative engagement by an appropriately set plunger in a plurality of machine cycles.

42. In a printing machine having a plurality of operative mechanisms and through which machine a series of printing devices each adapted to bear identifying means at one or more selected identifying positions thereon are adapted to be passed to a sensing station in the machine, sensing means at said sensing station for sensing such identifying means, a storage drum having a plurality of storage plungers mounted thereon in peripherally spaced relation and for longitudinal set-up movement from an initial position to any selected one of a plurality of set up positions, means for indexing said drum in each machine cycle, means operable under control of said sensing means to set said storage plungers one by one to set-up positions determined by said sensing means, a plurality of shiftable control members operatively associated with said operative mechanisms for controlling the operation of said operative mechanisms in accordance with shifting movements imparted to said control members, said control members being disposed in such positions as to be selectively actuated by said plungers in accordance with the positions to which said plungers are set, arms on said control members extended partially about said drum and having cam surfaces thereon formed and arranged for operative engagement by an appropriately set plunger in a plurality of machine cycles to impart different shifting movements to said control members in at least certain machine cycles.

43. In a printing machine having a plurality of operative mechanisms and through which machine a series of printing devices each adapted to bear identifying means at one or more selected identifying positions thereon are adapted to be passed to a sensing station in the machine, sensing means at said sensing station for sensing such identifying means, a storage drum having a plurality of storage plungers mounted thereon in peripherally spaced relation and for longitudinal set-up movement from an initial position to any selected one of a plurality of set up positions, means for indexing said drum in each machine cycle, means operable under control of said sensing means to set said storage plungers one by one to set-up positions determined by said sensing means, a plurality of shiftable control members each adapted for shifting movement to different control positions, means operatively associating said control members each with a plurality of said operative mechanisms for controlling the operation of such operative mechanisms differently in accordance with control positions to which said control members are shifted, said control members being disposed in such positions as to be operatively related to said plungers selectively in accordance with the positions to which said plungers are set, arms on said control members extended partially about said drum and arranged for operative engagement by an appropriately set plunger in a plurality of machine cycles, and a plurality of cam surfaces on each of said arms for successive engagement by a plunger when such plunger is appropriately set, and said cam surfaces on each arm being so formed as to determine the sequence of control positions to which the related control member is shifted in such a plurality of machine cycles.

44. In a printing machine having a plurality of operative mechanisms and through which machine a series of printing devices each adapted to bear identifying means at one or more selected identifying positions thereon are adapted to be passed to a sensing station in the machine, sensing means at said sensing station for sensing such identifying means, a storage drum having a plurality of storage plungers mounted thereon in peripherally spaced relation and for longitudinal set-up movement from an initial position to a selected set position, means for indexing said drum in each machine cycle, means operable under control of said sensing means for setting said storage plungers, a shiftable control member having a normal position and a control position to which it may be shifted, means associating said control member with at least one of said operative mechanisms to govern operation of said operative mechanisms when said control member is shifted to said control position, and means on said control member affording a plurality of cam surfaces adapted to be successively engaged in successive machine cycles by a storage plunger located in said set position to thereby shift said control member to its control position in a plurality of machine cycles under the control of identifying means on a single printing device.

45. In a printing machine having a plurality of operative mechanisms and through which machine a series of printing devices each adapted to bear identifying means at one or more selected identifying positions thereon are adapted to be passed to a sensing station in the machine, printing device advancing means for moving printing devices through the machine, sensing means at said sensing station for sensing such identifying means, a storage drum mounted for indexing movement and having a plurality of storage plungers mounted thereon in peripherally spaced relation and for longitudinal movement from an initial position to a selected active position, means for indexing said drum when said printing device advancing means are operated, means operable under control of said sensing means for setting said storage plungers in said active position, a shiftable control member having a normal position and a control position to which it may be shifted, means associating said control member with a plurality of said operative mechanisms to govern operation of said operative mechanisms when said control member is shifted to said control position, the means associating said control member with one of said operative mechanisms being inoperative when shifting

movement of said control member takes place after a predetermined time in a machine cycle, and means on said control member affording a plurality of cam surfaces adapted to be successively engaged in successive machine cycles by a storage plunger located in said set position to thereby shift said control member to its control position in a plurality of machine cycles under the control of identifying means on a single printing device, one of said cam surfaces being so disposed as to delay the shifting movement of said control member until after said predetermined time in the machine cycle.

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