Oct. 10, 1944. L. H. MORSE 2,359,852

PRINTING MACHINE

Filed July 21, 1941 14 Sheets-Sheet 1

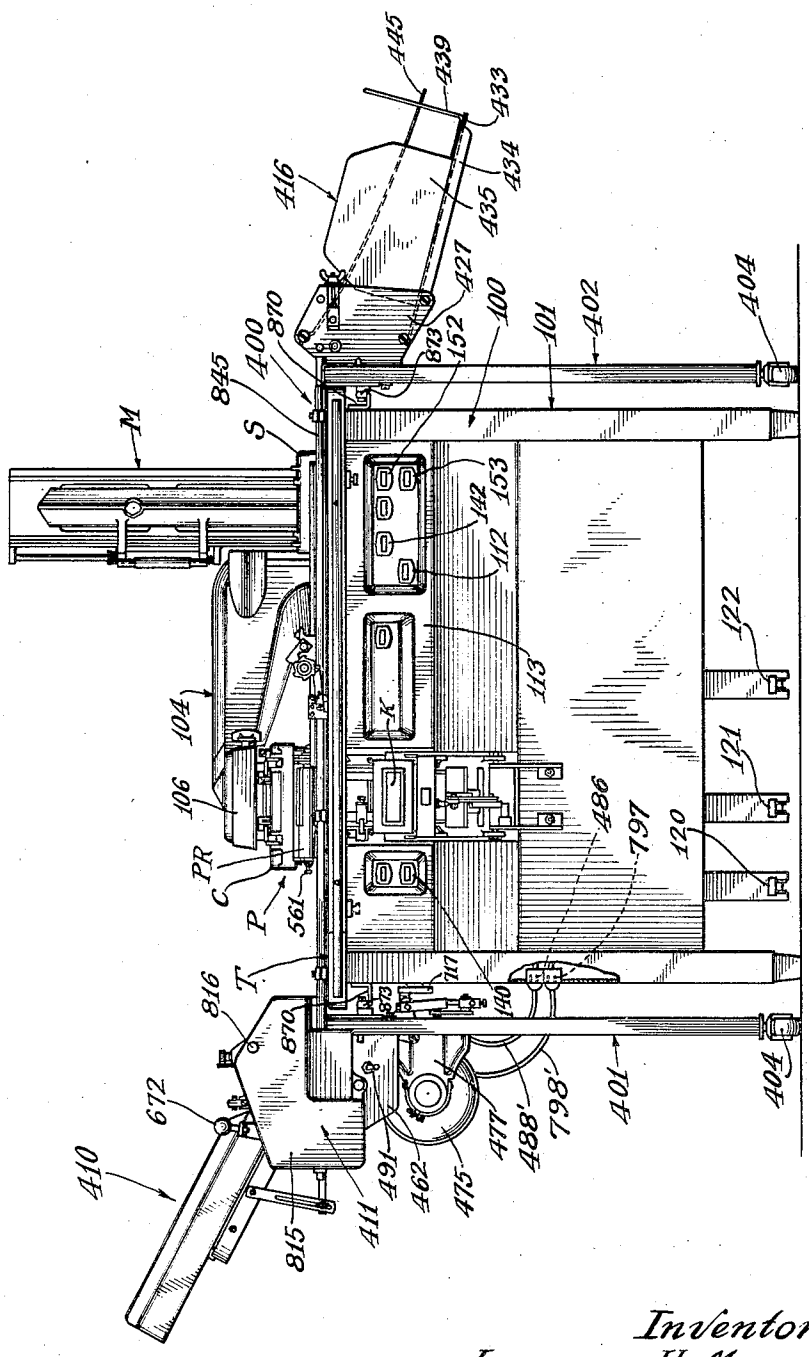


Fig. 1.

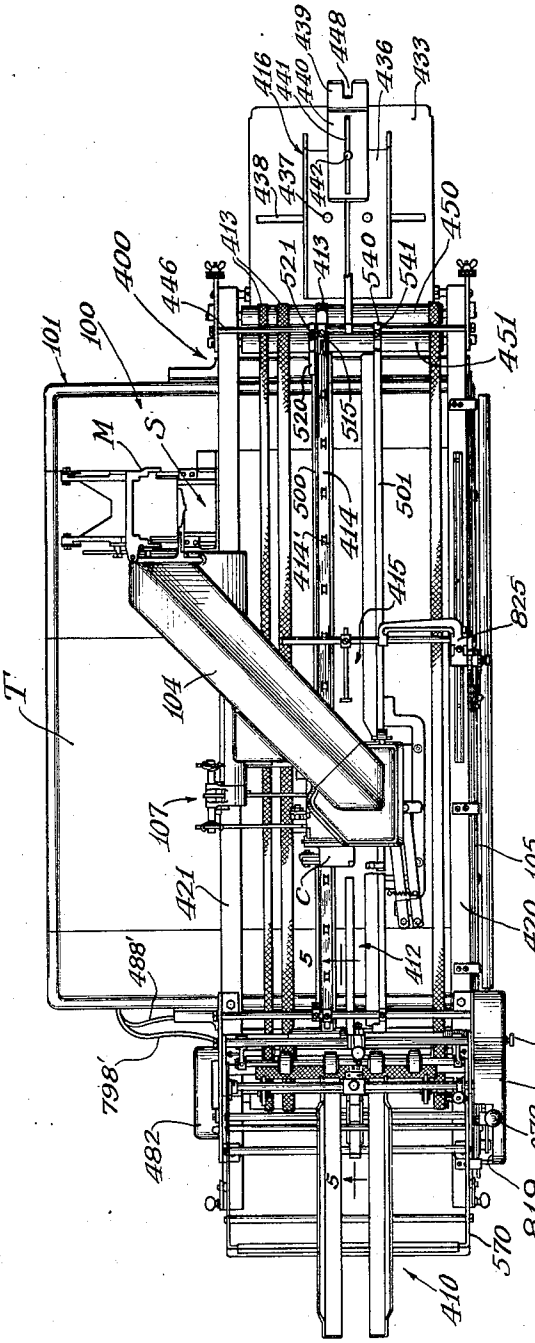
Inventor:
Lawrence H. Morse
By Wallace and Cannon
Attorneys

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PRINTING MACHINE

Filed July 21, 1941 14 Sheets-Sheet 2

FIG. 2.



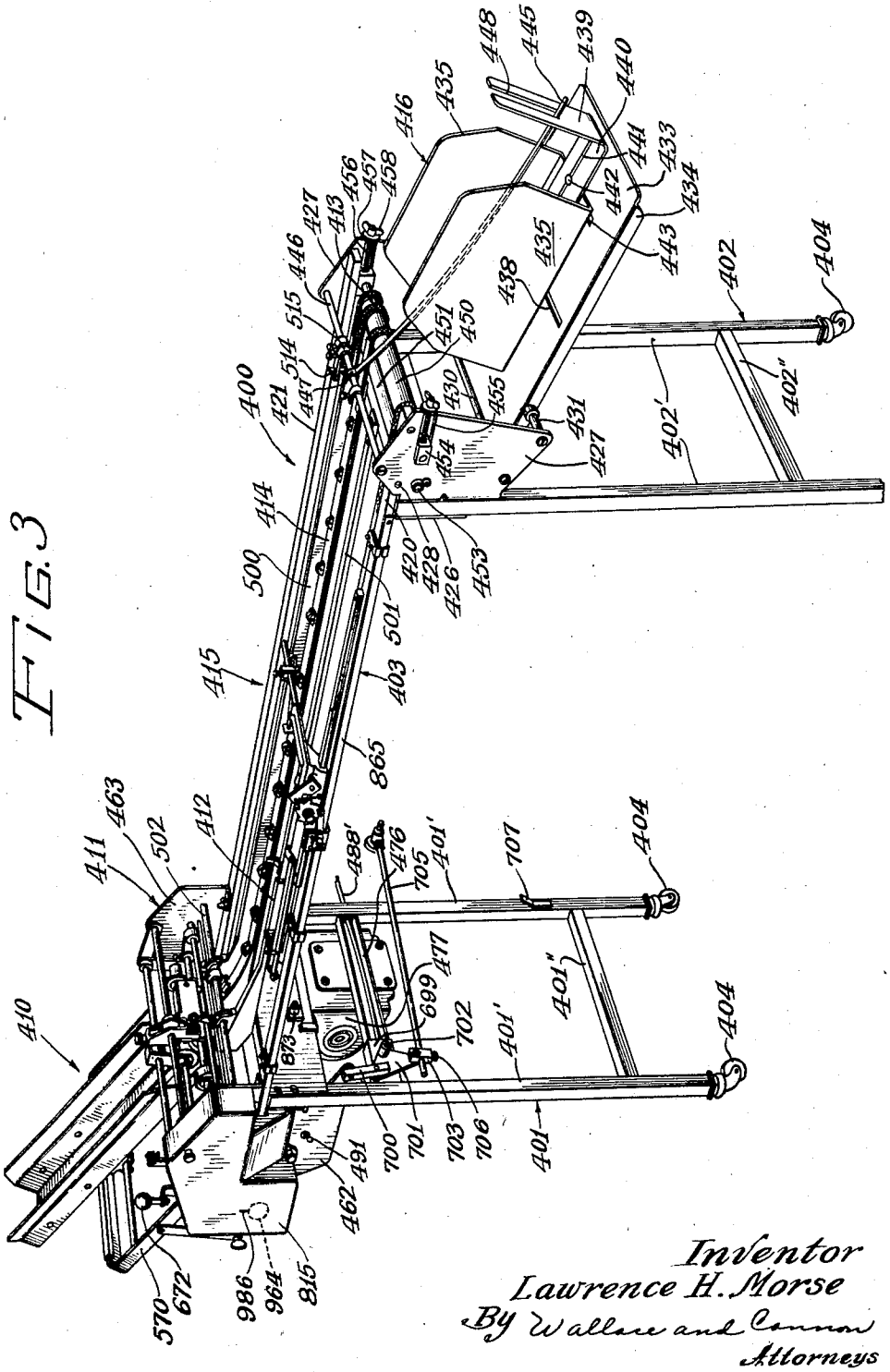
Inventor:
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PRINTING MACHINE

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FIG. 3



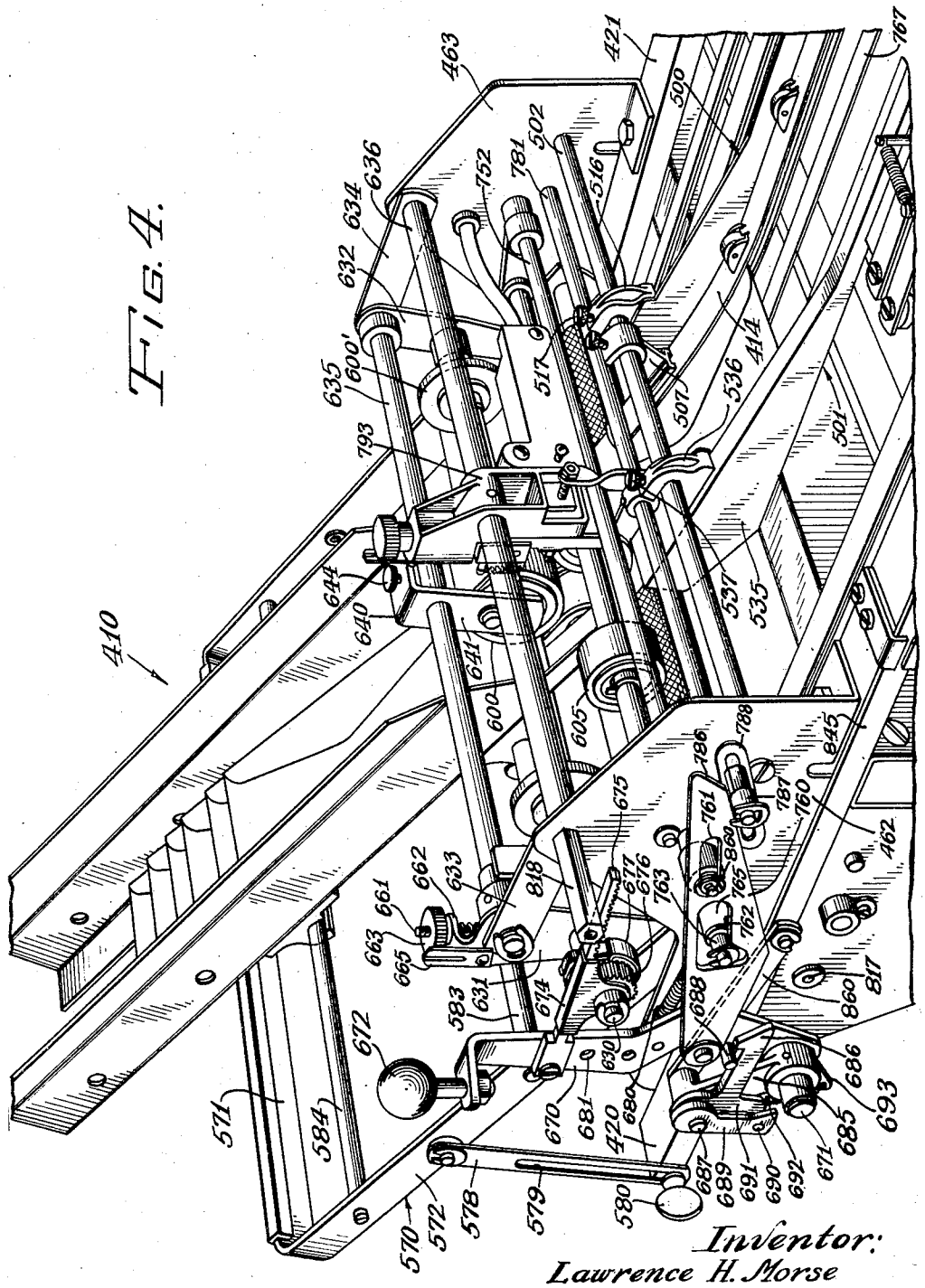
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PRINTING MACHINE

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FIG. 4.

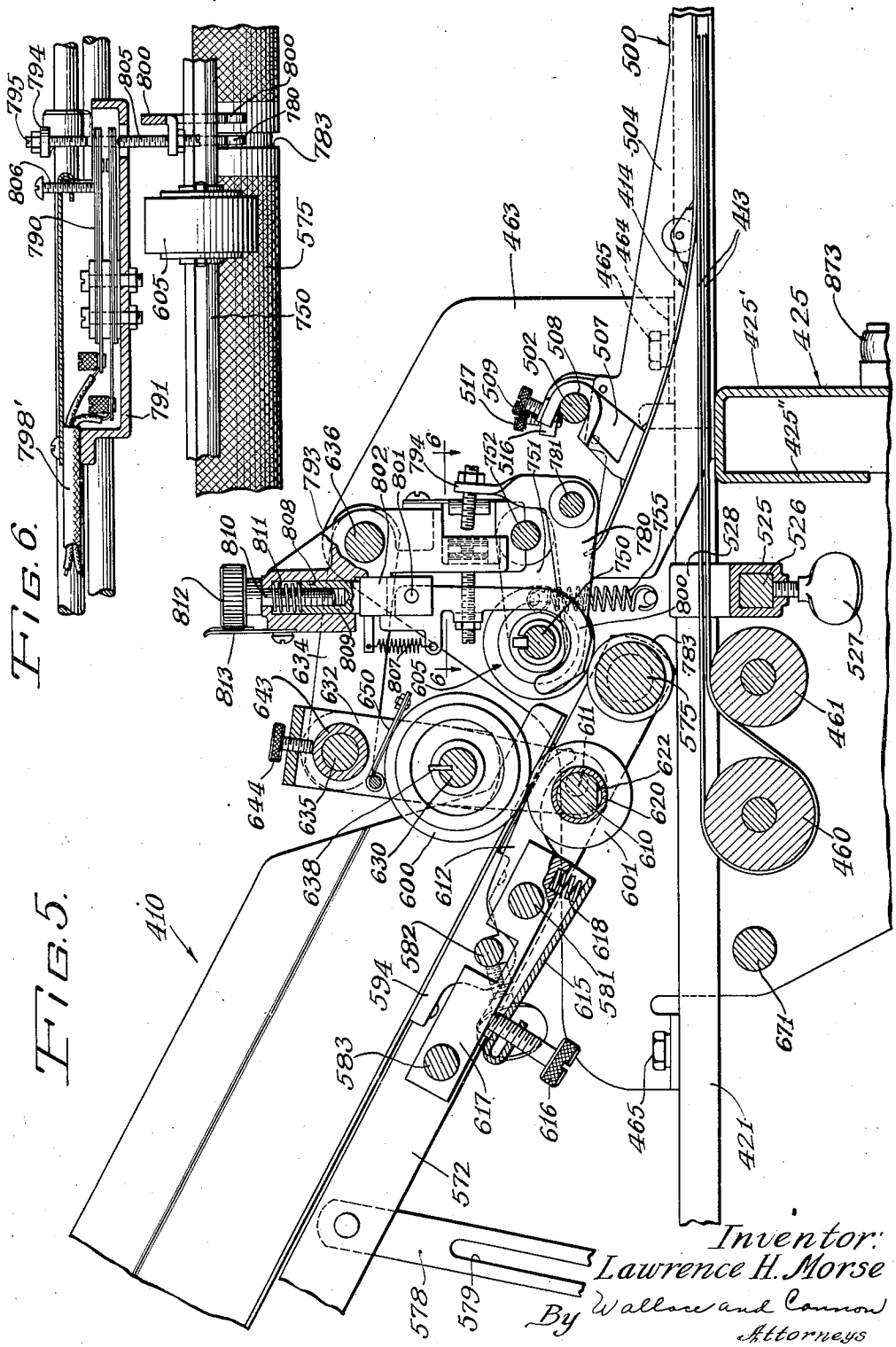


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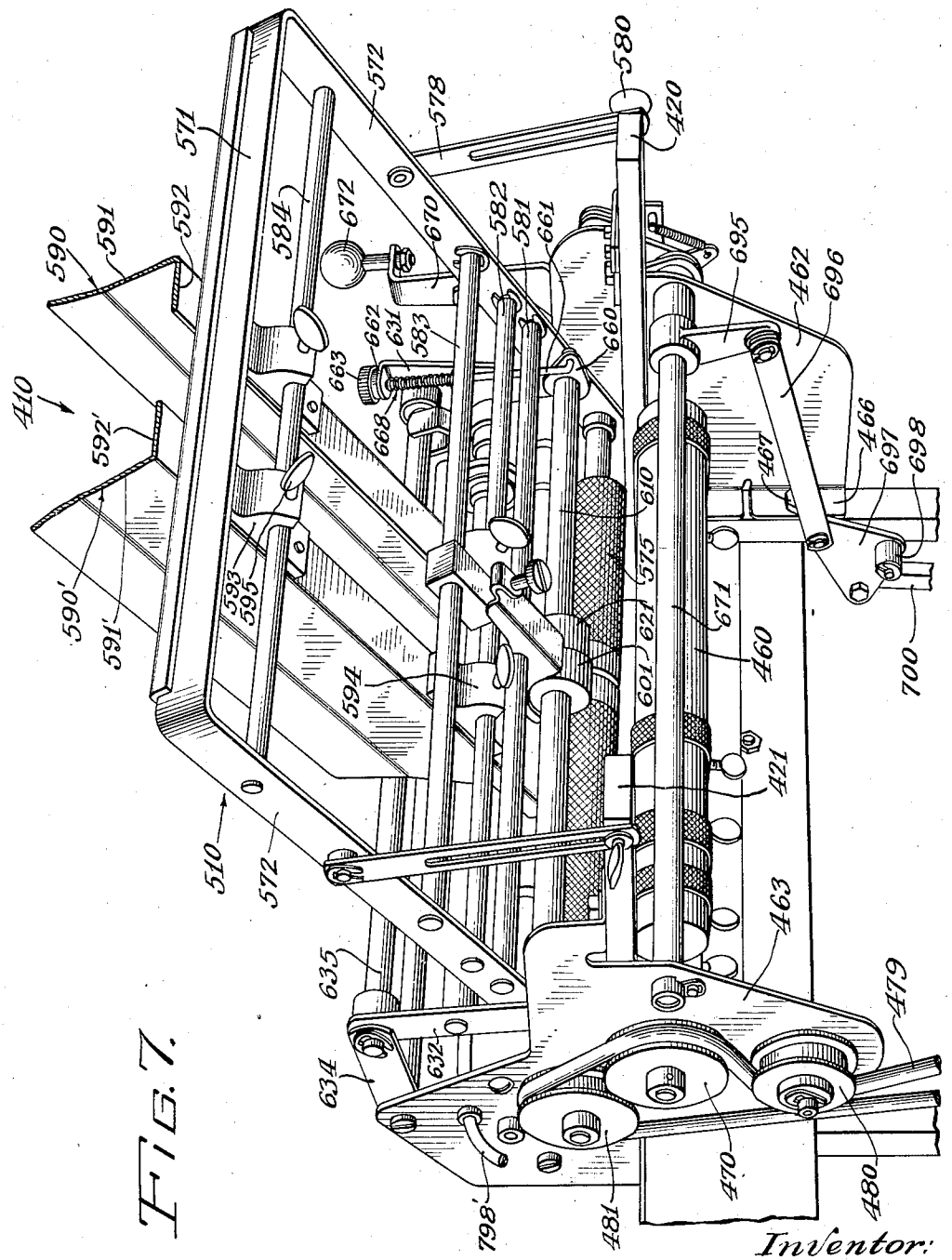


FIG. 7.

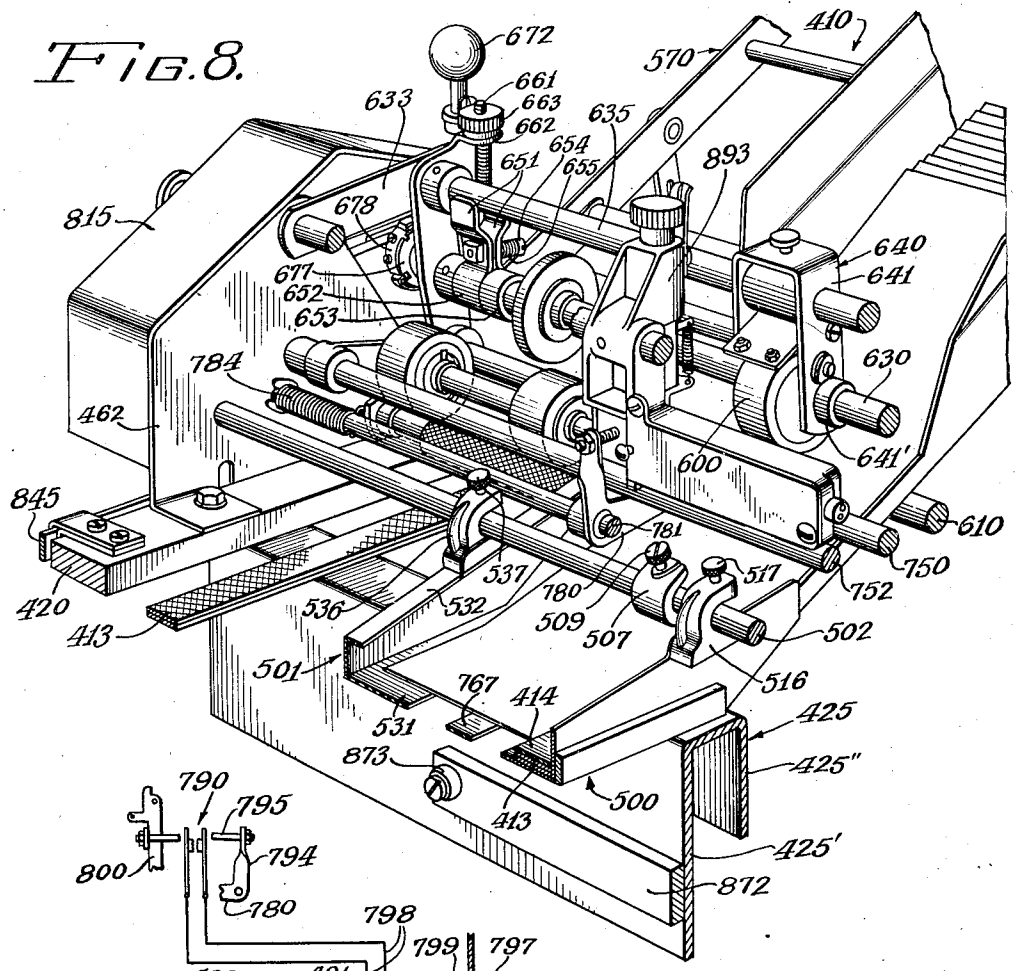
Inventor:
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PRINTING MACHINE

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FIG. 8.



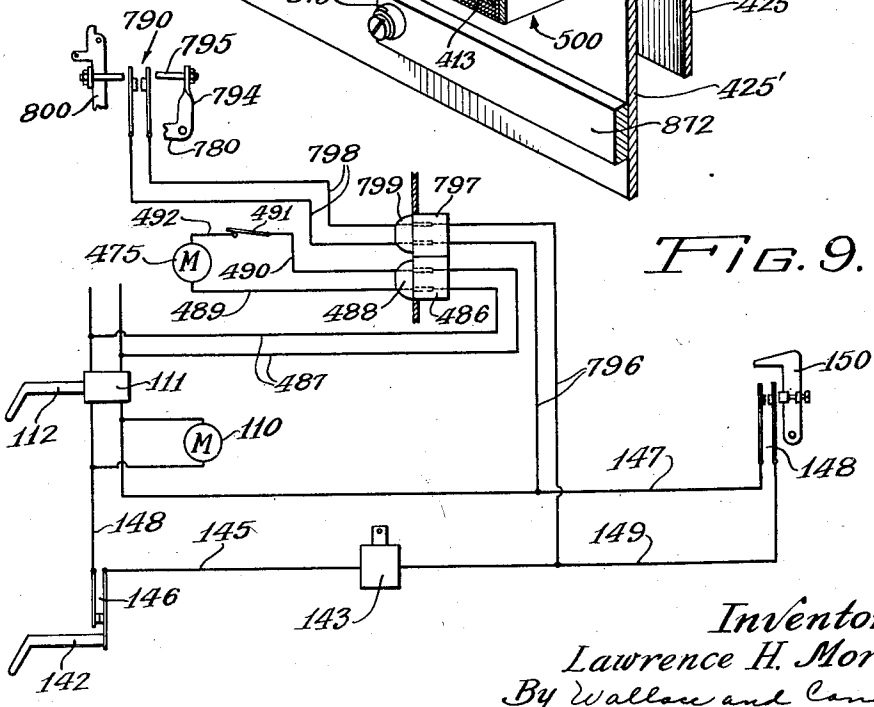


FIG. 9.

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FIG. 10.

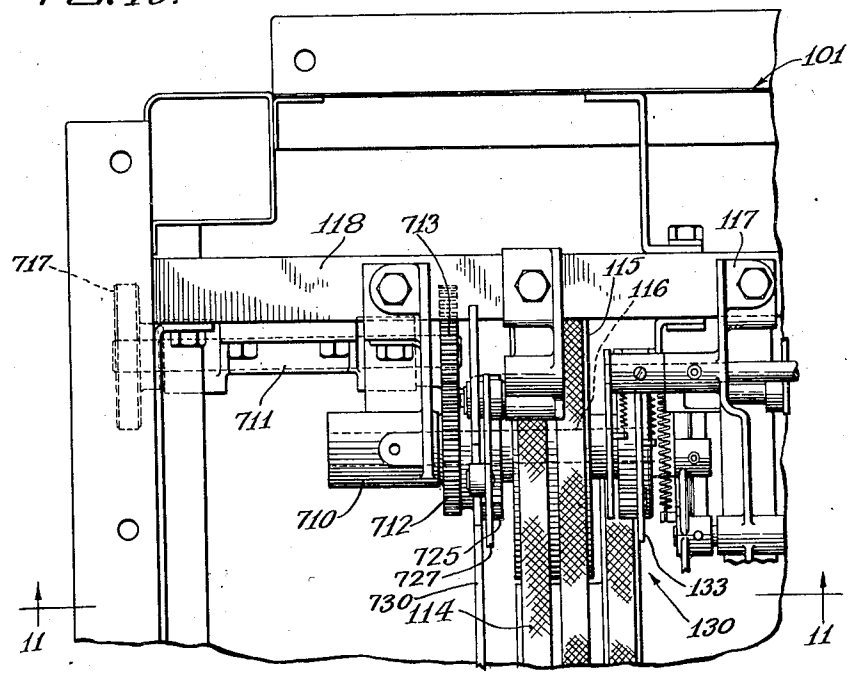
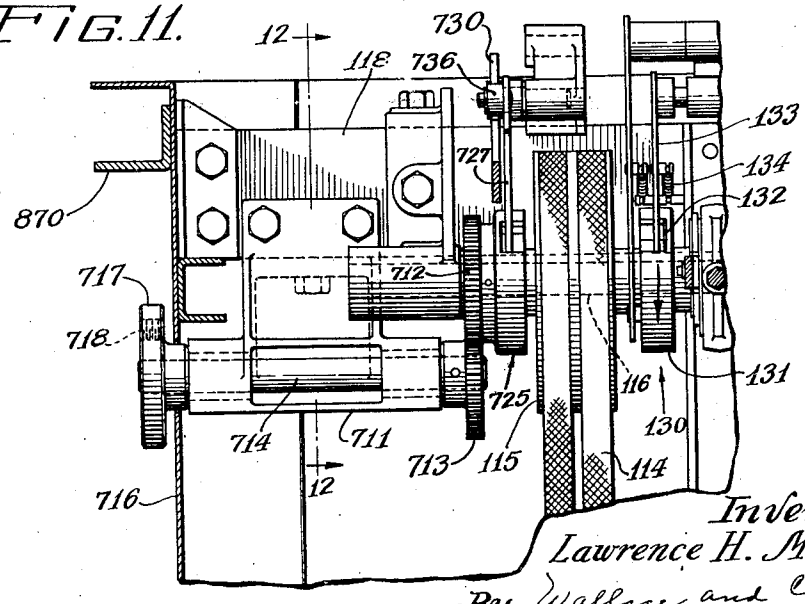


FIG. 11.



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Fig. 12.

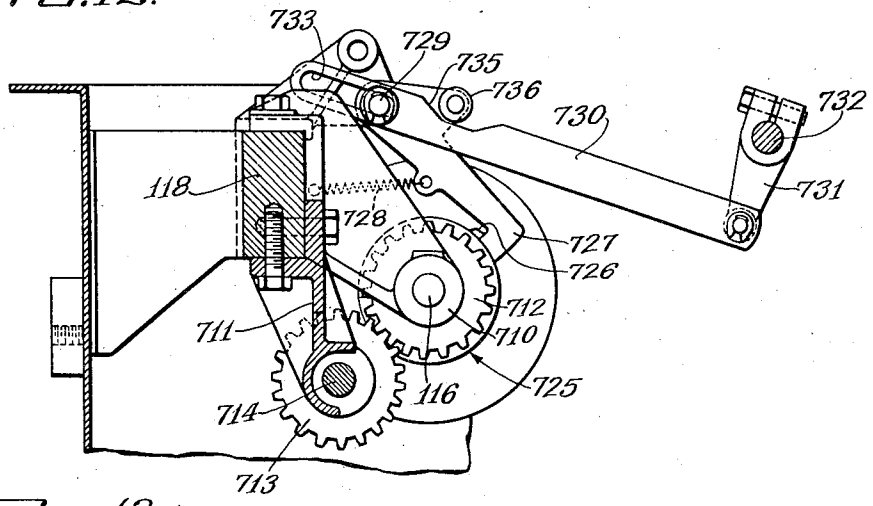


Fig. 13.

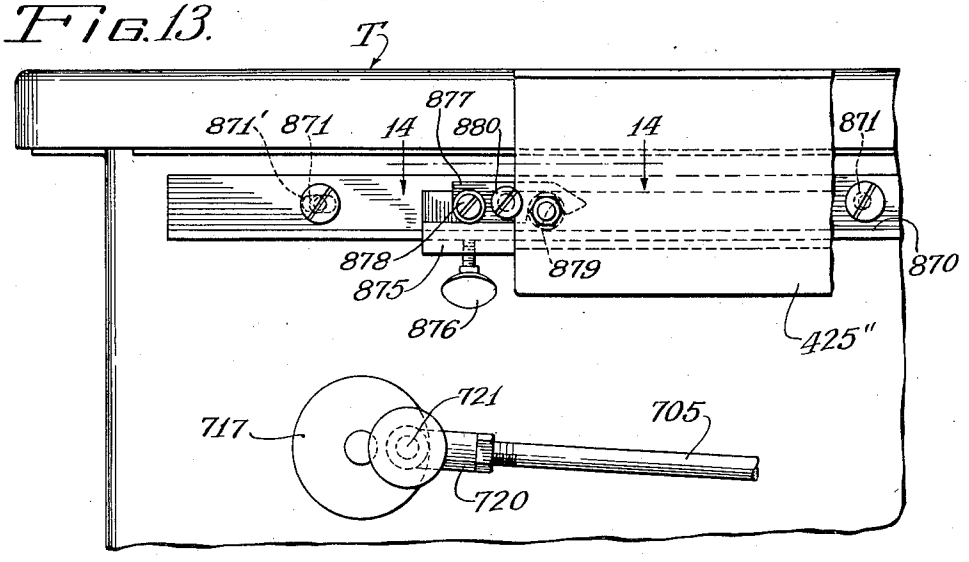
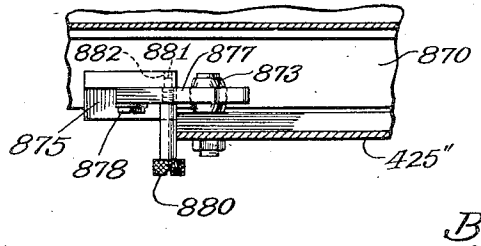


Fig. 14.



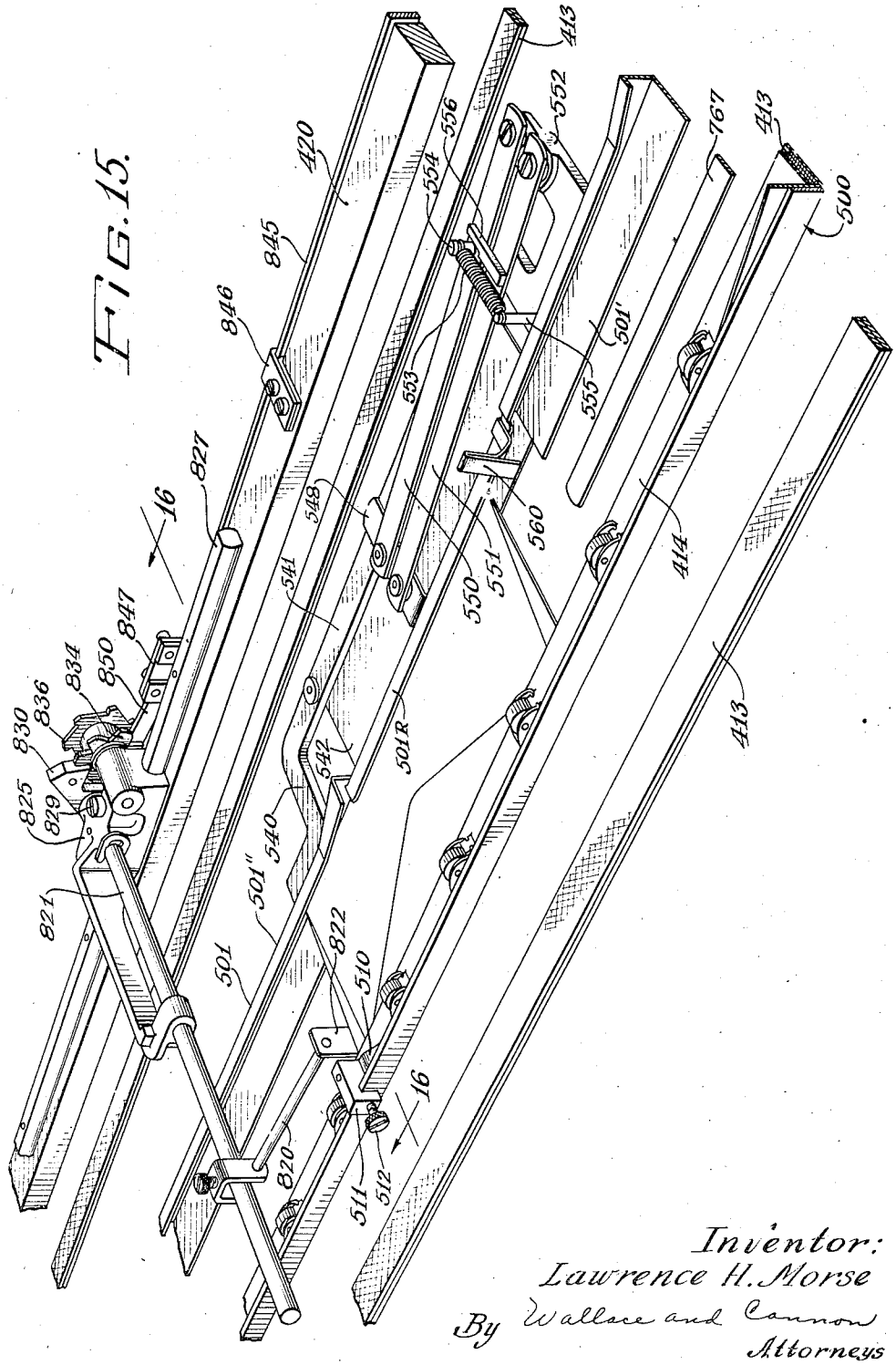
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Fig. 15.



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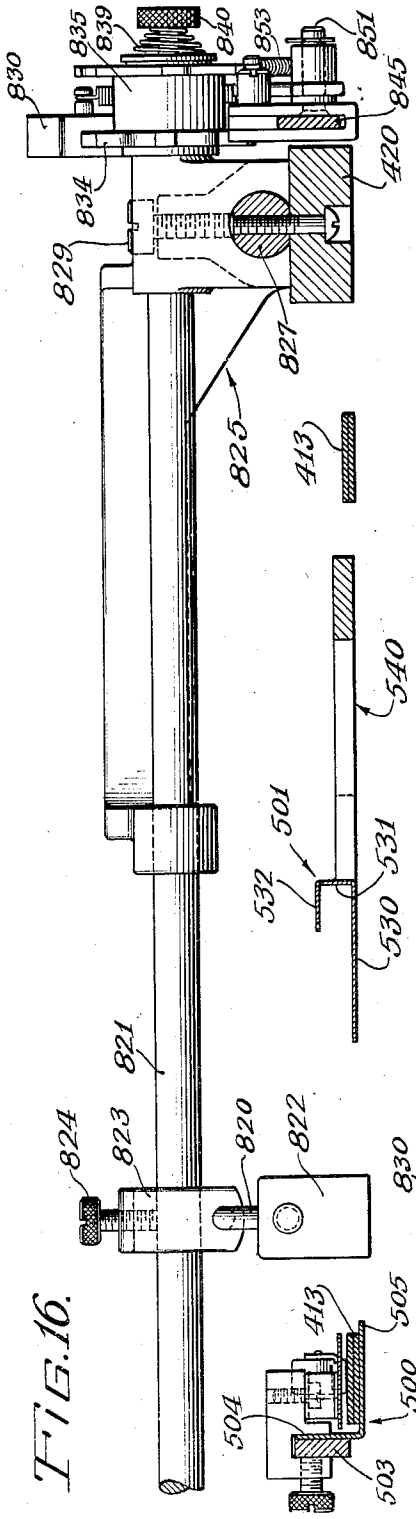


FIG. 16.

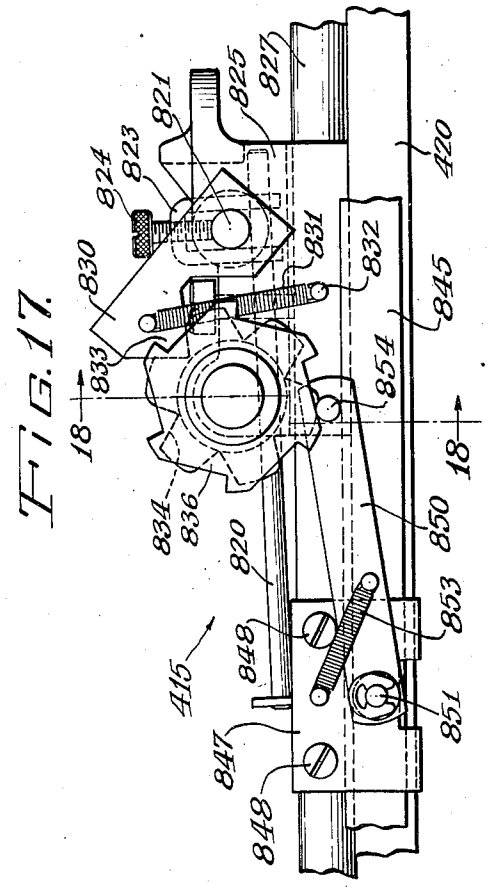


FIG. 17.

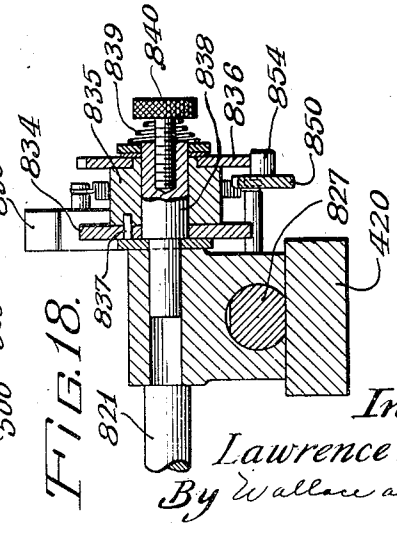


FIG. 18.

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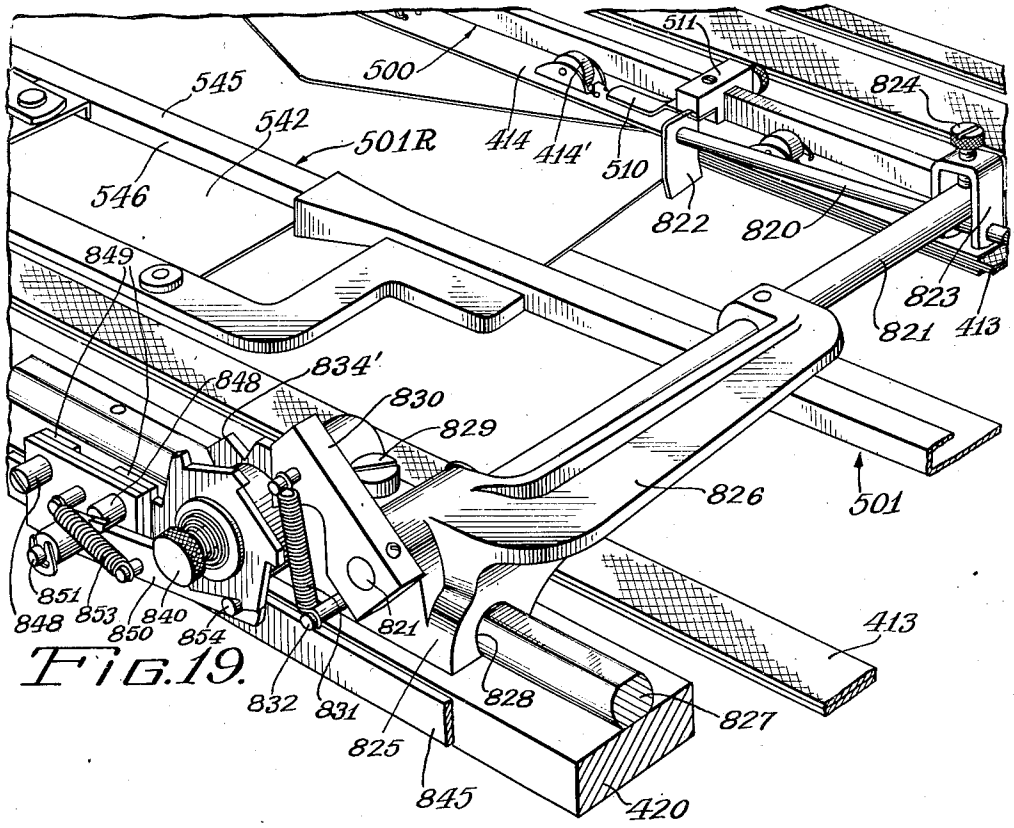


Fig. 19.

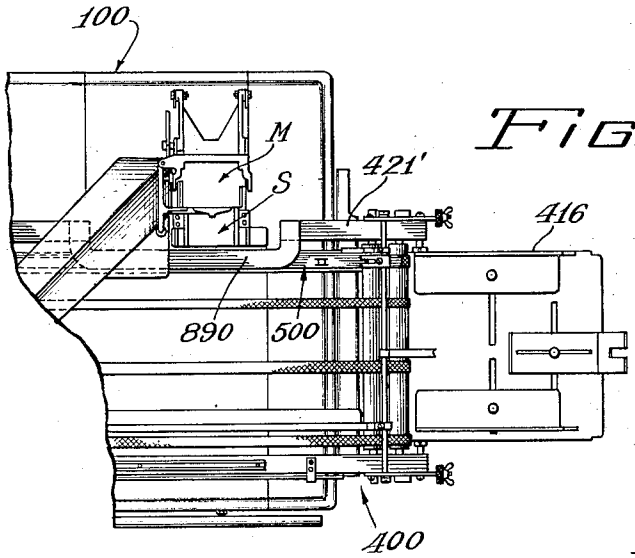


Fig. 20.

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FIG. 21.

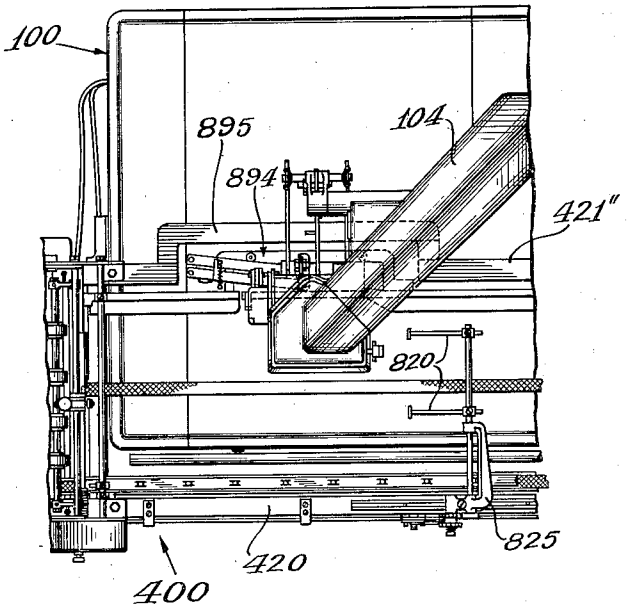


FIG. 22.

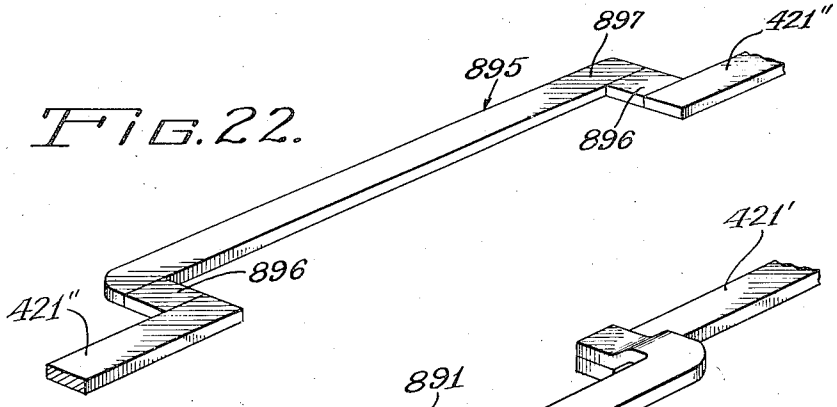


FIG. 23.

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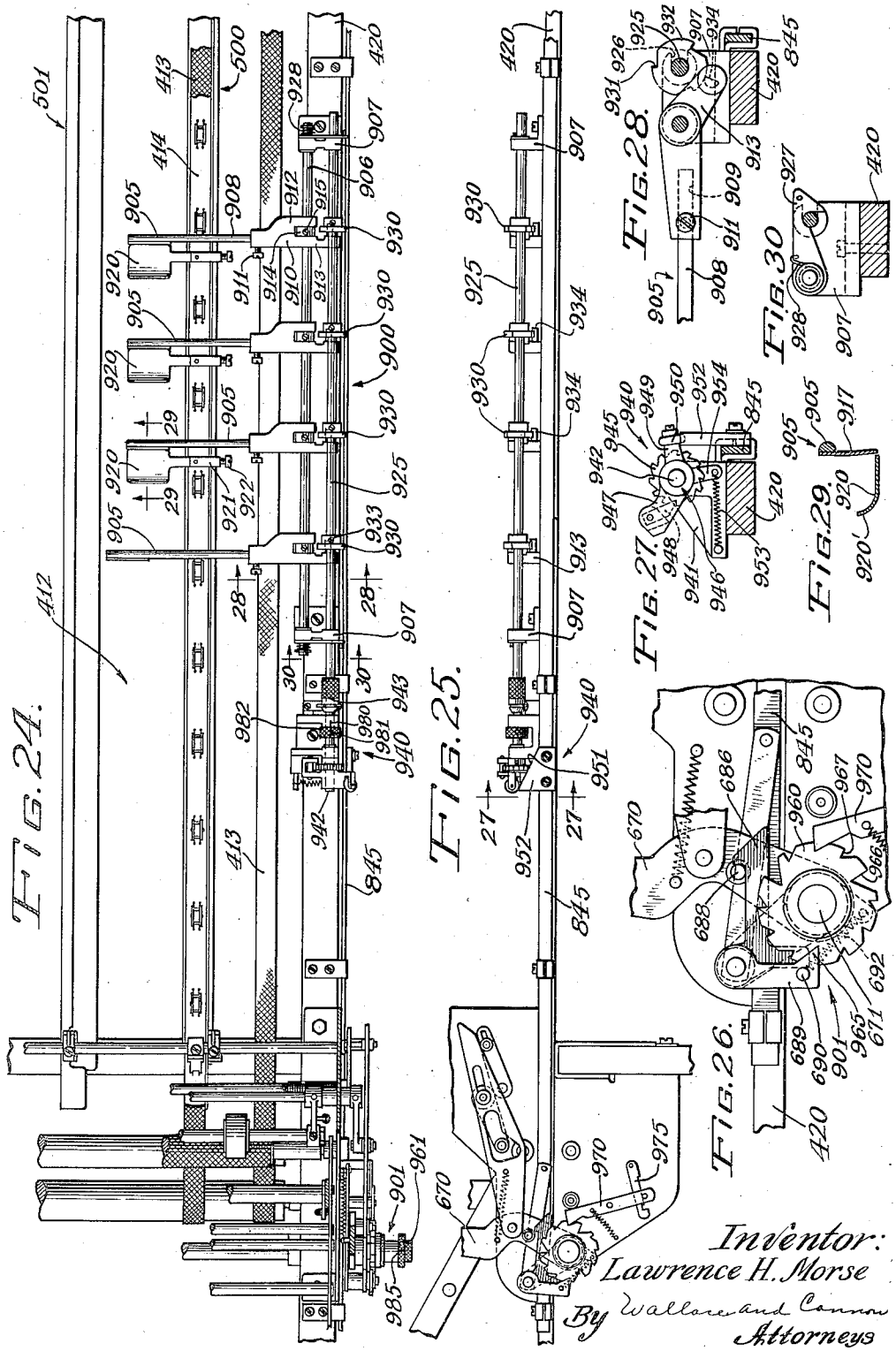


Fig. 24.

Fig. 25.

Fig. 28.

Fig. 30

Fig. 27.

Fig. 29.

Fig. 26.

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Patented Oct. 10, 1944 2,359,852

UNITED STATES PATENT OFFICE

2,353,852

PRINTING MACHINE

Lawrence H. Morse, Mentor, Ohio, assignor to Addressograph-Multigraph Corporation, Wilmington, Del., a corporation of Delaware

Application July 21, 1941, Serial No. 403,282

56 Claims. (Cl. 101—56)

This invention relates to printing machines of the kind through which a series of printing devices are fed to printing position where printing impressions are made therefrom, and more particularly the invention relates to the automatic feeding of sheets, forms, booklets and the like to the printing position to have printing impressions made thereon from the printing devices.

The primary object of the present invention is to simplify and facilitate the use of automatic sheet feeding means with printing machines of the aforesaid kind, and to enable such an automatic sheet feeder to be used efficiently and in a convenient manner by the usual operators of such printing machines.

Printing machines of the aforesaid character are usually employed in business establishments wherein the machines have a wide range of use in producing printed letters, addressing envelopes, folders and the like for distribution, as well as in the production of office forms, shop tickets, tax forms, accounting forms, and the like. Thus in many instances it is desirable to employ the machine for a series of printing operations wherein the sheets or forms are manually located at the printing position, while in other instances it is desirable to feed envelopes, booklets, sheets or forms automatically to the printing position, thereby to attain greater production speed. Since the use of an automatic sheet feeding means with such a printing machine attains such a high rate of production, it is found that in most business establishments where such automatic sheet feeding is employed, the volume of work to be performed by the use of such an automatic sheet feeding means does not consume all of the available operating time of the printing machine, and as a result it would be possible, were it not for difficulties and objectionable features inherent in prior sheet feeding means, to utilize the printing machine for other types of work during the intervals between periods of use of the automatic sheet feeding means.

In the prior use of printing machines of the aforesaid character it has been found that automatic sheet feeding means have been difficult to mount in an operative association with the printing machine, and hence it has been impossible as a practical matter to utilize the printing machine in manually fed printing operations during these idle intervals between the periods of use of the automatic sheet feeding means. An important object of the present invention is, therefore, to enable a printing machine to be readily set-up for automatic feeding of sheets or forms to printing position, and an object ancillary to the foregoing is to enable an automatic sheet feeder to be quickly and easily placed in or removed from an operative relation with respect to a printing machine.

In the use of printing machines of the aforesaid character many different types of work are produced, a variety of different sizes of forms being employed, and the printing impressions made by the printing machine on the forms are located in a wide variety of different locations or positions on such forms, in accordance with the type or lay-out of the form used in each run of the machine. Thus when an automatic sheet feeding means is employed with a printing machine of the aforesaid character, the sheet feeding means must be adjusted to conform to not only the size of the sheet upon which the printing impressions are to be made, but also to provide for proper lateral and transverse location of the printing impression upon each sheet. Such adjustments must, of course, be made in an accurate manner, and in prior sheet feeding mechanisms the arrangement has been such that removal of the sheet feeding mechanism from its operative relation with respect to the printing machine has, in effect, destroyed at least a part of these adjustments, thereby rendering it necessary for the operator to again make these adjustments when the sheet feeding means is returned to its operative relation with respect to the printing machine; and such repeated adjustment has been necessary in each instance even though the same size sheet and the same location of the printing impression were to be attained. Another object of the present invention is, therefore, to enable all of the adjustments which are made on a sheet feeding mechanism to be preserved, or remain undisturbed, when the sheet feeding mechanism is removed from its operative relation with respect to the printing machine, thereby to enable the operator to quickly and easily return the sheet feeding mechanism to its operative relation to the printing machine.

When an automatic sheet feeding mechanism is used with a printing machine of the aforesaid character in a particular business establishment, it has been found that one of the most frequently performed adjustments is the adjustment of the position of the printing impression laterally of the printed sheet, and another object of the invention is to enable such adjustment of the location of the printing impression laterally of the sheet to be readily and easily attained; and a further object related to the foregoing is to en-

able an operator, after a particular lateral or vertical adjustment of the printing impression has been once established, to re-establish this adjustment in a simple and effective manner.

It is often desirable to produce bills and the like having a series of duplicate or related printing impressions thereon, as for example a multiple section public utility bill, where it is desired to print the customer's name on the bill proper, on the customer's receipt, and upon the accounting stub, and in such instances it is necessary to advance each such bill in a step by step manner past printing position so that the desired number of duplicate or related impressions may be made at the desired positions on the sheet or form; and to enable such work to be performed readily and conveniently by a conventional printing machine of the aforesaid character is still a further object of this invention.

It will be recognized, of course, that several different types of sheets or forms may be employed by a particular business establishment and that the business establishment may wish to prepare all of these different sheets or forms with the same printing machine and through the use of the same automatic sheet feeding mechanism. The sheet feeding mechanism may, of course, be provided with a series of stop fingers which are rendered effective in succession upon the advancing sheet or form to cause the same to come to rest successively in the different desired relationships with respect to the printing position, and another object of the invention is to enable the number of stops employed on an automatic sheet feeder to be readily varied as required for different types of work.

Another object is to enable a multiple stop mechanism to be readily correlated with the operation of the sheet separating and advancing means of the automatic sheet feeder; and a further object related to the foregoing is to enable the sheet separating means and the sheet stop mechanism to be readily correlated with the operative cycle of the printing machine with which it is associated.

Another object of the present invention is to provide an automatic sheet feeding device of the aforesaid character which may be constructed in a particular form and size to accommodate sheets within the average range of sizes, and which may be readily modified to provide for the feeding of relatively high or long forms and for the printing of the printing impression relatively close to either the upper or lower margin of such relatively long or high forms.

Other and related objects are to provide a novel drive mechanism in such an automatic sheet feeder; to enable the drive mechanism of such a sheet feeder to be readily adjusted; to provide for convenient and effective adjustment of the sheet calipering means in such a machine; to provide a simple and effective detecting means for detecting the failure of the mechanism to feed a sheet or for detecting the feeding of more than one sheet; to provide a conveniently adjustable supply magazine for a sheet feeder of the aforesaid character; to associate a receiving or collecting magazine with the sheet feeder in a simple and effective manner; to simplify the adjustment of the longitudinal guides of the sheet feeder and of the feeding belts thereof; to provide a simple and effective sheet stop means in such a sheet feeder and to construct such stop means and its driving mechanism so that the sheet feeder constructed in a basic form may be readily adapted for the use of a multiple impression stop means; and to so construct and relate the driving mechanism of the separating means and the sheet stop means that where a multiple impression stops means is employed the operation of the stop means and the sheet separating means may be readily correlated.

Other and further objects of the present invention will be apparent from the following description and claims and by reference to the accompanying drawings which, by way of illustration, show preferred embodiments and the principles thereof and what I now consider to be the best mode in which I have contemplated applying those principles. Other embodiments of the invention embodying the same or equivalent principles 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 a printing machine equipped for the automatic feeding of sheets, envelopes, business forms or the like in accordance with the present invention;

Fig. 2 is a plan view of the printing machine and sheet feeding means of Fig. 1;

Fig. 3 is a perspective view of the automatic sheet feeder after removal from its operative association with relations to the printing machine;

Fig. 4 is an enlarged fragmental view showing the supply hopper and the associated sheet separating and advancing means, the front housing of the mechanism being removed so as to show details of construction;

Fig. 5 is an enlarged vertical sectional view taken along the line **5—5** of Fig 2 and showing the relationship of the supply hopper to the sheet separating and advancing means;

Fig. 6 is a fragmental plan view taken along the line **6—6** of Fig. 5 and showing details of the switch mechanism whereby the detecting of faulty machine operation serves to stop the operation of the machine;

Fig. 7 is a fragmental perspective view showing the mounting and relationship of the various operative elements located beneath the supply hopper;

Fig. 8 is a fragmental perspective view showing the mechanism of Fig. 4 from a different angle;

Fig. 9 is a schematic wiring diagram illustrating the relationship of the various control elements embodied in the machine;

Fig. 10 is a fragmental plan view showing the left-hand rear portion of the printing machine and illustrating the manner in which the drive mechanism of the printing machine is adapted for association with the sheet feeder.

Fig. 11 is a fragmental vertical sectional view taken along the line **11—11** of Fig. 10;

Fig. 12 is a fragmental vertical sectional view taken along the line **12—12** of Fig. 11;

Fig. 13 is a fragmental side elevational view of the printing machine showing the manner in which the automatic sheet feeder is operatively associated with the printing machine;

Fig. 14 is a fragmental horizontal sectional view taken along the line **14—14** of Fig. 13;

Fig. 15 is a fragmental perspective view illustrating the sheet guiding and advancing means and the associated sheet stop;

Fig. 16 is a vertical sectional view taken along the line **16—16** of Fig. 15;

Fig. 17 is a fragmental front elevational view of the mechanism employed to impart timed actuation to the sheet stop;

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

Fig. 19 is a fragmental perspective view taken from the front of the sheet feeder and illustrating the sheet stop and its actuating mechanism;

Fig. 20 is a fragmental plan view similar to Fig. 2 and illustrating an alternative construction of the frame of the automatic sheet feeder whereby added utility may be imparted to the sheet feeder;

Fig. 21 is a fragmental plan view similar to Fig. 2 and illustrating still another alternative construction for the frame of the sheet feeder whereby the utility of the sheet feeder may be increased;

Fig. 22 is a fragmental perspective view showing the modified frame construction embodied in the arrangement of Fig. 21;

Fig. 23 is a fragmental perspective view illustrating alternative frame construction embodied in Fig. 20;

Fig. 24 is a fragmental plan view of an alternative embodiment of the automatic sheet feeder whereby a sheet or form may be brought to rest successively in a plurality of different positions so that a plurality of spaced printing impressions may be made thereon;

Fig. 25 is a fragmental front elevational view of the automatic sheet feeder shown in Fig. 24;

Fig. 26 is an enlarged front elevational view of the ratchet and pawl mechanism of Fig. 25, the parts being shown in a different position;

Fig. 27 is a fragmental vertical sectional view taken along the line 27—27 of Fig. 25;

Fig. 28 is a fragmental vertical sectional view taken along the line 28—28 of Fig. 24;

Fig. 29 is a fragmental sectional view taken along the line 29—29 of Fig. 24; and

Fig. 30 is a fragmental vertical sectional view taken along the line 30—30 of Fig. 24.

General description

The invention is herein illustrated as embodied in a printing apparatus comprising a printing machine 100 and a unitary automatic sheet feeder 400 constructed and related in such a manner that the sheet feeder 400 may be quickly and easily placed in an operative association with the printing machine 100 or may be quickly and easily removed from such operative association when an operator wishes to use the printing machine without the automatic sheet feeder. The sheet feeder 400 is constructed and arranged so that it may be adjusted to provide for the automatic separating and feeding of sheets, booklets, forms and the like of various sizes and shapes, and is also constructed and arranged so that the desired printing impressions may be made upon such sheets or forms in a variety of different positions which may be obtained by suitable adjustment of the automatic sheet feeder. In accordance with the present invention the construction and arrangement of the automatic sheet feeder 400, and its relationship to the printing machine 100 are such that when a particular adjustment of the sheet feeder 400 has been established and when a particular relationship of the automatic sheet feeder 400 to the printing machine 100 has been determined, the automatic sheet feeder may be removed from its operative relationship with respect to the printing machine without destroying any of these adjustments, and by reason of this construction and arrangement of the automatic sheet feeder, the operator may remove the automatic sheet feeder at will and may readily return the automatic sheet feeder to this relationship so as to resume the automatic feeding of the sheets without the performance of complicated adjusting and set-up operations such as have been heretofore required.

The printing machine

The printing machine 100 is of the type wherein a plurality of individual printing devices each bearing printing means thereon, are advanced one by one from a supply means, such as a magazine M, to a printing station which in the present instance, may be considered as being defined by a platen mechanism P. The magazine M is supported on a printing machine frame 101 which in the present instance, is desk-like in form so as to provide a table top T which affords a supporting and working surface upon which sheets, forms and the like may be supported beneath the platen mechanism P for the performance of the desired printing operations.

In so far as the broader aspects of the present invention are concerned, the particular form and construction of the printing machine 100 are immaterial, but for purposes of disclcosure I have herein illustrated the printing machine 100 as being of the form and construction illustrated in the copending application of Carl J. Hueber, Ser. No. 388,998, filed April 17, 1941. As disclosed in the aforesaid copending application, the printing devices are advanced one by one from the bottom of the magazine M beneath the table top T so as to come to rest in register with a printing opening which is provided in the table top T beneath the platen P so as to cooperate with the platen mechanism in defining the printing position of the printing machine. After each printing device has passed into and from printing position, the printing device is discharged from printing postion so as to be refiled in collector means such as the drawer K.

Further, with respect to the broader aspects of the present invention, the printing devices employed in the printing machine may be of many different types, but the printing machine which is shown herein is particularly adapted for the use of printing devices of the character disclosed, for example, in Gollwitzer Patent No. 2,132,412, patented October 11, 1938. However, the invention may also be used with printing machines employing other types of printing devices, as for example those shown in Gollwitzer Patent No. 1,992,661, patented February 26, 1935. Furthermore, the invention may also be utilized with printing machines which employ printing devices of the character comprising a frame enclosing a thin sheet of stencil paper or the like.

In the printing machine herein illustrated, the platen mechanism P is supported in an operative relationship above the table top by means of a printing frame 104, the specific construction of which is illustrated and described in the copending application of Carl J. Hueber, now Patent No. 2,275,439, patented March 10, 1942, the printing frame 104 being disposed so as to project upwardly from the table top at a point located a considerable distance rearwardly and to the right of the printing position, so that the printing frame 104 extends in a forward direction toward printing position at an angle of substantially 45°

with espect to the forward edge 105 of the table top T. The magazine M is located just to the right of the vertically extending portion of the printing frame 104, and the printing devices are advanced along a relatively complex path beneath the table top T to printing position, as disclosed in the aforesaid copending application Ser. No. 388,998. The advancing movement of the printing device is accomplished in a step by step manner such that each printing device comes to rest at a plurality of different stations along the printing device guideway, and the first of these stations comprises a sensing station S at which suitable identifying means such as index tabs carried on the printing devices may be sensed. The sensed presence or absence of selected identifying means on the printing device at sensing station S may be rendered effective to control the operation of the platen mechanism P when the printing device from which the sensed identification is derived reaches printing position, and the means employed in the present printing machine for accomplishing this result are fully disclosed and claimed in copending application of Carl J. Hueber, Ser. No. 392,151, filed May 6, 1941, and reference may be had to said application for disclosure of one form of selector means which may be employed in the utilization of the present invention.

The platen mechanism P, in so far as the broader aspects of the present invention are concerned, may be of many different forms, but I have herein illustrated the platen mechanism as being of the form which is incorporated in the printing machine shown in copending applications Ser. No. 350,678 and Ser. No. 388,998, and this platen mechanism is described in detail in the copending application of Carl J. Hueber, Ser. No. 361,530, filed October 17, 1940. For present purposes it is necessary only to point out that the platen mechanism P comprises a carriage C supported for reciprocation from front to rear along tracks provided beneath a head 106 carried on the forward end of the printing frame 104, and a platen roller PR is supported on and carried by the carriage C. The platen roller PR is disposed in a horizontal position at right angles to the path of reciprocation of the carriage C and the platen roller PR is supported by means such as toggles so that the platen roller may be shifted from a normal elevated or inactive position to a lower or active position wherein the platen roller may be effective to press a sheet or the like into cooperating printing relationship with respect to a printing device disposed at printing position. The platen mechanism P is, in the form herein disclosed, arranged so that the platen roller PR is in its elevated inactive position when the carriage C is in its at rest or rearward position shown in Fig. 2 of the drawings. When a printing operation is to be performed, the carriage C is actuated through a forward or idle stroke by means of actuating mechanism indicated generally at 107, and in the course of the forward or idle stroke of the carriage C, the toggle means which support the platen roller PR are actuated to shift the platen roller to its lower or active position. This active position of the platen roller PR is reached at substantially the time when the carriage C completes its forward stroke, and the platen roller is latched in this lower or active position so that in the return or rearward stroke of the carriage C, the platen roller PR may be rolled across the sheet to effect the desired printing operation. Near the end of the rearward stroke of the carriage C the platen roller PR is withdrawn to its elevated or inactive position so that the sheet upon which the printing impression has been made may be removed from printing position and replaced by a new sheet.

In a printing machine such as the printing machine 100, the various operative cycles of the printing machine are in most instances initiated by selective manipulation of control means such as a plurality of foot pedals 120, 121 and 122, which are disposed near the floor beneath the frame 101. The foot pedals 120, 121 and 122, serve selectively to initiate different types of single cycle operations of the actuating means which is provided in the printing machine, and this actuating means is fully disclosed in copending application Ser. No. 388,998, and reference may be had to said application for the details of structure and operation of such actuating means.

For purposes of the present disclosure it is sufficient to point out that the printing machine 100 has a motor 110 (Fig. 9) energized through a switch 111 controlled by a plunger 112 disposed in a recessed forward panel 113 of the printing machine frame. The motor 110 serves through a speed reducing means including a pair of belts 114, to constantly drive a pulley 115, this pulley being mounted on a shaft 116 mounted within the frame 101 of the printing machine by means including a bearing bracket 117. The supporting means for the drive shaft 116 are carried by a supporting bar 118 which forms part of the frame 101 and is disposed beneath the table top T near the rear edge thereof as shown in Figs. 10 and 11, and the shaft 116 is located in a horizontal position just forwardly and slightly below the supporting bar 118. As hereinbefore pointed out the pulley 115 is constantly driven during the use of the printing machine, and this pulley runs loosely on the shaft 116. The driving connections from the shaft 116 to the various operative mechanisms of the printing machine are arranged for conection to the shaft 116 and the drive pulley 115 selectively as the several mechanisms are to be operated, and to this end a plurality of clutches are associated with the shaft 116. Only one of these clutches is shown herein, this clutch being what may be termed the master clutch 130 whereby the constantly driven pulley 115 is operatively connected to the shaft 116 to impart rotative movement thereto when such rotative movement of the shaft 116 is required for the actuation of one or more of the operative mechanisms of the machine. While the clutch 130 is fully described in the aforesaid copending application Ser. No. 388,998, it will be observed that this clutch is of the one-revolution type having a driven member 131 fixed to the shaft 116 and carrying a clutch pawl 132. The clutch pawl 132 is normally urged by a spring (not shown) into engagement with a driving member which in the present instance comprises the hub of the pulley 115, and when the pawl 132 is in its operative engaged relation, the driven member 131 is rotated in the direction shown by the arrow in Fig. 11 of the drawings. Such rotation is terminated by a stop lever 133 which is urged by means of a spring 134 into an active position wherein it is engaged by the projecting end of the clutch pawl 132 near the end of the desired one-revolution cycle. The one-revolution cycle is initiated by momentary withdrawal of the stop lever 133, thereby to release the clutch pawl 132 for spring biased movement to its operative en-

gaging relation with respect to the driving hub of the pulley 115.

As described in the aforesaid copending application Ser. No. 388,998, the drive shaft 116 has two additional clutches of the same general type mounted thereon, one of these clutches being operative when engaged to operate the printing device feeding means of the printing machine through an operative feeding cycle, and the other of said clutches being operative when engaged to operate the platen feed mechanism P through an operative feeding cycle. The arrangement for control of these clutches is such that whenever the clutch of the printing device feeding means or the clutch of the platen mechanism are to be engaged, the master clutch 130 is also engaged so as to impart the requisite rotative movement to the drive shaft 116.

The foot pedal 120 is in the present instance arranged to initiate operation of the printing device feeding means only, so that this foot pedal is sometimes termed the skip pedal in a machine of this character, in that it serves to cause a printing device to be fed through printing position without the performance of a printing operation with respect to such printing device. To this end the foot pedal 120 is arranged to cause operative engagement of the master clutch 130 and the printing device feed clutch. The foot pedal 121 is arranged when it is momentarily depressed to initiate operation of the platen mechanism only, so that the foot pedal 121 is often termed the repeat pedal, since it serves to cause repeated printing operation of the platen mechanism while the same printing device remains at printing position. To accomplish this purpose the foot pedal 121 is so arranged that momentary depression of this pedal causes the master clutch 130 and the platen clutch to be engaged thereby to operate the platen clutch through its operative printing cycle.

The foot pedal 122 is arranged when momentarily depressed to cause simultaneous or timed operation of the printing device feeding means and of the platen mechanism P, and since such operation results in the performance of but a single printing impression from each printing device, the foot pedal 122 is often termed the consecutive pedal of the printing machine. The term consecutive as applied to the foot pedal 122, is, however, merely a term of convenience, since the printing machine 100, as disclosed in the aforesaid copending application Ser. No. 388,998, embodies means whereby the printing device feeding means may be automatically disabled in certain cycles in a predetermined sequence such that a plurality of printing impressions may be made from each printing device. Such automatic control mechanism may be termed the multiprint mechanism of such a printing machine, and such mechanism is in the present machine rendered operative or inoperative under the control of a plunger 140 mounted in a recess in the front panel 113 of the printing machine frame. Thus the operation of the multiprint mechanism of the printing machine due to appropriate setting of the control plunger 140, modifies the operation of the consecutive pedal 122.

In the association of the automatic sheet feeding means and the printing machine in accordance with the present invention, use is also made of a means for automatically stopping the operation of the printing machine when certain undesired conditions are detected, and this means, which may be termed the auto-stop mechanism of the printing machine, is fully disclosed in said copending application Ser. No. 388,998. Since reference may be had to said copending application for details of construction and operation of the auto-stop mechanism it will suffice for present purposes to point out that the auto-stop mechanism is under the control of a plunger 142 mounted in a recess in the front panel 113 of the printing machine, and when the auto-stop control plunger 142 is withdrawn in an outward direction, means is effective to actuate the mechanism associated with the consecutive pedal 122 so as to produce the same controlling result as would follow from continued depression of the foot pedal 122. Thus the platen mechanism and the printing device feeding mechanism will, in the absence of a dominating action of the selector mechanism controlled by the sensing means S, operate continuously so long as the auto-stop plunger 142 is retained in its withdrawn position. Means is provided for returning the auto-stop plunger 142 to its inward position, thereby to terminate the continuous operation of the printing machine, and as shown diagrammatically in Fig. 9 of the drawings, this means comprises a solenoid 143 which when energized is operable to cause inward movement of the auto-stop 142. The solenoid 143 is arranged so as to be energized whenever an undesirable operating condition is detected by any one of a plurality of detecting means which may be provided in the machine. Thus wires 144 and 145 and an intermediate conditioning switch 146 serve to connect one terminal of the solenoid 143 to one side of the motor circuit between the motor 110 and the control switch 111. The other side of the motor circuit is connected by means of a wire 147 to one terminal of a control switch 148, the other terminal of the switch 148 being connected to the other terminal of the solenoid 143 by the wire 149. The switch 148 may, of course, be controlled by any desired detecting means, but as herein shown this switch is governed by a detecting finger 150 which, as disclosed in the aforesaid copending application 388,998, is arranged to operate as a detecting means associated with the magazine M to detect the feeding of the last printing device from the magazine M. Thus when the last printing device is fed from the magazine M the detecting finger 150 moves through an additional stroke to the left so as to engage one blade of the normally open switch 148 and thereby close this switch. The normally open conditioning switch 146 is arranged so as to be controlled by the auto-stop plunger 142 so as to be closed when the printing machine is operating continuously under the control of the auto-stop means, and hence when the switch 148 is closed by the detecting finger 150, the solenoid 143 is energized and the auto-stop plunger is thereby actuated to its innermost position so as to stop the continuous operation of the machine.

As hereinbefore pointed out, the continuous operation of the printing machine under the control of the auto-stop means may be modified in certain instances through the dominating action of the selector mechanism which operates under the control of the sensing means S and which is disclosed in detail in the copending Hueber application Ser. No. 392,151, filed May 6, 1941. This selector mechanism is rendered active or inactive through the medium of a control plunger 152 disposed in the recessed front panel 113, and as pointed out in said copending application Se-

rial No. 392,151, the action of the selector mechanism may be varied in certain respects through appropriate setting of a control plunger 153 mounted in the front panel 113. The controlling action of the selector mechanism is such that when the sensed presence or absence of the selected identifying means on a particular printing device indicates that this printing device is to be skipped, the selector mechanism prevents engagement of the platen clutch in the cycle in which this printing device is to reach printing position. This dominating controlling acton of the selector mechanism also modifies the action of the machine when the machine is being operated or controlled manually by means of the consecutive foot pedal 122.

The automatic sheet feeding means

In accordance with the present invention the automatic sheet feeding means 400 is constructed and arranged so as to constitute a self-contained unit in so far as the primary and most frequently performed adjustments of the sheet feeder are concerned, and the construction and arrangement of the sheet feeder is such that it may be readily moved into or out of the desired operative relationship with respect to the printing machine without destroying any adjustments or set-up arrangements which have been made in the sheet feeder.

To this end the sheet feeder 400 embodies a framework upon which all of the operative mechanisms of the sheet feeder are mounted, and this framework is adapted to be moved as a unit into and out of operative relationship with respect to the printing machine. In the form herein shown this framework comprises a pair of spaced leg structures 401 and 402 between which a bridging structure 403 is supported, the bridging structure 403 and the leg structures 401 and 402 being so related that the bridging structure 403 may extend across the table top T from end to end thereof with the leg structures 401 and 402 extending downwardly toward the floor beyond the opposite end edges of the table top T. Thus when the bridging structure 403 is in position across the table top T of the printing machine 100, as shown in Figs. 1 and 2 of the drawings, the various operative mechanisms mounted on the frame structure of the sheet feeder 400 are in a predetermined operative relationship to the printing machine 100 as well as to each other, while when the sheet feeder 400 is removed from this operative relationship with respect to the printing machine 100, the elements of the sheet feeder remain undisturbed in the desired operative relationship to each other and the sheet feeder is supported by the leg structures 401 and 402 at substantially the height which these elements occupy when the sheet feeder 400 is associated with the printing machine. Thus the removal of the sheet feeder 400 from or its replacement in an operative relationship to the printing machine is facilitated, and in accomplishment of this purpose the leg structures are preferably provided with casters 404 whereby the sheet feeder may be rolled along the floor in the requisite shifting movement thereof.

In the broad sense the sheet feeder 400 embodies a supply magazine adjacent one end thereof for containing a supply of sheets, forms or the like, a separating means for separating such sheets and feeding them one at a time from the magazine toward and into an operative relationship with an advancing means, and from the advancing means the sheets are fed one at a time to a suitable guide means and an associated feeding means whereby each sheet is advanced along the bridging structure 403 and across the table top T to printing position, at which point the advancing movement of the sheet is interrupted momentarily for the performance of the printing operation thereon. The feeding means then advances the sheet along the guideway toward the other end of the sheet feeder where the sheet is deposited in a suitable collecting means. The sheet separating and advancing means and the sheet stop means are operated in timed relation to the operation of the printing machine, and are suitably connected to an operative portion or mechanism of the machine to attain this desired timing. The means which have herein been described generally as forming elements of the present sheet feeder may, in accordance with the broader aspects of the invention, take many different forms and may be interrelated in many different ways, but I have herein disclosed one form of each of these means and a particular relationship thereof which I have found to be advantageous, it being understood that those skilled in the art may make many changes and variations in such means and in their relationship without departing from the scope of the claims appended hereto.

In the automatic sheet feeder 400 as disclosed herein the feeding movement of the sheets, forms, or the like progresses from left to right across the table top T of the printing machine, and the supply means for containing the sheets, forms or the like, comprises an adjustable supply hopper 410 disposed above the plane of the bridge structure 403 and somewhat to the left of the left-hand leg structure 401. The sheet separating means of the present automatic sheet feeder 400 are disposed just to the right of the supply hopper 410 in a mounting structure 411 so that sheets separated and fed one by one by the separating means in a right-hand direction from the supply hopper 410 are advanced into an adjustable guideway 412 which extends entirely across the bridging structure from left to right. The guideway 412 has suitable advancing means associated therewith and this advancing means in the present instance comprises one or more endless fabric belts 413 and a hold-down means 414 which maintains each sheet in operative frictional engagement with at least one of the belts 413. Thus when a sheet has been fed into the guideway beneath the hold-down means and on top of one or more of the belts 413, this sheet is advanced to the right across the table top in accordance with the driven speed of the belts 413. The means for interrupting such movement of the sheet when it reaches printing position comprises a stop mechanism 415 which is lowered into an active position in the path of the advancing sheet at the proper time in the machine cycle. After the performance of the printing operation the stop element 415 is retracted or elevated so that the sheet is again actuated and advanced to the right by the belt or belts 413, and when the sheet reaches the end of the upper run of the belts, it is discharged into a collecting or receiving means such as a receiving hopper 416 disposed on the framework of the sheet feeder just to the right of the right-hand leg structure 402.

When a sheet is fed from the supply hopper

410 along the guideway 412 to the printing position, this sheet is disposed face down, with the normal top edge of the sheet disposed along the rear edge of the guideway 412 and the edge which is normally the left-hand edge of the sheet disposed as the leading edge of the sheet. Thus the location of the printing impression transversely of the sheet is determined by the location of the stop element 415 along the guideway 412, and this transverse location of the printing impression may be varied by adjustment of the stop element 415 along the guideway 412. The location of the printing impression vertically of the sheet is determined by the location of the guideway 412 with respect to the forward edge of the printing machine. Thus by positioning the feeder frame as shown in Fig. 2 of the drawings, and with the guideway adjusted on the feeder frame as there shown, a particular location of printing impression vertically of the sheet will be obtained, and in the event that the operator wishes to change this location of the printing impression, such a result may be obtained by slightly shifting the feeder frame in a forward direction with respect to the printing machine frame. The same result could, of course, be obtained by a different set up of the guideway 412 and the related mechanisms in a different location on the feeder frame, but it will be recognized that when the automatic sheet feeder has once been set up for a particular type or size of sheet, the most simple way of obtaining a variation in the vertical location of the printing impression on the sheet is through adjustment of the feder frame in an appropriate amount from front to rear with respect to the printing machine frame. As will hereinafter be pointed out in detail, means is provided in the present apparatus for accomplishing such adjustment of the feeder frame and for maintaining the feeder frame in any desired adjusted position with relation to the printing machine frame.

Since the sheets or forms to be fed by the present automatic sheet feeder may vary considerably in their sizes or dimensions, the bridging structure 403 is so constructed that it is open throughout substantially its entire area, thereby to enable substantially any portion of the lower face of such a form to be pressed downwardly into printing cooperation with the printing device located at printing position in the printing machine. To this end the bridging structure is in the present instance formed by a front member or rail 420 and a rear member or rail 421 which are spaced apart so as to be located along and to form the front and rear edges of the bridging structure. Thus the bridging structure may be said to be of an open-top construction, and in this connection it is to be observed that so far as the formation of the printing impression is concerned this open-top construction may be such that the opening therethrough is confined to that area which extends from front to rear of the bridge structure between the front and rear rails and immediately over the printing position. As shown in Figs. 7, 8, 15, 16 and 18, the front and rear rails 420 and 421, are formed from solid steel bars, since by this expedient the desired strength may be attained in members of relatively small cross section, and the front and rear rails 420 and 421, are disposed so as to extend over and beyond the left-hand and right-hand leg structures 401 and 402, thereby to facilitate the mounting of other structural elements of the automatic sheet feeder. In the present instance the leg structure 401 is formed by a pair of spaced leg members 401' connected near their lower ends by a cross bar 401'', while at their upper ends the two leg members 401' extend between and are bolted to the downwardly extending flanges 425' and 425'' of an inverted sheet metal channel member 425. The front and rear rails 420 and 421 extend across the closed upper end of the channel 425 and are secured thereto by suitable means such as welding.

The leg structure 402 is similarly formed from a pair of spaced leg members 402 connected near their lower ends by a cross bar 402'', and at their upper ends, the two leg members extend between and are bolted to the downwardly extending flanges of a sheet metal channel member 426 which is generally similar in form to the channel 425. The front and rear rails 420 and 421 extend across and beyond the closed upper end of the channel 426 and are secured thereto as by welding.

Each of the leg structures 401 and 402 is in effect braced with relation to the bridge structure 403 and this is attained by means which also serves as a mounting for operative portions of the automatic sheet feeder. Thus a pair of bracing and mounting plates 427 are provided adjacent the right-hand end of the machine, one of the plates 427 being arranged to abut the forward edge of the projecting end of the front rail 420 just to the right of the leg structure 402, and this plate 427 is secured to the rail 420 by screws 428. The other plate 427 is similarly arranged in abutment with the rear surface of the projecting end of the rear rail 421, and is similarly secured to the rear rail 421 by means of screws. The left-hand edge of each of the plates 427 has an inturned flange which is secured to the right-hand face of the adjacent leg 402' by means such as bolts.

The two plates 427 are connected by a plurality of mounting rods which are used in mounting and supporting certain of the elements or parts of the sheet feeder. Thus a pair of spaced rods 430 and 431 are mounted in spaced parallel relation so as to extend between the two plates 427 a substantial distance below the level of the bridging structure 403. The rods 430 and 431 are utilized to support a suitable sheet-receiving means such as the receiving hopper 416. Thus the receiving hopper 416 comprises a base plate 433 which preferably has downwardly extending flanges 434 along its opposite side edges to impart strength thereto. The receiving hopper 416 is formed on the base plate 433 in such a manner as to be adjustable, thereby to enable the size of the receiving hopper to be varied in accordance with the size of the sheets which are to be collected therein. Thus a pair of side walls 435 are provided, each side wall having an inwardly turned bottom flange 436 adapted to rest on the top of the base plate 433. Provision is made for lateral adjustment of the side walls 435 by means of screws 437 which extend downwardly through the mountng flanges 436 through transverse slots 438 formed in the base plate 433. Wing nuts on the lower ends of the screws 437 enable the screws to be tightened to hold the side walls 435 in any desired position of adjustment. An adjustable right-hand or end wall 439 is also formed to provide a bottom flange 440 extending to the left,

this flange 440 being longitudinally slotted as at 441 so that a headed screw 442 may extend downwardly through the slot to receive a wing nut beneath the base plate 433 for clamping purposes. The end wall 439 may thereby be adjusted in a direction from right to left of the machine, and further adjustment at right angles is afforded by a slot 443 which is formed in the base plate 433 parallel to the slot 438. It will be understood, of course, that the clamping screw 442 extends through the slot 443 as well as the slot 441. The receiving hopper 416 which is thus provided is removably associated with the sheet feeder, and to this end each of the flanges 434 has a downwardly facing notch (not shown) formed therein to embrace the mounting rod 431, and these notches are so positioned that when they are engaged with the rod 431, the left-hand end of the base plate 433 extends beneath the mounting rod 430, thereby to cause the receiving hopper 416 to be held in place by gravity.

It will be recalled that the sheets or forms are discharged to the right from the upper run of one or more of the belts 413 into the receiving hopper 416, and to guide the sheets in such discharge movement, a guide strip 445 is provided in association with the receiving hopper 416. The guide strip 445 is mounted at its left-hand end on a mounting rod 446 which extends between the two plates 427 somewhat above the level of the belts 413 and the front and rear rails 420 and 421. The desired mounting of the guide strip 445 on the mounting rod 446 is accomplished by providing a U-shaped spring clasp 447 on the left-hand end of the guide strip 445 to be slipped over the mounting rod 446. The right-hand end of the guide strip 445 is supported and held in position within an upwardly facing slot 448 formed in the upstanding right-hand wall 439 of the receiving hopper.

The two plates 427 also serve as a mounting means for the right-hand belt tensioning and guiding means, and to this end a tensioning roller 450 and a guide roller 451 are disposed between the two plates 427 with the upper surfaces of the two rollers 450 and 451 located a slight distance above the top surface of the inverted channel 426. The arrangement is such that the lower run of each belt 413 extends to the right over the top of the guide roller 451 and is then looped downwardly about the tension roller 450 so that the upper run of the belt extends back to the left over that portion of the lower run of the belt which rides upon the guide roller 451. Hence the guide roller 451 is mounted upon a fixed axis, the guide roller 451 in the present instance being formed by a cylinder made from wood and mounted upon a central steel shaft. The ends of the steel mounting shaft of the guide roller 451 extend through suitable stationary bearings 453 provided in the mounting plates 427. The tensioning roller 450 is similarly formed and the ends of its central mounting shaft are journaled in bearing blocks 454. A bearing block 454 is mounted slidably in a horizontal slot 455 formed in the adjacent mounting plate 427 and means is provided for adjusting these mounting blocks to tighten the belts 413. The adjusting means in the present instance comprises a screw shaft 456 fixed in each bearing block and extending to the right along the central axis of the slot 455 in which the bearing block is mounted. At its right-hand end each screw shaft 456 has a nut formed by a knurled washer 457, the washer 457 being sufficiently wide to span the end of the slot 455. A locking wing nut is provided on the end of each screw shaft 456. Thus either one of the bearing blocks 454 may be withdrawn to the right by suitable manipulation of a knurled washer or nut 457, and this adjustment may be preserved by the tightening of the associated locking wing nut 458.

At their other or left-hand ends the belts 413 are arranged in a similar relation to a pair of rollers 460 and 461, and the rollers 460 and 461 are also mounted in a pair of spaced bracing plates 462 and 463 which are connected between the front and rear rails 420 and 421 respectively and the adjacent legs 401. The present plates 462 and 463 also serve a mounting function, and are generally similar in form. Thus, as shown in Figs. 4, 5 and 7, each bracing plate engages the outer side surface of the adjacent one of the rails of the bridge structure 403, and each of the two mounting plates 462 and 463 has a pair of inturned horizontally positioned ears 464 which overlie the upper surface of the adjacent rail and are secured thereto by bolts 465. As will be evident in Figs. 5 and 7, each of the two mounting plates 462 and 463 extends a suitable distance above and below the rails of the bridge structure 403, and the downwardly projecting portion of each of the plates 462 and 463 is located to the left of the adjacent leg structure 401. The right-hand edge of each of the plates 462 and 463 has an inturned flange 466 which engages and is secured by means such as bolts 467 to the adjacent left-hand face of the adjacent leg 401.

In the present instance the aforementioned right-hand roller 461 constitutes a guide roller over which both the upper and lower runs of each belt extend so that the left-hand end of each belt encircles the left-hand roller 460. The two rollers 460 and 461 have their central shafts suitably journaled in stationary bearings carried in the downwardly projecting portions of the two plates 462 and 463, and as shown in Fig. 7, the shaft of the roller 460 extends through the rear plate 463 and has a drive pulley 470 fixed thereon. Thus the roller 460 constitutes a drive roller for the system of belts 413, and suitable means are provided for driving the roller 460 and the associated belts 413 continuously during periods of use of the automatic sheet feeder. To this end a suitable drive means such as an electric motor 475 is mounted on the leg structure 401 just beneath the rollers 460 and 461. To facilitate such mounting the legs 401' are, in the present instance, connected by a mounting channel member 476 upon which the bracket 477 of the motor 475 is mounted so that the shaft of the motor 475 is disposed in a horizontal relation parallel to and below the axis of the drive roller 460. The shaft of the motor 475 projects rearwardly so that a pulley (not shown) carried on its rear end is disposed generally below and in the plane of the pulley 470. An endless belt 479 driven by the motor pulley extends upwardly about an idler pulley 480 mounted on the lower portion of the rear face of the mounting plate 463, and the belt then extends upwardly about the pulley 470 and over another pulley 481, the belt then extending down to the other side of the motor pulley. The belt 479 and the pulleys engaged thereby are preferably enclosed by a guard housing 482 secured as by screws to the rear face of the mounting plate 463. Thus when the motor 475 is energized, it imparts continuous rotation to the drive roller 460 in such a direction that

the upper run of each belt **413** moves continuously from left to right along the bridge structure of the automatic sheet feeder, thereby to provide a continuously available driving or advancing means for frictionally engaging the lower face of a sheet, form, or the like for moving the same to the right along the guideway **412**. While the motor **475** of the automatic sheet feeder might be so connected as to be controlled by the main motor switch **111** of the printing machine, I prefer to provide for independent control of the motor **475**. To this end a plug outlet **486** is provided in the left-hand wall of the printing machine **100**, as shown in Figs. 1 and 9, and the contacts of the plug outlet **486** are connected to the line or power wires ahead of the switch **111** by means of wires **487** as indicated in Fig. 9. When the automatic sheet feeder is in its operative relationship to the printing machine **100**, the motor **475** of the sheet feeder may be connected to the plug outlet **486** by means of a connector plug **488**, the connector plug being connected to one terminal of the motor **475** by a wire **489** and being connected by a wire **490**, a switch **491** and a wire **492** in series to the other terminal of the motor **475**. The switch **491** is, in the present instance, in the form of a toggle switch located on the forward face of the mounting plate **462** as shown in Figs. 1 and 3. Thus after the connector plug **488** has been inserted in the plug outlet **486**, the switch **491** must be closed in order to energize the motor **475** of the sheet feeder. In practice the two wires **489** and **490** are included as parts of an ordinary two wire conductor which is indicated in Figs. 1, 2 and 3 by the reference numeral **488'**.

The guideway **412** to which the sheets or forms are fed one by one from the supply hopper **410** must of course be adjustable to accommodate different sizes and types of sheets, and in the present instance the guideway is provided by one or more elongated and adjustably supported guiding elements which are usually mounted on the machine so that one guide element is located along the upper edge of the sheet and another guide element is arranged along the lower edge of the sheet. In some instances the desired location of the printing impression on a sheet may render it necessary or desirable to dispense with the guide element which would normally be located adjacent to this particular edge of the sheet.

In the present instance I have illustrated two different types of guide elements, one of these guide elements being what is termed an angle guide **500** while the other is what is termed a channel guide **501**. The two guides **500** and **501** are supported at their right-hand ends from the mounting bar **446**, while the left-hand ends of the guides are supported on a mounting rod **502** which extends between the two upstanding mounting plates **462** and **463** adjacent to the right-hand edges thereof. The cross sectional form of the two guides **500** and **501** is best shown in Figs. 15, 16 and 19, wherein it will be seen that the angle guide **500** comprises a relatively heavy rectangular side bar **503** to which a relatively light sheet metal angle member is secured so that one flange **504** thereof is positioned vertically in abutment with one side surface of the bar **503** while the other flange **505** projects horizontally somewhat beneath the lower edge of the bar **503**. The angle guide **500** is disposed in the machine so that the horizontal flange **505** thereof is relatively close to the table top T and underlies the two runs of one of the belts **413** as shown in Fig. 16. When a sheet is positioned in the guideway with one of its edges overlying the belt **413** which is associated with the angle guide **500**, the desired frictional engagement of the sheet with this belt **413** is assured by the hold-down means **414**. This type of hold-down means is sometimes termed a skid and as herein shown comprises an elongated strip of flexible spring steel having relatively small rollers **414'** mounted therein so as to extend slightly below the lower surface of the strip to engage the upper face of a sheet of paper in the guideway. The hold-down means or skid **414** is adjustably secured at its left-hand end to the mounting rod **502**, this adjustable connection being attained by means of a bracket **507** fixed to the left-hand end of the steel strip and having a U-shaped upper end **508** adapted to be moved to the left into an embracing relation to the mounting rod **502**. A set screw **509** is provided in the U-shaped upper end **508** for clamping the bracket **507** in position on the mounting rod **502**. In some instances it is found desirable to apply downward pressure to the hold-down means or skid, and this may be accomplished by a spring **510** carried on a mounting block **511** which is slotted to embrace the upstanding flange **504** and the bar **503** as shown in Figs. 15 and 16, there being a set screw **512** in the mounting block **511** to secure the mounting block in position on the angle guide **500**. At its other or right-hand end the hold-down means or skid **414** has an upstanding pin **514** mounted thereon and this pin is arranged to be located in a longitudinal slot formed in a guide member **515** which is adjustably located or mounted on the mounting rod **446**, such adjustable mounting being accomplished through the medium of a set screw provided in the guide member **515**.

The left-hand ends of both of the guides **500** and **501** are slightly flared apart as will be evident in Fig. 2 of the drawings, thereby to provide an entrance throat into which the sheets or forms may be readily introduced by the separating and advancing means of the sheet feeder. As applied to the angle guide **500**, such a flare is provided by slightly bending the bar **503** in a direction away from the lower flange **505** of the angle guide, the vertical flange **504** being appropriately bent or formed so as to follow the contour of the bar **503**. The vertical flange is also gradually increased in height adjacent to the left-hand end and the lower flange **505** is widened somewhat to provide the desired throat, and at an appropriate point on the vertical flange **504**, a U-shaped clamp member **516** is mounted. The clamp member **516** may be moved to the left into embracing relation with respect to the mounting rod **502** and may be secured in position by means of a set screw **517** provided in the clamp. As shown in Fig. 5 of the drawings, the vertical flange **504** of the angle guide **500** extends somewhat to the left beyond the mounting rod **502**, and the left-hand end of the hold-down member or skid **414** is so related to its mounting bracket **507** that the left-hand end of the skid is bent upwardly to a considerable degree. Thus the required entry throat is provided in that portion of the guideway which is formed by the angle guide and the skid **414**.

At its other or right-hand end the angle guide **500** is adjustably connected to the mounting bar **446** by means of a bracket **520** secured

to the top of the bar **503** and having a U-shaped clamp portion facing toward the left of the machine so that it may be moved into embracing relationship with respect to the mounting bar **446** at the same time that the clamp **516** is engaged with the mounting rod **502**. The bracket **520** has a suitable set screw **521** therein for securing the right-hand end of the angle guide **500** in position.

To insure proper positioning of the belt **413** within the angle guide **500** and beneath the skid **414**, suitable guide means is provided such as a guide bracket **525** which is mounted on a supporting rod **526** extending between the two mounting plates **462** and **436** just to the right of the guide roller **461** as shown in Fig. 5 of the drawings. The guide bracket **525** encircles the supporting bar **526** and has a thumb screw **527** for securing the guide bracket in place on the mounting bar. On its upper side the guide bracket **525** has a pair of spaced guide lugs **528** which extend upwardly on opposite sides of the belt **413** thereby to prevent lateral displacement of the belt. Similar guide brackets **525** are provided for each of the belts **413** so that lateral positioning of the belts may be individually adjusted. In the present instance the several belts are shown in a machine set-up which calls for but one belt **413** to be active, and the guide brackets **525** are therefore arranged so that the three other belts are disposed outside of the guideway provided by the two guide members **500** and **501**.

The channel guide **501**, as herein shown, is constructed and arranged particularly for disposal as a guide along the lower or forward edge of the guideway, but it will be understood that in certain instances such a channel guide might be used along the upper edge of the guideway, and in such an instance the construction of the channel guide would be in effect reversed from that herein shown. As shown in Fig. 16 of the drawings, the channel guide **501** is formed from sheet metal to provide a lower flange **530**, an intermediate and vertically positioned web **531**, and a relatively narrow upper flange **532**. The channel guide **501** is in practice so disposed that the lower or forward edge of the sheet overlies the lower flange **530** and projects into the space between the lower flange **530** and the upper flange **532**. At its left-hand end the channel guide **501** is flared somewhat in a vertical direction as shown at **535** in Fig. 4 of the drawings, thereby to cooperate with the enlarged left-hand portion of the angle guide **500** and the upwardly sloping left-hand end portion of the skid **414** in providing an entry or receiving throat into which the sheets may be advanced by the sheet separating and advancing means. At its left-hand end the channel guide **501** has an adjustable mounting bracket **536** fixed thereto, the bracket **536** having a mounting slot formed therein so as to face to the left, thereby to adapt the mounting bracket for movement into an embracing relation with respect to the mounting rod **502**. A set screw **537** is provided on the mounting bracket **536** for securing the left-hand end of the channel guide **501** in position on the mounting rod **502**. The mounting bracket **537**, as shown in Fig. 8 of the drawings, is secured upon the upwardy sloping upper flange **532** of the channel guide in the flared portion **535** thereof. At the other or right-hand end of the channel guide **501** a mounting bracket **540** is provided, this mounting bracket having a set screw **541** whereby the mounting bracket **540** may be secured in adjusted position on the mounting rod **446**. The mounting bracket **540** is generally similar in form and construction to the mounting bracket **520** of the angle guide **500**.

The relationship of the feeder frame to the table top T in a vertical sense is such that as a sheet advances along the guideway **412** it is located relatively close to the table top T so that after the sheet has stopped at printing position it may be pressed downwardly into printing cooperation with the printing device then at printing position. The lower face of the sheet is, of course, exposed through the open top of the bridge structure **403** and between the adjacent edges of the flanges **505** and **530**, as shown in Fig. 16 of the drawings, and if the two guides **500** and **501** are spaced apart a sufficient distance and the desired location of the printing impression upon the sheet is disposed a sufficient distance from the adjacent edges of the two flanges **505** and **530**, the platen mechanism P of the printing machine may be operated through a printing cycle to make the desired printing impression upon such a form. It often happens, however, that the sheet or form being fed through the guideway is of such small height that the two guides **500** and **501** must be located relatively close to each other, as in the case where envelopes such as those shown in Fig. 4 are being fed by the sheet feeder, or in other instances, it may be desirable to form the printing impression so close to the lower margin of the sheet that sufficient working room will not be available at the proper point between the two guides **500** and **501** to allow operative movement of the platen mechanism P. In the form herein disclosed the channel guide **501** is constructed and arranged to care for such a contingency, and an intermediate portion of the channel guide **501** is arranged for receding movement, away from the adjacent edge of the sheet or form, as an incident to the operation of the platen mechanism P through a printing cycle. It will be recognized, of course, that in some instances where the printing impression is to be performed relatively close to the upper margin or edge of the sheet, the receding portion would be provided in the upper or rear guide which in such an instance would usually be constructed as a channel guide rather than an angle guide.

Thus the channel guide **501**, as shown in Figs. 15, 16 and 19, is divided into two sections which are herein designated as **501'** and **501''** and between these sections a shiftable or receding guide section **501R** is mounted so that it may be moved away from the adjacent edge of the sheet to provide clearance for the operative movement of the platen roller PR. The two adjacent ends of the sections **501'** and **501''** are connected together by a relatively rigid U-shaped member **540** which is secured as by welding to the vertical webs **531** of the channel guide sections **501'** and **501''**. From the connecting portion **541** of the U-shaped member **540** a thin metallic plate **542** extends in a rearward direction, or toward the guideway, so as to partially underlie the adjacent edge of the sheet when the sheet comes to rest at printing position. Thus the rear edge of the plate **542** performs the function of the lower flange **530** of the channel guide in this portion of the guideway. The left-hand end edge of the plate **542** underlies the lower flange **530** of the left-hand guideway section **501'**, while at the right-hand end of the plate **542** an ear is provided which extends for a short distance into

the guideway section 501'' directly over the flange 530, thereby to insure smooth sliding movement of the sheets into the guideway section 501''. This desired smooth feeding action is also facilitated by slightly flaring the left-hand end of the guideway section 501'' as shown in Fig. 15 of the drawings.

The receding guide section 501R is formed by a sheet metal angle having an upper flange 545 along its upper edge which corresponds to the flange 532 in function, and having a vertical flange 546 which corresponds in size and in function with the web 531, and it will be recalled that the plate 542 extends into the guideway to thereby perform the function of the lower flange 530. The receding guide member 501R has an arm 548 projecting forwardly therefrom so that its forward end overlies the connecting portion 541. The arm 548 constitutes a part of the guiding means for the receding guide member 501R, and this guiding means is in the present instance in the form of a pantograph linkage. Thus two links 550 and 551 are pivoted at spaced points on the arm 548 so as to project in parallel relation to similarly spaced pivots between the other ends of the links 550 and 551 and an arm 552 which is formed as a part of the U-shaped connecting member 540. A spring 553 acts between an anchoring stud 555 mounted on the U-shaped connecting member 540 so as to urge the receding guide member 501R in a rearward direction, or toward its normal guiding position. Such movement is limited by a stop arm 556 rigidly secured on the link 551 and arranged to strike the stud 554 when the guide member 501R has reached its operative position. The guide member 501R normally remains in this position while a sheet is being fed into and along the guideway 412, and hence the receding guide 501R is effective to properly locate the sheet at printing position. After the sheet has come to rest at printing position, the guide 501R is shifted to its retracted position as an incident to the platen mechanism P. In the present instance this action is attained by an upstanding arm 560 secured on the guide member 501R and projecting upwardly so as to lie in the path of a mounting pin 561 which is utilized in mounting the platen roller PR in the printing machine.

The supply hopper 410 of the present sheet feeder is so constructed that it may be readily adjusted for receiving sheets of different heights or sizes, and in addition is so constructed and arranged as to permit variation or adjustment in the angle of slope of the supply hopper. To this end a supporting frame 570 is provided for the hopper 410, the supporting frame 570 being in the form of a bail having a cross member 571 and arms 572. The arms 572 are spaced apart in such an extent that they are disposed just inwardly of the two mounting plates 462 and 463, and the ends of the arms 572 are pivotally mounted on the axis of a roller 575 which, as will hereinafter be described in detail, constitutes a part of the sheet advancing means. Thus the roller 575 is located relatively close to the entrance throat of the guideway 412, and the axis of the roller 575 is somewhat above the upper surfaces of the front and rear rails 420 and 421. In the present instance the roller 575 is disposed above the idler roller 461, and is supported in suitable bearings in the mounting plates 462 and 463. Thus the supporting bail 570 may be moved about the axis of the roller 575 to different angles, and such adjustment is attained by means of a pair of links 578 which are connected between the side members 572 of the bail and the left-hand end portions of the front and the rear rails 420 and 421. Each link 578 has its upper end pivoted to the adjacent one of the side members 572, and each link has a longitudinal slot 579 formed therein through which a wing-headed clamping screw 580 extends into threaded engagement with the adjacent rail 420 or 421 of the feeder frame.

For the purpose of mounting the various elements upon the mounting member 570, a plurality of transversely extending mounting bars 581, 582, 583 and 584 extend in spaced relation between the two side members 572, all of these members being parallel to the cross member 571 and to the roller 575. The two cross bars 582 and 584 are in the present instance utilized in attaining the desired adjustable mounting of the supply hopper 410. As shown herein the supply hopper 410 comprises two side sections which as best illustrated in Fig. 7 of the drawings, are formed from sheet metal. The front member 590 of the hopper 410 has an upwardly extending side flange 591 and a bottom flange 592 which extends in a rearward direction to form a bottom surface for the forward portion of the supply hopper 410. The rear member 590' of the supply hopper has an upwardly extending rear side portion 591' and a forwardly extending bottom flange 592' which serves to provide a bottom surface for the rear portion of the supply hopper. Each of the sections of the supply hopper has mounting means in the form of a pair of spaced brackets 593 and 594 secured to the bottom surface of the bottom flange thereof, each of the two brackets 593 and 594 having a U-shaped groove or notch formed therein to embrace one of the mounting rods 582 or 584. Suitable set screws 595 are provided in the several mounting brackets 593 and 594 whereby the supply hopper sections may be secured in the desired relationship upon the mounting rods 582 and 584.

When a supply of sheets, envelopes or the like have been properly fanned and placed in the supply hopper 410, as shown in Fig. 4 of the drawings, the supply of sheets moves by gravity down the sloping bottom surface of the supply hopper 410 to an extent determined by the separating means which feeds the lower or right-hand one of the sheets in succession and one by one out of the supply hopper. When a sheet is to be advanced to printing position, the separating means is operated to withdraw the first or leading sheet from the hopper 410 and move it in the general direction of the receiving throat of the guideway 412. The separating means, as herein shown, includes a rotatable separating roller 600 which engages the upper or right-hand surface of the leading one of the sheets in the hopper 410 and a stationary lower or retard roller 601 which engages the leading edge and in some instances a portion of the bottom surface of the leading sheet in the supply hopper. In a general sense it may be said that the two rollers 600 and 601 constitute a caliper means which is adjusted in accordance with the thickness, stiffness and other characteristics of the sheets which are being fed so as to cause the sheets to be fed one at a time from the supply hopper 410. Where relatively large sheets are being fed from the supply hopper 410, one or more supplemental rollers 600' may be rendered operative, these supplemental rollers 600' being coaxial with the roller

600. In each feeding movement the separating roller 600 is rotated in a counterclockwise direction as viewed in Fig. 5 of the drawings so as to withdraw the leading one of the sheets in the supply hopper and feed its leading edge to a point between the roller 575 and an upper roller 605, the rollers 575 and 605 constituting advancing rollers which complete the withdrawal of the sheet from the supply hopper 410 and advance the sheet into the receiving or entry throat of the guideway 412. The separating operation of the separating roller 600 is attained by a limited rotative movement of the separating roller 600, and during such separating movement the upper advancing roller 605 is elevated so as to be spaced from the lower advancing roller 575, and after the leading edge of the sheet has been fed between the two spaced rollers 575 and 605, the upper roller 605 is lowered into firm engagement with the upper surface of the sheet. The roller 575 is, during use of the machine, constantly driven in a clockwise direction (as viewed in Fig. 5) by the belt 479, the pulley 481 which is driven by the belt 479 being fixed on the projecting end of the shaft which supports and drives the roller 575, as shown in Fig. 7 of the drawings. The means for actuating the separating roller 600 and for raising and lowering the upper advancing roller 605 will be described in detail hereinafter.

The retard roller 601 is in the present instance formed from rubber and is mounted on a supporting shaft 610 which extends between and is carried by the two arms 572. In order to provide for adjustment of the upward projection of the retard roller 601 into the bottom of the hopper 410, the roller is mounted concentrically with respect to the axis of the shaft 610, and the shaft 610 is eccentrically mounted by means of eccentric end portions 611, as shown in Fig. 5 of the drawings. Thus by rotating the shaft 610 in a counterclockwise direction about the axis of its eccentric supporting end portions 611, the retard roller 601 may be caused to project to a greater extent in an upward direction into the space between the lower flanges 592 and 592' of the hopper 410. This adjustment, in effect, forces the retard roller 601 against the separating roller 600 with a greater force, and such adjustment may be utilized in securing the desired feeding or separating action.

The manner of engagement of the leading edge of the leading sheet in the hopper 410 with the retard roller 601 has a marked effect upon the separating action attained in the machine, and to provide for adjustment of this engagement a pair of spaced guide fingers 612 are provided on opposite sides of the retard roller 601. The guide fingers 612 are pivoted on the mounting bar 581 as shown in Fig. 5, and project to the right on opposite sides of the retard roller 601. The two guide fingers 612 are connected by a web 615 so as to move in unison and spring means acting upon a portion of the web which is located to the right of the mounting rod 581 acts to urge the effective right-hand ends of the fingers 612 in a downward direction. Means is provided for adjusting the fingers in an upward direction so as to expose a gradually smaller portion of the peripheral edge of the roller 601 to the leading edge of the leading sheet in the hopper 410. This end is attained in the present instance by an adjusting screw 616 mounted in the left-hand portion of the web 615 and acting against a reaction block 617 which extends between the two mounting rods 581 and 582. The reaction block projects to the right beyond the rod 581 and a spring 618 acts between this end of the block 617 and the web 615 to provide the aforementioned spring biasing means. The block 617 and the two guide fingers 612 are freely shiftable upon the mounting bars 581 and 583 so as to move with the retard roller 601 as it is adjusted along the shaft 611. Such adjustment of the retarding roller 601 is desirable in order to permit most efficient feeding of the different types of sheets which may be fed by the present sheet feeder. It will be observed that the roller 601 has a central sleeve 620 formed from metal and upon which the rubber or resilient portion of the roller is mounted. This sleeve 620 embraces the mounting shaft 601, and the sleeve is connected to a mounting hub 621 which embraces the shaft 610 as shown in Fig. 7 of the drawings. A set screw (not shown) passes through the mounting hub 621 and engages the flattened portion 622 of the shaft 610 so that the retard roller 601 is held against rotation and may be secured in different adjusted positions longitudinally of the shaft 610.

The separator roller 600 is mounted directly above the retard roller 601, and is arranged to maintain substantially the same relationship with respect to the roller 601 when the angle of slope of the supply hopper 410 is adjusted. To this end the separator roller 600 is mounted on a shaft 630 which at its opposite ends is journaled in a pair of vertically extending links 631 and 632, the lower ends of the links 631 and 632 being pivoted on the projecting end portion 611 of the shaft 610. The mounting links 631 and 632 are maintained in their substantially vertical positions by means of a pair of positioning links 633 and 634. The links 633 and 634 have their left-hand ends pivotally connected to the upper ends of the links 631 and 632 by means of a shaft 635 which connects the upper ends of the two links 631 and 632, and the right-hand ends of the two links 633 and 634 are pivotally mounted on a stationary axis provided by a mounting shaft 636 which connects the upper ends of the two mounting plates 462 and 463. Thus when the mounting frame 570 is raised or lowered to vary the angle of the supply hopper 410, the two links 631 and 632 are in effect raised, and yet these links are held in substantially vertical relationship by the guiding action of the two links 633 and 634. The separating roller 600 is splined to the shaft 630 as shown at 638 in Fig. 5 of the drawings, and means is provided for holding the separating roller 630 in any adjusted position. This means in the present instance comprises a U-shaped guide member 640. The downwardly extending side portions 641 of which are mounted on the connecting shaft 635 and extend downwardly so as to embrace the shaft 630 upon which the separating roller 600 is mounted. Thus the side portions 641 of the guide member 640 are disposed on opposite sides of the separating roller 600, and in the present instance, the side members have bearing means 641' (Fig. 8) associated therewith so as to prevent objectionable wearing action between the side members and the shaft 630. Between the two side member 641 a sleeve 643 surrounds the shaft 635, and when the guide member 640 and the separating roller 600 have been adjusted, a thumb screw 644 in the cross bar of the guide member 640 is tightened to press the sleeve 643 against the shaft

635 and thereby hold the separator roll assembly against lateral movement from the desired adjusted position. In the present instance the two side members 641 serve to support a pivoted plate 650 on the bottom of which a suitable abrasive such as sandpaper may be mounted to run against the effective surface of the separator roller 600 and thereby prevent objectionable glazing of this surface. The supplemental rollers 600' are also mounted on the shaft 630, as by means of a splined connection so that these rollers 600' may be readily shifted to different positions as dictated by the size and character of the sheets which are to be fed.

It will be recognized that when the separator roller 600 has advanced the leading sheet into the space between the advancing rollers 575 and 605 and these two rollers have continued the withdrawing movement of the leading sheet, such action of the advancing rollers 575 and 605 will impart continued movement to the separating roller 600, even though the positive driving means of the separating roller 600 may have completed its driving stroke, and means is therefore provided to stop the rotative movement of the separating roller 600 as soon as a sheet has been completely withdrawn from the space between the separating roller 600 and the retard roller 610. As shown in Fig. 8 of the drawings this means comprises a pair of metallic clips 651, the upper ends of which embrace or rest upon opposite sides of the shaft 635 and the lower ends 652 of which embrace a replaceable brake section 653 provided on the shaft 630. A screw and nut device 654 extends through the intermediate sections of the members 651, and a spring 655 which surrounds the screw 654 between its head and the adjacent one of the members 651 may be tensioned by tightening of the screw and nut device 651 so as to exert the desired braking action upon the shaft 630.

The desired adjustment of the retard roller 601 about its eccentric mounting provided by the eccentric end portions 611 of the shaft 610 is provided by means which in the present instance is mounted on the link 631. This means is best shown in Figs. 4, 7 and 8 of the drawings, and in Fig. 7 it will be observed that an arm 660 is provided on the shaft 610 adjacent to the link 631. The arm 660 projects to the left from the shaft 610, and has a link 661 pivoted thereto. The link 661 extends upwardly through a laterally projecting ear 662 formed on the upper end of the link 631. The upper portion of the link 661 is screw threaded, and a knurled nut 663 is threaded on the upper end of the link so as to bear against the ear 662. Beneath the ear 662 an expansive coil spring 664 surrounds the link 661 and bears downwardly against a shoulder (not shown) formed on the link 661, so that the spring 664 acts between this shoulder and the lower face of the ear 662 to force the link 661 downwardly and maintain the nut 663 in engagement with the ear 662. A spring arm 665 mounted on the link 631 bears against the knurled edge of the nut 663 thereby to maintain the nut 663 in adjusted position.

The drive means for the separator roller 600 is preferably arranged so that it may be actuated manually when an operator desires to feed a sheet from the supply hopper 410 to printing position for the performance of the first printing operation, and this actuating means is also arranged so that it is automatically operated as an incident to the operation of the printing machine through a printing cycle. The manual actuating means for the separator roller 600 comprises a lever 670 pivoted at its lower end on the projecting end of a shaft 671 which is mounted so as to extend between the two mounting plates 462 and 463. The lever 670 extends upwardly and has a manual actuating handle 672 mounted thereon. Below the handle 672 one end of a rack 675 is pivotally connected to the lever 670, and the rack 675 extends to the right from the lever 670 through a guide bearing 674 which is pivotally mounted on the projecting end of the shaft 630. The rack 675 is connected to the shaft 630 by a one way drive means such that rocking movement of the lever 670 serves to impart rotation to the shaft 630 in but one direction, which in the present instance is a counterclockwise direction as viewed in Fig. 5. This one way driving connection, as herein shown, comprises a relatively wide pinion 676 which is freely mounted on the shaft 630 so as to be maintained in mesh with the rack 675 by the guide bearing 674. Thus when the pinion 676 is rotated first in one direction and then in the other direction during a complete stroke of the manual actuating lever 670, and the resulting rotation of the pinion 676 in a counterclockwise direction is transmitted to the shaft 630 by a suitable ratchet means. This ratchet means comprises a disk-like member 677 fixed to the shaft 630 and having a plurality of spring pawls 678 fixed thereon so as to engage the teeth of the pinion 676. The pawls 678 are of course so arranged as to transmit movement of the pinion 676 in but one direction. A coil spring 680 acting between the lever 670 and a stud on the mounting plate 462 serves to urge the manual actuating lever 670 to a normal right-hand position as viewed in Figs. 1, 3 and 4, and when an operator desires to feed a sheet from the supply hopper 410, the actuating lever 670 is moved to the left so as to impart counterclockwise rotative movement to the shaft 630 and the separator roller 600. When the lever 670 has reached the left-hand limit of its movement, it is released by the operator and returns through an idle stroke under the yielding force exerted by the spring 680. In the feeding of different sizes and types of sheets or forms, it is sometimes desirable to vary the extent of the rotative movement to be applied to the separator roller 600 in each feeding or separating operation and in order that this may be accomplished without varying the extent of the stroke of the manual operating lever 670, this lever 670 is provided with a plurality of openings 681 which may be utilized selectively for providing the point of pivotal connection between the lever 670 and the rack 675.

The lever 670 and the associated mechanism which has just been described also function in the automatic operation of the sheet separating roller 600, and such operation is attained through the medium of the shaft 671 which is actuated through a rocking movement each time the printing mechanism of the printing machine is operated through a printing cycle. To this end an arm 685 is fixed on the end of the shaft 671 adjacent to the lever 670, and means is provided on the arm 685 whereby rocking movement of the shaft 671 in a counterclockwise direction from the position shown in Fig. 4 imparts a similar counterclockwise movement to the lever 670, and this connection is such that the manual lever 670 may be actuated manually without imparting movement to the shaft 671. In the present instance this connection is provided by a hook-like pawl 686 which is pivoted on a stud 687

which projects from the arm 685. The pawl 686 is adapted to engage a pin 688 which projects from the lever 670, and spring means is provided which urges the pawls 686 into such engagement. In the present instance this yielding force is exerted upon the pawl 686 through a lever arm 689 which is pivoted on the stud 687. At its lower end the lever arm 689 carries a pin 690 which projects rearwardly so as to be engageable with the left-hand edge of a depending tail portion 691 provided on the pawl 686. A spring 692 acts between the pin 690 and a portion 693 of the arm 685 so as to urge the lever arm 689 in a counterclockwise direction, thereby to urge the pawl 686 toward its engaging relationship with respect to the pin 688 carried by the arm 670.

The desired rocking stroke for the rockshaft 671 is in the present instance obtained in timed relation to the operation of the printing machine by means of a direct mechanical connection between the driving mechanism of the printing machine and the rockshaft 671. Thus as shown in Fig. 7, rockshaft 671 has a downwardly projecting arm 695 fixed thereto just rearwardly of the mounting plate 462. The lower end of the arm 695 is connected by a link 696 to one arm of the bell crank which is provided by a triangular plate 697. The bell crank 697 is pivoted at 698 on a mounting bracket 699 which is secured to the mounting rail 476 adjacent to the forward one of the legs 401'. The other arm of the bell crank 697 has the upper end of a link 700 connected thereto through the medium of a universal type of connection. The lower end of the link 700 is connected to one arm of a bell crank provided by a triangular plate 701, the bell crank 701 being pivoted at 702 on the mounting bracket 699. The other arm of the bell crank provided by the plate 701 has a connecting block 703 secured thereto by a suitable pivot pin, and the driving force for imparting rocking movement to the shaft 671 is imparted to the link and lever system through the connecting block 703. Thus a connecting rod 705 extends through a bore in the connecting block 703, and a set screw 706 is provided in the connecting block 703 for securing the connecting rod 705 in the desired longitudinally adjusted relation with respect to the connecting block. The connecting rod 705 extends in a rearward direction from the connecting block 703 so that the connecting rod 705 may be operatively associated with a portion of the drive mechanism of the printing machine. When the sheet feeder 400 is disconnected from the printing machine and is not in use, the connecting rod 705 may be lowered about the pivotal axis of the connecting block 703 so as to rest in a supporting bracket 707 mounted on the rear one of the legs 401'.

The operative driving connection for the connecting rod 705 is best shown in Figs. 10 to 13 inclusive of the drawings wherein it will be evident that the driving power is derived from the constantly driven drive pulley 115. The arrangement is such that the driving connection from the pulley 115 is normally disengaged, and the driving connection is rendered operative only when the platen mechanism P is driven through an operative cycle. To this end a pair of mounting castings 710 and 711 are fixed upon the rear rail 118 just to the left of the drive pulley 115, the mounting casting 710 serving to support a stub shaft which carries a gear 712 thereon. This gear 712 is meshed in a one to one relation with a gear 713 which is carried on a shaft 714 mounted in the bearing casting 711. The shaft 714 extends through the left end wall or panel 716 of the printing machine frame, and a driving disk 717 is fixed on the projecting end of the shaft 714. A screw threaded bore 718 is provided in the disk 717 eccentrically thereof, and means is provided for connecting the rear end of the connecting rod 705 to the eccentric bore of the disk 717. This means comprises a bearing fitting 720 secured to the rear end of the rod 705 and having a bearing stud 721 rotatably mounted therein transversely of the axis of the rod 705. The bearing stud 721 has an enlarged head whereby the stud may be manually rotated, and the other end of the stud 721 is screw threaded so that it may be screwed into the bore 718.

The connection between the gear 712 and the drive pulley 115 is provided by a one-revolution clutch 725 which has its driven member fixed to the pinion 712. The driven member of the clutch 725 includes a pawl 726 which is spring biased so that when the pawl is released it engages the hub of the drive pulley 115 so as to be rotated with the pulley 115. A stop lever 727 is biased by a spring 728 toward an engaging relationship with respect to the pawl 726, as shown in Fig. 12 of the drawings, and when the pinion 712 is to be driven, the stop lever 727 is withdrawn in an upward direction about its pivot pin 729 to release the pawl 726. The stop lever 727 is then returned to the position shown in Fig. 12 so that the pawl 726 will be engaged and withdrawn at the end of a single revolution of the driven member of the clutch.

The desired releasing movement or control movement is imparted to the stop lever 727 in timed relation to the operation of the printing machine, the arrangement being such that the stop lever 727 is withdrawn early in each operating cycle of the platen mechanism P. To this end an operating link 730 is connected to an arm 731 which is fixed on a rockshaft 732. The rockshaft 732 forms a part of the platen driving mechanism, and it is rocked in a counterclockwise direction from the position shown in Fig. 12 during the first half of the cycle of operation of the platen mechanism. The other end of the link 730 is guided by a longitudinal slot 733 formed therein and engaged with the pivot pin 729. When the link 730 is shifted in a right-hand direction from the position shown in Fig. 12, a cam surface 735 thereon is engaged with a cam roller 736 which is mounted on a portion of the stop lever 727, and the stop lever 727 is thereby withdrawn in an upward or releasing direction. The timing of the mechanism is such that the link 730 is returned to the position shown in Fig. 12 before the driven member of the clutch 725 completes its one-revolution cycle, and the clutch 725 is thereby disengaged after it has completed its one-revolution cycle. The arrangement of the parts is such that the shaft 714 comes to rest with the eccentric bore 718 disposed in the position shown in Fig. 13, and hence when the shaft 714 is rotated, the connecting rod 705 is withdrawn in a rearward direction and immediately starts the operative rocking stroke of the rockshaft 671.

The rocking movement imparted to the lever 670 by the rockshaft 671 is also utilized to impart operative movement to other mechanisms in the machine. One such mechanism is the means which supports the upper advancing rollers 605.

These advancing rollers 605 are supported on a shaft 750 which is carried at the ends of arms 751 which are in turn fixed to a rockshaft 752. The rockshaft 752 is supported between the mounting plates 462 and 463, and by rocking movement imparted to the rockshaft 752, the upper advancing rollers 605 may be elevated to their inactive positions, or may be lowered to their active positions wherein they bear against the lower, constantly driven, advancing roller 575. The lower advancing roller 575 is in the form of a substantially continuous cylinder having a roughened or knurled surface, while the upper advancing rollers 605 are in the form of rubber faced disks, which are splined to the shaft 750 for adjusting movement therealong. Thus one or more of the upper advancing rollers 605 may be utilized, and the other of these rollers may be shifted to inactive or out of the way positions adjacent to the ends of their supporting shaft.

The upper advancing rollers 605 are urged toward their lower or active positions by means of a pair of springs 755 which act on the two arms 751 as shown in Fig. 5 of the drawings. Means is provided in association with the actuating lever 670 for shifting the upper advancing rollers 605 to their elevated inactive positions, and for lowering these rolls after the leading edge of a sheet has been fed between the rollers 575 and 605 through the action of the separating roller 600. To this end a cam plate 760 has its left-hand end pivoted to the arm 670. The cam plate 760 extends forwardly and has a guide slot 761 formed therein which engages a guiding means provided by the projecting end of the shaft 752. The cam plate 760 has a cam slot 762 formed therein somewhat to the left of the guide slot 761, and the lower edge surface of the cam slot 762 is engaged by a cam roller 763 which is carried on the end of an arm 765 fixed to the shaft 752 just rearwardly of the cam plate 760. Thus the springs 755 act on the rock shaft 752 so as to urge the cam roller 763 toward an engaging relation with respect to the lower edge surface of the cam slot 762. When the lever 670 is in its right-hand or normal position shown in Figs. 1 and 4, the upper advancing rollers 605 are engaged with the lower and constantly driven advancing roller 575, and the cam roller 763 is slightly spaced from the lower surface of the slightly enlarged left-hand end of the cam slot 762. When the lever 670 is actuated to the left in Fig. 4, the lower surface of the cam slot 762 engages the cam roller 763 and operates to move the upper rollers 605 to their elevated positions, and when the lever 670 is allowed to return to its right-hand position, after having imparted the desired separating movement to the separating roller 600, the advancing rollers 605 are again lowered to their active positions so that the advancing movement of the sheet thus separated may be continued until the sheet has been engaged with the belt 413. In such advancing movement the leading edge of the sheet is advanced in a somewhat downward direction, and proper feeding movement is facilitated in the present instance through the provision of a resilient member 767 which is secured to the mounting bar 526 so as to project across the top of the adjacent leg structure 401 and longitudinally of the guideway 412 in the direction of the printing or operating position. The member 767 is carried by an adjustable mounting bracket which is generally similar to the belt guiding brackets 525 in so far as the manner in which it is associated with the mounting bar 526.

The operative movement of the cam plate 760 is also utilized to impart timed operative movement to a detecting means which is provided in the present machine for detecting the absence of a sheet between the advancing rollers 575 and 605. This detecting means comprises a feeler finger 780 which is fixed on a rockshaft 781 so as to project in a left-hand direction therefrom. The rockshaft 781 extends between the two mounting plates 462 and 463, and the feeler finger 780 is disposed so as to extend to the left from the rockshaft 781 to overlie an annular groove 783 formed in the lower advancing roller 575. The rockshaft 781 is normally biased in a counterclockwise direction as viewed in Fig. 5 so as to tend to maintain the feeler finger 780 in a lowered or active position. This end is attained by a coiled torsion spring 784 which surrounds the rockshaft 781 and acts between this shaft and the plate 462.

The desired detecting movement is imparted to the feeder finger 780 under the control of the cam plate 760, and for this purpose the cam plate 760 has its lower edge surface formed adjacent the right-hand end thereof to provide a cam surface 786. This cam surface is adapted to engage a cam roller 787 which is mounted on the forward end of the forwardly projecting arm 788, this arm 788 being fixed to the rockshaft 781. When the cam plate 760 is in its right-hand or rest position shown in Fig. 4 the cam roller 787 is engaged and the rockshaft 781 is held so that the feeler finger 780 is in its elevated or inactive position. When the lever 670 is actuated to the left in the course of a cycle of operation of the machine, the cam plate 760 is withdrawn in a left-hand direction, and after the action of the separator roller 600 has had an opportunity to advance a sheet from the supply hopper 410 to a position between the two advancing rollers 575 and 605, the cam plate allows the feeler finger 780 to be lowered with a yielding action. In the event that a sheet has been fed from the supply hopper 410, the feeler finger 780 comes to rest on the upper surface of this sheet, while in the event that a sheet has not been fed from the supply hopper, the feeler finger is lowered for an additional distance and into the annular groove 783. Such additional movement of the feeler finger into the groove 783 constitutes the detecting movement of the feeler finger, and in such movement the feeler finger 780 is arranged to actuate means which causes the operation of the printing machine to be stopped at the end of the cycle of operation then in progress. In the present instance this means comprises a normally open switch 790 which is of the spring blade type. The switch 790 is mounted in a housing 791 which is disposed just above the rockshaft 752 and is held in position by a mounting bracket 793 carried on the shaft 636. To close the switch 790 in the course of a detecting movement of the feeler finger 780, an arm 794 is provided on the rockshaft 781 so as to extend upwardly just to the right of the contact ends of the blades of the switch 790. On the arm 794 an adjustable switch closing screw 795 is mounted, and this screw is so adjusted that when the movement of the feeler finger 780 is stopped by engagement with a sheet of paper, the switch 790 is not actuated to its closed position, while when the feeler finger 780 moves into the annular groove 783, the screw 795 engages the right-hand

blade of the switch 790 and closes the switch. The switch 790 is arranged so that it functions in the same manner as the switch 148, which it will be recalled, is closed when the detecting finger 150 senses the feeding of the last printing device from the magazine M of the printing machine. To provide the requisite connection between the switch 790 and the auto-stop mechanism of the printing machine, a pair of wires 796 are connected to the wires 147 and 149, the wires 796 being connected at their other ends to a plug socket 797 mounted adjacent to the plug socket 486. A two wire conductor 798' having its wires 798 connected to the two terminals of the switch 790 has the other ends of these wires connected to a plug connector 799 which may be inserted into the plug socket or outlet 797 to connect the switch 790 in parallel with the switch 148.

The second detecting means which is provided in the machine operates to detect the feeding of more than one sheet from the supply hopper, and this second detecting means includes a sensing finger 800 which is disposed beside the feeler finger 780. The detecting finger 800 is somewhat hook-like in form at its lower end and is positioned relatively close to the peripheral surface of the lower advancing roller 575. The detecting member 800 extends upwardly and is pivoted at 801 on a supporting block 802 so that engagement of a rapidly advancing sheet with the left-hand edge of the detecting member 800 may impart pivotal detecting movement to the detecting member 800. In such detecting movement, an adjustable screw 805 carried on the detecting member 800 somewhat below its pivot 801 engages the other one of the spring contacts of the switch 790 so as to close this switch. It will be observed that when the screw 805 engages the adjacent contact of the switch 790, the other contact of the switch is in effect held against movement by an adjustable back-up screw 806 which is shown in Fig. 6 of the drawings. A similar backing-up action is attained by the screw 805 when the switch 790 is closed through the operation of a feeler finger 780 and its associated screw 795, this action being attained through the mounting of a detecting member 800 in such a manner that its movement in a clockwise direction about its pivot is limited by abutment of a portion of the detecting member with a portion of the mounting block 802. The detecting member 800 is urged to this position by a spring 807 as shown in Fig. 5 of the drawings. The operation of the detecting member 800 must, of course, be rendered dependent upon the feeding of two or more sheets from the supply hopper 410 and means is therefore provided for vertically adjusting the mounting block 802, thereby to vary the spacing between the lower face of the detecting member 800 and the peripheral surface of the roller 575. Such an adjustable mounting is provided on the mounting bracket 793 which, as shown in Fig. 5, has a vertical bore 808 into which a sleeve-like upward extension 809 of the mounting block 802 projects. The upper end of the bore 808 has a reduced section through which an adjusting screw 810 projects downwardly into threaded engagement with the internally threaded surface of the sleeve-like extension 809. An expansive spring 811 surrounds the screw 810 within the bore 808 so as to urge the mounting block 802 in a downward direction, and this action serves to hold the lower face of a knurled head 812 of the screw 810 against the top of the mounting bracket 793. Thus by rotation of the screw 810, the mounting block 802 and the associated detecting finger 800 may be raised against the force of the spring 811 or may be released for gradual downward movement by the spring. A retaining spring 813 fixed on the mounting bracket 793 engages the knurled edge of the head 812 thereby to hold the same in adjusted position. In practice the adjusting screw 810 is operated so that a single sheet may be fed between the roller 575 and the detecting finger 800 without actuation of the detecting finger, and this adjustment is so made that when two sheets are fed, the upper sheet will strike the detecting finger 800 and so actuate the detecting finger that the switch 790 will be closed and operation of the machine stopped.

As shown in Figs. 1, 2 and 3, the several moving parts and operative mechanisms located on the forward face of the mounting plate 462 are enclosed by a removable housing 815 which is held in place by a pair of knurled screw devices 816. The lower one of these screw devices 816 is threaded into a bushing 817 provided in the plate 462, while the upper device 816 is threaded into an elongated stud 818 which projects forwardly on the axis of the shaft 636. The housing 815 is, of course, slotted as at 819 to provide for operative movement of the lever 670.

The sheet stop means 415, in the form illustrated in Figs 1 to 19 of the drawings, is actuated at the proper point in the machine cycle through an operative connection with the rockshaft 671, as will hereinafter be explained in detail. The particular form of the sheet stop means 415 is best shown in Figs. 15 to 19 inclusive of the drawings wherein it will be evident that the sheet stop means includes a stop finger 820 which projects radially from the rockshaft 821 so that the stop finger may be raised and lowered through rocking movement of the shaft 821. The stop finger 820 has an abutment plate 822 at its remote or left-hand end, and the stop finger is rendered effective by lowering the abutment plate 822 into the guideway 412 in the path of the advancing sheet. At its other or right-hand end the stop finger 820 projects through apertures in the lower ends of a U-shaped mounting clip 823, there being a set screw 824 which extends through the top or cross member of the mounting clip 823 so that when the set screw is tightened against the rockshaft 821 the stop finger is held in a fixed adjusted relation with respect to the rockshaft 821 as well as with respect to the mounting clip 823. A plurality of such stop fingers 820 may, of course, be mounted upon the rockshaft 821 where dictated by the size of the sheets being fed, and such an arrangement is shown in Fig. 21 of the drawings.

The rockshaft 821 is mounted in a bearing bracket 825 which has an arm 826 whereby two spaced bearings are provided for the rockshaft 821. The mounting bracket 825 is mounted on the forward rail 420 of the feeder frame, and since it is sometimes necessary to adjust the position of the stop finger 820 in an extent which cannot be cared for by the longitudinal adjustment of the stop finger in the mounting clip 823, the mounting bracket 825 is mounted on the rail 420 so as to provide for convenient adjustment of the bracket 825 along the rail 420. This adjustment is provided in the present instance by a slidable interlocking track means which comprises a stationary bar 827 and a complemental undercut groove 828 formed in the lower face of the bracket 825. As herein shown the mounting bar 827 is formed from a round rod which is

flattened on its top and bottom surfaces. The rod 827 is secured in a fixed position on the top of the rail 420 by means such as screws, and when the mounting bracket 825 has been shifted to an adjusted position along the mounting bar 827, this adjustment is preserved by means of a set screw 829 which is threaded through the top of the mounting bracket 825 and is engageable with the flattened top surface of the mounting bar 827. Through the use of the flattened top surface on the mounting bar 827, the roughening of the surface by the set screw is rendered immaterial.

The rockshaft 821 of the sheet stop means is actuated in proper timed relation to the operation of the sheet separating and advancing means through the medium of a cam mechanism which is in turn actuated by a ratchet and pawl means whenever the sheet stop means is to be actuated. Thus as shown in Figs. 15 to 19, the rockshaft 821 has an arm 830 fixed thereon, and a spring 831 acting between the arm 830 and an anchoring pin 832 on the mounting bracket 825 serves to urge the rockshaft 821 in a counterclockwise direction as viewed in Fig. 17, thereby to tend to shift the stop finger 820 downwardly to its effective position. Such downward movement is limited by an engagement of an end portion 833 of the arm 830 with a disk-like cam 834. The cam 834, as shown in Fig. 18 of the drawings, forms a part of a cam and ratchet wheel assembly wherein the cam 834 is associated with one end of a sleeve 835 and the ratchet wheel 836 is fixed on the other end of the sleeve 835. The operative association of the cam 834 with the sleeve 835 is attained by means of a pin 837 fixed on the cam and engaged with a suitably positioned longitudinally extending bore formed in the sleeve 835. The cam and ratchet wheel assembly thus provided is rotatably mounted on a stud 838 which projects forwardly from the mounting bracket 825, and a spring and washer arrangement 839 bears against the outer face of the ratchet wheel 836 and is held in place by a screw 840. By tightening of the screw 840 a braking action is exerted which prevents overthrowing of the cam and ratchet wheel assembly when the assembly is actuated at high speed.

The cam and ratchet assembly is in the present instance actuated by reciprocating movement of an actuating slide bar 845 which is slidably mounted along the forward edge of the rail 420 by means of bearing brackets 846. The slide bar 845 has a pawl mechanism mounted thereon for operative engagement with the ratchet wheel 836 when the slide bar 845 is reciprocated. In the present instance this pawl mechanism comprises a carrier 847 adapted to be adjustably clamped in the desired position longitudinally of the slide bar 845 by means including screws 848. The carrier 847 is formed by a front plate which engages the front surface of the slide bar 845 and by a pair of rear clamp members 849 which are located behind the slide bar 845 between the slide bar and the rail 420. When the screws 848 are tightened, the clamp members 849 are drawn against the rear face of the slide bar and the carrier 847 is thereby clamped in position. A pawl 850 is pivoted on a stud 851 which projects forwardly from the carrier 847, and a spring 853 acting between the carrier 847 and the pawl 850 tends to rotate the pawl 850 in a counterclockwise direction, thereby to elevate the right-hand end of the pawl and move a laterally projecting pin 854, carried by the pawl, into engagement with the toothed edge of the ratchet wheel 836. Such upward movement of the end of the pawl 850 is limited by engagement of the upper surface thereof with the head of one of the screws 848. Thus when the carrier 847 is properly adjusted, movement of the slide bar 845 to the left from the position shown in Fig. 17 of the drawings will move the pin 854 of the pawl 850 to the left beyond the lowermost tooth of the ratchet wheel 836, and when the slide bar 845 is returned in a right-hand direction, the engagement of the pawl with the ratchet wheel will serve to impart angular movement to the cam and ratchet assembly.

The cam 834 is formed to provide a plurality of cam lobes 834' so that when the cam is thus actuated, the arm 830 wil ride upwardly over one of the cam lobes 834' thereby to rock the shaft 821 first in a clockwise direction and then in a counterclockwise direction. As a result the stop finger 820 is momentarily elevated and a sheet, which has been stopped thereby at the desired printing position, is released for further advancing movement along the guideway and to the collecting hopper 416. The immediate return of the stop finger 820 to its lower or active position takes place in time to cause the stop finger to stop the next sheet at the desired printing position.

The reciprocating movement which is required in the slide bar 845 is attained through an operative connection of the slide bar 845 with the rockshaft 671. As shown in Fig. 4 of the drawings this connection is provided by a link 860 which is pivoted at one of its ends to the slide bar 845 and at its other end upon the pivot pin 687. It will be recalled that the pivot pin 687 is mounted on the arm 685 which projects upwardly from the rockshaft 671. Thus when the rockshaft 671 is moved in a clockwise direction the link 860 imparts movement to the slide bar 845 in a right-hand direction, and the slide bar is returned in a left-hand direction when the rocking movement of the shaft 671 is reversed. Thus the stop finger 820 is elevated at the proper time in the cycle of operation of the sheet separating and advancing means, and this action releases the sheet which is then located at printing position for discharge movement by the belts 413, and the stop finger 820 is returned almost immediately to its lower or active position so that the sheet which is at this time being withdrawn from the supply hopper 410 will be stopped in the proper operative relation to the printing mechanism of the printing machine to receive a printing impression in the next operative cycle of the platen mechanism P.

As hereinbefore pointed out, the automatic sheet feeder 400 is adapted to be quickly and easily moved into or out of its operative relationship with respect to the printing machine, and cooperating means is provided on the automatic sheet feeder 400 and the printing machine 100 for maintaining the automatic sheet feeder in any desired relationship with respect to the printing machine. This means is of such a character that the automatic sheet feeder may be quickly and easily released for removal from its operative relationship with respect to the printing machine, and this means is further of such a nature that the automatic sheet feeder may be quickly and easily returned to a previously established relationship. Thus as shown in Figs. 1, 3, 5, 8, 11, 13 and 14, the printing machine has a pair of supporting and guiding rails or trackways 870 secured on its opposite end

panels, such trackways 870 being in the form of heavy and rigid sheet metal angles, the vertical flanges of which are disposed adjacent the end panels of the printing machine frame so that the other flanges of the angles project outwardly in a horizontal plane. In order to afford adjustability of the rails 870 relative to the table top T, each of these rails is supported by a pair of longitudinally spaced eccentric screws 871, Fig. 13, which are passed through suitable openings formed in such rail 870 and in the adjacent end panel of the printing machine, nuts (not shown) being threaded on the iner ends of these screws to clamp the parts together. Preferably the opening in the rail 870 in which the eccentric portion of one of the screws 871 is disposed is in the form of a slot 871' to enable independent adjustment of the screws 871 for the purpose of leveling the flange of the rail 870. By proper adjustment of the screws 871 the trackways 870 may be disposed parallel to and at a predetermined distance below the table top T. Suitable means are provided on the leg structures of the feeder frame for cooperating with the trackways 870 to thereby enable the feeder to be arranged in operative relation to the printing machine. Thus, on the flange 425' of the leg structure 401 a horizontal mounting bar 872 is secured, and adjacent opposite ends of the mounting bar 872 a pair of spaced rollers 873 are mounted. These two rollers are spaced apart a considerable distance in a direction from front to rear of the feeder frame, and a similar mounting bar and similar rollers 873 are provided on the other leg structure 402 for cooperation with the trackways 870 of the right-hand end of the printing machine.

When the automatic sheet feeder 400 is to be moved into operative association with the printing machine, the sheet feeder is rolled along the floor on its casters 404 to a position just forwardly of the printing machine. The sheet feeder 400 is then rolled rearwardly along a path parallel to the trackways 870 until the rear roller 873 at each end of the feeder frame engages the forward end of the adjacent trackways 870. The aforesaid vertical adjustment of the trackways 870 and the location of the rollers 873 in a vertical direction are such that the feeder frame must then be elevated slightly from its normal height in order to position the rollers 873 on the trackways. This elevation may, of course, be very slight, since it is intended only to remove the weight from the legs 401 and 402 and thereby insure accurate interrelation of the sheet feeder and the printing machine in a vertical sense. Rearward movement of the sheet feeder 400 is continued until the other or most forward rollers 873 are in position on the trackways 870, and the sheet feeder may then be moved along the trackways until the desired relationship of the sheet guideway 412 to the printing position has been established. This relationship is maintained by latching means which is adapted to be readily connected between the sheet feeder and the printing machine, and to be readily disconnected. This latching means in the present instance comprises a pair of mounting blocks 875, one of which is adjustably secured on each of the trackways 870 by means of a set screw 876. Each mounting block carries a latching pawl 877 pivoted on the mounting block at 878 and having a notch 879 formed therein which is adapted to be moved downwardly into an embracing relationship with respect to the adjacent roller 873. This embracing or interlocked relationship may be maintained by means of a locking screw 880 which is threaded through the latching pawl 877 so that its reduced end 881 may be projected into a locking opening 882 formed in the mounting block 875.

When the desired relationship of the feeder to the printing machine has been established, the mounting blocks 875 are secured in position on the trackways 870 so as to be engageable in the above described manner with the adjacent rollers 873, and when the sheet feeder is removed from its operative position, the mounting blocks 875 are left in this adjusted position. Hence it is possible for the operator to quickly and easily return the sheet feeder to the operative relationship which has thus been established.

It will be recognized, of course, that the two electrical connections provided by the cords 798' and 408' must in each instance be connected or disconnected, and that the connecting rod 705 must be disconnected through manipulation of the pivot pin 721. It should be observed, however, that when the connecting rod is released from the drive mechanism, the adjustment thereof provided by the set screw 706 is retained, and hence the operations involved in re-establishing the previously determined relationship of the sheet feeder 400 with respect to the printing machine 100 are relatively simple and may be performed by an ordinary office worker without the aid of a repair or service man.

Modified forms of feeder frame

In those instances where an operator wishes to make a printing impression relatively close to the bottom of the sheet, it is necessary to so adjust the sheet feeder 400 and to so relate the sheet feeder 400 to the printing machine 100 that the sheet, when it comes to rest at printing position, is located relatively far to the rear with respect to the printing position, and where the sheets are relatively short in a vertical direction, this may be accomplished through setting up the guideway 412 relatively close to the rear rail 421 of the feeder frame. Where, however, the sheet feeder 400 is being used to supply relatively long or high sheets to the printing machine, this result cannot be attained through such a set up of the guideway 412, and to overcome the limitation thus imposed, an alternative embodiment of the invention is illustrated in Figs. 20 and 23 of the drawings. According to this embodiment of the present invention the rear rail which is in this embodiment designated as 421' is modified so that clearance is provided about the sensing means and the upstanding portion of the printing frame 104. Thus the rear rail 421' is formed in two sections and has a U-shaped connector portion 890 joined thereto as by welding so as to project forwardly about the sensing means S and the lower portion of the printing frame 104. With this arrangement the U-shaped portion 890 in effect projects forwardly over a possible location for the angle guideway 500, and for this reason the connector member 890 is mounted on top of the rail 421' and is slightly offset in an upward direction as indicated at 891 in Fig. 23 of the drawings. With this construction the feeder frame may be set up in a position which is somewhat further back on the printing machine 100 than would be possible with the normal construction of the rear rail 421.

The automatic sheet feeder 400 is of course

constructed in a normal or basic model such as that shown in Figs. 1 to 19 hereof, but this basic model is capable of convenient and relatively simple modification to provide for various other contingencies which may arise in use. For example, it may in some instances be necessary or desirable to feed relatively long or high sheets with the sheet feeder, and to locate the printing impression relatively close to the top of the sheet. To care for such an instance another alternative embodiment of the sheet feeder is illustrated in Figs. 21 and 22 of the drawings. In such an instance it would, of course, be necessary to form the sheet guideway 412 through the use of a rear guide having a receding section such as the section 501R which has hereinbefore been described in detail, and such a rear guide would be constructed as a channel guide 501' substantially like the guide 501 hereinbefore described. To provide clearance for the receding guide structure which is designated in Fig. 21 as 894, the rear rail 421'' of the feeder frame is formed in two sections in that portion which is adjacent to printing position, and a U-shaped connecting portion 895 connects the adjacent ends of the sectional rear rail 421''. In the present instance the U-shaped form in the connecting portion 895 is attained by welding a pair of blocks 896 to the rear edges of the rail sections 421'', and by welding a straight connector bar 897 to the rear edges of the blocks 896. In this instance all of the elements 896, 897 and 421'' are arranged in a common plane. Thus the channel guide 501' may be disposed relatively close to the rear rail 421'' with the elements of the receding guide structure 894 disposed in the clearance space provided by the U-shaped connector portion 895.

The multiple impression sheet feeder

The automatic sheet feeder of the present invention may also be readily adapted from the basic form shown in Figs. 1 to 19 inclusive of the drawings so as to enable the feeder to be used for multiple impression types of work, and such an embodiment of the invention is illustrated in Figs. 24 to 30 inclusive of the drawings. With this embodiment of the invention the printing apparatus may be used to form a plurality of printing impressions from each printing device upon a sheet or form, and where this class of work is being done it is customary to use a sheet or form which is relatively wide. An example of such a form may be found in the public utility bills wherein a plurality of connected sections are provided. One of these sections may be the main body of the bill, another may be the return stub, and there may be one or more additional sections which may be termed accounting sections adapted to be detached after the preparation of the bill and retained by the accounting department for subsequent use in the accounting work. When such a public utility bill is to be printed, a printing impression showing, for example, the name and address of a customer, is printed on each of the several sections of the bill, and in the embodiment of the invention shown in Figs. 24 to 30 inclusive of the drawings, the automatic sheet feeder of the present invention is illustrated as adapted for the printing of four successive printing impressions upon each bill. It will be recognized, of course, that during the printing of the several impressions upon each bill, the printing device pertaining to such bill or form is maintained stationary at the printing position. This action may be attained in the printing machine 100 herein shown through appropriate adjustment and setting of the multiprint mechanism which is controlled by the control plunger 140 and which is described in detail in the aforesaid copending application of Carl J. Hueber, Ser. No. 388,998, filed April 17, 1941.

In adapting the basic model of the present automatic sheet feeder 400 for multiple impression work as hereinabove described, the primary elements of the automatic sheet feeder remains unchanged, and a multiple stop mechanism 900 is provided along the front rail 420 of the feeder frame and a control means 901 therefor is associated with the rockshaft 671 to correlate the operation of the sheet separating roller 600 with the operation of the automatic multiple stop mechanism 900.

The multiple stop mechanism 900 is, in accordance with the present invention, so constructed and arranged that it may be readily adjusted and readily varied to care for a different number of impressions which the operator may desire to make from each printing device. The control mechanism 901 is also constructed and arranged so that such variation in the number of printing impressions may be readily attained. The multiple stop mechanism 900 is arranged to be actuated by the slide bar 845 and as herein shown comprises a plurality of stop fingers 905 projecting in rearward direction so as to overlie the guideway 412. The stop fingers 905 are mounted on a supporting shaft 906 which is disposed parallel to and above the front rail 420 by means of a pair of spaced upstanding bearing brackets 907. Each stop finger 905 comprises a rod 908 having one end extending into a suitable bore 909 formed in a supporting casting 910. The rod 905 may be removed from the supporting casting 910 by loosening of a set screw 911. At its other or forward end each supporting casting is bifurcated to provide two spaced arms 912 and 913 which have aligned bores therethrough perpendicular to the axis of the associated rod 908, these bores providing bearings through which the mounting shaft 906 extends. Between the two arms 912 and 913 a collar 914 is provided on the mounting shaft 906 and a set screw 915 in the collar 914 enables the collar 914, and hence the bearing casting 910, to be secured in different adjusted positions along the mounting shaft 906.

At their outer or rear ends the rods 908 have stop plates 917 secured thereto so as to depend therefrom, and when the rear end of the rod 908 is allowed to move downwardly, the stop plate 917 thereof is disposed in the path of the leading edge of a sheet being advanced along the guideway 412. After a sheet has been stopped by a stop plate 917, and the desired printing impression has been made upon the sheet, the stop finger is rocked about the shaft 906 so as to raise the stop plate and permit further advancing movement of the sheet. Where the sheets which are being fed through the machine are relatively thin so as to tend to adhere to the stop plate 917 when the stop plate is elevated, a stripper plate 920 may be disposed just to the left of such stop fingers 905 as shown in Figs. 24 and 29. Each stripper plate 920 is curved upwardly at its left-hand edge as indicated at 920', and each such stripper plate may be supported by a mounting block 921 adapted to be secured by a set screw 922 on the upstanding flange portion of the angle guideway 500. In the present instance the first or left-hand one of the stop fingers 905 is not provided with a stripper plate 902 since the por-

tion of the sheet immediately adjacent to the left-hand one of the stop fingers 905 is disposed beneath the platen roller PR and is held against appreciable upward movement by the platen roller.

The several stop fingers 905 are actuated in timed relation by a readily replaceable cam mechanism which is driven by the slide bar 485 and which operates to lower and then to elevate the several stop fingers 905 in succession from left to right to thereby stop the sheet successively in a plurality of different positions such that printing impressions may be formed thereon whenever the sheet is stopped. In the present instance such actuation of the several stop fingers 905 is attained by a cam assembly which is mounted in the bearing brackets 907 in such a manner that the cam assembly may be readily removed and replaced when the machine is to be adapted for forming a different number of successive printing impressions on each sheet. The cam assembly as herein shown is adapted for use where four successive printing impressions are to be made on each sheet, and this assembly comprises a cam shaft 925 disposed parallel to and forwardly of the mounting shaft 906 so as to overlie the forwardly projecting arms 913 of the several stop fingers 905. Such mounting of the cam shaft 925 may be readily accomplished through the provision of forwardly facing bearing slots 926 in each of the bearing brackets 907, as shown in Figs. 28 and 30 of the drawings. The appropriate portions of the cam shaft 925 may be inserted into the bearing slots 926 and a retaining hook member 927 provided on each of the bearing brackets 907 may be then lowered so as to engage the adjacent outer face portions of the shaft 925 and hold the same in the bearing slots. The retaining members 927 are pivotally mounted on the axis of the bearing shaft 906, and biasing springs 928 are provided on this shaft adjacent each of the retaining members 927 so as to urge the retaining members toward their active positions of Fig. 30.

The cam shaft 925 is provided with a plurality of cams 930, one for each of the stop fingers 905 which is to be active, and these cams may be of duplicate form disposed in fixed but angularly displaced relationship upon the cam shaft so as to attain the desired sequence of actuation of the stop fingers 905. As shown in Fig. 28 of the drawings each cam has a plurality of recesses 931 disposed alternately between dwell surfaces 932 thereon, there being in the present instance three such recesses 931 disposed in equally spaced relationship about the periphery of each cam. The cams 930 are secured by means of set screws 933 in positions adjacent to the arms 913, and each arm 913 has a follower pin 934 projecting laterally therefrom so as to underlie and be engaged by gravity with the peripheral surface of the adjacent cam 930. The arrangement is such that when a cam follower pin 934 is engaged with a dwell surface 932 of its cam 930, the associated stop finger 905 is in its elevated position, and as the cam shaft 925 is rotated in a counterclockwise direction as viewed in Fig. 28, a cam recess 931 is moved into register with the follower pin 934 so as to allow the associated stop finger to drop to its lower or active position. In the next advancing or rotative movement of the cam shaft in a counterclockwise direction, the leading surface of the engaged cam recess 931 forces the follower pin 934 downwardly, thereby to elevate the associated stop finger 905 and permit the sheet, which has been stopped thereby, to advance beyond this stop finger. The arrangement is such that when the first or left-hand stop finger is elevated to release a sheet after the formation of the first printing impression thereon, the second stop finger 905 is in its active position so that the sheet advances until its leading edge strikes the second stop finger. This sequence continues until the last or right-hand stop finger is elevated to thereby release the sheet for discharge movement, and the first or left-hand stop finger 905 is then lowered so as to properly position the next sheet which is fed into the guideway 412. It will be understood of course that when a smaller number of stop fingers 905 is to be used, the rods 908 of one or more of the stop fingers will be removed from the mounting castings 910, and the other ones of the stop fingers will be adjusted along the mounting shaft 906 to the desired positions. The cam shaft 925 carrying cams 930 adapted for actuating four stop fingers will, of course, be removed and a different cam assembly will be substituted bearing the required number of cams 930 formed in accordance with the number of stop fingers 905 which are to be actuated.

The actuating means for the cam shaft 925 comprises a cam and ratchet assembly 940 which embodies a mounting bracket 941 in which a stub shaft 942 is rotatably mounted in alignment with the cam shaft 925. The stub shaft 942 projects in a right-hand direction toward the cam shaft 925 and is detachably connected thereto by a conventional connector device 943 which insures connection between the shaft 925 and 942 in but a single angular relationship.

The stub shaft 942 has a ratchet wheel 945 fixed thereon, and a rocking carrier member 946 is mounted on the left-hand end of the stub shaft 942. The rocking member 946 has a rearwardly projecting arm 947 which carries a spring biased pawl 948 adapted to engage the teeth of the ratchet wheel 945 to rotate the same in a counterclockwise direction as viewed in Fig. 27. The rocking member 946 also has a forwardly projecting arm 949 which carries a cam roller 950, and this cam roller overlies the effective cam surface 951 of a cam 952 which is secured on the slide bar 485 for movement therewith. The cam roller 950 is maintained in engagement with the cam surface 951 by a spring 953 which acts between a stationary portion of the mounting bracket 941 and a downwardly projecting arm 954 provided on the rocking member 946. The cam surface 951 slopes downwardly to the right as viewed in Fig. 25, and in the present instance the cam 952 is so positioned at the end of an operating cycle of the slide bar 485 that the cam roller 950 engages the left-hand or highest portion of the cam surface 951. When the slide bar 485 is withdrawn to the left in the first part of a rocking movement of the rockshaft 671, the ratchet carrying member 946 is allowed to move through an idle stroke in a clockwise direction so that when the return movement of the slide bar 485 is initiated, the cam roller 950 will be elevated and will impart an actuating movement to the ratchet wheel 945, thereby to advance the cam shaft 925 and its associated cams 930 through the desired stroke.

In order that the separating means provided by the separator roller 600 will invariably operate in proper timed and correlated relation with respect to the operation of the stop fingers 905, means is provided which alters the driving

effect of the rockshaft 671 upon the separating roller 600. This controlling means is arranged to obtain this result through selective and sequential actuation of the hook-like pawl 686 to an ineffective relation during certain cycles of operation of the printing machine. It will be recalled that the pawl 686 is normally urged, by the spring biased pawl 689 and its pin 690, so as to assume an engaged or operative relationship with respect to the pin 688. The pin 688 being carried upon the lever arm 670, a rocking movement of the rockshaft 671 in a counterclockwise direction acts normally through the hook-like pawl 686 and the pin 688 to impart corresponding counterclockwise rocking movement to the lever 670. This normal actuating connection between the rockshaft 671 and the actuating lever 670 is arranged to be periodically or sequentially disabled by the control means 901, thereby to cause feeding of a succeeding sheet into the guideway 412 only after the desired number of printing impressions have been made upon the previously fed sheet. To this end the control means 901 comprises a disk-like cam 960 rotatably mounted on the rockshaft 671 and having a knurled head 961 projecting axially in a forward direction so as to project normally beyond the forward wall of the enclosing housing 815, which housing is in this embodiment of the invention substantially like the housing shown in Figs. 1 to 3 of the drawings. In the embodiment of Figs. 24 to 30 inclusive, however, this housing 815 has an opening 964 formed therein to provide clearance through which the knurled head 961 may extend, this opening being illustrated in dotted outline in Fig. 3 of the drawings.

The cam 960 is arranged to act upon the pawl 689, which has a projecting nose 965 on its lower end which may extend into any one of the plurality of spaced notches 966 or 967 which are formed about the periphery of the cam 960. It will be observed that the notches 966 are relatively deep so that when the nose 965 is engaged with one of these deep notches, the hook-like pawl 686 will assume its normal engaged or actuating relationship with respect to the pin 688. Hence when the rockshaft 671 is again actuated, the hook-like pawl 686 will actuate the lever 670 and cause the separating roller 600 to feed a sheet into the guideway 412. Such a relationship of the pawl 689 with one of the deep notches 966 is illustrated in Fig. 26 of the drawings, and it will be observed that when the rockshaft 671 advances in a counterclockwise direction, it will correspondingly advance the cam 960 to such a point that a pivoted and spring biased retard pawl 970 will engage another notch on the periphery of the cam 960. Hence when the rocking movement of the shaft 671 is reversed to a clockwise direction, the cam 960 will remain stationary and the nose 965 of the pawl 689 will be withdrawn from the deep notch 966 with which it has been engaged and will be moved into engagement with the notch which is located next to this deep notch in a clockwise direction. Such a relationship of the pawl 698 to the next notch of the cam 960 is illustrated in Fig. 25 of the drawings, and it will be there observed that this next notch is a shallow notch 967. Hence the pawl 689 is so located that its pin 690 is withdrawn in a left-hand direction, and hence the hook-like pawl 686 assumes the released position shown in Fig. 25 wherein it will be ineffective in the next cycle of operation to cause actuation of the lever 670 and the advancing roller 600.

The deep notches 966 and the shallow notches 967 are so disposed about the periphery of the cam 960 that a sheet will be fed into the guideway only after the desired number of printing impressions have been made on the preceding sheet, and where the machine is set up for making four impressions on each sheet as shown in Figs. 24 to 30, the cam 960 takes the form which is best illustrated in Fig. 26. In this form each deep notch 966 is followed, in a clockwise direction, by three shallow notches 967 so that each sheet feeding operation of the separator roller 600 is followed by three rocking movements of the rockshaft 671 in which its only important driving or control action is the continued advancing of the control cam 960 and the successive actuation of the stop fingers 905. In the present case the cam 960 has three equally spaced deep notches 966 between which the shallow notches are disposed as aforesaid.

It will be evident, of course, that when a different cam assembly 925—930 is employed in the machine for the purpose of enabling a different number of printing impressions to be made upon each sheet, the cam 960 must be removed and a different cam substituted which is formed in accordance with the number of impressions which are to be made upon each sheet. During such removal and replacement of the cam 960, the retard pawl 970 may be latched in a withdrawn position by means of a latch lever 975 which is shown in Fig. 25.

When a cam assembly 925—930 and a related cam 960 have been mounted in the machine, it is of course, important that these two cam elements be correlated so that when a sheet is advanced into the guideway 412 by the feed roller 600, this sheet will be stopped in the first or left-hand position in the guideway 412 through proper positioning of the left-hand or first stop finger 905. In accomplishing this end an index mark 980 is provided on a stationary portion of the mounting bracket 941 and a similar index mark 981 is provided on a knurled collar 982 which is fixed to the stub shaft 942. When the stub shaft 942 and the associated cam shaft 925 are manually rotated by manual actuation of the knurled collar 982 to a position wherein the two index marks 980 and 981 are in registry, the parts are in position for initiation of the first machine cycle.

A corresponding index arrangement is provided for the control means 901, there being an index mark 985 provided on the knurled head 961 of the cam 960. In adjusting this portion of the mechanism the cam 960 is rotated in a counterclockwise direction by means of the knurled head 961 until the index mark 985 is in registry with an index mark 986 which, as shown in Fig. 3 of the drawings, is provided on the enclosing housing 815 adjacent to the clearance opening 964. When the two index marks 985 and 986 are in registry, the control means provided by the cam 960 and the control means provided by the cam assembly 925—930 are in a correlated relationship. In the present instance this relationship is such that in the next cycle of operation of the sheet feeder, which is of course manually performed by operation of the manual lever 670 in order to supply the first sheet to printing position, the separating roller 600 will advance a sheet into the guideway 412 and this sheet will be stopped in the first of the desired printing

positions through the action of the left-hand stop finger 905.

The index marks provide for the initial setting of the stop finger mechanism 900 and the control mechanism 901 are important from a practical standpoint, since in the use of a multiple stop mechanism, the operation of the sheet feeder must be correlated with the multiprint means of the printing machine, to thereby insure that the four printing impressions made upon a particular sheet will be made from the same printing device. As pointed out in the aforesaid copending application of Carl J. Hueber, Ser. No. 388,998, the multiprint means of the printing machine 100 which is herein shown can be thrown into operation only in such a manner that the next cycle of operation of the printing machine will be the first cycle of the multiprint means. Hence through proper setting in the manner hereinabove set forth of the multiprint means, the cam shaft 925 and the control cam 960, proper correlation of the various mechanisms is assured.

Operation

In utilizing the printing apparatus of the present invention in an ordinary or usual business establishment the automatic sheet feeder 400 is normally stored in an out of the way location when the printing machine 100 is to be used under the control of the foot pedals 120, 121, and 122, in which instance the sheets are fed to printing position manually by the operator seated in front of the printing machine. When the printing apparatus is to be used for relatively large runs of work upon sheets of a uniform size and character, the automatic sheet feeder 400 may be readily associated with the printing machine 100 to feed the sheets automatically to printing position. In the event that the automatic sheet feeder 400 has not been previously adjusted for operation upon the particular size of sheets which are to be fed, a part of these adjustments may be performed prior to the shifting of the automatic sheet feeder into an operative relationship with respect to the printing machine. Such adjustments may, of course, be performed after the automatic sheet feeder has been moved into its operative relationship shown in Figs. 1 and 2 of the drawings, and for the present purposes these adjusting operations will be described with reference to such a location of the automatic sheet feeder.

It will be observed that the automatic sheet feeder 400 may be wheeled along the floor on its castors 404 until it is directly in front of the printing machine 100, and the sheet feeder 400 is then moved rearwardly parallel to the end edges of the printing machine until the rear ones of the rollers 873 move into engagement with the forward ends of the mounting tracks 870. The diameter of the rollers 873 is such that a rearwardly exerted force will cause these rollers to ride slightly upwardly on to the upper surfaces of the tracks 870, and in continued rearward movement of the sheet feeder the forward ones of the rollers 873 are similarly moved onto tracks 870. The arrangement is such that when the rollers 873 are on the tracks 870 the sheet feeder is elevated slightly so that no weight rests upon the castors 404. Since the tracks 870 are parallel to the plane of the table top T of the printing machine, the entire automatic sheet feeder is by this arrangement positioned in a predetermined vertical relationship to the table top T.

The position of the automatic sheet feeder longitudinally of the tracks 870 may be determined and fixed by means of the latch devices 877 and the clamping screws 876 by which the position of the latch devices is fixed with relation to the tracks. In the initial adjustment of the automatic sheet feeder the latch devices 877 are merely placed in position so as to steady the sheet feeder and maintain the same stationary on the tracks 870, this procedure being followed merely because the final positioning of the sheet feeder along the tracks 870 is influenced by the adjustment and arrangement of the guideway 412. The supply hopper 410 is then adjusted, as to size and lateral position, in accordance with the size of the sheets which are to be fed, this adjustment being obtained by shifting of the side wall sections 590 and 590' to the proper relationship on the mounting bars of the pivoted frame 510. The side walls 590 and 590' are then secured in adjusted position by the set screws 595. The angle of slope of the supply hopper may then be adjusted by proper manipulation of the clamping screws 580.

The separating assembly which includes the separating roller 600 and the retard roller 601 may then be adjusted along the supporting shafts 630 and 610, the clamping screw 644 which acts upon the mounting rod 635 first being loosened to permit such positioning. The separating assembly is normally mounted substantially centrally of the discharge end of the supply hopper 410, and if relatively high sheets are to be fed, one or more of the auxiliary separating rollers 600' may be shifted along the shaft 630 so as to be effective upon the sheets in the supply hopper. The separator assembly is, of course, secured in the desired position by tightening of set screw 644. In accordance with the thickness of the sheets which are to be fed, the vertical positioning or engagement of the retard roller 601 with the separator roller 600 is adjusted by means of the knurled adjusting nut 663 which in effect shifts the retard roller 601 about its eccentric mounting axis 611. The thickness of the sheets which are to be fed also influences the setting of the guide fingers 612, and this adjustment is made through appropriate manipulation of the adjusting screw 616.

The guideway 412 is then adjusted and it will be evident that the arrangement of this guideway and the nature of the guide members 500 and 501 to be employed therein is influenced by the size and character of the sheets which are to be fed and by the desired location of the printing impressions upon such sheets. Where the sheets to be fed are in the form of envelopes as herein illustrated, the guideway 412 is formed by an angle guide 500 and a channel guide 501. These guides must, of course, be placed relatively close to each other, and since the printing impression must be made relatively close to the lower edge of the envelopes the channel guide 501 includes a receding section 501R. Where envelopes are to be fed, but a single feed belt 413 is arranged in the guideway 412, and this belt is disposed so as to overlie the lower flange of the angle guide 500. The belt is maintained and guided in this relationship by means of one of the guide members 525 which is adjustably secured in the appropriate position along the mounting bar 526. The other belts are in such an instance arranged outside of the guideway 412 through appropriate setting of their guide members 525.

The guides 500 and 501 are supported at

their left-hand ends on the mounting rod 502 and are held in position by set screws as shown in Fig. 4. At their other or right-hand ends the two guides 500 and 501 are mounted on the mounting rod 446. The hold-down means 414 is arranged in the angle guide 500 so as to overlie the belt 413 and this hold-down means or skid is mounted between the mounting rods 502 and 446, the left-hand end being supported on the rod 502 and the right-hand end being merely guided by means including the guide pin 514.

The receiving or collecting hopper 416 is readily removable from its operative position shown in Fig. 3 and is often so removed to conserve space during periods when the sheet feeder is not in use. The mounting plate 433 which carries the receiving hopper 416 is therefore placed in position and the side members 435 and the end member 439 are adjusted to conform with the size of the sheets which are to be fed. The guide bar 445 is, of course, placed in position to cause the sheets to move downwardly in the proper relation within the receiving hopper.

The machine is now in condition for adjustment of the safety devices and for testing of the adjustment of the separator mechanism. The drive motor 475 may, therefore, be connected by means of the cord 488' to the outlet plug socket 486 as shown in Fig. 1 of the drawings, and by means of the switch 491 the motor 475 may be started so as to drive the belts 413 and the lower advancing roller 575. The manual operating handle 672 may then be actuated in a left-hand direction to impart a separating rotative movement to the separating roller 600, and if the mechanism has been properly adjusted, the first one of the sheets which are arranged in a fanned relation within the supply hopper 410 will be withdrawn and fed toward the bite between the advancing rollers 575 and 605. When such withdrawing and feeding of the sheet takes place the advancing rollers are separated due to the action of the cam plate 760 upon the cam roller 763. After such withdrawing movement has ceased, the manual lever 672 is allowed to return to the right, thereby to allow the upper advancing roller 605 to move downwardly and clamp the leading portion of the sheet against the constantly rotating lower advancing roller 575. The advancing rollers 575 and 605 then act to complete the withdrawal of the sheet from the supply hopper 410 and to thereby feed the sheet into the throat of the guideway 412. In such further advancing movement the sheet is engaged between the hold-down device 414 and the moving upper run of the belt 413 so that the advancing movement of the sheet is continued by reason of the frictional action of the belt 413 on the sheet.

As an incident to the completion of the withdrawing movement of the sheet from the supply hopper 410, the advancing sheet must be withdrawn from its gripped relation between the retard roller 601 and the separating roller 600, and hence the advancing sheet imparts rotation to the separating roller 600, and in order to prevent undesired feeding of the next sheet, the brake means 651 is adjusted by means of the spring brake device 651—654 so as to exert a braking action upon the shaft 630, thereby to stop rotation of the separating roller 600 as soon as the withdrawal of the sheet from the supply hopper 410 has been completed.

When the sheet separating means has been operated and the advancing rollers 605 have been lowered, the detecting means provided by the detecting members 780 is lowered through the action of its cam means 786—787, and in the event that the separating means has failed to feed a sheet from the supply hopper, the detecting member is allowed to move through a detecting movement into the annular groove 783 in the lower advancing roller 575. In such detecting movement the detecting member 780 acts through the screw 795 to close the detecting switch 790, and upon closure of the detecting switch 790, the solenoid 143 of the auto-stop mechanism would be energized in the event that the printing machine were being operated under the control of the auto-stop mechanism.

The detecting member 800 is also adjusted, by means of the adjusting screw 812, so that a single sheet may be advanced between the detecting finger 800 and the lower feed roller 575 without actuating the detecting finger 800 about its pivot 801. The adjustment, however, is such that when two or more sheets are fed, the detecting finger 800 will be pivoted in such a manner as to close the detecting switch 790.

Having thus adjusted the elements of the hopper, the separating means, the advancing means, the detecting means, the guideway, and the receiving hopper, the machine may now be adjusted so as to interrupt the feeding or advancing movement of the sheet along the guideway 412 at such a point as to produce a printing impression at the proper position transversely of each sheet. This result is attained through adjustment of the sheet stop mechanism 415. Such adjustment is accomplished in an approximate manner through appropriate location of the rockshaft 821 and the associated ratchet and pawl mechanism. The rockshaft 821 is adjusted through shifting of the bearing bracket 825 along the mounting bar 827, and this adjustment is preserved through the set screw 829. The pawl mechanism must, of course, be appropriately adjusted along the slide bar 845, and this adjustment is preserved by the clamp screws 848.

Having thus adjusted the sheet stop mechanism in a preliminary way the final adjustment is obtained through loosening of the set screw 824 and adjusting the rod 820 longitudinally through the U-shaped mounting clip 823, after which the set screw 824 is tightened. By this adjustment the stop plate 822 is so located that when it is in its lowered or active position, it will be engaged by the leading edge of the advancing sheet so as to stop the sheet in the desired relationship to the printing position in the printing machine.

The location of the printing impression vertically, or from front to rear, of the sheet may then be verified, and through shifting of the sheet feeder longitudinally of the tracks 870, in other words from front to rear of the printing machine, this vertical location of the printing impression on the sheet may be accurately adjusted. The mounting blocks 875 of the latch devices 877 are then secured in their final positions along the rails 870 by means of the thumb screws 876, the latch devices 877, of course, being engaged with the adjacent rollers 873 and being held in such engaged relation by the locking screws 880. If desired, suitable index marks may be placed on the tracks 870 to indicate such adjusted positions of the blocks 875, and by this procedure the sheet feeder may readily be changed to another setting along the tracks 870, and yet may be quickly and easily returned to its original relationship.

The actuating mechanism through which the sheet separating means and the sheet stop means are operated in timed relation to the operation of the printing machine may then be operatively connected and adjusted. This is accomplished by threading the pivot member **721** of the connecting rod **705** into the eccentric bearing opening **718** in the driving disk **717**, the adjusting screw **706** being first loosened so as to permit the requisite longitudinal shifting movement of the connecting rod **705**. The set screw **706** may then be tightened, and the machine is then in condition for use. If the auto-stop mechanism is to be employed the conductor **798'** is connected to the outlet socket **797**.

After loading the magazine M with printing devices and loading the supply hopper **410** with properly fanned sheets, the operation of the machine may be started. The printing machine would, of course, be operated through the medium of the skip pedal **120** through the requisite number of idle feeding operations so as to advance the first printing device to such a position in the printing device guideway that it will be operative in the first printing operation. The manual operating handle **672** is also actuated through a single stroke so as to feed the first sheet to printing position. The motor **110** of the printing machine having been started by means of the switch control plunger **112** in order to perform the idle feeding operations with respect to the printing devices, the machine is now conditioned for automatic operation. This is accomplished through withdrawal of the auto-stop plunger **142** which starts the printing operation of the printing machine. As the platen mechanism P operates in the first printing cycle to produce a printing impression from the first printing device upon the sheet which has been separated through manual operation of the lever **672**, the clutch control link **730** is withdrawn in a right-hand direction as viewed in Fig. 12 so as to release the clutch **725** for operation through its one-revolution cycle. The connecting rod **705** is thereby actuated and through the associated linkage causes rocking movement of the rockshaft **671**. The rockshaft **671** acts in the first half of its rocking cycle to operatively engage the hook-like member **686** with the pin **688** carried on the lever **670**. As the lever **670** is withdrawn to the left the rack and pinion device **675—676** and the associated one-way drive or ratchet imparts a rotative separating movement to the separating roller **600**. At this same time the upper advancing roller **605** is elevated so that the sheet which is thus separated is fed into the bite between the upper and lower advancing rollers. The detecting finger **780** is also elevated so that the sheet may be fed into the space between the detecting finger **780** and the lower advancing roller **575**. In the last half of the rocking movement of the rockshaft **671**, the separating roller remains stationary due to the one-way drive connections between the pinion **676** and the shaft **630**. Near the end of such return movement of the rockshaft **671** the cam plate **760** permits lowering movement of the upper advancing rollers **605** and of the detecting finger **780**. In the event that a sheet has not been withdrawn from the supply hopper **410**, the detecting finger **780** causes the switch **790** to be closed, thereby to energize the auto-stop solenoid **143** and cause the printing machine to be stopped at the end of the cycle. Similar closing of the detecting switch **790** would, of course, take place somewhat earlier in the cycle of operation in the event that two sheets were withdrawn from the supply hopper **410** to thereby actuate the detecting finger **800**.

In the event that a single sheet has been fed from the supply hopper so that a leading portion thereof is located between the advancing rollers **575** and **605** at the time the upper rollers **605** are lowered, then this sheet is rapidly withdrawn and is fed into the throat of the guideway **412** so as to be advanced by the belt **413** until the leading edge of the sheet engages the sheet stop plate **822**. The advancing movement of the sheet into the guideway **412** is, of course, delayed until late in the return rocking movement of the rockshaft **671**, and just prior to the advancing of the new sheet into the guideway, the slide bar **845** acts in its return or right-hand movement to engage the pawl **850** with the ratchet **836**. This action imparts an indexing movement to the cam **834** to thereby momentarily elevate the stop finger and permit the sheet upon which a printing impression has just been formed to continue its advancing movement along the guideway to be thereby discharged into the collecting hopper **416**.

Such operation of the machine will continue automatically until the feeding of the last printing device from the magazine M is detected by the detecting finger **150**, or until improper operation of the sheet feeding mechanism is detected by the detecting fingers **780** or **800**. In the event that such improper operation is detected, the solenoid **143** of the autostop mechanism is energized so as to stop operation of the machine.

In the event that an operator wishes to slightly change the vertical location of the printing impression upon the sheets, this result may be readily obtained by manipulation of the set screws **876** of the latching devices **877** so as to permit shifting and proper re-setting of the sheet feeder rearwardly or forwardly as the case may be with relation to the printing machine. In making such an adjustment the set screw **706** will be loosened so as to permit proper movement of the connecting rod **705**, and the set screw **706** would again be tightened after the sheet feeder had been properly located.

When the sheet feeder has been adjusted for the feeding of sheets of a particular size and thickness and for the attainment of a particular location of the printing impressions upon such sheets, the sheet feeder may be readily removed from its operative relationship with respect to the printing machine without disrupting any of these adjustments, and the arrangement is such that an ordinary office worker may not only accomplish such removal of the sheet feeder but may also readily return the sheet feeder to the previously established relationship with respect to the printing machine. Through this arrangement the user is enabled to utilize the printing machine for manually performed work during intervals when the automatic sheet feeder is not required. In accomplishing such removal of the sheet feeder from its operative relationship with respect to the printing machine, the locking bolts **880** are unscrewed so as to permit lifting of the latches **877** to an elevated or disengaged relationship. The pivot pin **721** is then unscrewed from the driving disk **717**, and the two connecting cords **488'** and **798'** are withdrawn from the plug sockets. The automatic sheet feeder **400** may then be rolled forwardly along the tracks **870** until the weight of the sheet feeder is lowered upon the casters **404**, and the sheet feeder may then be rolled to an out of the way position

for storage until such time as it is again required.

It will be observed that in such removal of the sheet feeder from its operative relation to the printing machine, all of the adjustments which have been established are preserved so that the sheet feeder may be quickly and easily returned to such operative relationship by a relatively unskilled worker. Thus the sheet feeder may be rolled into place as hereinbefore described so as to engage the rollers 873 with the tracks 870. The rearward movement of the sheet feeder along the tracks 870 is continued until the latch members 877 may be engaged with the rear rollers 873. The latch members 877 are then secured in their effective positions by the locking screws 880. The pivot member 721 is then screwed into the eccentric bore in the driving disk 717, and the two connecting cords 488' and 798' are connected in the appropriate outlet sockets. Thus by a few relatively simple connecting operations the exact relationship between the sheet feeder and the printing machine is quickly and easily re-established.

The sheet feeder of the present invention is, of course, built in a basic model such as that shown in Figs. 1 to 19, but its construction and arrangement are such that the machine may be readily modified as illustrated in Figs. 20 and 21 to meet special conditions which arise in certain business establishments. For example, the sheet feeder shown in Fig. 20 has its rear rail 421 modified so that the sheet feeder may be positioned somewhat rearwardly of the most rearward position which could be obtained with the sheet feeder shown in Figs. 1 to 19 inclusive. This arrangement of the rear rail provides clearance space about the vertically extending portion of the printing frame 104 and the sensing means S and by this arrangement the printing impression may be made relatively close to the lower edge of a relatively high sheet.

The arrangement shown in Fig. 21 embodies a different construction in the rear rail of the feeder frame whereby relatively high sheets may be fed through the machine in such a manner as to enable the printing impressions to be made relatively close to the upper edge of such sheets.

The automatic sheet feeder of the present invention may also be readily modified from its basic form so as to adapt the sheet feeder for use in the production of multiple impression work. In this embodiment of the invention, as shown in Figs. 24 to 30 inclusive, a multiple stop mechanism is mounted on the forward rail 420 of the sheet feeder, and this multiple stop mechanism is actuated by the reciprocating slide bar 845. Proper timing of the separator roller 600 is attained through the use of a ratchet and cam assembly 901 which is actuated or indexed in each rocking movement of the rockshaft 671 and which acts automatically to disengage the hook-like member 686 in proper sequence so that a sheet is withdrawn from the supply hopper 410 only after the required number of printing impressions have been made upon the previously fed sheet. The multiple stop mechanism is actuated by a cam assembly, and this cam assembly is readily removable through release of the retaining members 927 so that a different cam assembly may be substituted when a different number of stop fingers is to be employed. The stop fingers 905 are adjustable along a mounting shaft 906 so that proper spacing of the successive printing impressions may be attained, and the cams 930 of the cam assembly are similarly adjustable along the cam shaft 925.

When a cam shaft bearing a different number of cams is substituted in the multiple stop mechanism, the cam shaft of the new assembly is connected in a predetermined angular relationship to the aligned driving shaft 942 by means of the coupling 943, and index means 980—981 are employed to properly position the cam assembly for the performance of the first printing operation.

The cam assembly 901 is also replaced so that the cam assembly conforms with the number of stop fingers being employed in the multiple stop mechanism, and the cam assembly 901 is initially adjusted so as to align the index means 985—986, thereby to correlate the operation of the separating means with the operation of the multiple sheet stop means.

Summary

From the foregoing description it will be evident that the present invention enables the usual operator of printing machines of this character to utilize an automatic sheet feeding means with such a printing machine in a highly efficient manner. In accordance with the present invention the automatic sheet feeding means may be quickly and easily removed from its operative association with the printing machine so as to enable the printing machine to be utilized for printing operations wherein the sheets are fed manually to printing position, and this end is accomplished in such a manner that the operator may readily return the automatic sheet feeding means to the previously established operative relationship through the performance of but a few readily accomplished connecting operations. Hence the same printing machine may be readily utilized for the performance of printing operations where the sheets are manually fed to printing position or for printing operations where the sheets are fed automatically to printing position, and it will be obvious that in many instances such an arrangement results in a marked economy since it renders it unnecessary to provide different printing machines for the manually fed and the automatically fed work.

It will be evident that the advantages set forth hereinabove are attained through the provision of an automatic sheet feeding means which is so constructed and arranged that the accurately made adjustments which are required to adapt the machine for the feeding of sheets of a particular size and shape are preserved when the automatic sheet feeder is removed from its operative relationship with respect to the printing machine. Because of this construction and arrangement of the present sheet feeder its usefulness is extended far beyond the usefulness attained in prior sheet feeders. Moreover, the present sheet feeder is such that it may be readily moved about an office so that it may be stored in a convenient, out of the way location, and the usual operator of the printing machine may readily move the sheet feeder about the office as required.

It will also be evident that the present invention enables an automatic sheet feeder to be constructed in a relatively basic or standard model and that this basic model may be readily modified to meet the most frequently encountered special conditions such as the location of the printing impression close to the top of the sheet or the feeding of large sheets in such a manner

as to permit the printing impression to be made near the top or the bottom of the sheet. The present invention has also provided an automatic sheet feeder which, when constructed in a basic model, may be readily modified to provide for multiple impression work. The arrangement is such that when the sheet feeder is thus modified the various timing mechanism for the sheet separator and the multiple stop mechanism may be readily correlated with respect to each other and with respect to the multiprint mechanism of the printing machine with which it is associated. The embodiment of the present invention for multiple impression work is such that the multiple stop mechanism and the control for the sheet separator means may be readily changed so as to adapt the sheet feeder for the performance of a different number of printing impressions upon each sheet thus fed.

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 apparatus, a printing machine having a table top with a printing position thereon to which a series of printing devices are fed one by one, impression means on said printing machine for making a printing impression from a printing device onto a sheet as the sheet and printing device are located at printing position, and an automatic sheet feeder adapted for removal and replacement as a unit with respect to said printing machine and having an open-top feeder frame adapted to extend across said table top and over said printing position, adjustable means carried on said feeder for separating sheets or the like and advancing the same one by one into an adjustable operating position over said printing position and for thereafter moving each sheet out of said operating position, and cooperating connecting means for mounting and positioning said feeder with respect to said printing machine and including cooperating parts mounted respectively on said feeder and said printing machine and releasably related to each other whereby said feeder may be operatively associated with the printing machine and adapted to be connected and disconnected to permit removal of the adjusted feeder as a unit for periods of manual sheet feeding intermediate periods of use of said automatic sheet feeder.

2. In a printing apparatus, a printing machine having an upstanding floor-mounted frame providing a table top with a printing position thereon into which a series of printing devices are fed one by one, impression means on said printing machine frame for making a printing impression from a printing device onto a sheet as the sheet and printing device are located at printing position, and an automatic sheet feeder having feeder frame comprising a bridge structure adapted to extend across said table top and over said printing position and having legs at the opposite ends of said bridge structure adapted to extend downwardly past opposite edges of said table top, adjustable means carried on said feeder frame for separating sheets or the like and advancing the same one by one along said bridge structure into an adjustable operating position over said printing position and for thereafter moving each sheet out of said operating position, and cooperating connecting means on said feeder frame and said printing machine whereby said feeder may be operatively associated with the printing machine and adapted to be readily connected and disconnected to permit removal of the adjusted feeder as a unit for periods of use of the printing machine with manual sheet feeding intermediate periods of use of said automatic sheet feeder.

3. In a printing apparatus, a printing machine having a table top with a printing position thereon to which a series of printing devices are fed one by one, impression means on said printing machine for making a printing impression from a printing device onto a sheet as the sheet and printing device are located at printing position, and an automatic sheet feeder having an open-top feeder frame adapted to extend across said table top and over said printing position, adjustable means carried on said feeder frame for separating sheets or the like and advancing the same one by one along a path across said table top and into an adjustable operating position over said printing position and for thereafter moving each sheet out of said operating position, and cooperating connecting means on said feeder frame and said printing machine whereby said feeder may be operatively associated with the printing machine any one several different relationships to said printing machine spaced laterally of said path, and said connecting means being adapted to be readily disconnected from and then reconnected in a selected one of said relationships to thereby permit temporary removal of the adjusted feeder as a unit from the printing machine for periods of manual sheet feeding intermediate periods of use of said automatic sheet feeder.

4. In printing apparatus, a printing machine of the type through which a series of printing devices are advanced one by one to a printing position, a portable open-top feeder frame adapted for removal and replacement as a unit with respect to the printing machine and having a plurality of means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of operating position on said feeder frame, and cooperating means including releasably related pairs of parts mounted respectively on said feeder frame and said printing machine and each pair of releasably related parts being arranged for cooperation in a particular relation whereby said feeder frame may be placed in or removed as a unit from a predetermined operative relationship with the printing machine.

5. In printing apparatus, a printing machine of the type through which a series of printing devices are advanced one by one to a printing position, a portable open-top feeder frame adapted for removal and replacement as a unit with respect to the printing machine and having a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of a variably adjustable operating position on said feeder frame, and cooperating means including releasably related pairs of parts mounted respectively on said feeder frame and said printing machine and each pair of releasably related parts being arranged for cooperation in a particular relation whereby said feeder frame may

be placed in or removed as a unit from a predetermined operative relationship with the printing machine, said operative relationship being such as to establish a predetermined desired relationship between the printing position of the printing machine and said adjusted operating position in which each sheet is stopped on said feeder frame.

6. In a printing apparatus, a printing machine of the type through which a series of printing devices are advanced one by one to a printing position, a portable open top feeder frame adapted for removal and replacement as a unit with respect to the printing machine and having a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of a variably adjustable operating position on said feeder frame, and cooperating means including releasably related pairs of parts mounted respectively on said feeder frame and said printing machine and each pair of releasably related parts being arranged for cooperation in a particular relation whereby said feeder frame may be placed in or removed as a unit from an operative relationship with the printing machine, said operative relationship being such as to establish a predetermined desired relationship between the printing position of the printing machine and said adjusted operating position in which each sheet is stopped on said feeder frame, and one of the parts of each pair of releasably related parts of said cooperating means being variantly settable to establish different operative relationship of the sheet with respect to printing position in a direction transversely of the path of feeding movement of the sheets.

7. In a printing apparatus, a printing machine of the type through which a series of printing devices are advanced one by one to printing position, a portable sheet feeder adapted for removal and replacement as a unit with respect to the printing machine and having an open-top feeder frame and a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of a variably adjustable operating position on said feeder frame in which operating position each sheet is operatively related to the printing position of the printing machine, cooperating means including releasably related pairs of parts mounted respectively on said feeder frame and said printing machine and each pair of releasably related parts being arranged for cooperation in a particular relation whereby said feeder frame may be placed in or removed as a unit from an operative relationship with the printing machine, one of said pairs of parts comprising a driving element on said printing machine and a connecting element between said driving element and one of said means on said feeder frame, and another of said pairs of parts comprising positioning elements on said feeder frame and said printing machine for establishing a fixed relation between the feeder and the printing machine, one of said elements in each pair being adjustable whereby to permit variation in the operative relationship of the feeder frame with respect to the printing machine.

8. In a printing apparatus, a printing machine of the type through which printing devices are advanced one by one to a printing position, a portable sheet feeder adapted for removal and replacement as a unit with respect to the printing machine and having an open-top feeder frame with a plurality of adjustable means on the feeder frame operable to separate and feed sheets of paper or the like one by one to a variably adjustable operating position on the feeder frame, in which operating position each sheet is located in an operative relationship to the printing position of the printing machine, driving mechanism for actuating certain of said means of the sheet feeder, said driving means being located on said printing machine and being operated in timed relation thereto, means for supporting said feeder frame in an adjustable operating relationship with respect to said printing machine, and means forming an adjustable actuating connection between said actuating means and certain of the means of said sheet feeder, the two last mentioned of said means each being so constructed and arranged as to be readily disconnectible while retaining previously established adjustments thereof to thereby facilitate removal of said portable sheet feeder from and its return to a predetermined operative relationship with respect to said printing machine.

9. In combination with a printing machine having a main frame providing a table top upon which a printing station is formed, a sheet feeder for feeding sheets of paper or the like to the printing station of the printing machine comprising a feeder frame adapted to span said table top across said printing station and beyond opposite edges of said table top, means at one end of said feeder frame for separating such sheets and feeding the same, one at a time toward said printing station, advancing means including belts carried by said feeder frame and extending from said separating means and across said printing position and operable frictionally upon each sheet to convey the same from said separator means to and beyond said printing position, stop means on said feeder frame for stopping each sheet or the like at printing position, collector means at the other end of said feeder frame to receive and collect the sheets as they are discharged from said belts, actuating means for said separator means and said stop means adapted to be detachably associated with an operative part of the printing machine exteriorly of the printing machine frame to cause operation thereof in timed relation to said printing machine, upwardly facing tracks along said printing machine frame adjacent to said opposite edges of said table top and parallel to said table top, means on said feeder frame adapted to rest on said tracks to support said feeder frame at a predetermined level over and in operative relation to said table top, and legs on said feeder frame adapted to extend downwardly past said edges of said table top and to support said feeder frame slightly below said predetermined level when said feeder frame is removed from said operative relation to the printing machine.

10. In combination with a printing machine having a main frame providing a table top upon which a printing station is formed, a sheet feeder for feeding sheets of paper or the like to the printing station of the printing machine comprising a feeder frame adapted to span said table top across said printing station and beyond opposite edges of said table top, said feeder frame being of an open top construction at least over said printing position, means at one end of said feeder frame for separating such sheets and feed-

ing the same, one at a time toward said printing station, advancing means including belts carried by said feeder frame and extending from said separating means and across said printing position and operable frictionally upon each sheet to convey the same from said separator means to and beyond said printing position, stop means on said feeder frame for stopping each sheet or the like at printing position, collector means at the other end of said feeder frame to receive and collect the sheets as they are discharged from said belts, actuating means for said separator means and said stop means adapted to be detachably associated to an operative part of the printing machine exteriorly of the printing machine frame to cause operation thereof in timed relation to said printing machine, upwardly facing mounting tracks along said printing machine frame adjacent to said opposite edges of said table top and parallel to said table top, means on said feeder frame adapted to rest on said tracks to support said feeder frame at a predetermined level over and in operative relation to said table top, legs on said feeder frame adapted to extend downwardly past said edges of said table top and to support said feeder frame slightly below said predetermined level when said feeder frame is removed from said operative relation to the printing machine, and means for detachably securing said feeder frame in a predetermined position along said mounting tracks.

11. In combination with a printing machine having a main frame providing a table top upon which a printing station is formed, a sheet feeder for feeding sheets of paper or the like to the printing station of the printing machine comprising a feeder frame adapted to span said table top across said printing station and beyond opposite edges of said table top, a pluraltiy means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of an operating position on said feeder frame in which operating position each such sheet is located in an operative relation to the printing station of the printing machine, upwardly facing tracks along said printing machine frame adjacent to said opposite edges of said table top and parallel to said table top, means on said feeder frame adapted to rest on said tracks to support said feeder frame at a predetermined level over and in operative relation to said table top, and legs on said feeder frame adapted to extend downwardly past said edges of said table top and to support said feeder frame slightly below said predetermined level when said feeder frame is removed from said operative relation to the printing machine.

12. In combination with a printing machine having a main frame providing a table top upon which a printing station is formed, a sheet feeder for feeding sheets of paper or the like to the printing station of the printing machine comprising a feeder frame adapted to span said table top across said printing station and beyond opposite edges of said table top, a plurality of means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of an operating position on said feeder frame in which operating position each such sheet is located in an operative relation to the printing station of the printing machine, upwardly facing mounting tracks along said printing machine frame adjacent to said opposite edges of said table top and parallel to said table top, means on said feeder frame adapted to rest on said tracks to support said feeder frame at a predetermined level over and in operative relation to said table top, legs on said feeder frame adapted to extend downwardly past said edges of said table top and to support said feeder frame slightly below said predetermined level when said feeder frame is removed from said operative relation to the printing machine, and means for detachably securing said feeder frame in a predetermined position along said mounting tracks.

13. In a printing apparatus the combination of a printing machine having an upstanding floor-mounted frame providing a table top with a printing position thereon to which a series of printing devices may be fed one by one, impression means on said printing machine frame for making printing impressions from printing devices as they come to rest at printing position, and an automatic sheet feeder having a feeder frame comprising an open-top bridge structure adapted to extend across said table top and over said printing position and having legs at the opposite ends of said bridge structure adapted to extend downwardly past opposite edges of said table top, adjustable means carried on said feeder frame for separating sheets or the like and advancing the same one by one along said bridge structure into an adjustable operating position over said printing position and for thereafter moving each sheet along said feeder frame out of said operating position, and cooperating means on the leg structures of said feeder frame and on the adjacent portions of said printing machine frame forming straight line guide means parallel to said table top operable to support said feeder frame on said printing machine frame with the leg structures of said feeder frame spaced from the floor and whereby said feeder frame may conveniently be shifted into or out of an operative relation with respect to said printing machine.

14. In a printing apparatus the combination of a printing machine having an upstanding floor mounted frame providing a table top with a printing position thereon to which a series of printing devices may be fed one by one, impression means on said printing machine frame for making printing impressions from printing devices as they come to rest at printing position, and an automatic sheet feeder having feeder frame comprising an open-top bridge structure adapted to extend across said table top and over said printing position and having legs at the opposite ends of said bridge structure adapted to extend downwardly past opposite edges of said table top, adjustable means carried on said feeder frame for separating sheets or the like and advancing the same one by one along said bridge structure into an operating position over said printing position and for thereafter moving each sheet out of said operating position, and cooperating means on the leg structures of said feeder frame and on the adjacent portions of said printing machine frame operable to support said feeder frame in a predetermined relationship on said printing machine frame.

15. In a printing apparatus the combination of a printing machine having an upstanding floor mounted frame providing a table top with a printing position thereon to which a series of printing devices may be fed one by one, impression means on said printing machine frame for making printing impressions from printing

devices as they come to rest at printing position, and an automatic sheet feeder having feeder frame comprising an open-top bridge structure adapted to extend across said table top and over said printing position and having legs at the opposite ends of said bridge structure adapted to extend downwardly past opposite edges of said table top, adjustable means carried on said feeder frame for separating sheets or the like and advancing the same one by one along said bridge structure into an operating position over said printing position and for thereafter moving each sheet out of said operating position, and cooperating means on said feeder frame and on the adjacent portions of said printing machine frame operable to support said feeder frame in a predetermined relationship on said printing machine frame.

16. In a printing apparatus the combination of a printing machine having an upstanding floor mounted frame providing a table top with a printing position thereon to which a series of printing devices may be fed one by one, impression means on said printing machine frame for making printing impressions from printing devices as they come to rest at printing position, and an automatic sheet feeder having feeder frame comprising a bridge structure adapted to extend across said table top and over said printing position and having legs at the opposite ends of said bridge structure adapted to extend downwardly past opposite edges of said table top, adjustable means carried on said feeder frame for separating sheets or the like and advancing the same one by one along said bridge structure into an operating position over said printing position and for thereafter moving each sheet out of said operating position, said leg structures having roller means thereon adapting said sheet feeder to be rolled along the floor, and cooperating means on said sheet feeder frame and said printing machine frame including rollers on one of the frames whereby said sheet feeder may be rolled into an operative relation to the printing machine with the sheet feeder supported by said cooperating means.

17. In combination with a printing machine having a main frame providing a table top upon which a printing station is formed, a sheet feeder for feeding sheets of paper or the like to the printing station of the printing machine comprising a feeder frame adapted to span said table top across said printing station, means on said feeder frame operable to support said feeder frame independently of said table top, means at one end of said feeder frame for separating such sheets and feeding the same one at a time toward said printing station, advancing means including belts carried by said feeder frame and extending from said separating means and past said printing position and operable frictionally upon each sheet to convey the same from said separator means to and beyond said printing position, stop means on said feeder frame for stopping each sheet or the like at printing position, collector means at the other end of said feeder frame to receive and collect the sheets as they are discharged from said belts, actuating means for said separator means and said stop means adapted to be detachably associated with an operative part of the printing machine exteriorly of the frame thereof, and means for detachably securing said feeder frame in an operative relation to said printing machine frame.

18. In combination with a printing machine having a main frame providing a table top upon which a printing station is formed, a sheet feeder for feeding sheets of paper or the like to the printing station of the printing machine comprising a feeder frame adapted to span said table top across said printing station, means on said feeder frame operable to support said feeder frame independently of said table top, means at one end of said feeder frame for separating such sheets and feeding the same one at a time toward said printing station, advancing means including belts carried by said feeder frame and extending from said separating means and past said printing position and operable frictionally upon each sheet to convey the same from said separator means to and beyond said printing station, stop means on said feeder frame for stopping each sheet or the like at printing position, collector means at the other end of said feeder frame to receive and collect the sheets as they are discharged from said belts, actuating mechanism for at least one of said means adapted to be detachably associated with an operative part of the printing machine exteriorly of the frame thereof, and means for detachably securing said feeder frame in an operative relation to said printing machine frame.

19. In combination with a printing machine having a main frame providing a table top upon which a printing station is formed, a sheet feeder for feeding a series of sheets of paper or the like to the printing station of the printing machine, said sheet feeder comprising a feeder frame adapted to span said table top across said printing station, means on said feeder frame operable to support said feeder frame over but independently of said table top, adjustable means at one end of said feeder frame for separating such sheets and feeding the same one at a time toward said printing station advancing means including guide means and belts carried by said feeder frame and extending along a feed path from said separating means and across said printing position, said guide means and said belts being adjustable on said feeder frame laterally of said feed path to provide for feeding of sheets of different sizes, said belts being operable frictionally upon each sheet to convey the same along said feed path from said separator means to and beyond said printing position, variantly settable stop means on said feeder frame for stopping each sheet or the like at printing position, collector means at the other end of said feeder frame to receive and collect the sheets as they are discharged from said belts, actuating means for said separator means and said stop means adapted to be detachably connected to an operative part of the printing machine exteriorly of the frame thereof, and means for detachably securing said feeder frame in an operative relation to said printing machine frame whereby said feeder frame may be mounted in or removed from an operative relation to said printing machine while maintaining the adjusted setting of the operative parts of said feeder.

20. In combination with a printing machine having a main frame providing a table top upon which a printing station is formed, a sheet feeder for feeding a series of sheets of paper or the like to the printing station of the printing machine, said sheet feeder comprising an open top feeder frame having spaced front and rear rails adapted to span said table top on opposite edges of said printing station, means on said feeder frame operable to support said feeder frame over but

independently of said table top, adjustable means at one end of said feeder frame for separating such sheets and feeding the same, one at a time toward said printing station, advancing means including guide means and belts carried by said feeder frame and extending along a feed path from said separating means and across said printing position, said guide means and said belts being adjustable laterally of said feed path in the open space between said front and rear rails to provide for feeding of sheets of different sizes and to feed such sheets in different relationships to said front and rear rails, said belts being operable frictionally upon each sheet to convey the same along said feed path from said separator means to and beyond said printing position, adjustable stop means on said feeder frame for stopping each sheet or the like in an adjustably determined relation with respect to printing position, collector means at the other end of said feeder frame to receive and collect the sheets as they are discharged from said belts, actuating means for said separator means and said stop means adapted to be detachably connected to an operative part of the printing machine exteriorly of the frame thereof, and means for detachably securing said feeder frame in an operative relation to said printing machine frame whereby said feeder frame may be mounted in or removed from an operative relation to said printing machine while maintaining the adjusted setting of the operative parts of said feeder.

21. In a printing apparatus, a printing machine comprising a frame providing a table top and having printing device feeding means including a main drive means whereby printing devices may be advanced one by one from a supply magazine to a printing position provided in said table top, impression means operable in each cycle of operation thereof to produce a printing impression from a printing device at printing position, a portable sheet feeder having a feeder frame and a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of a variably adjustable operating position on said feeder frame wherein each sheet is operatively related to said printing position of the printing machine, cooperating means on said feeder frame and said printing machine whereby said feeder frame may be place in or removed as a unit from an operative relationship with the printing machine, said cooperating means including a driving mechanism for said feeder located on said printing machine having a one-revolution clutch for connecting the same to said main drive means, a connecting element between said driving mechanism and one of said means on said feeder frame, and said cooperating means also including positioning elements on said feeder frame and said printing machine for establishing a fixed relation between the feeder and the printing machine, such elements being adjustable whereby to permit variation in the operative relationship of the feeder frame with respect to the printing machine, and a control means for said one revolution clutch connected in timed relation to said impression means to operatively connect said feeder to said main drive means each time said impression means is operated through a cycle.

22. An automatic sheet feeder for use with printing machines of the type having an upstanding floor mounted frame with a table top providing a printing position in such table top, said automatic sheet feeder having a floor mounted portable feeder frame having an open-top and adapted to be moved from a separated and inactive relation into an operative nested relation over the frame of such a printing machine, and adjustable means mounted on and carried at all times by said feeder frame for separating and advancing sheets one by one along the top of said feeder frame into and then out of an adjustably determined operating position wherein a printing operation may be performed on each such sheet by such a printing machine.

23. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable open-top feeder frame having adjustable sheet separator means, adjustable sheet advancing means, adjustable sheet guiding means, and adjustable sheet stop means, all mounted on said feeder frame, and releasable coupling devices carried on said frame whereby said feeder frame and the several adjustable means carried thereby may be secured in or released for removal from a predetermined operative relationship to such a printing machine independently of and without disruption of the adjusted relationship of said several means carried on said feeder frame.

24. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable open-top feeder frame having adjustable sheet separator means, adjustable sheet advancing means, adjustable sheet guiding means, and adjustable sheet stop means, all mounted on said feeder frame, and releasable coupling devices carried on said feeder frame whereby said feeder frame and the several adjustable means carried thereby may be placed in or removed from an adjustably determined operative relationship to such a printing machine independently of and without disruption of the adjusted relationship of said several means carried on said feeder frame.

25. In an automatic sheet feeder for seperating sheets or the like and feeding the same one by one to predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable open-top feeder frame having adjustable sheet separator means, adjustable sheet advancing means, adjustable sheet guiding means, and adjustable sheet stop means, all mounted on said feeder frame, releasable coupling devices whereby said feeder frame and the several adjustable means carried thereby may be placed in or removed from an adjustably determined operative relationship to such a printing machine independently of and without disruption of the adjusted relationship of said several means carried on said feeder frame, and leg structures on said feeder frame operable to support said feeder frame and all of said adjustable means carried thereby at substantially the proper height for operative association of the automatic sheet feeder with such a printing machine.

26. In an automatic sheet feeder for association with a printing machine of the type wherein

series of printing devices are fed one by one to a printing position provided on a table top of the printing machine, said automatic sheet feeder comprising a feeder frame having an open-top bridge structure adapted to extend at a predetermined height across the table top of such a printing machine and beyond the opposite edges of the table top and having leg structures at the opposite ends of said bridge structure adapted to extend downwardly past said edges toward the floor and adapted to rest on the floor to support said bridge structure at a height somewhat less than said predetermined height, means on said bridge structure for feeding a sheet to printing position thereon and for thereafter feeding such sheet away from printing position, disconnectible means for coordinating the operation of said feeding means with the operation of the printing machine, and disconnectible means on said feeder frame for cooperation with the frame of such a printing machine to support said bridge structure at said predetermined height and in its bridging, operative relation to the printing machine.

27. In an automatic sheet feeder for association with a printing machine of the type wherein series of printing devices are fed one by one to a printing position provided on a table top of the printing machine, said automatic sheet feeder comprising a feeder frame having an open-top bridge structure adapted to extend at a predetermined height across the table top of such a printing machine and beyond the opposite edges of the table top and having leg structures at the opposite ends of said bridge structure adapted to extend downwardly past said edges toward the floor and adapted to rest on the floor to support said bridge structure at a height somewhat less than said predetermined height, means on said bridge structure for feeding a sheet to printing position and for thereafter feeding such sheet away from printing position, disconnectible means on said feeder frame for cooperation with the frame of such a printing machine to support said bridge structure at said predetermined height and in its bridging, operative relation to the printing machine, disconnectible means for coordinating the operation of said feeding means with the operation of such a printing machine, said disconnectible means including a drive element for said feeding means and a connecting rod having disconnectible means at one end adapted for detachable operative connection with a driven element of a printing machine and having an adjustable connection at its other end with said drive element of said feeding means, whereby the length of said connecting rod may be adjusted in accordance with the relationship established between the feeder frame and such a printing machine and such adjustment may be preserved when the feeder is removed from its operative relation with respect to such printing machine.

28. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable open-top feeder frame having a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of a variably adjustable operating position on said feeder frame, wheeled leg structures at opposite ends of said feeder frame for supporting said feeder frame at substantially a predetermined working height, and other means on said leg structures whereby said feeder frame may be secured in or released for removal from an operative relationship with such a printing machine while maintaining the adjusted relationship of said adjustable means.

29. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable open-top feeder frame having a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of a variably adjustable operating position on said feeder frame, leg structures at opposite ends of said feeder frame for supporting said feeder frame at substantially a predetermined working height, and other means on said feeder frame whereby said feeder frame may be secured in or released for removal from an operative relationship with such a printing machine while maintaining the adjusted relationship of said adjustable means.

30. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable open-top feeder frame having a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of a variably adjustable operating position on said feeder frame, leg structures at opposite ends of said feeder frame for supporting said feeder frame at substantially a predetermined working height, said leg structures being so spaced and arranged as to be adapted to extend downwardly past opposite edges of a printing machine with which the sheet feeder is to be associated, and other means on said feeder frame whereby said feeder frame may be secured in or released for removal from an operative relationship with such a printing machine while maintaining the adjusted relationship of said adjustable means.

31. In an automatic sheet feeder for association with a printing machine of the type wherein series of printing devices are fed one by one to a printing position provided on a table top of such a printing machine, said automatic sheet feeder comprising a feeder frame having an open-top bridge structure adapted to extend across the table top of such a printing machine beyond the opposite edges of the table top and having leg structures at the opposite ends of said bridge structure adapted to extend downwardly past said edges toward the floor, means on said bridge structure for feeding a sheet to printing position and for thereafter feeding such sheet away from printing position, disconnectible means on said feeder frame for coordinating the operation of said feeding means with the operation of the printing machine, and disconnectible means on said feeder frame for securing said feeder frame in a predetermined relation to the printing machine.

32. In an automatic sheet feeder for association with a printing machine of the type wherein series of printing devices are fed one by one to a printing position provided on a table top of such a printing machine, said automatic sheet

feeder comprising a feeder frame having an open-top bridge structure adapted to extend across the table top of such a printing machine beyond the opposite edges of the table top, means on said bridge structure for feeding a sheet to printing position and for thereafter feeding such sheet away from printing position, disconnectible means on said feeder frame for coordinating the operation of said feeding means with the operation of the printing machine, and disconnectible means on said feeder frame for securing said feeder frame in a predetermined relation to the printing machine.

33. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable open-top feeder frame having a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of a variably adjustable operating position on said feeder frame, and means whereby said feeder frame may be placed in an operative relationship with such a printing machine to establish a selected desired relationship between the printing position of the printing machine and said adjusted operating position in which each sheet is stopped on said feeder frame.

34. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to predetermined relation to a printing position provided in the table top of a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable open-top feeder frame constructed and arranged to span the table top of such a printing machine and having a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one along said feeder frame parallel to the table top of such a printing machine into and then out of a variably adjustable operating position on said feeder frame, and means whereby said feeder frame may be placed in an operative relationship with such a printing machine to establish a selected desired relationship between the printing position of the printing machine and said adjusted operating position in which each sheet is stopped on said feeder frame.

35. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to predetermined relation to a printing position provided in the table top of a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable open-top feeder frame constructed and arranged to span the table top of such a printing machine and having a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one along said feeder frame parallel to the table top of such a printing machine into and then out of a variably adjustable operating position on said feeder frame, and means whereby said feeder frame may be placed in an operative relationship with such a printing machine to establish a selected desired relationship between the printing position of the printing machine and said adjusted operating position in which each sheet is stopped on said feeder frame, said last mentioned means being constructed and arranged for convenient reestablishment of a selected operative relationship after the sheet feeder has been temporarily removed from such relationship.

36. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable open-top feeder frame having a plurality of adjustable means on said feeder frame operable to separate and feed sheets of paper or the like one by one into and then out of a variably adjustable operating position on said feeder frame, and means carried by said feeder frame whereby said feeder frame may be placed in or removed from an operative relationship with such a printing machine while maintaining any adjusted relationship of said adjustable means.

37. A sheet feeding attachment for use with a bed-and-platen type printing machine and comprising, in combination, a pair of spaced vertical standards mounted on rollers or the like, an open-top and substantially flat horizontal framework interconnecting said standards and adapted to overlie the bed of said printing machine in a predetermined relation when said attachment is operatively positioned relative to said machine, said standards being spaced apart in an amount sufficient to embrace the sides of said machine when said attachment is so positioned, a sheet pack receptacle carried by one of said standards, a sheet separating and advancing unit supported by said one standard intermediate said receptacle and one end of said framework, means for operatively interconnecting said unit with said machine for intermittently driving said unit in timed relation with the actuation of the platen in said machine, means embodied in said framework and affording a guideway disposed in an intimate relation to the bed of the machine when the sheet feeding attachment is in said predetermined relation to the printing machine and through which guideway sheets may be passed into and then out of a predetermined printing station in association with said platen, said unit operating upon each actuation thereof to separate a sheet from the pack contained in said receptacle and to advance such sheet into one end of said guideway, a sheet feeding tape, rollers mounted on said standards, means for guiding said tape along said guideway and around said rollers, and in intimate relation with the bed of said machine, driving means for constantly rotating at least one of said rollers to thereby actuate said tape so that sheets advanced into said guideway by said unit may be fed along said guideway by said tape, means carried by said framework for maintaining each sheet in intimate frictional engagement with said tape as such sheet is advanced into and through said guideway, a stop finger mounted on said framework for arresting each sheet in printing position while an impression is made on such sheet by said platen, and means operatively connecting said stop finger with said intermittent drive means for controlling the action of said finger whereby sheets are successively disposed in printing position in timed relation with the operation of said platen.

38. In an automatic sheet feeder for separating sheets or the like and feeding the same one

by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said feeder frame and a receiving magazine at the other end of said feeder frame, means operatively associated with said supply magazine for separating and feeding sheets one at a time from said supply magazine, advancing means mounted on said feeder frame and operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, means for periodically actuating said separating and withdrawing means, a slide bar reciprocable along one of said rails, a sheet stop means adjustably supported on one of said rails, and ratchet means for operating said sheet stop means operatively connected to and actuated by said slide bar in its reciprocating movement.

39. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said feeder frame and a receiving magazine at the other end of said feeder frame, means operatively associated with said supply magazine for separating and feeding sheets one at a time from said supply magazine, advancing means mounted on said feeder frame and operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, means for periodically actuating said separating and withdrawing means, operating means mounted on and extending along one of said rails and operatively connected to said last mentioned means for actuation in timed relation thereto, a sheet stop means adjustably supported on one of said rails, and ratchet means for operating said sheet stop means operatively connected to and actuated by said last mentioned operating means.

40. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said feeder frame and a receiving magazine at the other end of said feeder frame, means for separating and feeding sheets one at a time from said supply magazine, advancing means mounted on said feeder frame and operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, a slide bar reciprocable along one of said rails, a sheet stop means adjustably supported on one of said rails, ratchet means for operating said sheet stop means operatively connected to and actuated by said slide bar in its reciprocating movement, and means for periodically actuating said separating and withdrawing means and for reciprocating said slide bar in predetermined timed relation to each other.

41. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said feeder frame and a receiving magazine at the other end of said feeder frame, means for separating and feeding sheets one at a time from said supply magazine, advancing means operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, means for periodically actuating said separating and withdrawing means, sheet stop means carried on one of said rails and embodying a rockshaft, a stop finger carried by said rockshaft, a rotatable cam operable in a step by step rotative movement to actuate said rockshaft to produce releasing movements of said stop finger, and ratchet means operable to produce such step by step operation of said cam.

42. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said feeder frame and a receiving magazine at the other end of said feeder frame, means for separating and feeding sheets one at a time from said supply magazine, advancing means operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, sheet stop means carried on one of said rails and embodying a rockshaft, a stop finger carried by said rockshaft, a rotatable cam mounted on said one of said rails and operable in a step by step rotative movement to actuate said rockshaft to produce releasing movements of said stop finger, ratchet means operable to produce such step by step operation of said cam, a slide bar mounted on and parallel to said one of said rails for movement through a reciprocating stroke, means operatively connecting said slide bar to said ratchet means to operate said ratchet means in such a reciprocating stroke of said slide bar, and means for periodically actuating said separating and withdrawing means and for reciprocating said slide bar in predetermined timed relation.

43. A portable automatic sheet feeder of the

character described adapted for association in a nested relation with a printing machine of the type having a printing machine frame and a table top thereon in which printing position is provided, said automatic sheet feeder comprising a pair of spaced leg structures and a bridging structure comprising spaced front and rear rails connected to and extending between and slightly beyond said leg structures at both ends thereof and affording an open top for the feeder frame, said bridging structure being adapted to extend across the table top of such a printing machine with the leg structures extending downwardly past opposite edges of such table top, front and rear bracing and mounting plates rigidly connected between each leg structure and the adjacent projecting ends of said rails, a supply magazine mounted between the mounting plates associated with one of said leg structures and having separating and withdrawing means associated therewith for feeding sheets one by one from said supply magazine, an adjustable guideway mounted on and extending between the mounting plates at opposite ends of said bridge structure to thereby extend from a point adjacent to said supply magazine to a point beyond the other one of said leg structures, endless belt means associated with said guideway for frictionally engaging and advancing sheets fed thereto by said separating means and including guiding and driving rollers mounted in said mounting plates, drive means mounted on said one leg structure adjacent to said supply magazine, sheet stop means mounted on said bridge structure and including a stop finger, operating means for said stop finger operable to actuate said stop finger to stop a sheet in said guideway in a predetermined position therealong, said operating means being operatively connected to said driving means to actuate said stop finger in each cycle of said driving means, and means connecting said driving means to said separating means for actuating the same in timed relation to the operation of said stop finger.

44. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said feeder frame and a receiving magazine at the other end of said feeder frame, means for separating and feeding sheets one at a time from said supply magazine, advancing means operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, means for periodically actuating said separating and withdrawing means, the plurality of sheet stop fingers mounted on one of said rails and adapted to be successively rendered effective, a cam assembly mounted on said one of said rails and operable when actuated to produce such successive effectiveness of a predetermined number of set stop fingers, and means supporting said cam assembly for removal and replacement as a unit when a different number of stop fingers is to be employed.

45. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said feeder frame and a receiving magazine at the other end of said feeder frame, means for separating and withdrawing sheets one at a time from said supply magazine, advancing means operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, means for periodically actuating said separating and withdrawing means, a mounting shaft carried on and extending along one of said rails, a plurality of rockable stop fingers mounted on said mounting shaft transversely thereof, a plurality of mounting brackets having transverse bearing slots disposed at right angles to said mounting shaft and into which a shaft may be transversely inserted, shiftable retaining means on said brackets for retaining such a shaft in said bearing slots, a cam assembly including a cam shaft adapted to be mounted in said bearing slots and carrying a plurality of cams for rocking said stop fingers, an actuating ratchet assembly also mounted on said selected rail and including a stationary mounting bracket and a driven stub shaft aligned with said bearing slots, releasable connecting means for connecting said stub shaft and said cam shaft in predetermined angular relationship, and cooperating index means on said stub shaft and said stationary mounting bracket and operable to indicate the operative relationship of said cam assembly and said stop fingers.

46. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said frame and a receiving magazine at the other end of said frame, means operable in each cycle of operation to separate and withdraw a single sheet from said supply magazine, advancing means operable to advance each sheet thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, means for periodically actuating said separating and withdrawing means, a mounting shaft extending along a selected one of said rails, a plurality of rockable stop fingers mounted on said mounting shaft transversely thereof, a plurality of mounting brackets having transverse bearing slots disposed at right angles to said mounting shaft and into which a shaft may be transversely inserted, shiftable retaining means on said brackets for retaining such a shaft in said bearing slots, a cam assembly in-

cluding a cam shaft adapted to be mounted in said bearing slots and carrying a plurality of cams for rocking said stop fingers, an actuating assembly also monuted on said selected rail and including a stationary mounting bracket and a driven stub shaft aligned with said bearing slots, releasable connecting means for connecting said stub shaft and said cam shaft in predetermined angular relationship, and cooperable index means on one of said aligned shafts and said stationary mounting bracket and operable to indicate the operative relationship of said cam assembly and said stop fingers.

47. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said frame and a receiving magazine at the other end of said frame, means for separating and feeding sheets one at a time from said supply magazine, advancing means operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, the plurality of sheet stop fingers adapted to be successively rendered effective, a cam assembly operable when actuated to produce such successive effectiveness of a predetermined number of set stop fingers, ratchet means for actuating said cam assembly, a drive element operable in each cycle to actuate said ratchet means, and means operable to actuate said separating and withdrawing means in selected cycles of said drive element.

48. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said frame and a receiving magazine at the other end of said frame, means for separating and feeding sheets one at a time from said supply magazine, advancing means operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, the plurality of sheet stop fingers adapted to be successively rendered effective, a cam assembly operable when actuated to produce such successive effectiveness of a predetermined number of set stop fingers, ratchet means for actuating said cam assembly, a drive element operable in each cycle to actuate said ratchet means, and means operable in predetermined sequence to render said drive element operable to actuate said separating and withdrawing means in certain of the cycles of operation of said drive element.

49. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said frame and a receiving magazine at the other end of said frame, means for separating and feeding sheets one at a time from said supply magazine, advancing means operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, the plurality of sheet stop fingers adapted to be successively rendered effective, a cam assembly operable when actuated to produce such successive effectiveness of a predetermined number of set stop fingers, ratchet means for actuating said cam assembly, a drive element operable in each cycle to actuate said ratchet means, a second ratchet and cam means operable in predetermined sequence to render said drive element operable to actuate said separating and withdrawing means in certain of the cycles of operation of said drive element, and cooperating index means associated with both of said ratchet means whereby an operator may establish a predetermined operating relationship therebetween.

50. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said frame and a receiving magazine at the other end of said frame, means for separating and feeding sheets one at a time from said supply magazine, advancing means operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, multiple sheet stop means mounted on one of said rails, actuating means including independently mountable sequencing cam devices for said multiple stop means and for said sheet separating and withdrawing means, and means for correlating the independent cam devices to accurately interrelate the sequencing operations thereof.

51. In an automatic sheet feeder for separating sheets or the like and feeding the same one by one to a predetermined relation to a printing position provided in a printing machine of the type through which a series of printing devices are advanced one by one to such printing position, a portable feeder frame adapted to be positioned across the top of such a printing machine, said feeder frame having a pair of spaced mounting rails parallel to the path along which the sheets are to be moved and affording an open top for the feeder frame, a supply magazine at one end of said frame and a receiving magazine at the other end of said frame, means for sep-

arating and feeding sheets one at a time from said supply magazine, advancing means operable to advance the sheets thus withdrawn from the supply magazine along said path to said predetermined relation with respect to printing position and thence to said receiving magazine, a plurality of independently actuatable sheet stop fingers, stop control means for rendering said stop fingers effective in sequence, control means for rendering said sheet separating and withdrawing means operative to feed a sheet each time a particular one of said stop fingers is effective, and mounting means for said control means whereby at least certain portions of such control means may be removed and replaced to thereby change the number of effective sheet stop fingers.

52. A portable automatic sheet feeder of the character described adapted for association in a nested relation with a printing machine of the type having a printing machine frame and a table top thereon in which printing position is provided, said automatic sheet feeder having a feeder frame comprising a pair of spaced leg structures and an open top bridging structure rigidly connected to and extending between said leg structures and adapted to extend across the table top of such a printing machine with the leg structures extending downwardly past opposite edges of such table top, a supply magazine mounted on one of said leg structures and having separating and withdrawing means associated therewith for feeding sheets one by one from said supply magazine, an adjustable guideway mounted on said bridge structure and extending from a point adjacent to said supply magazine to a point beyond the other one of said leg structures, means associated with said guideway for frictionally engaging and further advancing sheets fed thereto by said separating means, drive means mounted on said one leg structure adjacent to said supply magazine and including a rockable element, multiple sheet-stop means mounted on said bridge structure and having a plurality of stop fingers, operating means for said stop fingers operable to actuate said stop fingers in predetermined succession whereby to stop a sheet in said guideway in a plurality of successively advanced positions therealong, means operatively connected to said rockable member and operable in each cycle of operation of said member to actuate said operating means of said multiple stop means, a clutch element for connecting said rockable member to said separating means for actuating the same, and a cam and ratchet assembly mounted on said rockable member and advanced through an indexing movement each time said rockable member is actuated through a cycle, and follower means connected to said clutch and operated by said cam to engage and disengage said clutch in predetermined sequence in accordance with the number of stop fingers embodied in said multiple stop means.

53. In combination with a printing machine having a main frame providing a table top upon which a printing station is formed, a sheet feeder for feeding sheets of paper or the like to the printing station of the printing machine comprising an open-top feeder frame adapted to span said table top across said printing station and beyond opposite edges of said table top, means mounted on said feeder frame adjacent to one end thereof for separating such sheets and feeding the same, one at a time toward said printing station, advancing means including belts carried by said feeder frame and extending from said separating means and across said printing position and operable frictionally upon each sheet to convey the same from said separator means to and beyond said printing position, stop means on said feeder frame for stopping each sheet or the like at printing position, collector means at the other end of said feeder frame to receive and collect the sheets as they are discharged from said belts, actuating means for said separator means and said stop means adapted to be detachably associated with an operative part of the printing machine exteriorly of the printing machine frame to cause operation thereof in timed relation to said printing machine, upwardly facing tracks along said printing machine frame adjacent to said opposite edges of said table top and parallel to said table top, means on said feeder frame adapted to rest on said tracks to support said feeder frame at a predetermined level over and in operative relation to said table top, and legs on said feeder frame adapted to extend downwardly past said edges of said table top and to support said feeder frame when said feeder frame is removed from said operative relation to the printing machine.

54. In combination with a printing machine having a main frame providing a table top upon which a printing station is formed, a sheet feeder for feeding sheets of paper or the like to the printing station of the printing machine comprising an open-top feeder frame adapted to span said table top across said printing station and beyond opposite edges of said table top, means mounted on said feeder frame adjacent to one end thereof for separating such sheets and feeding the same, one at a time, toward said printing station, advancing means including belts carried by said feeder frame and extending from said separating means and across said printing position and operable frictionally upon each sheet to convey the same from said separator means to and beyond said printing position, stop means on said feeder frame for stopping each sheet or the like at printing position, collector means at the other end of said feeder frame to receive and collect the sheets as they are discharged from said belts, actuating means for said separator means and said stop means adapted to be detachably associated with an operative part of the printing machine exteriorly of the printing machine frame to cause operation thereof in timed relation to said printing machine, upwardly facing tracks along said printing machine frame adjacent to said opposite edges of said table top and parallel to said table top, and means on said feeder frame adapted to rest on said tracks to support said feeder frame at a predetermined level over and in operative relation to said table top.

55. In a printing apparatus the combination of a printing machine having an upstanding floor mounted frame providing a table top with a printing position thereon to which a series of printing devices may be fed one by one, impression means on said printing machine frame for making printing impressions from printing devices as they come to rest at printing position, and an automatic sheet feeder having feeder frame comprising an open-top bridge structure adapted to extend across said table top and over said printing position and having legs at the opposite ends of said bridge structure adapted to extend downwardly past opposite edges of said table top, adjustable means carried on said feeder

frame for separating sheets or the like and advancing the same one by one along said bridge structure into an operating position over said printing position and for thereafter moving each sheet out of said operating position, and cooperating means on said sheet feeder frame and said printing machine frame including rollers on one of the frames whereby said sheet feeder may be supported on and may be rolled relative to the printing machine to locate the sheet feeder in the desired operative relation with the sheet feeder supported by said cooperating means.

56. In a sheet feeder for feeding a series of sheets of paper or the like to a printing station afforded in the table top of a printing machine, an open top feeder frame having spaced front and rear rails adapted to span said table top on opposite edges of the printing station of such a printing machine, means on said feeder frame operable to support said feeder frame over but independently of the table top of such a printing machine, adjustable means at one end of said feeder frame for separating such sheets and feeding the same, one at a time, toward said printing station, advancing means including guide means and belts carried by said feeder frame and defining a feed path from said separating means and parallel to said rails to the other end of said feeder frame, said guide means and said belts being adjustable on said feeder frame laterally of said feed path in the open space between said front and rear rails to provide for feeding of sheets of different sizes and to feed such sheets in different relationships to said front and rear rails, said belts being operable frictionally upon each sheet to convey the same along said feed path from said separator means to the other end of said feeder frame, adjustable stop means on said feeder frame for stopping each sheet or the like in an adjustably determined relation with respect to the printing position of such a printing machine, collector means at the other end of said feeder frame to receive and collect the sheets as they are discharged from said belts, actuating means for said separator means and said stop means adapted to be detachably connected to an operative part of such a printing machine exteriorly of the frame thereof, and means for detachably securing said feeder frame in an operative relation to such a printing machine frame whereby said feeder frame may be mounted in or removed from an operative relation to said printing machine while maintaining the adjusted setting of the operative parts of said feeder.

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