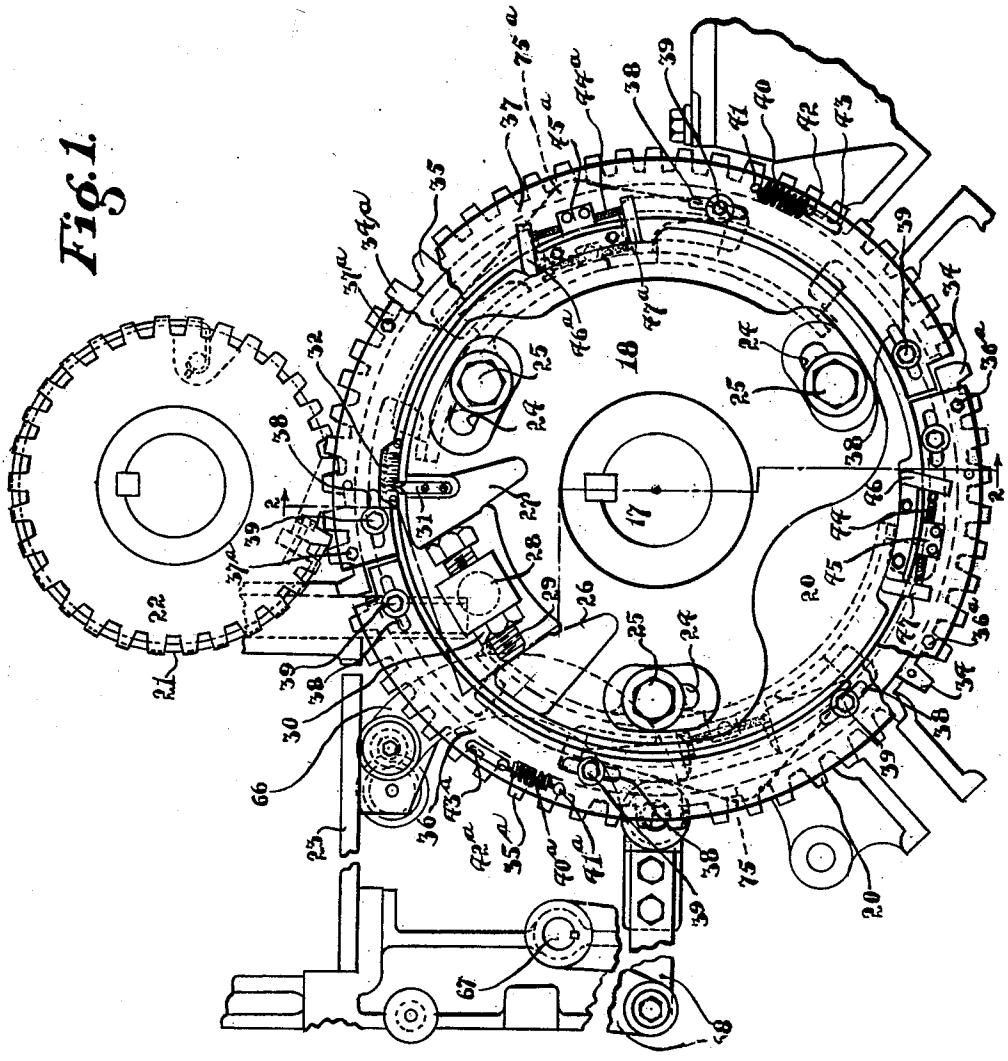
Jan. 5, 1932. P. AITCHISON 1,839,722

PRINTING MACHINE

Filed Jan. 19, 1929 4 Sheets-Sheet 1

Fig. 1.



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PRINTING MACHINE

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Fig. 3.

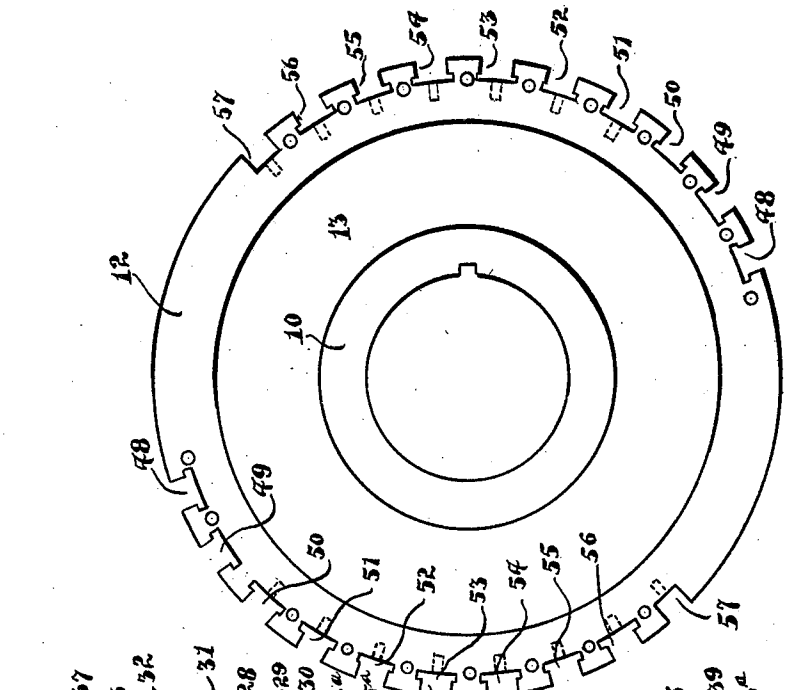
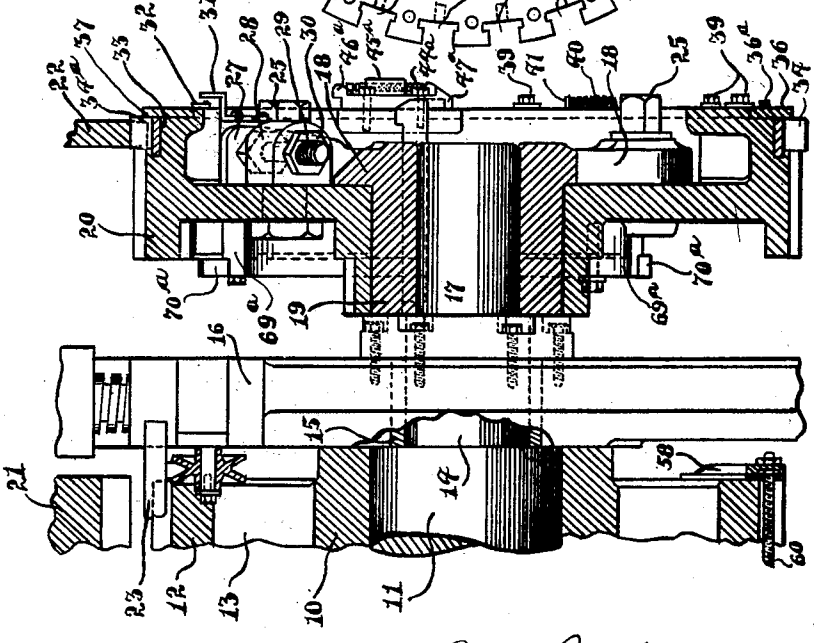


Fig. 2.



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PRINTING MACHINE

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Fig. 5.

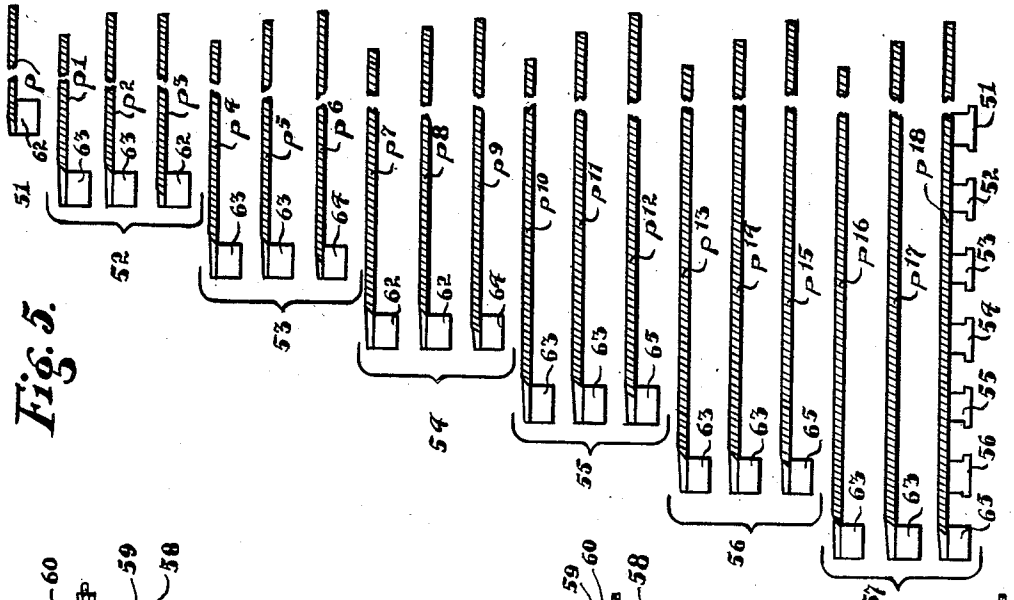
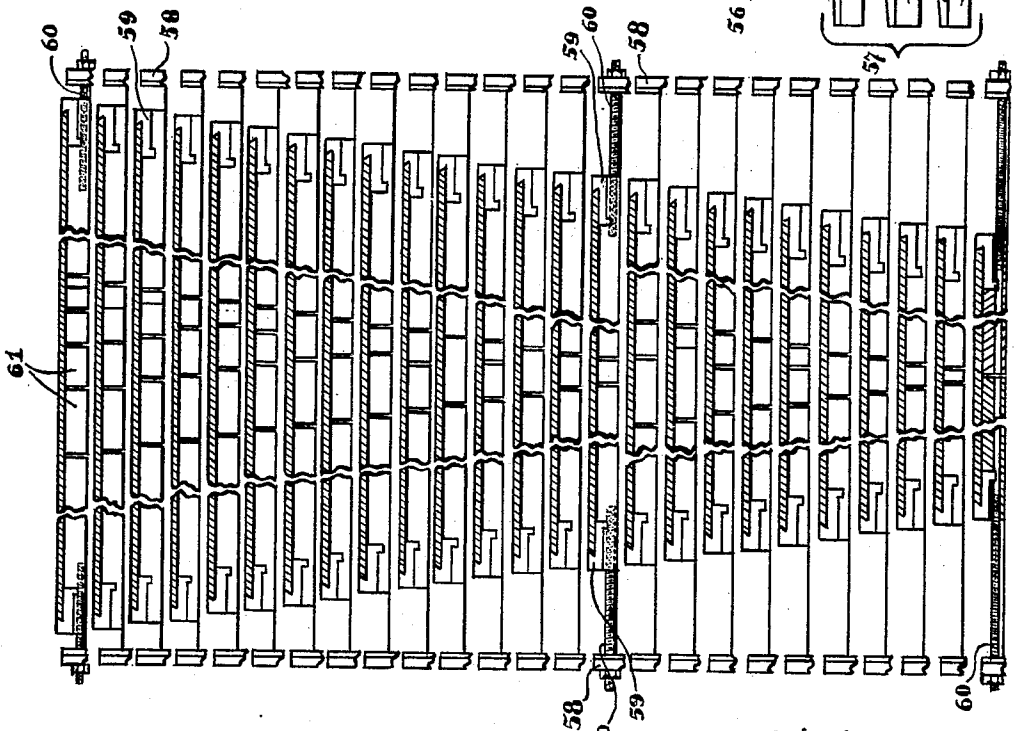


Fig. 4.



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Jan. 5, 1932. P. AITCHISON 1,839,722

PRINTING MACHINE

Filed Jan. 19, 1929 4 Sheets-Sheet 4

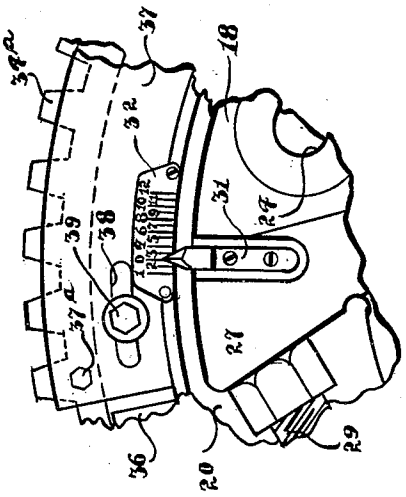


Fig. 7.

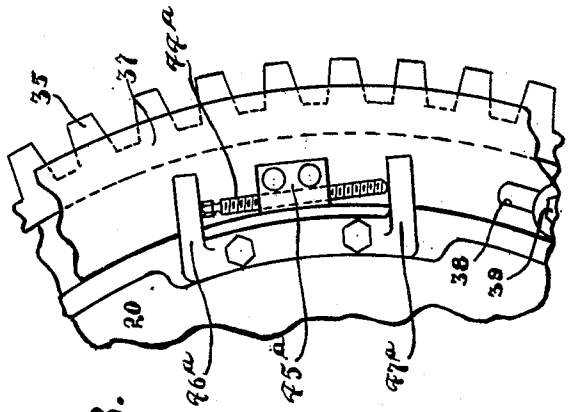


Fig. 8.

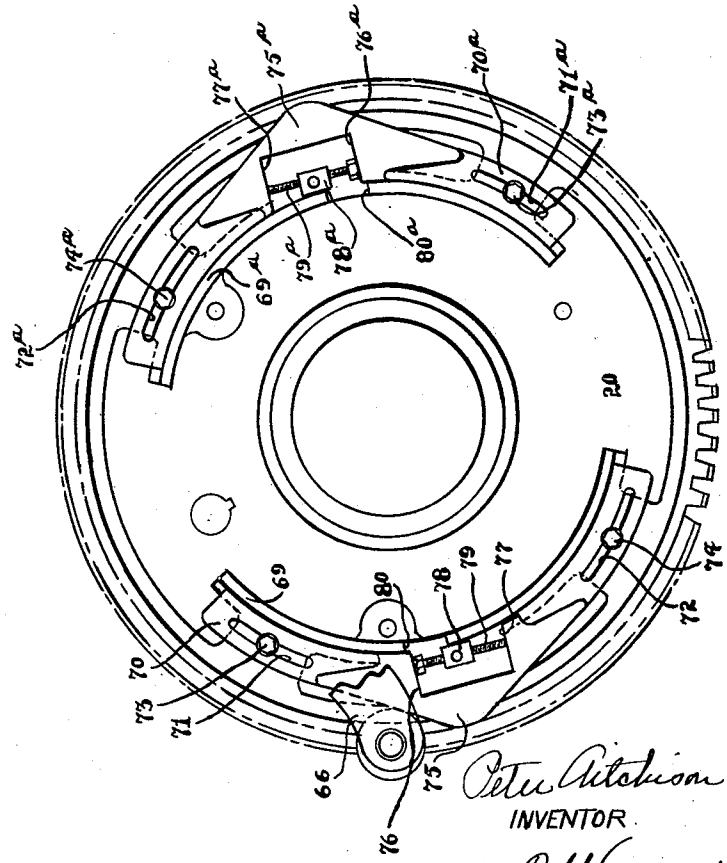


Fig. 6.

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Patented Jan. 5, 1932 1,839,722

UNITED STATES PATENT OFFICE

PETER AITCHISON, OF NEW ROCHELLE, NEW YORK, ASSIGNOR TO AMERICAN BANK NOTE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

PRINTING MACHINE

Application filed January 19, 1929. Serial No. 333,541.

My invention relates to printing machines, and more particularly in a construction and arrangement of the members of the printing couple of a rotary steel plate printing machine and of their associated parts, by which the makeready of the machine is facilitated, and accuracy in their operation is assured.

In rotary steel plate or undersurface printing machines of the general type to which my invention relates, the printing couple consists of a plate cylinder usually adapted to receive two or more plates and an impression cylinder or D-roll having an axially extending recess in which the mechanisms for mounting and adjusting the blanket are located. In such machines, the paper sheets, whether dry or dampened, are fed by a feed shelf, or other feeding mechanism, with the forward edge thereof in a position where, with the rotation of the plate cylinder and the impression cylinder or D-roll, it will be firmly gripped between the blanket of the latter and the engraved, intaglio or undersurface plate upon the former, and will be advanced through the machine as a result of the friction resulting from the high pressure developed at the meeting point of such cylinders.

In such machines, it has been the practice to mount the plate cylinder upon the shaft of the gear with which it was associated, and to adjust this cylinder about the shaft of such cylinder driving gear. This construction either resulted in the presence of a large bearing area between the cylinder and the shaft having a fairly free running fit, or, if it were desired to cut down such bearing area, large spaces between the shaft and the cylinder, both of which conditions resulted in a certain amount of undesirable spring or yielding of the cylinder during the making of an impression.

In such presses, the proper locating of plates upon the plate cylinder was dependent entirely upon the skill of the pressman, no means being provided to ensure accuracy and expedition in such work.

It was the common practice, in such machines, to use either an oscillatory impression cylinder or D-roll or an intermittently actuated rotatable impression cylinder or D-roll, and to provide mechanisms by which a starting impulse was imparted thereto at certain periods of each cycle of operations of the machine. It also was customary to adapt the makeready to certain inflexible conditions in the machine, both as to the actuation of the members of the printing couple and of the associated feeding mechanisms controlled thereby.

In a machine embodying my invention, the plate cylinder is so constructed and so associated with its driving gear as to not only permit the desired rigidity throughout the length of the cylinder, but to permit it to be quickly and accurately adjusted in relation to the gear as required by the particular size or length of the plate or plates to be used during a run of the machine. This adjustment of the plate cylinder is not accompanied by any change in the relation of its driving gear and the gear of the impression cylinder or D-roll, separate means being provided by which the position of the impression cylinder or D-roll may be adjusted in relation to the plate cylinder when required.

To ensure the desired accuracy in the locating of plates of different sizes upon the plate cylinder, this cylinder is not only so constructed as to permit the back cleat to be located in different, accurate, predetermined positions, but the cylinder and its driving gear are provided with gauge devices by which the cylinder may be accurately adjusted in relation to the gear to accord with the setting and the form of the cleat used.

The adjusting mechanism itself is so constructed as to not only permit ease and accuracy in the adjustment of the cylinder, but to be readily accessible so as to expedite the adjustment and avoid possibility of loss of the adjustment as a result of vibrations during the operation of the machine.

This mechanism is used because the timing of the delivery of the sheet is determined by the location of the forward edge of the plate, while the adjustment of the cylinder is determined by the location of the cleat used in locating the plate. It has been found impracticable to so locate the different cleats

as to secure uniformity in the location of the forward edges of different plates, or to secure an adequate range of adjustment of the cylinder to adapt the pres sto the various sizes of plates used thereon, unless the back cleat be differently located with plates of different sizes.

A printing machine embodying the invention is also so constructed as to permit continuous rotation of the impression cylinder with the plate cylinder by a geared connection between the cylinders, thus dispensing with the use of interrupted gears and a separate starting mechanism for the impression cylinder or D-roll. The geared connection between these cylinders is so constructed and arranged as to ensure a positive drive of the impression cylinder or D-roll during that interval while it is disengaged from a plate upon the plate cylinder, while permitting a compensating or equalizing action during the making of an impression so as to permit substantially a full friction drive of the impression cylinder or D-roll during the making of an impression. This is to compensate for possible variation in the angular speed of the impression cylinder or D-roll, due to slight variations in the height of different portions of the surface of the plate, or in the thickness of the makeready of the impression cylinder or D-roll.

The gear enmeshed with the continuous gear upon the impression cylinder or D-roll is so constructed as to be adjustable circumferentially in order to permit adjustment of the impression cylinder or D-roll to ensure a proper timing of its engagement with a plate upon the plate cylinder, to take up wear and to compensate for slight variance in the lengths of different plates when two or more are used upon the plate cylinder.

Throughout, the construction of a machine embodying the invention is such as to permit the members of the printing couple, and the mechanisms incidental to the making of the imprint associated therewith, to be quickly and accurately adjusted to accord with the size of the plate or plates to be used during a run of the machine. These mechanisms are so constructed and arranged that the impression cylinder or D-roll has continuous unidirectional rotation, and may have such slight variations in its angular speed as are frequently required during the making of an impression. Furthermore, the machine is so constructed as to permit an independent adjustment of the plate cylinder and of the impression cylinder or D-roll without interfering with the working conditions of the machine, so far as the other adjustments are concerned.

The great rigidity secured throughout the entire length of the plate cylinder, by avoiding bearing areas therefor between the side frames of the machine, and by mounting the driving gear upon one of the arbors of the plate cylinder, is of great importance so far as the quality of the work done upon the machine is concerned.

The invention consists in the novel features of construction and combination of parts hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings,

Fig. 1 is a side elevation of the printing couple of a machine embodying the invention, showing the portions of the feed shelf mechanism actuated thereby;

Fig. 2 is a section on the line 2—2 of Fig. 1, omitting all parts excepting those incidental to the adjustment of the plate cylinder, of the impression cylinder or D-roll and the feed shelf actuating cam;

Fig. 3 is an end view of the plate cylinder showing the arrangement of slots for a two-plate machine;

Fig. 4 is a schematic view showing the side dog and slot filler arrangement with plates of different widths;

Fig. 5 is a schematic view showing the back cleat construction and adjustment with plates of different lengths;

Fig. 6 is a detail view of the feed shelf actuating cam construction;

Fig. 7 is an enlarged detail view of the gauge plate and gauge finger; and

Fig. 8 is an enlarged detail view of the starting rack adjusting mechanism.

Like numerals refer to like parts throughout the several views.

In the embodiment of the invention shown in the drawings, the plate cylinder having a hub 10 is carried by a heavy rigid shaft 11, being firmly secured thereto in any desired manner so as to be rotatable therewith. The cylinder proper has a heavy rim 12, suitably reinforced by webs 13 between same and the hub 10, a construction affording great rigidity throughout the entire cylinder. The shaft 11 is provided with a reduced arbor shown at 14, mounted in a bearing bushing 15 in the side frame 16 of the machine. This construction is shown more particularly in Fig. 2 of the drawings.

Beyond the bushing 15, the end of the arbor 14 is further reduced at 17 and has keyed, or otherwise secured thereto, an end plate 18 through which power is applied to rotate the plate cylinder, and by means of which said plate cylinder may be circumferentially adjusted in a manner to be more fully referred to hereinafter.

Mounted upon a hub 19 of the plate 18 is a gear wheel 20 through which power is applied to the plate cylinder and to the cooperating impression cylinder or D-roll 21, this gear 20 normally rotating with the plate cylinder and with the plate 18.

The impression cylinder 21 is of the usual

and well known construction, a gear wheel 22 being secured to the arbor of said cylinder, said gear wheel being relatively narrower than the gear wheel 20 and receiving its power therefrom through a differentially operative gear structure permitting continuous rotation of the impression cylinder or D-roll 21, either through positive application of power thereto from the main gear 20, or by friction alone, as required by the operative relation of the impression cylinder or D-roll and of the plate upon the plate cylinder. The particular construction for securing this result will be more fully described hereinafter.

Co-operating with the members of the printing couple, the plate cylinder and the impression cylinder 21 is a feed shelf, a fragmentary portion of which is shown at 23 in Fig. 2.

In the further consideration of the case, that construction permitting circumferential adjustment of the plate cylinder in relation to its driving gear 20, and to the impression cylinder or D-roll 21, will first be considered.

The particular mechanism for transmitting power from the gear 20 through the gear 22 to the impression cylinder or D-roll 21, while permitting, when occasion demands, the friction drive of the impression cylinder or D-roll independently of this gearing, and the adjustment of the impression cylinder or D-roll gear in relation to its driving gear, will next be described.

This will be followed by a description of the means employed for mounting plates of different sizes upon the plate cylinder so as to bring the forward edge of a plate, irrespective of its size, into a predetermined position, for establishing a basis determining the extent of actuation of the adjusting mechanism operative upon the plate cylinder.

Finally, the mechanism by which the actuations of the feed shelf may be accurately timed with the engaging relation of a plate upon the plate cylinder and the impression cylinder or D-roll, will be described.

It is to be noted that, whenever, during the makeready of a press or printing machine, the plate to be used is of a size differing from that for which the various mechanisms of the machine are set, it may be necessary to adjust the plate cylinder to establish a proper relation between such plate and the impression cylinder or D-roll, the latter ordinarily requiring no adjustment.

Any adjustment of the impression cylinder or D-roll may necessitate a corresponding adjustment in the mechanism controlling the actuations of the feed shelf. Furthermore, it will be noted that any adjustments required in the plate cylinder are determined by the position of the forward edge of the plate mounted upon such cylinder. All of these adjustments are particularly desirable in a machine for producing work requiring accurate register upon succeeding impressions upon the same sheet by different plates, commonly known as multicolor work.

The end plate 18 is carried by and rotatable with the shaft 11 of the plate cylinder, being keyed or otherwise rigidly secured thereto, so as to avoid any possible lost motion between these parts. Said plate 18 is provided with a plurality of segmental slots 24 through which bolts 25 pass, these bolts, when tightened, being utilized to connect said end plate with the plate cylinder gear 20, and, when loosened, to permit adjustment of said cylinder about the axis of said gear and lock the gear 20 and the end plate 18 in a fixed position following the adjustment of the plate cylinder. Such bolts are not used, in any way, to impart any movement to the plate cylinder.

Projecting from one face of the end plate 19 are spaced lugs 26 and 27, positioned adjacent the rim of the gear wheel 20, so as to permit a close, small adjustment of the plate cylinder.

Carried by the gear wheel 20 is a stud 28 located between the lugs 26 and 27 and passing through an opening in the plate 18. This stud has a screw threaded opening extending therethrough in which is mounted a heavy adjusting bolt 29 between the lugs 26 and 27, and constantly engaging same respectively. Upon this adjusting bolt is a lock nut 30. It is obvious that since the gear 20 is held against movement by the gear train connecting it with the source of power, the actuation of the adjusting bolt 29 will have the effect of turning the plate cylinder in relation to the gear 20 in a direction determined by the direction in which said bolt is turned, and that at all times said bolt forms an effective coupling between the gear 20 and the end plate 18 carried by and rotatable with the plate cylinder. Since no fine adjustment of the plate cylinder is required, a heavy low-pitched screw bolt may be used.

By this construction, under normal conditions, the gear 20, shaft 11 and the plate cylinder carried by said shaft form a rigid unitary structure, none of the parts of which are subject to wear in relation to the other, and in which no clearance for lubrication or freedom of motion is necessary. During the operation of a machine, the only point where wear can occur is between the arbor 14 and the bearing bushing 15, and of course upon the teeth of the gear 20.

Carried by one of the abutments upon the plate 18, such as 27, is a gauge finger 31, co-operating with a graduated gauge plate 32, the graduations upon which indicate a required setting of the plate cylinder with regard to the size of the plate and its position upon said cylinder. The gauge plate 32 is carried by one edge of the rim of the gear 20.

While the impression cylinder or D-roll 21

receives its power through the gear 20, the construction of said gear 20 is such as to ensure the positive application of power to the gear 22 during only a portion or portions of each revolution of said gear 20, the remaining portion or portions of the revolution being either a positive application of such power, or else a friction drive of the impression cylinder or D-roll independently of the gear 20, as a result of a variable pressure relation between the blanket on the impression cylinder or D-roll and the plate upon the plate cylinder.

In addition to the above conditions the construction of the gear 20 is such as to permit of the adjustment of the gear 22 in relation to the gear 20 and the impression cylinder 21 in relation to the plate cylinder, in order to accurately time the engagement of the blanket upon the impression cylinder or D-roll with a plate, upon the plate cylinder, or with each such plate when a plurality of plates are carried by said cylinder.

In rotary steel plate engraving machines, the usual practice is to mount a plurality of plates upon the plate cylinder, the diameter of the impression cylinder or D-roll to the plate cylinder being in a ratio determined by the number of plates upon the latter. Since the timing of the operation of the impression cylinder or D-roll is with relation to the position of the plate upon the plate cylinder the construction of the gear 20, so far as the transmission of power therethrough to the gear 22 is concerned, is such as to permit, when necessary, a change in the timing of the actuation of the impression cylinder or D-roll during different portions of each revolution of the plate cylinder.

For example, in the form of the invention illustrated, the impression cylinder or D-roll has two revolutions to one revolution of the plate cylinder, and the construction is such that the timing of the initiation of one revolution of the impression cylinder or D-roll may be slightly different from the other revolution thereof, during each revolution of the plate cylinder.

In order to permit of the above adjustments and operation in the actuation of the impression cylinder or D-roll, I provide one edge of the rim of the gear wheel 20 with an undercut groove 33 extending entirely about the gear. Within this groove is mounted two transmission segmental rack structures, each extending, in the form of the invention shown, throughout substantially 180° of the gear 20.

Since each of these rack structures is identical with the other, but one of them will be described in detail, the parts of the other being indicated merely by reference numbers.

This rack structure includes a short segment 34, so positioned as to be enmeshed with the teeth of the gear 22 adjacent the cutout portion of the impression cylinder or D-roll 21. For convenience of expression, this segment 34 will be called the starting segment, since its function is to positively apply power from the gear 20 to the gear 22 during that interval when no impression is being made, and ensure a proper timing of the engaging relation between the blanket upon the cylinder 21 and a plate upon the plate cylinder.

Also seated within the channel 33 is a long segmental rack 35, which for convenience of expression, will be termed a floating rack, since the function of this rack is to permit variation in the angular speed of the gear 22 from that of the gear 20, so as to permit a friction drive of the impression cylinder at any time during the making of an impression, while ensuring a proper re-engagement of the gear 22 with a succeeding starting segment. The other starting segment corresponding with 34 is shown at 34^a, while the other floating segment corresponding with 35 is shown at 35^a. The various segments 34, 34*a*, 35 and 35*a* are held in position within the channel 33 by means of edge plates 36 and 37, each of which has a plurality of slots 38 therein through which clamp bolts 39 respectively pass, and engage the rim of the gear 20, to normally firmly secure said edge plate to said gear, while permitting adjustment of said plates circumferentially thereof for the purpose of changing the setting of the starting segments 34 and 34*a*.

The plate 36 is bolted to the starting segment or rack 34 by means of the bolts 36*a*, while the plate 37 is similarly secured to the starting rack 34*a* by the bolts 37*a*, so that any movement of the plate 36 or 37 circumferentially of the gear 20 will result in a similar movement of the starting segments or racks 34 or 34*a* and of the floating rack segments 35—35*a* respectively.

The floating rack 35 is connected with the plate 37 by a spring 40, one end of which is connected with a stud 41 carried by said plate 37, and the other end of which is connected with a stud 42 carried by said segment 35 and passing through a segmental opening 43 in the plate 37.

The plate 36 is connected with the floating segment 35*a* by a spring 40*a* co-operating with the studs 41*a* carried by the plate 36, and 42*a* carried by the segment 35*a*, the latter moving in a slot 43*a*. It will be noted that the springs 40—40*a* are so mounted that the floating segment has a normal tendency to have movement while engaged with the gear 22 in a direction counter to the movement of that gear, and that movement of said segment by said gear is always against the tension of said spring.

The adjustment of the starting segment 34 is secured by means of an adjusting screw 44, mounted in a screw threaded block 45 carried by the plate 36, the opposite ends of

this screw engaging spaced abutments 46 and 47 carried by the gear 20. A similar screw 44*a* mounted in a block 45*a* and acting between abutments 46*a* and 47*a* is operative upon the starting segment 34*a*.

It will be noted that the plate 36 has its opposite ends spaced slightly away from the adjacent ends of the plate 37, and that the ends of the starting segments 34—34*a* are respectively spaced away from the ends of the adjacent floating segments 35—35*a*, which construction permits an adjustment of either starting segment independently of the other.

While the above described floating segment structure is for the purpose of permitting the impression cylinder or D-roll 21 to have movement at a slghtly greater angular speed than that of the gear 20 to compensate for surface irregularities in a plate, or slight variation in the makeready, the adjustment of the starting segments is for the purpose of ensuring a properly timed initial engagement of the impression cylinder with a plate upon the plate cylinder, and to take up wear on the teeth of said segments and the gear 22. Ordinarily, where two plates are used upon the plate cylinder, each plate will bear the same design and be of the same size. There may, however, be slight variation in the setting of these plates.

There is a wide range in the size of plates which may be used upon printing machines of the character herein referred to, the range selected for purposes of illustration being 18 inches. Since the adjustment of the plate cylinder permitted by the construction above described is limited to only a few inches at the most, such adjustment is used merely to compensate for unavoidable variation in the position of the forward edge of each plate, an approximate accurate location of which forward edge is secured by the means used for securing a plate upon the plate cylinder, or in the locating of the back cleat in different positions upon the cylinder, and the construction of the side dogs.

In Figs. 4 and 5, I have shown comparative diagrammatic showings of the side dogs as used with different widths of plate, and differently constructed and arranged back cleats as used with different lengths of plate. The former is laterally condensed and the latter is circumferentially condensed.

The rim 12 of the plate cylinder is provided with a series of slots 48, 49, 50, 51, 52, 53, 54, 55, 56 and 57. These slots extend from end to end of the cylinder, and are equally spaced circumferentially about same. One set of slots is provided for each plate to be carried by the cylinder. The slot 57 is used solely to retain a back cleat. Slots 51 to 56 may be used either to retain a back cleat or to retain side dogs, according to the length of plate used. The remaining slots are used only for side dogs.

In Fig. 4, throughout the various conditions therein illustrated, but a single slot is shown. In Fig. 5, however, slots 51—57 are shown. In this view, the forward edge of the plate and its position, according to the setting of the plate upon the cylinder, is shown at the right. While nineteen different sizes of plates are shown in this view, there are only thirteen different positions of the forward edge of these plates, since this forward edge will occupy the same position with some plates of different sizes. The total range of variation in the position of the forward edge of the different plates will be about two inches. It is this two inches which the adjustment in the plate cylinder is required to correct. With the arrangement shown, thirteen definite adjustments are required in the plate cylinder, and these are indicated on the gauge plate 32.

Notwithstanding this narrow range of adjustment with a wide range of plate sizes, but seven different positions of the back cleats are required, and but four different constructions of back cleats.

In steel plate engraving machines it is essential that a rigid backing be afforded throughout the entire area of the plate, and this backing is afforded with the construction herein described, notwithstanding that the slots extend throughout the entire length of the cylinder. The detailed construction for securing the results above referred to is as follows:—

Removably secured to each cylinder end is a ring 58 closing the ends of all of the slots 48 to 57 inclusive. This ring is provided with openings registering with the various slots respectively. The short dog carriers 59 are slidably mounted in the several slots, and carried by each ring 58 and acting upon each dog carrier is a lead screw 60 by which the dog may be moved into or out of engagement with the side edge of a plate. The space in the slots between the dogs upon opposite ends of the cylinder is occupied by removable filler blocks 61, the upper face of which is curved to conform to, and is positioned flush with, the plane of the cylinder. The length and number of such filler blocks may be varied to accord with the width of the plate. This construction, illustrated in Fig. 4, with plates of varying sizes, results in a continuous supporting surface for the plate upon the plate cylinder, irrespective of the width or length of the plate, and is necessary because in some instances the back cleat, with plates of different sizes, will be mounted in different slots, and the side dogs and spacer blocks must be removed from a slot to permit the mounting of a cleat therein. The presence of a gap beneath the plate would, in steel plate work, result in a possible deformation of the plate by the pressure exerted thereon during the making of an imprint, and such deformation

would result in rapid wear of the plate upon both sides of the slot, with resultant broken or ragged lines.

In order to reduce the number of adjustments of the plate cylinder required with a large number of different plates, the spacing of the slots 51 to 57 is taken advantage of to secure an approximate positioning of the forward edge of a plate. The location of these slots, however, or their spacing, is determined largely by the requirements in the location of the side dogs. A further difficulty is that the back cleats are subject to very severe shearing strains during the operation of a press, which shearing strains increase with the size of the plate.

To compensate for the regular spacing of the slots 51 to 57, and variance in the lengths of different plates not corresponding with this spacing, I provide cleats having gripping areas, some of which are coincident with the forward edge of the slots, and others of which are offset rearwardly of the slot according to the size of the plate with which they are to be used. For convenience of expression, those cleats which are so formed as to bring the gripping area in a position to aline the back of the plate with the forward edge of the slot, will be called standard back cleats, and those cleats in which the gripping area is offset so as to position the back edge of the plate rearwardly of the forward edge of the slot, special cleats.

Referring to Fig. 5 of the drawings, at the top of this view a special cleat 62 is shown for use with the smallest size plate P to be used upon the machine shown in the drawings. This cleat 62 has its offset gripping area positioned parallel with, and closely adjacent, the rear edge of the slot 51. Immediately below the cleat 62, in this figure is shown three cleats adapted to be used in the slot 52 with the plates P′, P2 and P3 respectively. Two of these cleats are standard cleats 63, while the remaining cleat is a special cleat like 62. The three bracketed cleats immediately below are for use in the slot 53 with plates P4, P5 and P6, this group including two standard cleats 63 and one special cleat 64.

The three bracketed cleats immediately below, are for use in the slot 54 with plates P7, P8 and P9, this group including two standard cleats 63 and one special cleat 64. The three bracketed cleats immediately below are for use in the slot 55 with plates P10, P11 and P12, this group including two standard cleats 63 and one special cleat 65. The three bracketed cleats immediately below are for use in the slot 56 with plates P13, P14 and P15, and include two standard cleats 63 and one special cleat 65. The lowermost three bracketed cleats are for use in the slot 57 with plates P16, P17 and P18, and this group includes two standard cleats 63 and one special cleat 65.

At the bottom of this figure, I have shown the position of the various slots in vertical alinement with the cleats of each group to be used in that slot. I have also, to the left of each bracket, used a numeral corresponding with the slot with which the bracketed cleat or group of cleats is to be used.

It will be assumed that each of the plates P to P18 varies in length one inch, as compared with the plate of the next size, there being a difference of eighteen inches in length between the plate P and the plate P18. Yet it will be noted that the forward edges of the different plates are all positioned closely adjacent the same part of the cylinder surface. It will also be noted that the offset portion of the special cleat 64 is longer than the offset portion of the cleat 62, and that the offset portion of the cleat 65 is longer than that of the cleat 64, and that the increase in the length of the offset portion adapts these cleats for use with the larger sized plates where the shearing strains will be greatest. It will also be noted that the offset portion of each of the special cleats has the effect of minimizing excessive variance in the position of the forward edge of the plate co-operating therewith, as compared with the position of the forward edge of plates of the next size.

The size of the plate and the location of the cleat engaging the back edge thereof has been described at considerable length, because this forms the basis governing the adjusting mechanisms operative upon the plate cylinder.

The detailed construction of the feed shelf mechanism is immaterial to the invention, since this is old and well known in the art, it being merely necessary to state that the feed shelf is of the reciprocatory type and upon the completion of its movement toward the printing couple brings the forward edge of a sheet into a position where it can be frictionally engaged between the blanket of the impression cylinder or D-roll 21 and the plate upon the plate cylinder, and that no grippers are used in connection with the feeding of the sheet. The delivery mechanism is also not shown, since this is well known in the art.

The feed shelf is reciprocated by means of cams carried by and rotatable with the gear 20, there being one cam for each plate upon the plate cylinder, said cam being so located as to bring the sheet into its engaging relation with the members of the printing couple at substantially the same time that the forward edge of the plate upon the plate cylinder reaches the engaging relation with the blanket upon the impression cylinder or D-roll.

The present machine, as has heretofore been described, contemplates a condition wherein the plate cylinder may be adjusted

in relation to the gear 20, so that plates of different sizes may have their forward edge so positioned as to engage the blanket upon the impression cylinder or D-roll at the same moment, notwithstanding that different plates, as a whole, occupy different positions upon the plate cylinder. It is necessary, however, that the impression cylinder or D-roll 21 be accurately set so as to cause the moment of engagement to occur substantially simultaneously with the engagement of a floating segment 35 or 35*a* with the gear 22 for the impression cylinder or D-roll.

The means for accomplishing this close adjustment have been heretofore described. It is also necessary that the feed shelf actuating mechanism be set with the same degree of accuracy as the impression cylinder or D-roll gear, and I will now describe the feed shelf actuating means and the mechanisms employed for securing the desired close adjustment thereof, or close readjustment thereof, to compensate for wear.

The present invention is not concerned with the detailed construction of the feed shelf 23, nor of the mechanisms by which reciprocatory movement is imparted thereto, but merely to the construction and arrangement of the actuating cams by which the properly timed actuation of said feed shelf is assured. Such cams act upon an anti-friction roller carried by a rocking arm 66, which is connected with a rock shaft 67 by the link and lever mechanism 68. The connections between the shaft 67 and the feed shelf are not shown, since such are old and well known in the art and may take a wide variety of forms.

The sheets are manually fed to the shelf 23 in relation to gauge markings by the feeder, the present invention relating to the timing of the movement of the shelf to accord with the adjustment of the impression cylinder or D-roll 21 through the medium of the starting rack 34 or 34*a*.

Accuracy in the operation of the feed shelf is desirable to ensure a proper positioning of the sheet of paper upon the engraved plate, in order to secure accurate register. It also permits the use of narrow margins on the sheets with a consequent saving of paper.

Oscillatory movement is imparted to the arm 66 by means of cams carried by and rotatable with the gear 20. In the machine of the invention, two such cams are used, corresponding in number with that of plates upon the plate cylinder. These cams are entirely independent, one of the other, and like the starting racks 34—34*a*, are independently adjustable so that the actuation of the feed shelf may be accurately timed in relation to each plate upon the cylinder, without regard to the position of the cylinder gear 20.

Since each of the cams is mounted in relation to the gear 20 in the same manner as the other, and is similarly constructed and operated, but one of these cams will be described in detail, the corresponding parts of the other having merely reference numerals applied thereto.

Carried by or formed upon the gear 20 is an arcuate cam seat 69, slidably mounted upon which is an arcuate cam plate 70 having a single rise and fall. The cam plate 70 has a plurality of spaced segmental openings 71 and 72 therein, through which respectively screw bolts 73 and 74 pass and engage the gear wheel 20, which is of a thickness to receive said screw bolts and form a backing against which the cam plate may be pressed thereby.

Adjacent the high point of the cam plate 70, it is thickened and recessed, as indicated at 75, to form spaced parallel shoulders 76 and 77 adjacent the cam seat 69. Within the space between said shoulders 76 and 77, a block 78 is secured to the gear wheel 20, this block having a screw threaded opening therethrough in which is mounted an adjusting screw 79, the opposite ends of which constantly bear against the shoulders 76 and 77, so that by the rotation of this screw and the loosening of the screw bolts 73 and 74, a short accurate movement may be imparted to the cam plate 70 circumferentially of the gear 20. The cam seat is cut away at 80 to permit access to the screw 79 for adjustment purposes.

In the form of the invention shown, the other cam seat is indicated at 69*a* and the cam plate mounted thereon at 70*a*. The segmental openings in this cam plate are shown at 71*a* and 72*a*, and the bolts co-operating therewith at 73*a* and 74*a*. The recessed portion of the cam plate is shown at 75*a* and the opposed parallel bearing surfaces at 76*a* and 77*a*. The screw threaded block is shown at 78*a* and the adjusting screw therein at 79*a*. The opening in the cam seat for permitting access to the adjusting screw 79*a* is shown at 80*a*.

In the accompanying drawings, I have not shown any of the working mechanisms in the machine, beyond the actuating means for the printing couple and for the feed shelf, it being understood that any desired construction of delivery, inking, wiping, polishing and feed shelf mechanisms may be employed, and are old and well known in the art.

The operation of the herein described machine is substantially as follows:—

In the construction of machine shown in the drawings, the main portion of the gear 20 is used for receiving power from the source and transmitting it to the plate cylinder. The starting racks 34 and 34*a* and the floating racks 35 and 35*a* carried by this gear are used only to transmit power to the impression cylinder or D-roll 21.

The gear 22 upon the impression cylinder or D-roll, is one-half the diameter of the gear

20, and thus has one full revolution for each plate carried by the plate cylinder. Both the plate cylinder and the impression cylinder or D-roll have continuing, uni-directional rotary movement which not only ensures greater accuracy in the operation of the machine because of the constant enmeshment of the driving and driven gears, but avoids vibration, wear and other objectionable results arising from sudden starting and stopping impulses, followed by a continued rotary movement of the impression cylinder during each cycle of operations.

By mounting the plate cylinder rigidly upon its shaft 17 and providing for the adjustment of the cylinder through the rotation of said shaft, not only is great rigidity throughout this cylinder construction secured, and wear between this shaft and said cylinder with the resultant variation in the strength of the lines of the impression avoided, but a highly desirable permanency in the relation of the plate cylinder and the impression cylinder or D-roll is secured, irrespective of that adjustment of the cylinder in relation to said impression cylinder or D-roll which may be required from time to time.

The adjustment of the members of the printing couple may be required either for purposes of securing register when a plurality of impressions are made upon the same sheet; when there is slight variation in the dimensions of different plates supposedly of the same size, which latter will be very unusual; or when plates are of different sizes and the spacing or location of the back cleat will not bring the forward edge of the plate into accord with the normal setting of the machine, or its setting for a plate of a different size.

The adjustment for register is a minute adjustment. The adjustment to accommodate plates of different sizes is a much larger adjustment.

When it is desired to circumferentially adjust the plate cylinder, irrespective of the extent of this adjustment, the bolts 25 and nut 30 are loosened and the adjusting bolt 29 turned either to the right or left, according to the direction in which it is required to turn the cylinder, and the various bolts 25 and nuts 30 are tightened when the proper adjustment has been secured.

If the adjustment is for register, accuracy can be determined only as a result of repeated trials or the acquired skill of the pressman. The adjustment, when plates of different sizes are used, will be in accord with the gauge markings and gauge fingers 31 and 32, the extent of this adjustment being predetermined by the size and the location of the back cleat with plates of certain sizes. This will be more fully referred to hereinafter. When the plate cylinder has been properly adjusted, and it will be noted that this adjustment does not disturb the relation of the gears 20 and 22, the press may be operated without likelihood of any loss in the adjustment.

In Fig. 1 of the drawings, the starting rack 34*a* is shown as engaged with the gear 22. Since this rack is firmly secured to, and under all circumstances rotates with, the gear 20, positive rotary movement will be imparted to said gear 22 and to the impression cylinder or D-roll 21, so long as said rack is enmeshed with said gear. This rack and gear will pass out of mesh substantially simultaneously with the blanket upon the cylinder 21 engaging the forward edge of the plate at the printing line. This moment, however, is subject to variation, since there can be no offsetting upon the blanket of the impression cylinder or D-roll if the engaging interval of said blanket and the plate is delayed until after the forward edge of the blanket has passed the printing line.

Great accuracy is required in the functioning of machines of the type to which the invention relates, however, and it is preferable to establish and maintain certain predetermined conditions of the various co-operating parts to ensure the desired accuracy. Substantially simultaneously with the passing of the gear 22 from mesh with the starting rack 34*a*, it will be enmeshed with the floating rack 35*a* which will occur substantially simultaneously with the engagement of the paper sheet between the blanket upon the cylinder 21 and the plate upon the plate cylinder.

The tendency of the rack 35*a* is to positively drive the gear 22, by reason of the action of the spring 40*a* holding the rearward end of said floating rack 35*a* in engagement with the fixed starting rack 34, but after the engagement of the floating rack 35*a* with the gear 22, the impression cylinder or D-roll 21 will be rotated almost entirely as a result of the friction developed as a result of the engaging relation of its blanket with the paper and the plate upon the plate cylinder. If there be a high spot upon the plate, or slightly increased thickness of the paper, the floating rack will be advanced toward the starting rack 34*a* by the gear 22. If the conditions be such that the angular speed of the cylinder 21 is the same as that of the plate, no work will be required of the floating rack 35*a* because of the continued friction drive of the impression cylinder or D-roll.

If there should chance to be a low spot upon the plate extending for the full width thereof, then the floating rack 35*a* will maintain the cylinder 21 at the same angular speed as that of the plate. This, however, will seldom occur.

Upon the completion of the impression, the rear edge of a plate will pass from its engagement with the blanket upon the impres-

sion cylinder or D-roll, so that the spring 40*a* will be permited to restore the floating rack 35*a* to its normal engaging relation with the starting rack 34 and ensure a proper disengagement of the teeth of the gear 22 from said rack 35*a*, and their engagement with the succeeding starting rack 34. This operation will be same with the racks 34 and 35, the impression cylinder or D-roll, during the making of an impression, having a friction drive, at some times assisted by the floating rack.

By this construction, with a constant speed of the gear 20 and its appurtenances, there may be variable speed of the impression cylinder or D-roll during the making of an impression, as determined by the condition at the plate.

Following the making of each impression, the impression cylinder or D-roll receives continuing power solely from the floating or succeeding starting rack until the making of a succeeding impression, there being no dwell in the rotation of the impression cylinder or D-roll between impressions.

Since the starting racks 34 and 34*a* are secured to the edge plates 36 and 37, and thereby to the gear 20, it is obvious that movement of either of said edge plates circumferentially of the gear 20 will result in a corresponding movement of the starting rack connected therewith, and through the spring 40 or 40*a*, of the floating rack associated with the other starting rack.

It is also obvious that any adjustment of said starting or floating racks will result in a corresponding adjustment in the impression cylinder or D-roll, the gear 22 of which is constantly enmeshed with one of these racks, and that this adjustment will not, in any way, change or modify the functioning of the rack structure unless it be utilized to take up wear in the teeth thereof and of the gear 22. In fact, this adjustment is used largely in the assembly of the machine to establish a proper basis between the plate carrying portions of the plate cylinder, and the effective portion of the blanket upon the impression cylinder or D-roll. While, in a sense, the adjustment of the starting racks modifies the timing in the actuation of the impression cylinder or D-roll, this timing is not related to the initial printing moment, which is controlled by the adjustment of the plate cylinder.

The adjustment, under no circumstances, will ever be great, and this is equally true of the variation in the speed of the impression cylinder or D-roll, permitted by the use of the floating rack or racks.

It is possible that two plates, supposedly of the same length, may vary slightly, or that there may be slight variation in the positioning of the engraved or intaglio designs thereon. When two such plates are used upon the machine, it is obvious that the adjustment of the plate cylinder cannot be utilized to correct this condition. When such is the case, either starting rack 34—34*a* may be adjusted slightly so as to change the timing of the engagement of the impression cylinder or D-roll with one plate, as compared to the timing of its engagement with the other plate. This is strictly a register adjustment, and under no circumstances will ever amount to more than a few thousandths of an inch.

The adjustment of either edge plate 36 or 37 is accomplished by loosening the clamp bolts 39 and actuating the adjusting screw 44 or 44*a*, according to the direction of movement required. The bolts 39 are tightened after adjustment of the plate 36 or 37, or both.

In describing the mounting of a plate upon the plate cylinder in its relation to the adjusting mechanism for said cylinder, reference will be had to Fig. 5 of the drawings. As shown in Fig. 7, the gauge plate 32, secured to the gear 20, has thirteen graduations, indicated from 0 to 12, the zero position corresponding with a required setting of the longest plate P18 for which the machine is designed to be used.

It will be noted that graduations 1 and 2 are to the left of 0, and that graduations 3 to 12 are to the right thereof. In mounting plate P18 upon the plate cylinder, a special back cleat 65 is mounted in the slot 57, and all of the remaining slots 48 to 56 are filled with filler blocks 61 between the dog carriers 59, and the dog carriers tightened upon the side edges of the plate by means of the lead screw 60.

The number and size of the filler blocks of course will vary with the width of the plate, as will the length of the lead screws, as shown in Fig. 4. This ensures an adequate back stop for the plate to minimize likelihood of the development of shearing action upon the back cleat. This locating of the back cleat in the slot 57 will bring the forward edge of the plate to a position where, if the cylinder be rotated by means of the adjustment screw 29 until the gauge finger 31 registers with the gauge mark 0, the forward edge of the plate will be at a predetermined distance from the printing line of the plate cylinder and the impression cylinder or D-roll.

While, with the next smaller size plate P17, a standard back cleat 63 is used in the same slot 57, the forward edge of this plate will be advanced by said cleat in relation to the position of the forward edge of the longer plate P18 to an amount equalling only a part of the difference in the length of these plates, so that the forward edge of the plate P17 will be away from the printing line of the members of the printing couple a distance greater than would be the forward edge of the plate P18 with the same setting of the cylinder. This necessitates an adjustment of the plate

cylinder to the right to an extent corresponding with this difference. The extent of this adjustment required will be equal to the distance between the gauge marking 0 and some other gauge marking to the right upon the plate 32. This is arbitrarily determined by a makeready chart indicating the length of the plate, the type of back cleat to be used, the slot in which the back cleat is to be positioned, and the graduation mark upon the gauge plate 32 to be used as a result of the other conditions.

With some lengths of plates, the forward edge thereof will be closer to the printing line between the members of the printing couple than the plate P18 would be with the setting thereof as described. When this occurs, it is necessary to adjust the plate cylinder to the left of the gauge mark 0 as indicated by the gauge marking and the chart aforesaid.

By using different slots 51 to 57 for the back cleat, and by using standard and special cleats as described, the forward edge of any plate will be brought fairly close to the 0 setting of the cylinder, so as to reduce the amount of adjustment required. By the adoption of this expedient, plates varying in length in an amount materially different from the spacing of the slots, may be brought fairly closely to the 0 position, and in some instances plates of different lengths may be actually brought to the 0 position so as to require no adjustment, or to be brought to a position corresponding with that of other plates so as to reduce the number of adjustments required as compared with the number of plates of different lengths.

The 0 position is arbitrarily selected, the adjustments of the cylinder merely bringing the forward edge of any other plate to a position corresponding with the size of plate selected in determining this position.

When changing from one plate to a shorter plate, it is necessary to completely remove from the slot in which the back cleat must be mounted, the side dogs and the various filler blocks.

When substituting a longer plate for a short one, it is necessary to remove the filler blocks and side dogs from the slot where the back cleat must be inserted, and to replace the filler blocks and side dogs in the slot occupied by the cleat for the shorter plate, in order to afford a proper backing for the plate, particularly adjacent its longitudinal center.

The manner of mounting the plates is particularly desirable where two or more plates of the same size are used upon the same plate cylinder, since it ensures, with a single adjustment of the plate cylinder, the simultaneous accurate positioning of the forward edge of both plates. As heretofore stated, if there be any slight variation in the length of these plates, this may be corrected by the adjustment of the edge plates 36 or 37 and the starting racks 34—34*a*.

It is obvious that the construction and mode of adjustment of the cam plates 70—70*a* will permit them to be adjusted in relation to the 0 setting of the plate cylinder, and the initial engagement of the impression cylinder or D-roll with the plate, as determined by this setting. It is also obvious that either cam 70 or 70*a* may be adjusted circumferentially of the gear 20 to correspond with any adjustment of the starting rack 34 or 34*a* for the purpose of securing register due to conditions arising from slight variation in the length of different plates upon the plate cylinder, or in some instances to compensate for slight variation in the length of different sheets of paper used with plates of the same size. In fact, these cams may be adjusted within a limited range to ensure absolute accuracy in the delivery of the sheets to the printing couple.

It will be noted that the various characteristics of the machine herein described, all co-operate to not only facilitate the makeready of the press or printing machine, but to ensure the desired degree of accuracy in the relation of the various parts co-operating in the making of imprints from the plates upon the plate cylinder. This accuracy, it will be noted, is determined by the adjustment of the plate cylinder, the avoidance of any lost motion between same and its shaft, continuous rotary movement of the impression cylinder or D-roll at a varying speed when required while making the imprint, accurate functioning of the starting racks and the delivery of a sheet in timed relation to the operative portion of the cycle of the members of the printing couple as determined by their adjustment.

It is not my intention to limit the invention to the precise details of construction and combination of parts herein shown and described, it being apparent that such may be varied without departing from the spirit and scope of the invention.

Having described the invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. A printing machine embodying therein a heavy rigid main shaft, a plate cylinder having a hub secured to and rotatable with said shaft, a heavy rim, and reinforcing webs between said rim and said hub, means whereby plates of different sizes may be respectively positioned upon said rim with their forward edges in substantially the same position, a gear loosely mounted in relation to said shaft, adjustable means connecting said gear with said shaft, an impression cylinder or D-roll, and connections between said gear and said impression cylinder or D-roll embodying therein means permitting relative circumferential movement of said impression cylinder

or D-roll and said gear during the making of an impression, while imparting substantially continuous, uni-directional movement to said impression cylinder or D-roll.

2. A printing machine embodying therein a heavy rigid main shaft, a plate cylinder having a hub secured to and rotatable with said shaft, a heavy rim, and reinforcing webs between said rim and said hub, means whereby plates of different sizes may be respectively positioned upon said rim with their forward edges in substantially the same position; a gear loosely mounted in relation to said shaft, an end plate carried by and rotatable with said shaft, spaced abutments on said end plate, a stud having a screw threaded opening therein carried by said gear and extending between said abutments, an adjusting screw carried by said stud and having its opposite ends engaging said abutments respectively, an impression cylinder or D-roll, and connections between said gear and said impression cylinder or D-roll embodying therein means permitting relative circumferential movement of said impression cylinder or D-roll and said gear during the making of an impression, while imparting substantially continuous, uni-directional movement to said impression cylinder or D-roll.

3. A printing machine embodying therein a heavy rigid main shaft, a plate cylinder having a hub secured to and rotatable with said shaft, a heavy rim, and reinforcing webs between said rim and said hub, means whereby plates of different sizes may be respectively positioned upon said rim with their forward edges in substantially the same position; a gear loosely mounted in relation to said shaft, an end plate carried by and rotatable with said shaft, having segmental openings therein, spaced abutments on said end plate, a stud having a screw threaded opening therein carried by said gear and extending between said abutments, an adjusting screw carried by said stud and having its opposite ends engaging said abutments respectively, bolts passing through said segmental openings respectively and engaging said gear, whereby said plate may be clamped against said gear, or adjustment of said plate and said cylinder may be permitted, an impression cylinder or D-roll, and connections between said gear and said impression cylinder or D-roll embodying therein means permitting relative circumferential movement of said impression cylinder or D-roll and said gear during the making of an impression, while imparting substantially continuous, uni-directional movement to said impression cylinder or D-roll.

4. A printing machine embodying therein a heavy rigid main shaft, a plate cylinder having a hub secured to and rotatable with said shaft, a heavy rim, and reinforcing webs between said rim and said hub, means whereby plates of different sizes may be respectively positioned upon said rim with their forward edges in substantially the same position, a gear loosely mounted in relation to said shaft, adjustable means connecting said gear with said shaft, co-operating gauge members upon said gear and movable with said shaft respectively, whereby said adjustable means may be used to bring said cylinder to different predetermined definite positions, an impression cylinder or D-roll and connections between said gear and said impression cylinder or D-roll embodying therein means permitting relative circumferential movement of said impresson cylinder or D-roll and said gear during the making of an impression, while imparting substantially continuous, uni-directional movement to said impression cylinder or D-roll.

5. A printing machine embodying therein a heavy rigid main shaft, a plate cylinder having a hub secured to and rotatable with said shaft, a heavy rim, and reinforcing webs between said rim and said hub, means whereby plates of different sizes may be respectively positioned upon said rim with their forward edges in substantially the same position, a gear loosely mounted in relation to said shaft, an end plate carried by and rotatable with said shaft, spaced abutments on said end plate, a stud having a screw threaded opening therein carried by said gear and extending between said abutments, an adjusting screw carried by said stud and having its opposite ends engaging said abutments respectively, co-operating gauge members carried by said gear and said end plate respectively, whereby said adjustable means may be used to bring said cylinder to different predetermined definite positions, an impression cylinder or D-roll, and connections between said gear and said impression cylinder or D-roll embodying therein means permitting relative circumferential movement of said impression cylinder or D-roll and said gear during the making of an impression, while imparting substantially continuous, uni-directional movement to said impression cylinder or D-roll.

6. A printing machine embodying therein a main shaft, a plate cylinder secured to and rotatable with said shaft, said cylinder having a plurality of spaced parallel slots extending longitudinally thereof, a back cleat capable of being selectively mounted in said slots, whereby the forward edges of plates of different lengths may be positioned adjacent the same point upon the cylinder in relation to the printing line, a gear loosely mounted in relation to said shaft, an end plate carried by and rotatable with said shaft, spaced abutments on said end plate, a stud having a screw

threaded opening therein carried by said gear and extending between said abutments, an adjusting screw carried by said stud and having its opposite ends engaging said abutments respectively, a gauge plate having graduations thereon to indicate different positions to which said cylinder must be brought with different positions of said back cleat and with plates of different sizes, and a gauge finger movable with said shaft in operative relation to said gauge plate.

7. A printing machine embodying therein a main shaft, a plate cylinder secured to and rotatable with said shaft, said cylinder having a plurality of spaced parallel slots extending longitudinally and opening outwardly of the ends thereof, a back cleat capable of being selectively mounted in said slots, whereby the forward edges of plates of different lengths may be positioned adjacent the same point upon the cylinder in relation to the printing line, side dogs removably mounted in said slots, means for engaging said dogs respectively with a plate, filler blocks removably mounted in said slots intermediate said side dogs, a gear loosely mounted in relation to said shaft, an end plate carried by and rotatable with said shaft, spaced abutments on said end plate, a stud having a screw threaded opening therein carried by said gear and extending between said abutments, an adjusting screw carried by said stud and having its opposite ends engaging said abutments respectively, a gauge plate having graduations thereon to indicate different positions to which said cylinder must be brought with different positions of said back cleat and with plates of different sizes, and a gauge finger movable with said shaft in operative relation to said gauge plate.

8. A printing machine embodying therein a plate cylinder, having a plurality of sets of spaced parallel slots extending longitudinally thereof, back cleats capable of being selectively mounted in the slots of said sets respectively, whereby the forward edges of plates of different lengths may be positioned, as to each set of slots, adjacent the same point upon the cylinder in relation to the printing line, a gear loosely mounted in relation to said cylinder, means whereby said cylinder may be circumferentially adjusted in relation to said gear, a gauge plate carried by said gear having graduations thereon to indicate different positions to which said cylinder must be brought with different positions of said back cleats and with plates of different sizes, and a gauge finger movable with said cylinder co-operating with said gauge plate.

9. A printing machine embodying therein a plate cylinder, a main gear for rotating said cylinder, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a starting rack segment carried by and rotatable with said gear, a floating rack segment carried by and movable circumferentially of said main gear, and a spring acting upon said floating rack segment counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating rack permits a friction drive of said impression cylinder or D-roll.

10. A printing machine embodying therein a plate cylinder, a main gear for rotating said cylinder, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a starting rack segment carried by and rotatable with said gear, a floating rack segment carried by and movable circumferentially of said main gear, an edge plate connected with said starting rack segment and with said main gear, and a spring acting between said edge plate and said floating rack segment counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating rack permits a friction drive of said impression cylinder or D-roll.

11. A printing machine embodying therein a plate cylinder, a main gear for rotating said cylinder, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a starting rack segment carried by and rotatable with said gear, a floating rack segment carried by and movable circumferentially of said main gear, a spring acting upon said floating rack segment counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating rack permits a friction drive of said impression cylinder or D-roll, and means whereby said starting rack may be adjusted circumferentially of said main gear.

12. A printing machine embodying therein a plate cylinder, a main gear for rotating said cylinder, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a starting rack segment carried by and rotatable with said gear, a floating rack segment carried by and movable circumferentially of said main gear, an edge plate connected with said starting rack segment and with said main gear, a spring acting between said edge plate and said floating rack segment counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating rack permits a friction drive of said im-

pression cylinder or D-roll, and means whereby said edge plate may be adjusted circumferentially of said main gear.

13. A printing machine embodying therein a plate cylinder, a main gear for rotating said cylinder, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a starting rack segment carried by and rotatable with said gear, a floating rack segment carried by and movable circumferentially of said main gear, an edge plate connected with said starting rack segment and with said main gear, a spring acting between said edge plate and said floating rack segment counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating rack permits a friction drive of said impression cylinder or D-roll, spaced abutments carried by said main gear, a block having a screw threaded opening therein carried by said edge plate, and an adjusting screw mounted in said block with its opposite ends engaging said abutments respectively, whereby said edge plate and said starting rack segment may be adjusted in relation to said main gear.

14. A printing machine embodying therein a plate cylinder, a main gear for rotating said cylinder, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a plurality of starting rack segments carried by and rotatable with said gear, floating rack segments intermediate said starting rack segments carried respectively by and movable circumferentially of said main gear, and springs acting upon said floating rack segments respectively counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating racks permit a friction drive of said impression cylinder or D-roll, the diameter of said impression cylinder or D-roll, as to the diameter of said main gear, being such as to cause each starting and floating rack to impart one revolution to said impression cylinder or D-roll.

15. A printing machine embodying therein a plate cylinder, a main gear for rotating said cylinder, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a plurality of starting rack segments carried by and rotatable with said gear, floating rack segments intermediate said starting rack segments carried respectively by and movable circumferentially of said main gear, springs acting upon said floating rack segments respectively counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating racks permit a friction drive of said impression cylinder or D-roll, the diameter of said impression cylinder or D-roll, as to the diameter of said main gear, being such as to cause each starting and floating rack to impart one revolution to said impression cylinder or D-roll, and means operative upon said starting racks respectively, whereby they may be differentially adjusted circumferentially of said main gear.

16. A printing machine embodying therein a plate cylinder, a main gear for rotating said cylinder, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a plurality of starting rack segments carried by and rotatable with said gear, floating rack segments intermediate said starting rack segments carried respectively by and movable circumferentially of said main gear, edge plates connected respectively with a starting rack segment and with said main gear, springs acting between said edge plates respectively and said floating rack segments counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating racks permit a friction drive of said impression cylinder or D-roll, spaced abutments carried by said main gear adjacent each of said edge plates, a block having a screw threaded opening therein carried by each said edge plate, and an adjusting screw mounted in each said block with its opposite ends engaging the adjacent abutments carried by said main gear, whereby said edge plates and said starting rack segments may be independently adjusted in relation to said main gear, the diameter of said impression cylinder or D-roll, as to the diameter of said main gear, being such as to cause each starting and floating rack to impart one revolution to said impression cylinder or D-roll.

17. A printing machine embodying therein a main shaft, a plate cylinder secured to and rotatable with said shaft, a main gear loosely mounted in relation to said shaft, an end plate carried by and rotatable with said shaft, spaced abutments on said end plate, a stud having a screw threaded opening therein carried by said gear and extending between said abutments, an adjusting screw carried by said stud and having its opposite ends engaging said abutments respectively, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a plurality of starting rack segments carried by and rotatable with said gear, floating rack segments intermediate said starting rack segments carried respectively by and movable circumferentially of said main gear,

springs acting upon said floating rack segments respectively counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating racks permit a friction drive of said impression cylinder or D-roll, the diameter of said impression cylinder or D-roll, as to the diameter of said main gear, being such as to cause each starting and floating rack to impart one revolution to said impression cylinder or D-roll, and means operative upon said starting racks respectively, whereby they may be differentially adjusted circumferentially of said main gear.

18. A printing machine embodying therein a main shaft, a plate cylinder secured to and rotatable with said shaft, a main gear loosely mounted in relation to said shaft, an end plate carried by and rotatable with said shaft, spaced abutments on said end plate, a stud having a screw threaded opening therein carried by said gear and extending between said abutments, an adjusting screw carried by said stud and having its opposite ends engaging said abutments respectively, co-operating gauge members carried by said gear and said end plate respectively, whereby said adjustable means may be used to bring said cylinder to different predetermined definite positions, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a plurality of starting rack segments carried by and rotatable with said gear, floating rack segments intermediate said starting rack segments carried respectively by and movable circumferentially of said main gear, springs acting upon said floating rack segments respectively counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating racks permit a friction drive of said impression cylinder or D-roll, the diameter of said impression cylinder or D-roll, as to the diameter of said main gear, being such as to cause each starting and floating rack to impart one revolution to said impression cylinder or D-roll, and means operative upon said starting racks respectively, whereby they may be differentially adjusted circumferentially of said main gear.

19. A printing machine embodying therein a main shaft, a plate cylinder secured to and rotatable with said shaft, and having a plurality of sets of spaced parallel slots extending longitudinally thereof, back cleats capable of being selectively mounted in the slots of said sets respectively, whereby the forward edges of plates of different lengths may be positioned, as to each set of slots, adjacent the same point upon the cylinder in relation to the printing line, a main gear loosely mounted in relation to said shaft, an end plate carried by and rotatable with said shaft, spaced abutments on said end plate, a stud having a screw threaded opening therein carried by said gear and extending between said abutments, an adjusting screw carried by said stud and having its opposite ends engaging said abutments respectively, co-operating gauge members carried by said gear and said end plate respectively, whereby said adjustable means may be used to bring said cylinder to different predetermined definite positions, an impression cylinder or D-roll, a continuous gear carried thereby, and means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a plurality of starting rack segments carried by and rotatable with said gear, floating rack segments intermediate said starting rack segments carried respectively by and movable circumferentially of said main gear, springs acting upon said floating rack segments respectively counter to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating racks permit a friction drive of said impression cylinder or D-roll, the diameter of said impression cylinder or D-roll, as to the diameter of said main gear, being such as to cause each starting and floating rack to impart one revolution to said impression cylinder or D-roll, and means operative upon said starting racks respectively, whereby they may be differentially adjusted circumferentially of said main gear.

20. A printing machine embodying therein a plate cylinder, a main gear, adjustable means connecting said main gear with said plate cylinder, an impression cylinder or D-roll, means whereby said impression cylinder or D-roll is rotated from said main gear, and a feed shelf actuating mechanism embodying therein an oscillatory lever, means whereby movement may be imparted by said lever to a feed shelf, an arcuate cam seat carried by said main gear, an arcuate cam plate slidably mounted upon said seat, and means whereby said cam plate may be adjusted circumferentially of, and secured in relation to, said main gear.

21. A printing machine embodying therein a plate cylinder, a main gear, adjustable means connecting said main gear with said plate cylinder, an impression cylinder or D-roll, means whereby said impression cylinder or D-roll is rotated from said main gear, and a feed shelf actuating mechanism embodying therein an oscillatory lever, means whereby movement may be imparted by said lever to a feed shelf, an arcuate cam seat carried by said main gear, an arcuate cam plate slidably mounted upon said seat, said cam having a recessed portion forming spaced shoulders adjacent said cam seat, a block having a screw threaded opening therein secured to said main gear wheel, and an ad-

justing screw seated in said screw threaded opening in said block with its opposite ends engaging said shoulders respectively, whereby said cam plate may be adjusted circumferentially of, and secured in relation to, said main gear.

22. A printing machine embodying therein a plate cylinder, a main gear for rotating said cylinder, adjustable means connecting said main gear with said plate cylinder, an impression cylinder or D-roll, a continuous gear carried thereby, means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a plurality of starting rack segments carried by and rotatable with said gear, floating rack segments intermediate said starting rack segments carried respectively by and movable circumferentially of said main gear, and springs acting upon said floating rack segments respectively counted to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating racks permit a friction drive of said impression cylinder or D-roll, the diameter of said impression cylinder or D-roll, as to the diameter of said main gear, being such as to cause each starting and floating rack to impart one revolution to said impression cylinder or D-roll, and a feed shelf actuating mechanism embodying therein an oscillatory lever, means whereby movement may be imparted by said lever to a feed shelf, arcuate cam seats carried by said main gear, an arcuate cam plate slidably mounted upon each seat, and having a recessed portion forming spaced shoulders adjacent said cam seat, blocks having a screw threaded opening therein secured to said main gear wheel between said shoulders, respectively, and adjusting screws seated in said screw threaded openings in said blocks with their opposite ends engaging said shoulders respectively, whereby said cam plates may be differentially adjusted circumferentially of, and secured in relation to, said main gear.

23. A printing machine embodying therein a main shaft, a plate cylinder secured to and rotatable with said shaft, and having a plurality of sets of spaced parallel slots extending longitudinally thereof, back cleats capable of being selectively mounted in the slots of said sets respectively, whereby the forward edges of plates of different lengths may be positioned, as to each set of slots, adjacent the same point upon the cylinder in relation to the printing line, a main gear loosely mounted in relation to said shaft, an end plate carried by and rotatable with said shaft, spaced abutments on said end plate, a stud having a screw threaded opening therein carried by said gear and extending between said abutments, an adjusting screw carried by said stud and having its opposite ends engaging said abutments respectively, co-operating gauge members carried by said gear and said end plate respectively, whereby said adjustable means may be used to bring said cylinder to different predetermined definite positions, an impression cylinder or D-roll, a continuous gear carried thereby, means whereby said impression cylinder or D-roll is continuously rotated from said main gear, including therein a plurality of starting rack segments carried by and rotatable with said gear, floating rack segments intermediate said starting rack segments carried respectively by and movable circumferentially of said main gear, springs acting upon said floating rack segments respectively counted to the direction of movement of said main and said impression cylinder or D-roll, gears, whereby said floating racks permit a friction drive of said impression cylinder or D-roll, the diameter of said impression cylinder or D-roll, as to the diameter of said main gear, being such as to cause each starting and floating rack to impart one revolution to said impression cylinder or D-roll, and means operative upon said starting racks respectively, whereby they may be differentially adjusted circumferentially of said main gear, and a feed shelf actuating mechanism embodying therein an oscillatory lever, means whereby movement may be imparted by said lever to a feed shelf, arcuate cam seats carried by said main gear, and having a recessed portion forming spaced shoulders adjacent said cam seat, blocks having a screw threaded opening therein secured to said main gear wheel between said shoulders respectively, and adjusting screws seated in said screw threaded openings in said blocks with their opposite ends engaging said shoulders respectively, whereby said cam plates may be differentially adjusted circumferentially of, and secured in relation to, said main gear.

In witness whereof I have hereunto affixed my signature this 11th day of January, 1929.

PETER AITCHISON.