May 31, 1955 H. L. McWHORTER 2,709,405

PLATE LOCKUP FOR PRINTING PRESS

Filed Aug. 26, 1949 9 Sheets-Sheet 1

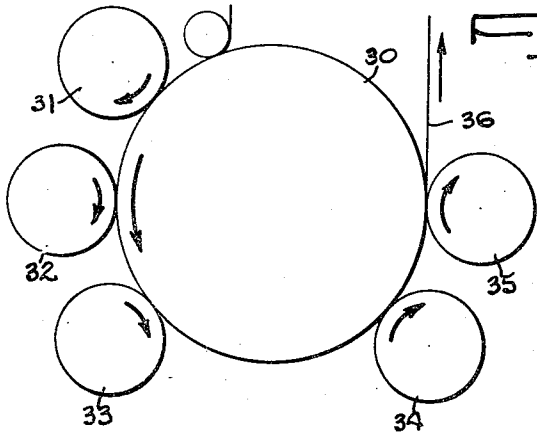


Fig. 1

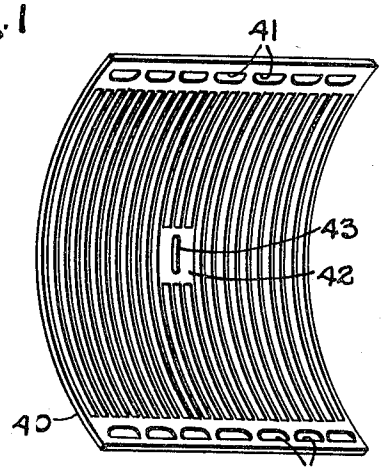


Fig. 2

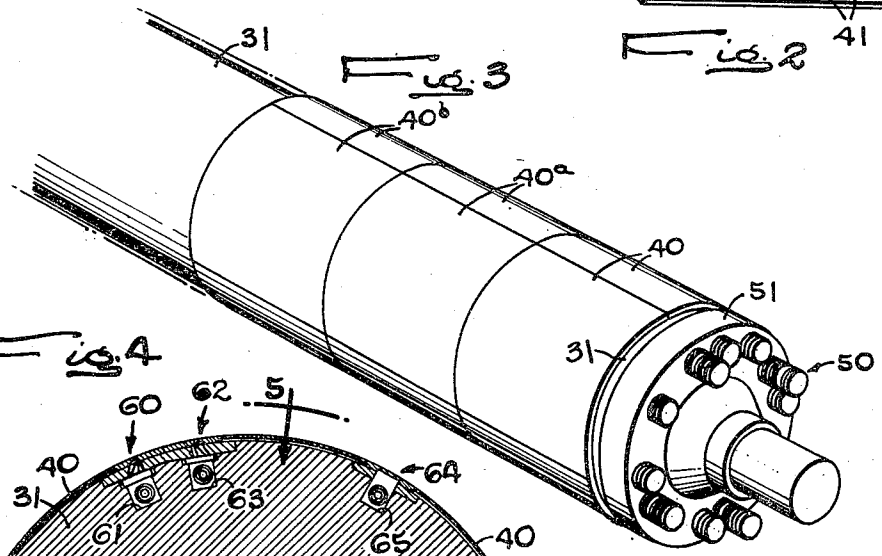


Fig. 3

Fig. 4

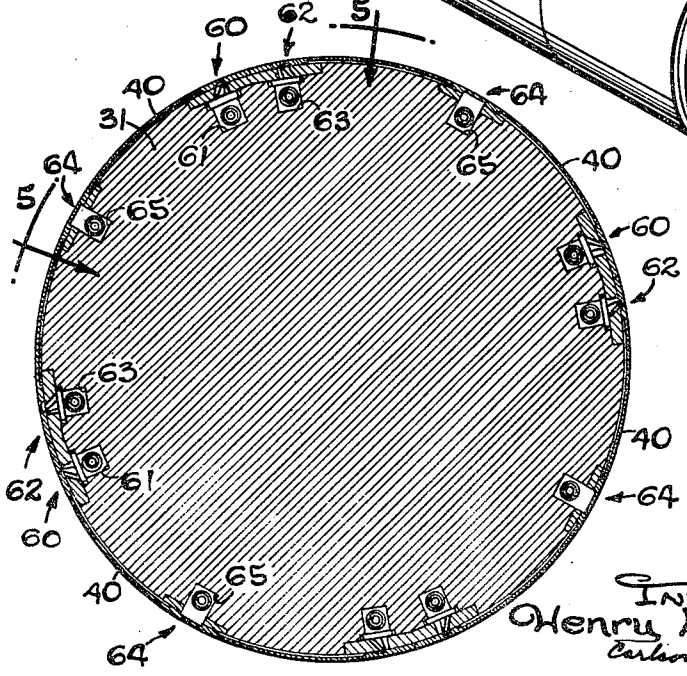
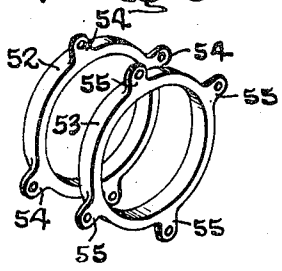


Fig. 3a



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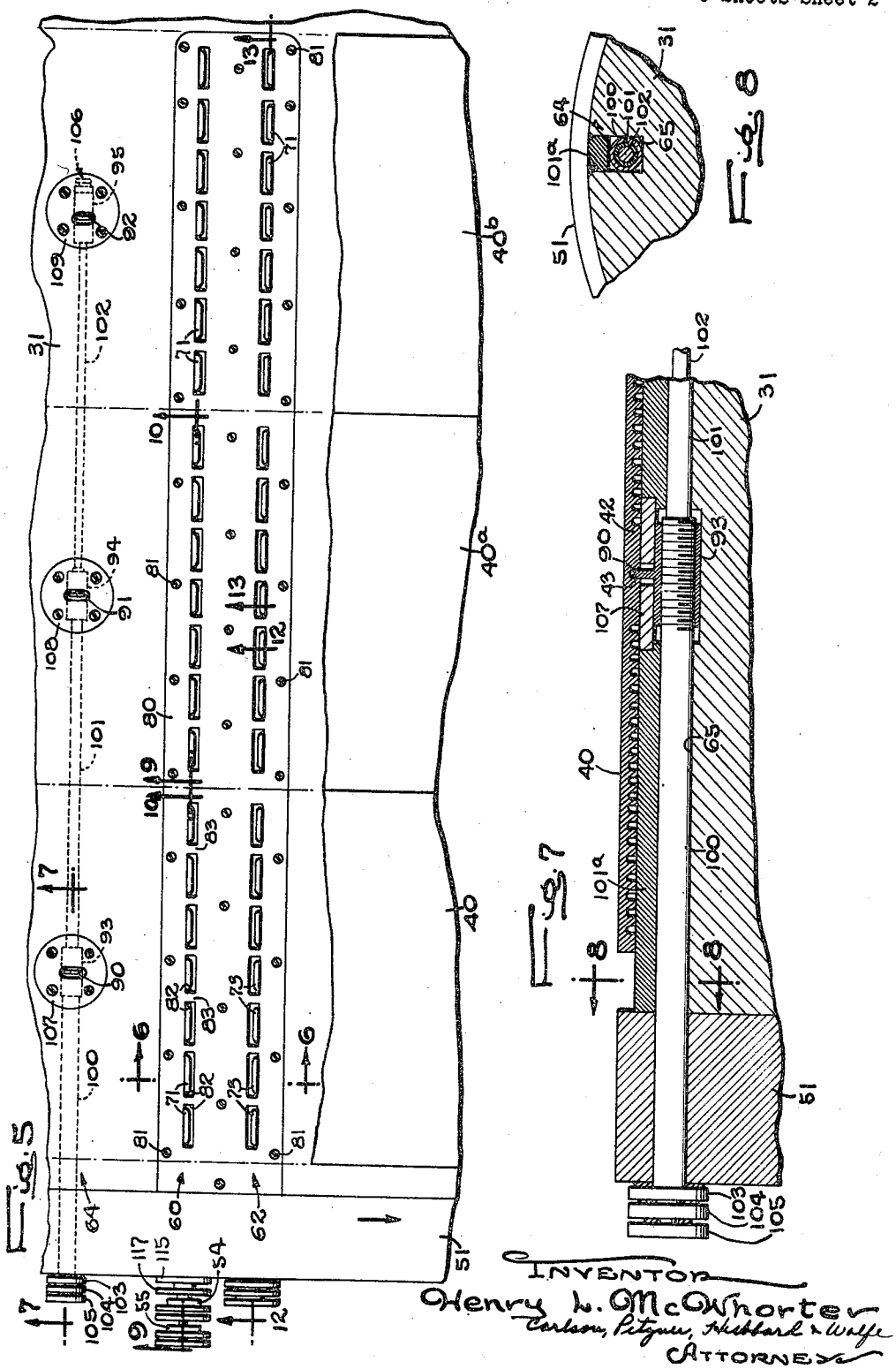


Fig. 5

Fig. 8

Fig. 7

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PLATE LOCKUP FOR PRINTING PRESS

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Fig. 6

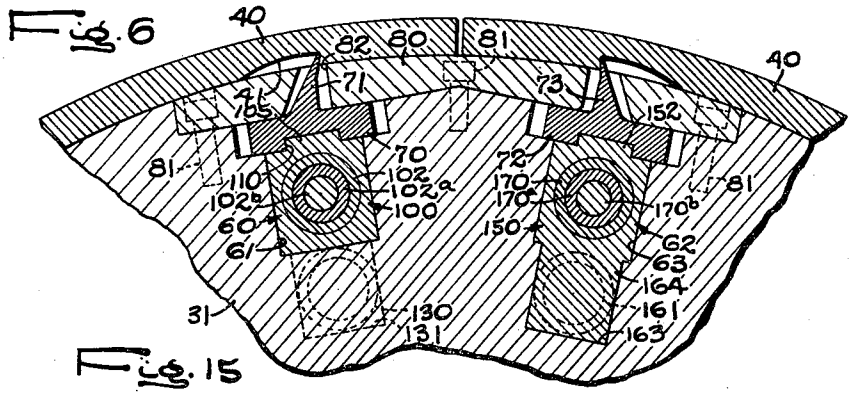


Fig. 15

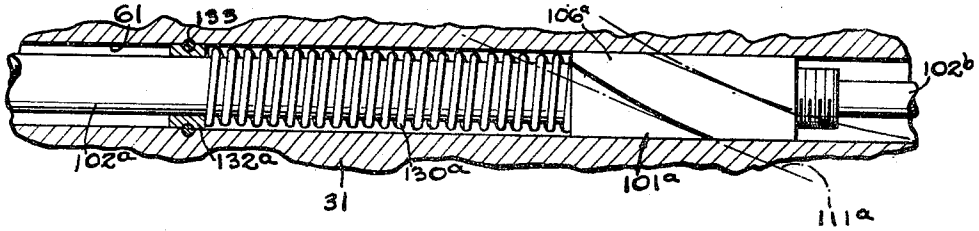
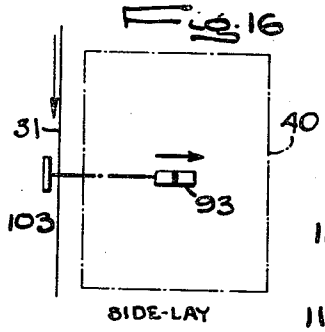
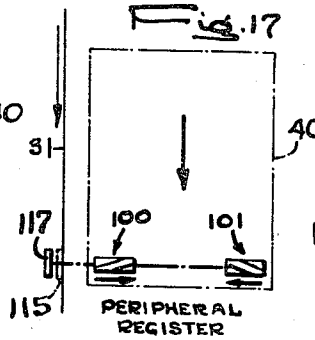


Fig. 16



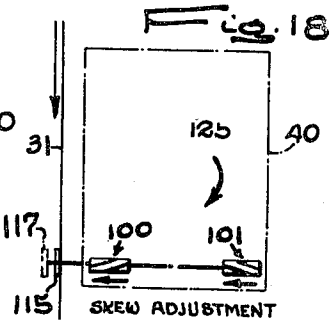
SIDE-LAY

Fig. 17



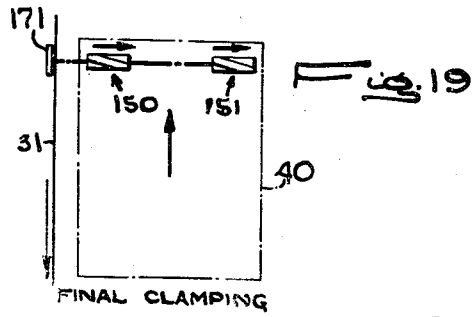
PERIPHERAL REGISTER

Fig. 18



SKEW ADJUSTMENT

Fig. 19



FINAL CLAMPING

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May 31, 1955

H. L. McWHORTER

2,709,405

PLATE LOCKUP FOR PRINTING PRESS

Filed Aug. 26, 1949

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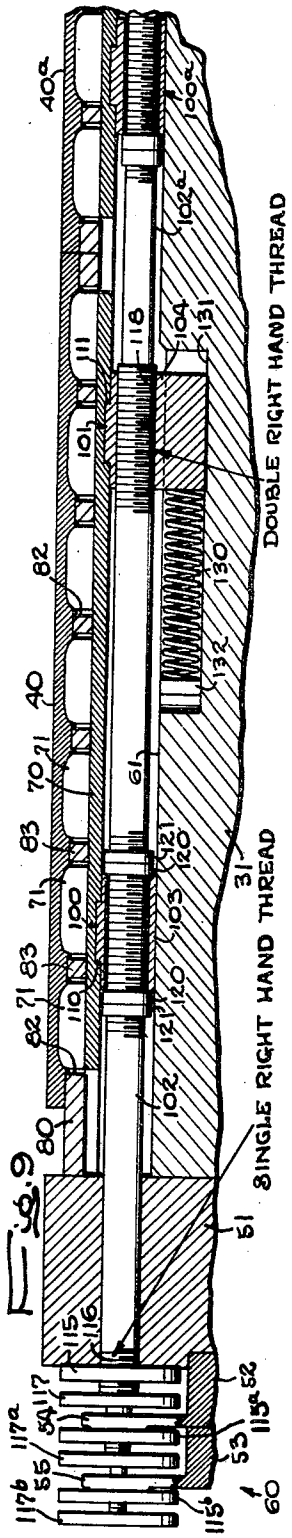


Fig. 9

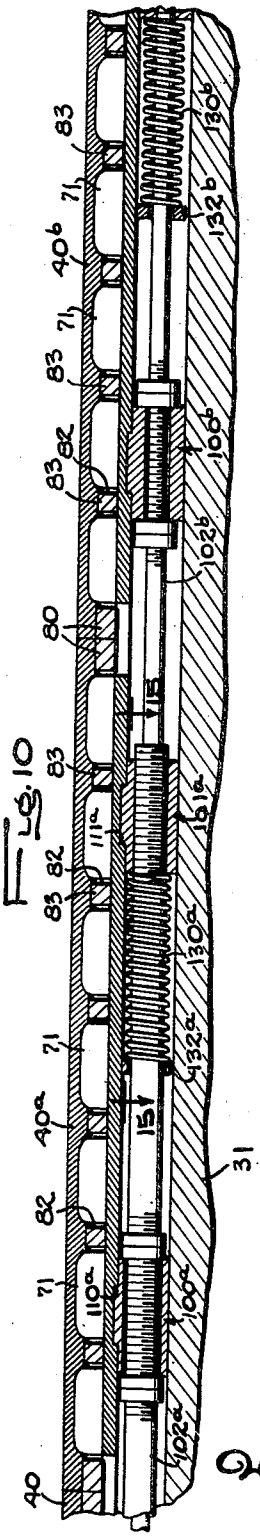


Fig. 10

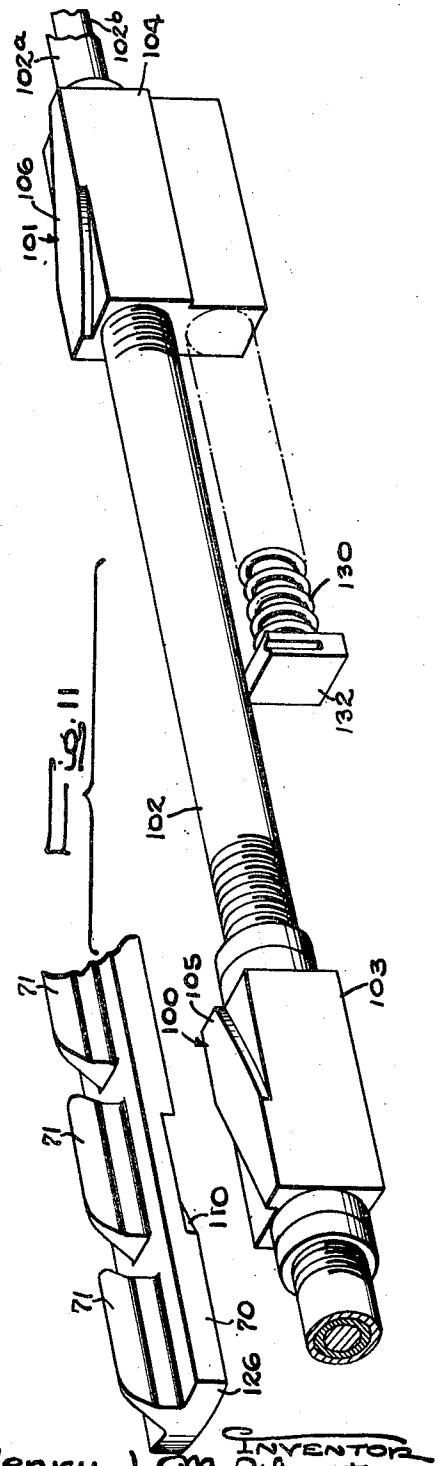


Fig. 11

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May 31, 1955 H. L. McWHORTER 2,709,405

PLATE LOCKUP FOR PRINTING PRESS

Filed Aug. 26, 1949 9 Sheets-Sheet 5

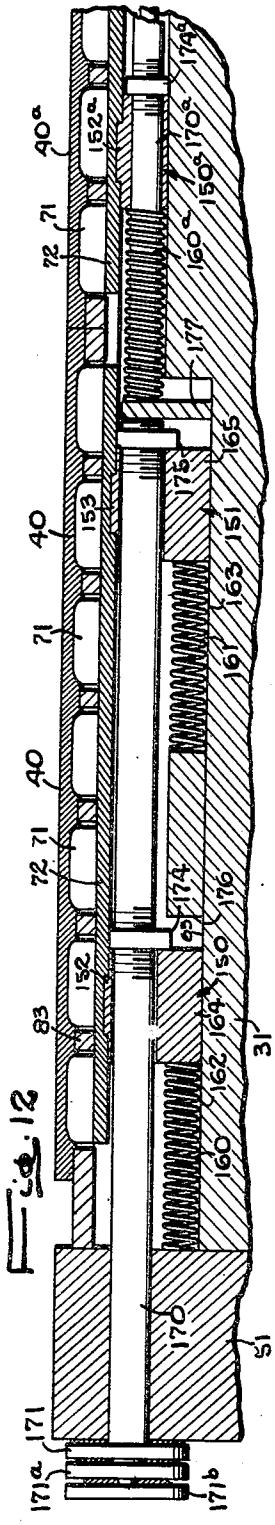


Fig. 12

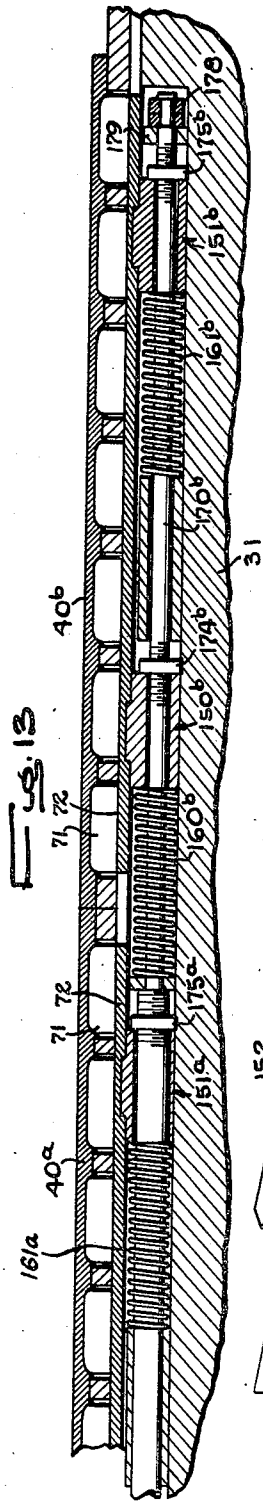


Fig. 13

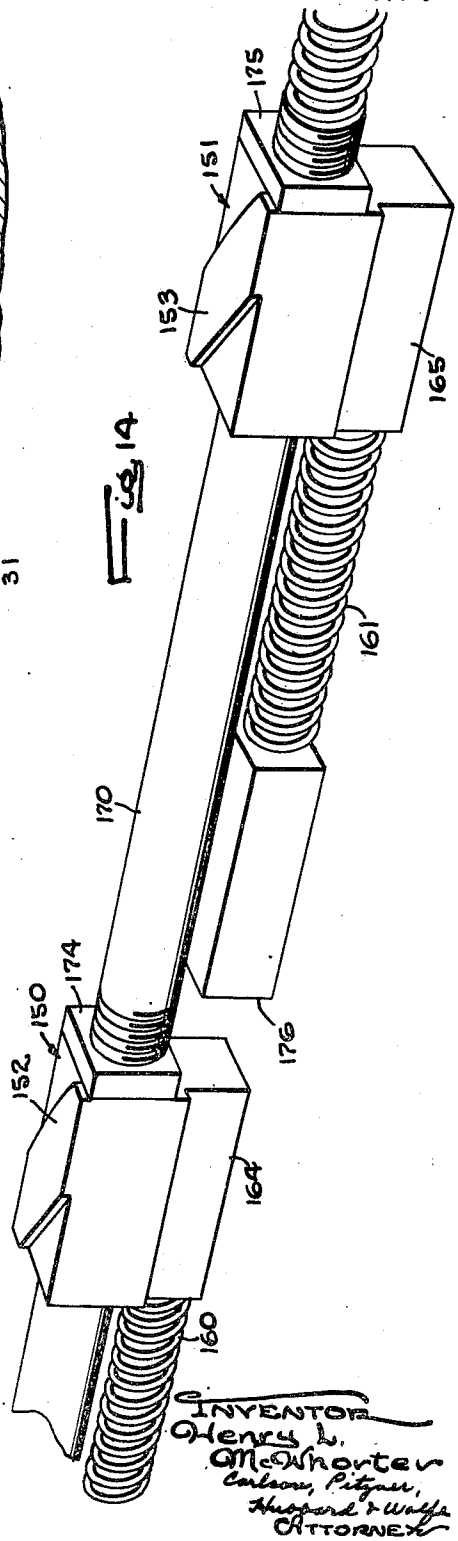


Fig. 14

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May 31, 1955 H. L. McWHORTER 2,709,405

PLATE LOCKUP FOR PRINTING PRESS

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Fig. 20

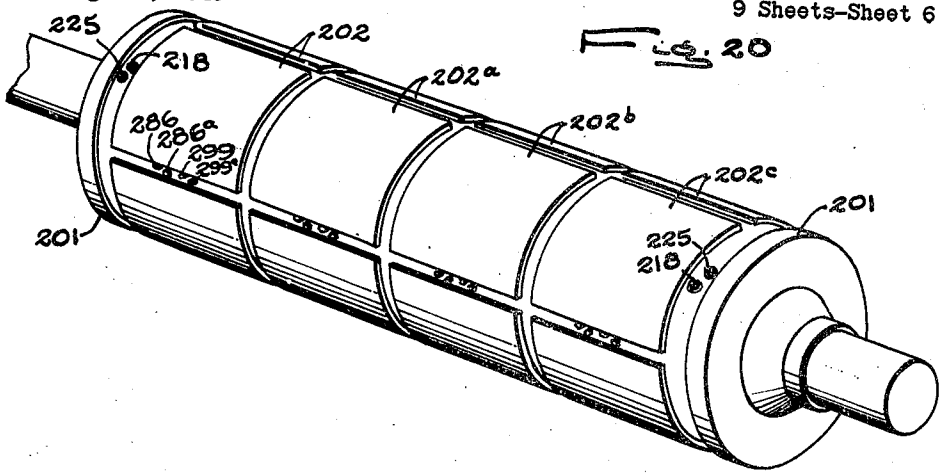
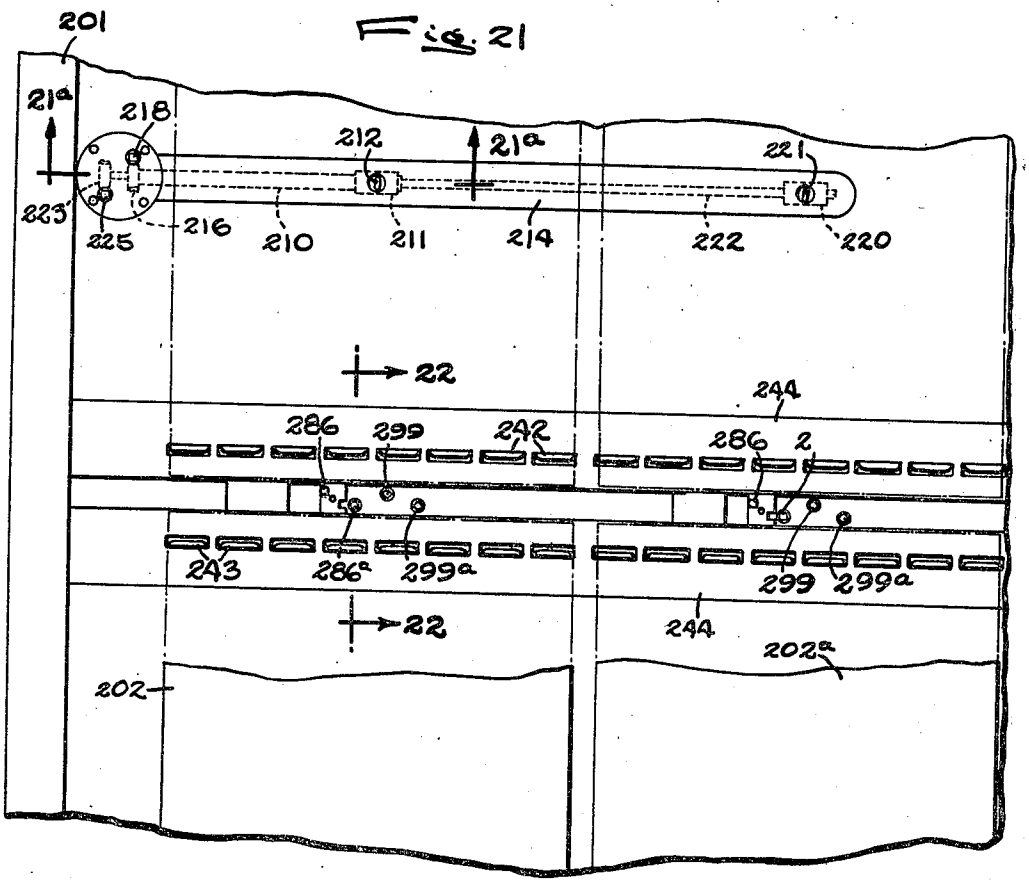


Fig. 21



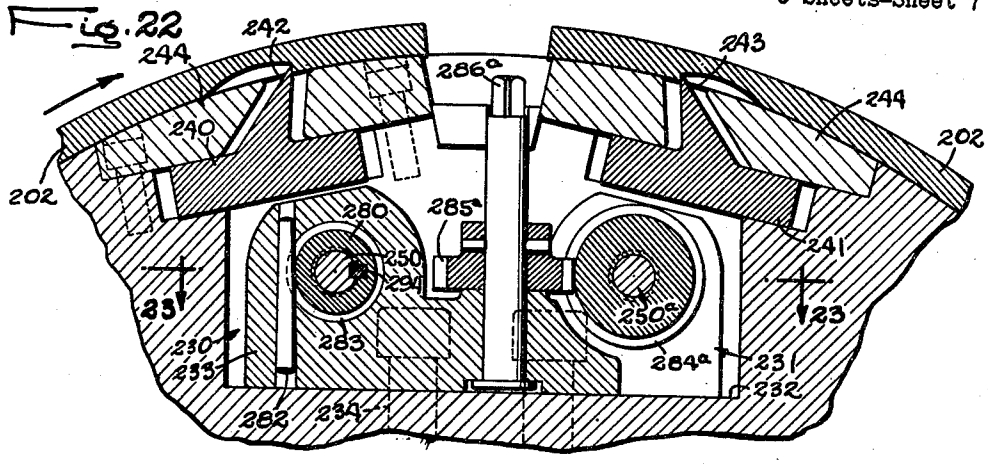
INVENTOR
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May 31, 1955 H. L. McWHORTER 2,709,405

PLATE LOCKUP FOR PRINTING PRESS

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Fig. 22



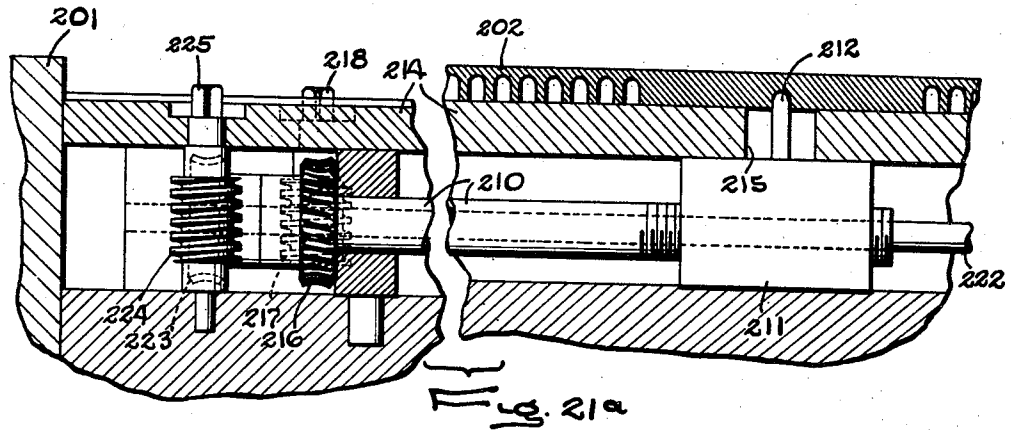


Fig. 21a

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PLATE LOCKUP FOR PRINTING PRESS

Filed Aug. 26, 1949 9 Sheets-Sheet 8

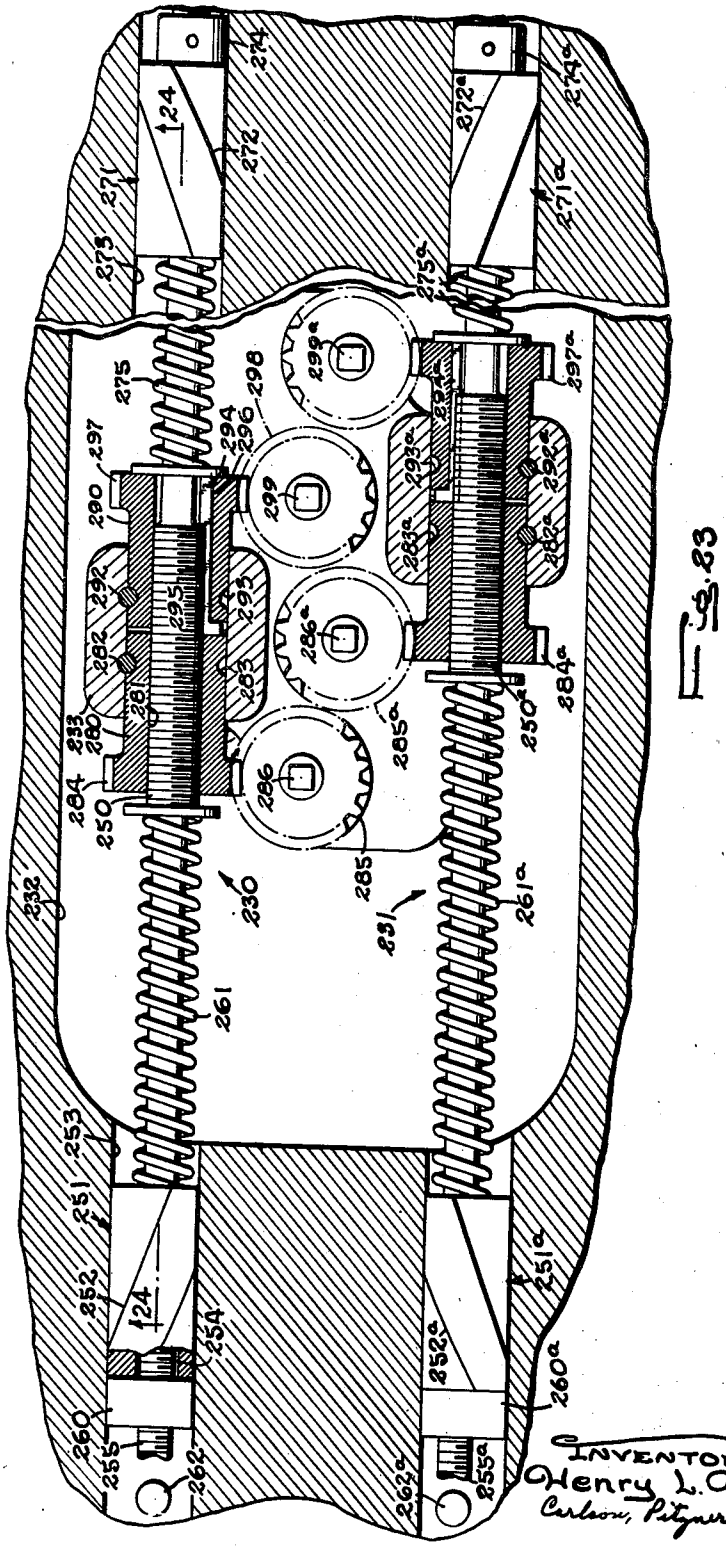


Fig. 23

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May 31, 1955 H. L. McWHORTER 2,709,405

PLATE LOCKUP FOR PRINTING PRESS

Filed Aug. 26, 1949 9 Sheets-Sheet 9

Fig. 24

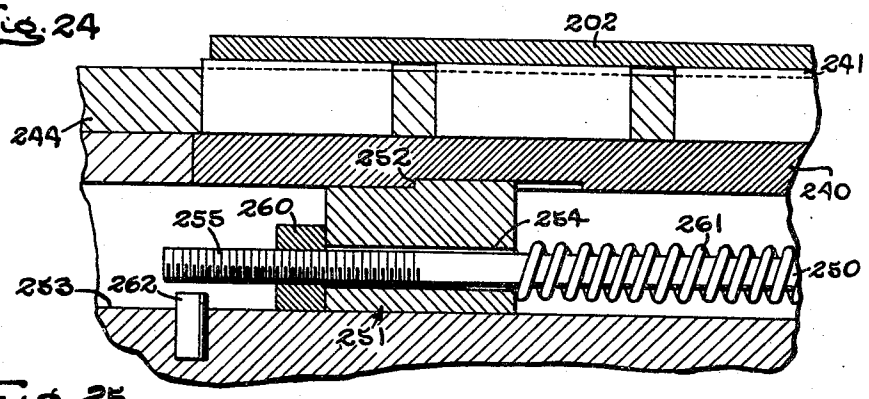


Fig. 25

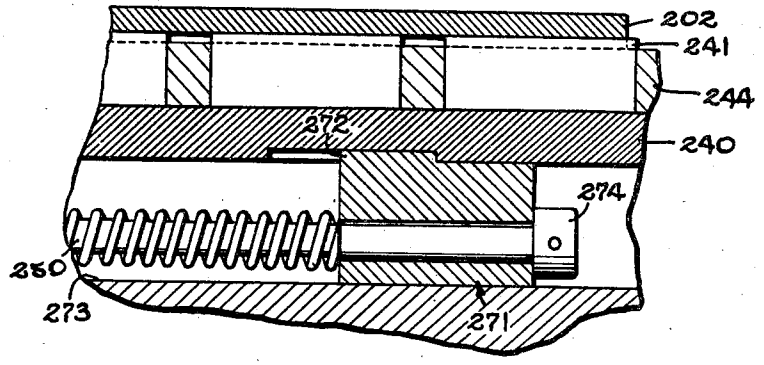
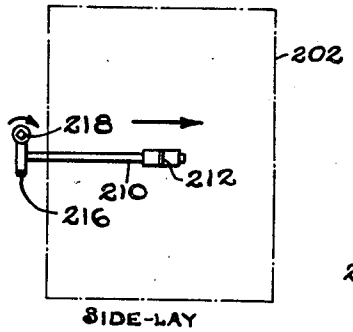
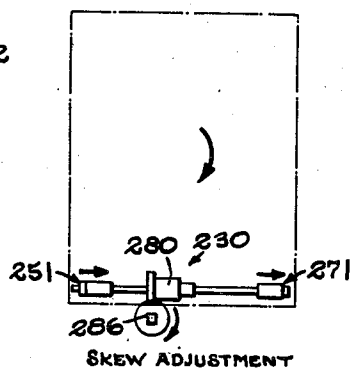


Fig. 26



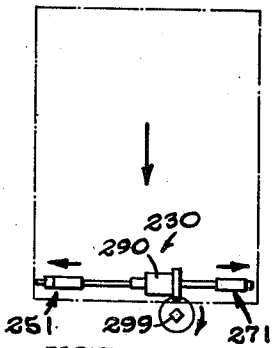
SIDE-LAY

Fig. 27

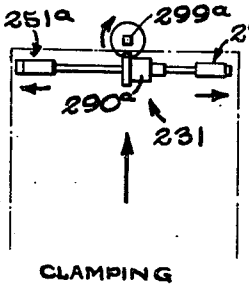


SKEW ADJUSTMENT

Fig. 28



PERIPHERAL REGISTER



CLAMPING

Fig. 29

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Carlson, Pitzner, Hubbard & Wolfe

ATTORNEYS

United States Patent Office 2,709,405 Patented May 31, 1955

2,709,405

PLATE LOCKUP FOR PRINTING PRESS

Henry L. McWhorter, Hinsdale, Ill., assignor to The Goss Printing Press Company, Chicago, Ill., a corporation of Illinois

Application August 26, 1949, Serial No. 112,583

15 Claims. (Cl. 101—378)

The present invention relates to printing presses and more particularly to means for locking printing plates on a cylinder.

In printing high grade color work in magazine presses and newspaper color presses it is necessary that the plates be precisely adjusted for proper color register. This requires that the plate be movable both peripherally and axially with respect to the plate cylinder and also rotatable through a small angle in each direction. Clamping and adjustment is usually accomplished in presses now in use by means of the spiral-groove type of lockup in which each plate is retained by a series of clamps or catches mounted in spiral slots on the surface of the plate cylinder and engaging the edges of the plate at spaced intervals. Since it is frequently necessary to use 20 or more of such catches in the mounting of a single plate, it is apparent that installing and removing a plate so mounted takes considerable time. Registration of the plates normally requires that practically all of the clamps be adjusted which is not only time-consuming but requires considerable skill. Adjustment for the most part must be carried out "in the dark" since there is no convenient relation between the magnitude of the desired change and degree of adjustment of each of the clamps.

After the press is put into operation the small bearing area of each of the clamps causes the plate to peen or deform locally resulting in progressive loss of register. And, since such a large proportion of the cylinder area must be taken up by the slots, the plates are not adequately supported and tend continuously to settle. Also important is the fact that the rotatable member of each of the clamps must be independently accessible between adjacent plates thus preventing edge-to-edge abutment of the plates and making the printing of bleed pages wasteful not only of paper but also of press capacity. The grooved cylinders are expensive to maintain since the grooves become clogged with dried ink which must be laboriously scraped out at frequent intervals.

Other lockup designs have been proposed for magazine presses to overcome the above disadvantages, but their lack of success is indicated by the fact that they have not displaced the spiral groove type of lockup to any noticeable extent. Of these designs the most promising is the mounting of printing plates by putting the leading and trailing edges in tension. The problem is, however, complicated by the fact that impression pounding causes a certain amount of stretching and the plates tend to work loose after short periods of operation giving rise to the possibility that they may be thrown. This difficulty has been overcome by providing means for keeping one set of lockup fingers under spring tension. In the past this has meant that the plate was often subjected to excessive tension. Newspaper stereo plates which are hard and thick can withstand large tensile forces but it has been found that the relatively thin stereos or soft electrotype plates usually used for color printing cannot be constantly stressed for maximum

loading and subjected to impression pounding without premature failure. In addition, prior tension lockups are not well suited for newspaper presses adapted for color work in which rotation of the plate cylinder must take place in either direction.

Accordingly it is an object of the invention to provide a printing plate lockup which enables the plate to be quickly and easily installed and removed and which enables translatory and angular adjustment as well as clamping with a minimum number of controls and following an extremely simple procedure. It is an allied object to provide a lockup of the above type in which the adjustment applicable to each plate may be made independently and in which there is a convenient relation between the desired change and the degree of adjusting movement of the control.

It is another object of the invention to provide a tension lockup which is applicable to both newspaper color presses and magazine presses enabling operation of the plate at high speed for extremely long periods without requiring manual takeup of the plate or readjustment of register. It is a related object to provide an improved tension lockup in which the plate is positively and snugly seated for the duration of a run while employing a tensile stress which is independent of the judgment of an operator and does not exceed the amount required for secure locking, making the lockup particularly well suited for use with relatively soft electrotype plates. It is a more detailed object to provide an improved tension lockup in which takeup of the plate occurs constantly and automatically and in which retrograde movement is eliminated.

It is an object of the invention in one of its aspects to provide a tension lockup for a newspaper color press which may be operated in either the forward or reverse direction of rotation. It is a related object to provide a lockup mechanism for use in a color press and capable of performing the gripping and adjusting functions applicable to either the leading edge or trailing edge of the printing plate.

It is an object of the invention in another aspect to provide a lockup particularly well suited for a magazine press and which permits the printing of bleed pages in any or all positions on the plate cylinder.

It is a further object of the invention to provide a tension lockup having provision for adjusting the register of each plate independently but which nevertheless permits of stiff cylinder construction and thus greater cylinder length with a proportional increase in press capacity.

It is an object to provide a plate lockup arrangement which is inexpensive to manufacture, which enables a considerable speedup of production and which reduces to a minimum the cost of installing and adjusting plates as well as maintaining the cylinders on which they art mounted. It is a general object of the invention to provide a tension lockup which produces a uniform and sustained high quality of printing, which reduces creep and eliminates settling of the plates and which substantially eliminates damage and fatigue failure even after prolonged use.

Other objects and advantages of the invention will become apparent by a reading of the following detailed description and with reference to the drawings in which:

Figure 1 is a schematic representation of an impression cylinder having a plurality of plate cylinders to which the present invention is applicable.

Fig. 2 shows a printing plate of the type preferably utilized in practicing the invention.

Fig. 3 is a perspective of a plate cylinder for a magazine press showing the plates mounted in abutting relation for the printing of bleeds.

Fig. 3*a* is an exploded view of the dial supports in Fig. 3.

Fig. 4 is a cross section of the cylinder illustrated in Fig. 3.

Fig. 5 is a fragmentary developmental view showing that portion of the surface of the cylinder indicated by the line **5—5** in Fig. 4.

Fig. 6 is a fragmentary section taken along the line **6—6** in Fig. 5.

Fig. 7 is a fragmentary section taken along the line **7—7** in Fig. 5.

Fig. 8 is a fragmentary section taken along the line **8—8** in Fig. 7.

Fig. 9 is a fragmentary section taken along the line **9—9** in Fig. 5.

Fig. 10 is a fragmentary section taken along the line **10—10** in Fig. 5.

Fig. 11 shows in perspective the cam assembly illustrated in Fig. 9.

Fig. 12 is a fragmentary section taken along the line **12—12** in Fig. 5, and shows the means for clamping the trailing edge of the plate.

Fig. 13 is a fragmentary section taken along the line **13—13** in Fig. 5.

Fig. 14 is a perspective of the cam assembly illustrated in Fig. 12.

Fig. 15 is a top view of the retaining spring and cam taken along line **15—15** in Fig. 10.

Fig. 16 is a diagrammatic representation of the side-lay adjustment.

Fig. 17 shows the adjustment of peripheral register.

Fig. 18 shows the adjustment of twisting or skew.

Fig. 19 illustrates the clamping of the trailing edge of the plate.

Fig. 20 is a perspective of a plate cylinder employed in a newspaper color press and forming another embodiment of the present invention.

Fig. 21 is a fragmentary developmental view similar to Fig. 5 but showing a portion of the surface of the plate cylinder of Fig. 20.

Fig. 21*a* is a fragmentary section taken along line **21*a*—21*a*** in Fig. 21.

Fig. 22 is a fragmentary section showing the finger bars and associated mechanism taken along the line **22—22** in Fig. 21.

Fig. 23 shows the appearance of the lockup mechanism as viewed along the line **23—23** in Fig. 22.

Figs. 24 and 25 are fragmentary sectional views taken along the line **24—24** in Fig. 23 and showing details of one of the plate gripping and adjusting mechanisms.

Fig. 26 shows diagrammatically the adjustment of side-lay in the modified embodiment.

Fig. 27 is a diagram showing the manner in which the printing plate is adjusted for skew.

Fig. 28 is similar to Fig. 27 but shows the manner in which the plate is adjusted for peripheral register.

Fig. 29 shows the tension mechanism as employed for clamping the trailing edge.

While the invention is susceptible of various modifications and alternative constructions and uses, I have shown in the drawings and will herein describe in detail only certain preferred embodiments of the invention. It is to be understood, however, that I do not intend to limit the invention by such disclosure, but aim to cover all modifications and alternative constructions and uses falling within the spirit and scope of the invention as expressed in the appended claims.

Turning now to the drawings, Figure 1 shows a portion of a magazine press including an impression cylinder **30** and plate cylinders **31—35** distributed about the periphery. Each one of the plate cylinders is supplied with ink of a different color by suitable inking mechanism (not shown) for five-color printing of a web **36**.

Fig. 2 illustrates a plate **40** of one type which may be employed in the present invention. Plates of this design

are described in detail in the Crafts Patent No. 2,474,889 dated July 5, 1949. It will suffice for present purposes to say that the plate includes arched and undercut pockets **41** at the leading and trailing edges and is designed to be placed in tension by the fingers of the gripping mechanism. For a purpose which will become clear as the discussion proceeds, each plate includes at its center an integral land **42** having a groove **43** therein which is engaged by the side-lay portion of the adjusting mechanism. A plurality of such plates **40**, **40*a*** and **40*b*** are arranged substantially edge to edge on the plate cylinder **31** as set forth in Fig. 3. In this figure the dials used for adjusting and clamping the individual printing plates are indicated at **50**. Such dials project through the bearer ring **51** and are readily accessible at the side of the press. Only one half of the entire plate cylinder **31** is shown, having a capacity of three plate widths or streamers. It will be understood that up to three additional streamers may be accommodated by the other half of the plate cylinder with the plates of the second set being adjustable by corresponding dials located at the bearer ring at the opposite end.

In order to establish a datum or reference position for the dials **50** associated with the individual plates, annular supports **52**, **53** are concentrically mounted at the end of the plate cylinder **31** and spaced parallel to the bearer ring **51**. Each of these supports includes radially-extending brackets or tabs **54**, **55** respectively as shown in Fig. 3*a*. The function of these tabs as positioning surfaces will become apparent as the discussion proceeds.

As shown in cross section in Fig. 4 the lockup mechanism is included within a series of shallow channels so that there is substantially no reduction in the stiffness of the plate cylinder. In the present embodiment the plate cylinder **31** accommodates four plates about its periphery. The leading edge of each plate is gripped by a leading edge lockup mechanism **60** contained in a channel **61**, while the trailing edge is gripped by a lockup mechanism **62** included within a channel **63**. At the center of the plate the side-lay adjusting mechanism **64** occupies a channel **65**. As shown in greater detail in Figs. 5 and 6 a leading edge finger bar **70** extends along the edge of one of the plates **40** and includes gripping fingers **71** which are somewhat narrower than the registering pockets **41**. Similarly there is provided a finger bar **72** having a series of fingers **73** at the trailing edge of each of the plates. To retain the finger bars **70**, **72** in position against the effect of centrifugal force and to protect the underlying mechanism as well as to provide a good plate-seating surface, a cover plate **80** is used which is held in place by bolts **81**. This plate has windows **82** registering with the fingers, the windows being separated by bridges **83**.

In accordance with one aspect of the invention an upwardly projecting tang or projection is centered under each of the plates and is arranged for adjusting movement lengthwise of the cylinder to position the plate for side-lay. In Fig. 5 the tangs corresponding to the three plates are designated **90**, **91** and **92** respectively, and are integral with traveling nuts **93**, **94** and **95**. Means are provided at the outer edge of the bearer ring **51** for adjusting the nuts **93—95** individually. In accordance with the present invention I prefer to accomplish this by threading the nuts on concentric telescoped shafts **100—102** having dials **103—105**. The assembly as a whole is kept in the position shown by a cover plate **101*a*** (Fig. 8), and end play is prevented by means of a collar assembly **106** associated with the innermost shaft **102**. The traveling nuts are kept in place by removable cover plates **107**, **108**, **109** respectively, having appropriate windows for the tangs. Preferably washers are used between the dials and friction at the nuts is sufficient so that the dials **103—105** may be turned individually to move one of the plates from side to side without affecting the positioning of the remaining two plates.

In accordance with another aspect of the invention

novel means are provided for adjusting the peripheral location of the leading edge of each plate as well as adjusting the skewing of the plate about the tang located at the center thereof. This is accomplished by employing cams at the ends of each finger bar and by providing means for moving the cams to advance either or both ends of the bar. The manner in which this is accomplished will be made clear by reference to Figs. 9 and 11 which show the cam assembly associated with the first of the plates in the series. In carrying out the present invention movable cams are provided at the ends of each of the finger bars for engaging angular cut grooves therein. Both of the cams are connected to a shaft with provision for either translating the shaft endwise or for screwing the shaft to shift the cams toward one another or away from one another. For moving plate **40** in the present instance I provide cams **100**, **101** consisting of traveling blocks **103**, **104** respectively riding in the slot **61** and having inclined cam projections **105**, **106** thereon. The latter projections are received in correspondingly angled slots **110**, **111** machined in the finger bar **70** as shown in Fig. 11 to provide a tongue and groove engagement. Preferably the cam projections have the edges rounded as shown to permit each projection to twist in its groove without binding.

For transporting the shaft **102** bodily a dial in the form of a nut **115** is provided at the bearer ring and in engagement with a thread **116** at the end of the shaft **102**. The shaft **102** is itself terminated in a dial **117** which permits convenient hand rotation. In accordance with one of the aspects of the invention one of the cams (here cam **101**) has a thread **118** of double pitch and of the same handedness as the thread **116** at the outer end of the shaft **102**. The remaining cam **100** is not threaded on the shaft **102** but is telescoped freely thereover and maintained captive by means of threaded collars **120** each maintained in place by locknuts **121**. As a result of the foregoing structure the dials **115** and **117**, acting alone, are effective to control the skewing of the plates on the cylinder and the peripheral position on the cylinder respectively. The manner in which this occurs will be apparent by considering the effect of turning the dial **115** to the right. If the threads are right-hand threads, this will cause the shaft **102** to be retracted and will cause the cams **100**, **101** to move to the left as viewed in Figs. 9 and 11. Because the cam projections are oppositely directed this will result in skewing of the finger bar **70** in a clockwise direction as indicated by the arrows **125** in Fig. 18 and corresponding movement of the plate. The direction of rotation of the plate will be the same as the direction of rotation of the dial **115** employed in making the adjustment. Skewing of the finger bars is facilitated by providing a rounded bearing surface **126** at each end and by blocking the ends against endwise movement. For the same purpose, the cover plate windows **82** which surround the finger **71** are dimensioned to provide appropriate clearance, the latter in the present instance being approximately 1/16 of an inch.

In carrying out the invention means are provided for retaining the shaft **102** inwardly biased to remove any play in the cams and to insure that the shaft **102** is transported inwardly upon reverse rotation of the dial **115**. In the present instance this is accomplished by means of a coil spring **130** which bears upon the cam **101**. The spring **130** is contained in a recess **131** and the force in the spring is adjustable by means of a stop **132** which is pinned in a desired position in the recess by means of pins **133** or the like (Fig. 15). It will be apparent, therefore, that upon counterclockwise rotation of the dial **115** the shaft **102** will be transported inwardly together with its cams **100**, **101** to cause counterclockwise rotation of the printing plate **40** about its center on tang **90**. The angle of skewing is for practical purposes proportional to the arc through which the dial **115** is rotated, giving the operator a convenient measure of the amount of turning movement required. Having understood the means used for imparting skew to the printing plate we will next consider the means for moving it peripherally in one direction or the other. This is accomplished by turning the dial **117** keeping the dial nut **115** fixed in position against the bearer. Since the cam **100** is collared to the shaft **102** movement of the dial screw **117** in a clockwise direction, or to the right as viewed by the operator, will cause the cam **100** to move inwardly. Because of the angling of the surfaces associated with the cam projection **105**, this will cause the finger bar **70** and the plate **40** mounted thereon to be advanced in the forward direction. In the case of cam **101** quite a different action takes place, although the effect is to move the printing plate in the same direction. Because the thread **116** transports the shaft **102** inwardly (to the right in Figs. 11 and 17), one might think that the cam **101** would move in the same direction. However, since the thread **118** in the cam is in the same direction as thread **116** and has double the pitch, the net movement of the cam is not only opposite to the direction of movement of the shaft **102** but takes place at the same rate. Consequently the cam projection **106** on the cam **101** is effective to move the end of the finger bar **70** in the clockwise or forward direction and both ends of the finger bar are moved in step with one another or broadwise when the dial screw **117** is turned. Purely peripheral movement of the plate is the result. Because of the lateral takeup provided by the spring **130** and the opposed angling of the cams, adjustment of dial **117** has no effect on the side-lay or skew adjustments and the plate is accurately maintained in the position to which it is initially adjusted.

The means used for adjusting the second and third plates **40***a* and **40***b* is completely analogous to that just described above. To simplify understanding corresponding parts concerned with control of the plate **40***a* have been assigned corresponding numerals with the subscript *a*. Control is effected by means of a hollow shaft **102***a* which is telescoped within the shaft **102** and which engages cams **100***a*, **101***a*. However in this case the spring designated **130***a* rather than being fitted in a special recess encircles the shaft **102***a* and bears directly against the cam **101***a*. The opposite end of the spring is maintained in place by means of the stop **132***a* which has a hole centrally bored therein for the reception of the shaft **102***a*. At the outer end of the shaft **102***a* are dials **115***a* and **117***a*. Because of the biasing effect of the spring **130***a*, the dial **115***a* is drawn up tightly against the bracket or tab **54** of the ring **52** shown in Figs. 3*a* and 9. Thus the tab **54** provides a datum or reference surface similar to the function performed by the end of the bearer ring in the case of the first plate. Rotation of the dials **115***a*, **117***a* associated with plate **40***a* produces the same effect as rotation of the dials **115**, **117** previously discussed.

Moving on to the third plate **40***b* a similar adjusting arrangement is used and the numbering corresponds to that previously discussed except for the addition of a subscript *b*. Control is effected through a central rod **102***b* controlling cams **100***b*, **101***b*. At the outer end of the shaft **102***b* are dials **115***b* and **117***b*, the dial **115***b* being drawn up tightly in contact with the bracket **55** on the ring **53** (Figs. 3*a* and 9). The arrangement of the biasing spring **130***b* is exactly the same as that of spring **130***a*. It will be apparent that the six dials in stacked relation form not only a convenient but also an extremely compact arrangement for adjusting the leading edge of the plate in skew as well as in peripheral register. The arrangement is very inexpensive to produce since it is sufficient to mill a rather shallow channel for receiving the telescoped shafts **102**, **102***a* and **102***b*. All the sliding parts are maintained securely in position by means of the cover plate **80**.

This brings us to the final control, namely that for effecting clamping of the trailing edge of each of the plates. In accordance with the present invention cams are provided for engaging the finger bar at the trailing end of the plate with the cams being urged in the plate tensioning direction by means of springs. Release of the cams and consequently retraction of the fingers engaging the plate is effected by an external adjustment which causes movement of the cams against the spring pressure. The structure here employed for effecting the above is disclosed in Figs. 12, 13 and 14.

Considering only the mechanism associated with the left-hand plate 40, the cams are designated at 150, 151 (Figs. 12, 14). The cams have inclined projections 152, 153 which engage corresponding slots in the associated finger bar 72. The cams are urged in the plate tensioning direction by means of springs 160, 161 respectively. The latter are, for convenience, received in slots 162, 163 and engage projections 164, 165 on the respective cams. Extending through the cams 150, 151 is a tubular control shaft 170 terminating at its outer end in a dial 171. It will be noted, however, that the cams 150, 151 are not threaded on the shaft 170 but slide loosely therealong. For moving the cams traveling nuts 174, 175 are threaded to the shaft 170 and are prevented from rotating by engaging the walls of the slot. By rotating the shaft 170 in a plate-releasing direction the nuts 174, 175 draw up the cams against the force of the springs 160, 161. For clamping the plate the shaft is rotated in the opposite direction, the nuts being moved in a retreating direction with the springs constantly urging the cams in a direction to clamp the plate. Since cam movement is "positive" in the retreating direction only, the connection may be referred to as a one-way spring takeup connection. The nut 174 is limited in the reverse direction of movement by means of a stop 176 while movement of the nut 175 in its reverse direction is limited by a stop 177. Jamming of the nuts against their respective stops thus serves as a clear indication to the operator that the cams 150, 151 are fully released and are under the exclusive control of the associated springs 160, 161.

In practicing the present invention the surfaces on the cam projections 152, 153 are arranged at such a shallow angle that retrograde or releasing movement of the cam due to tensile forces built up in the plate cannot occur. Simply stated, the cam is irreversible. Further, the springs 160, 161 are preferably so constructed that the effective force exerted thereby is just barely sufficient to overcome the friction in the mechanism when under centrifugal load. As a rule of thumb the springs should be sufficiently strong so that there is reliable followup between the cams and their respective nuts 174, 175. With the plate initially at standstill the finger pull on the plate due to the springs is only a small fraction of that which would be required to hold the plate in the event the cam surfaces were "reversible." Although a tongue and groove type of cam has been described and illustrated in the drawings, it will be apparent to one skilled in the art that the invention is not so limited but would include equivalent connections where the effective angle between the engaging parts is sufficiently shallow so that takeup of the plate in tension may occur while retrograde movement cannot.

A similar means is provided for final clamping of the adjacent plates 40*a*, 40*b*. The same reference numerals are used to designate corresponding parts with the addition of subscripts *a* and *b* respectively. In the case of plate 40*a* the shaft 170*a* terminates in a dial 171*a*. Cams 150*a*, 151*a* are telescoped over the shaft and abut traveling nuts 174*a*, 175*a*. The springs 160*a*, 161*a* instead of being mounted in special milled recesses are telescoped over the shaft 170*a* since stepdown of the shaft makes room available.

With regard to the means for clamping plate 40*b*, a central shaft 170*b* is controlled by a dial 171*b* to position the nuts 174*b*, 175*b* threaded thereon. The latter serve to position the cams 150*b*, 151*b*, being maintained in contact therewith by springs 160*b*, 161*b*. The entire final clamping assembly is maintained in the cylinder by means of a fixed collar 178 on the shaft 170*b*, riding on a collar 179 which is rigid with the plate cylinder.

The operation of the adjusting and clamping mechanism discussed above may be summed up by reference to Figs. 16–19 which should be considered purely diagrammatic. The small arrows indicate the cam adjusting movement while the larger indicate the movement of the plate which results. Fig. 16 shows adjustment of side-lay by rotation of dial 103. In Fig. 17 peripheral register is secured by rotation of the dial 117 which causes the cams to move in opposite directions. Fig. 18 illustrates that dial 115 is effective to cause bodily translation of the shaft 102 resulting in skewing of the plate about its center. The plate, precisely registered by such adjustment, is then shown clamped in Fig. 19 along its trailing edge by rotation of the dial 171 in a direction to free the cams for independent movement by their associated springs.

The above clamp construction includes a number of advantages which are important from a practical standpoint, the first being that the effective force supplied to the ends of the finger bar is independent of the force exerted by the operator in rotating the adjusting shaft 170. Turning the dial 171 in a direction to cause final clamping of the plate serves merely to release the cams 150, 151 so that they are placed fully under the control of the associated springs 162, 163. Additional rotation of the dial causes engagement of the traveling nuts 174, 175 when their stops signal the operator that clamping is complete. Under such conditions independent takeup occurs at each end of the finger bar as a result of the wedging at the cam surfaces. The force of the springs is not sufficiently great so that the plate is pulled down absolutely tight. However, upon rotation of the plate cylinder against the impression cylinder the plate is "rolled out," bodily displacement of the plate being prevented by the fingers at the leading edge. The very slight increase of the plate length which may occur as a result of the first few revolutions of the plate cylinder is immediately taken up by the cams.

When the press is rotated at a low speed the rolling action of the impression cylinder on the printing plate tends to relieve the stress exerted by the plate against the fingers at the trailing edge. As the impression cylinder leaves the plate there is a tendency for the plate to contract and re-establish the stress. It is to be noted, however, that in spite of the variation in stress which occurs at each revolution of the printing cylinder there is no corresponding change in the dimension of the printing plate. As the speed of the press is increased to full running speed, large centrifugal forces are set up in the plate tending to dislodge it radially. Such forces are resisted by the fingers at both the leading and trailing edges. The net result is that the force at the fingers varies upon each revolution and has a high average value under normal running conditions. Because retrograde movement cannot occur the plate does not undergo a corresponding cyclical variation in length and thus fatigue due to repeated straining is substantially eliminated. As the plate cylinder is slowed to a stop the centrifugal force disappears and the loading at the fingers is reduced. Again, there is no change in the dimension of the plate even though the finger force varies over wide limits. The tension at the fingers varies automatically to the extent necessary to keep the plate firmly seated on the cylinder. Although position and reliable seating is assured, the present clamp prevents overstress-

ing of the plate due to application of excessive initial spring pressure.

It is to be noted that spring takeup takes place independently at the ends of the finger bar 72 enabling such finger bar to become skewed exactly in accordance with the skew at the leading edge of the plate. The gripping force is therefore uniform all along the edge and substantially the same, plate after plate.

It is apparent that installation and removal of the plates may be accomplished very quickly using only a single control at the trailing edge and that all the controls required for adjustment are readily accessible at the ends of the cylinder. This combined with the fact that the plates may be lifted straight off enables the plates to be placed almost edge-to-edge in each direction; thus the printing of bleed pages by any or all of the plates on the cylinder is perfectly feasible. This adds greatly to press flexibility and, in addition to reducing the amount of planning prior to a run, has the effect of increasing the capacity of the press.

During a test run of over a million impressions, using a plate lockup embodying the present invention, it was found that the nickel plating was not worn off the plate at any point and that there was no peening at the points of engagement of the fingers with the plate. The leading edge of the plates moved back an average of only one thousandth of an inch or less and because of a certain amount of stretching the trailing edge moved back, but only an average of two thousandths of an inch. There was no noticeable settling of the plates and the useful life of the packing was considerably prolonged. Progressive loss of register noted in conventional magazine presses did not occur.

Reversible embodiment for newspaper color presses

In newspaper color work requirements are somewhat different from magazine practice since it is sometimes necessary for the plate cylinder to be reversed in direction of rotation and since it is normally not necessary to print bleed pages. An alternative embodiment of the invention particularly adaptable for such color work is set forth in Fig. 20. The cylinder has bearer rings **201** and supports a series of plates **202**, **202***a*, **202***b* and **202***c*. These plates will be assumed to be of the same type as previously discussed in connection with Fig. 2. One of the characteristics of the present arrangement is that the adjustments for the various plates are accessible at the periphery of the cylinder rather than at the ends thereof. The cylinder in the form illustrated is four plates wide although it will be apparent as the discussion proceeds that the invention is equally applicable where a larger number of plates are used.

The adjustment for side-lay illustrated in Figs. 21 and 21*a* is very similar to that previously described in Fig. 5. In the present instance a hollow threaded shaft **210** engages a traveling nut **211** having an upwardly extending tang **212** thereon. The nut is slidable back and forth in a milled slot as the shaft **210** is rotated in one direction or the other. It is retained in place by means of a cover plate **214** having an aperture **215** therein. For the purpose of rotating the shaft **210** there is provided at its outer end a worm wheel **216** and a worm **217** having a square head **218** for engagement by a suitable adjusting wrench. The worm and worm wheel drive is not only irreversible, preventing inadvertent movement of the plate, but also provides a convenient vernier type of adjustment.

Positioning of the adjacent plate **202***a* for side-lay is accomplished in similar fashion using a nut **220** having a tang **221** which may be moved from side to side by rotation of the central shaft **222**. The latter is rotated by means of a worm wheel **223** and worm **224** having a square head **225** on its shaft. The direction of the threads is preferably such that rotation of the square heads **218**, **225** to the right causes plate movement in the same direction. It will be understood that the remaining plates **202***b* and **202***c* are controlled by similar mechanism from the other end of the cylinder.

The means for gripping and adjusting the leading and trailing edges of the plate are shown in cross section in Fig. 22. The mechanism associated with one edge of the plate which we shall assume, for the present, to be leading is indicated at **230** and that associated with the adjacent plate is indicated at **231**. Both mechanisms **230**, **231** are mounted in a common recess **232**. Positioned at the top of the recess **232** and mounted for broadwise sliding movement as well as a limited amount of skewing movement are finger bars **240**, **241** having fingers **242**, **243** respectively. The latter may be constructed exactly the same as in the previous embodiment and may have rounded bearing surfaces at each end for preventing endwise movement. They are retained in place by means of a cover plate **244** which is of rigid construction and suitably bolted to the cylinder to resist the large centrifugal forces which are set up during operation of the press.

Seated at the bottom of the recess **232** is a frame or pillow block **233** for mounting both of the mechanisms **230**, **231**. This block is secured in position by means of suitable bolts **234**.

As in the previous embodiment the mechanisms **230**, **231** include irreversible cams for moving the finger bars broadwise or for skewing them in one direction or the other. The arrangement differs from that previously discussed in that one-way spring takeup connections including irreversible cams are available at both the leading and trailing edges of the plate instead of just at the trailing edge. Rotation of the adjustment in one direction is effective to move the finger bar in a plate-releasing direction with a positive action. Rotation of the adjustment in the opposite or plate-clamping direction is effective only to release a spring which in turn applies the actual clamping force. However, when using one of the mechanisms **230**, **231** for clamping the leading edge of a plate the adjustment is rotated in the spring-releasing direction only an amount sufficient to provide proper peripheral register of the plate, while the corresponding mechanism at the trailing edge of the plate has its spring fully released so that continuous automatic takeup may occur.

The manner in which the above is carried out in the present instance will be apparent upon inspection of Fig. 23 in which the mechanisms **230**, **231** are viewed from the top. Running parallel to the finger bar **240** is a shaft **250**. At one end of the shaft **250** there is a cam **251** having a cam surface **252** thereon and mounted in a channel or way **253** for endwise sliding movement. The cam **251** is bored as indicated at **254** to provide clearance over a thread **255** (see Fig. 24). Movement of the cam **251** in the releasing direction is effected by means of a nut **260** while movement in the opposite or plate-clamping direction is effected by a spring **261** which is telescoped over the shaft **250**. At the extreme end of the useful range of movement of the spring **261** and in the path of the nut **260** is a stop which in the present instance takes the form of a projecting pin **262**.

At the opposite end of the shaft **250** is a cam **271** having a cam projection **272** and received in a channel **273** for endwise sliding movement (see Figs. 23 and 25). Movement of the cam **271** in the plate-releasing direction is positively effected by means of a flange or collar **274** which is pinned or otherwise fixed to the shaft **250**. The cam is moved in the opposite or plate-clamping direction by a spring **275** which is telescoped over the shaft **250** and bears against the inner edge of the cam.

In accordance with the invention means are provided for moving the shaft bodily in an axial direction or for screwing it ahead for causing translation and skewing of the printing plate. In the present instance translation of the shaft is effected by rotating a threaded sleeve **280** having a single right-hand thread **281** engaging the shaft **250**. This sleeve is mounted for rotation in the pillow

block 233 but secured against endwise displacement by a pin 282 registering with a groove 283 in the sleeve. To rotate the sleeve 280 the latter has at one end a worm wheel 284 meshing with a worm 285. The worm 285 is mounted in the block 233 on an axis running substantially radially of the plate cylinder and has an upwardly projecting square head 286 for engagement by a wrench.

Because of the fact that the cam projections 252, 272 are angled in opposite directions, pure endwise movement of the shaft by turning the square head 286 causes the associated finger bar 240 to be skewed in one direction or the other. In the case of one of the cams, the cam displacement is positive and accompanied by compression of the associated spring, while in the case of the other cam movement takes place by reason of the releasing of the cam for movement under spring pressure. Since the skewing adjustment is applicable only to the leading edge of the plate and always occurs before the plate is clamped in tension, the pressure of the spring need be sufficient merely to overcome the frictional forces which tend to oppose the skewing adjustment. Preferably the direction of the teeth on the worm wheel and the direction of the thread 281 are such that the direction of skewing of the plate corresponds to the direction in which the square head 286 is rotated. Over the normal small range of adjustment the amount of skewing is roughly proportional to the amount that the square adjusting head is turned.

In accordance with a more detailed aspect of the invention peripheral movement of the associated finger bar and the plate attached thereto is effected by screwing the shaft 250 and by properly relating the thread 281 in the collar 280 with the thread 255 which engages the nut 260. Assuming a single right-hand thread is used at 281, the thread at 255 is of double pitch and of the same hand. This causes the associated cam 251 to move in the opposite direction from the shaft 250 but at the same rate. With regard to the means for rotating the shaft, a sleeve 290 is used which is rotatably mounted in the pillow block 233 and retained against axial movement by means of a pin 292 which registers with a groove 293 in the sleeve. Between the sleeve 290 and the shaft 250 is a slidable key engagement, the key indicated at 294 engaging opposd slots 295, 296 machined in the shaft and sleeve respectively. For the purpose of rotating the sleeve 290 a worm wheel 297 is formed at the end of the sleeve and engaged by a worm 298. The latter is rotated by means of a square adjusting head 299 similar to the head 286.

To summarize the operation it will be apparent that rotation of the sleeve 290 will cause the shaft 250 to be screwed through the thread 281 thereby causing movement of the cam 271 at a given rate. Because the thread 255 in the opposite cam 251 is of double pitch and of the same hand, movement of such cam will be in the opposite direction. Since the cam projections 252, 272 are oppositely directed it will be apparent that the opposite movement of the cams will cause the finger bar to be translated broadwise thus causing peripheral adjustment of the plate without varying the skewing adjustment. The angling of the projections 252, 272 is such that upon inward movement of the cams resulting from the positive advancement of the nut 260 and the collar 274 respectively, the clamping fingers tend to be disengaged from the plate while upon outward movement of the cams away from each other under the urging of the springs 261 and 275 the clamping fingers tend to move into engagement with the plate to move it forwardly. In order to increase the facility of adjustment, the direction of the teeth on the worm and worm wheel is preferably such that clockwise rotation of the square head 299 tends to draw the plate forwardly while reverse rotation tends to move the plate backwardly with respect to the leading edge thereof. The springs 261, 275 are sufficiently strong so that with the trailing edge unlocked they are effective to overcome the friction of the cams and the friction of the plate on the surface of the cylinder in advancing the plate forwardly into a desired position of peripheral adjustment.

When the plate has been adjusted for peripheral positioning as well as skew the cams 251, 271 are in contact with and firmly seated against the nut 260 and the collar 274 respectively. Thus, upon application of tension to the plate by the clamping of the trailing edge and as a result of normal operation there will be a tendency for the two cams to be squeezed inwardly. This tendency is completely overcome, however, by making the angle of the cam sufficiently shallow, say on the order of 20 degrees, so that the cam is irreversible. Under such conditions no amount of tension in the plate can cause inward movement of the cams. Since the nut 260 and collar 274 serve to positively position the cams against outward movement, they may be considered as accurately adjustable "stops." The forces in the shaft 250 are tensile under all conditions. As a result of the foregoing, the finger bar 240 may be adjusted to put the plate in a proper peripheral position by turning the square head 299. In each the change in the positioning of the plate in direction and magnitude corresponds to the direction and magnitude of turning, with the worm providing a smooth vernier action. Once set the adjustments remain unchanged and independent of forces on the plate. Attention will next be given to the use of the mechanism to produce final clamping of the plate at the trailing edge thereof.

That the same mechanism without change may be used for final clamping with automatic takeup will be apparent upon reference to the mechanism shown at 231, 232 clamping the trailing edge of the plate. Corresponding parts in the mechanism 231 are designated with the same reference numerals as in the case of the mechanism 230 with the addition of a subscript *a*. No further description of the mechanism 231 is required since the parts are substantially identical to those previously mentioned.

Since adjustment for skew is determined at the leading edge of the plate, the square head 286*a* and associated parts need not be used. The head should merely be set in a central position such that the associated finger bar 241 is not skewed substantially to the right nor to the left but extends longitudinally along the cylinder. The only control which need be used at the trailing edge is that shown at 299*a* which is effective to move the cams 251*a*, 271*a* away from and toward one another for clamping and release respectively.

When the plate is initially installed the adjustment head 299*a* should be turned in such a direction that the cams 251*a*, 271*a* are drawn toward one another substantially to the inner extremity of their range. As a result the fingers 243 on the finger bar 241 will be fully retracted and will not interfere with the installation of the plate nor with the skewing and peripheral adjustment thereof which occurs at the leading edge. After the plate has been adjusted clamping pressure is applied at the trailing edge of the plate by rotation of the square head 299*a* in a direction such as to move the cams 251*a*, 271*a* outwardly. A point will be reached during the course of such outward movement where the plate is placed in tension and where the cam surfaces are tightly engaged against the mating surfaces in the finger bar so that no further outward movement of the cams may occur. The head 299*a* is then turned an additional amount in the same direction until it cannot be turned any more. This signifies that the nut 260*a* has moved away from the cam 251*a* and into contact with the stop 262*a*. At this time also the collar 274*a* will have moved away from the associated cam 271*a*. The plate under such circumstances is under tension which is controlled exclusively by the force exerted by the springs 261*a*, 275*a* and is independent of any act of the operator. Stated another

way, it is impossible for the operator to cause the plate to be initially tensioned any more than the precisely predetermined value exerted by the springs. The force of the springs should normally be such as to overcome the friction of the cam surfaces and to insure that play or looseness between the plate and the cylinder is taken up.

To sum up the operation of the present embodiment reference may be made to the diagrams set forth in Figs. 26–29 inclusive. It will be seen in Fig. 26 that rotation of the square head **218** to the right causes side-lay adjustment in the same direction. In Fig. 27 clockwise rotation of the adjusting head **286** causes translation of the cams to the right and rotation of the plate in the clockwise direction about its center. As shown in Fig. 28 rotation of the head **299** in the clockwise direction causes advancement of the plate peripherally on the cylinder. After the above adjustments have been completed rotation of the head **299***a* in the opposite side of the plate (Fig. 29) causes outward movement of the cams under the urging influence of the associated springs to effect clamping of the plate in position for use.

It is to be noted that the clamping force applied at each end of the trailing edge finger bar **241** is completely independent of the amount that the plate has been adjustably skewed by the adjustment at the leading edge. To enable full takeup at each end of the plate the springs should preferably be quite long; in this way the spring force will not drop off appreciably with cam movement.

Since the cams have a surface on the order of 20 degrees to make them irreversible any slight stretching of the plate after it is installed will cause takeup of the increased length without, however, permitting the plate to retract when the impression forces are removed. Thus, just as in the case of the embodiment previously discussed, repeated stressing of the plate upon each revolution of the cylinder does not cause a cyclical change in the dimension thereof and fatigue is therefore eliminated or greatly minimized resulting in a much longer plate life.

It will be apparent that the above structure will enable operation of the printing cylinder in either direction. That is to say, the mechanism **231** may be employed at the leading edge of the plate and the mechanism **230** at the trailing edge when the cylinder rotates in a direction opposite to that indicated by the arrow in Fig. 22.

While I prefer to use a plurality of fingers on each finger bar and a corresponding number of registering pockets in the plate, it will be apparent to one skilled in the art that the invention is not limited thereto but would include equivalent constructions in which adjacent fingers were joined to one another resulting in one continuous finger projecting through a slotted cover plate and mating with a continuous pocket in the printing plate. In the claims, therefore, the word "fingers" is to be construed sufficiently broadly as to apply to the end portions of a single finger extending the width of the plate and the word "pockets" sufficiently broadly to apply to the end portions of a single long pocket in the plate.

I claim as my invention:

1. In a printing press the combination comprising a cylinder, a plate having pockets at the leading and trailing edges for placing the plate in tension, means engaging the center of the plate for manual adjustment of side-lay, a leading edge finger bar mounted on the surface of said cylinder for limited movement with respect thereto and having fingers for reception in the pockets along the leading edge of the plate, means including first and second cam members coupled to fingers located at spaced points along the leading edge of the plate, means for manually moving the cam members in the same sense to produce peripheral movement of the plate and differentially to produce skewing of the plate to locate the same in a desired position of register, a trailing edge finger bar mounted on said cylinder for limited and broadwise movement and having fingers thereon for engaging spaced pockets at the trailing edge of the plate, means including a pair of camming surfaces in non-retrograde wedging relation associated with said trailing edge finger bar and interposed between the same and said cylinder for placing the plate in tension, and means including a spring for maintaining said camming surfaces in engagement with one another for takeup of said plate, the pockets in said plate being so dimensioned relative to said fingers as to permit peripheral and skew adjustment as well as clamping independently of the side-lay adjustment.

2. In a tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension, the combination comprising a cylinder, lockup mechanisms positioned on said cylinder at the leading and trailing edges respectively of said plate, each of said lockup mechanisms including fingers for engaging widely spaced registering pockets in said plate, first and second cam members coupled in wedging relation to said fingers and mounted for endwise sliding movement in said cylinder and having an adjusting shaft extending therethrough, springs associated with said cam members respectively for forcing said cam members in a plate-tensioning direction, means including stops on said shaft for limiting the movement of said cam members under the influence of said springs respectively upon manual adjustment of the shaft, said cam member having a range of movement permitting adjustment of peripheral position and skew of the plate when one of said lockup mechanisms is employed at the leading edge of the plate, said stops being alternatively capable of retraction so that substantially unlimited spring takeup may occur when one of said lockup mechanisms is employed at the trailing edge of the plate.

3. A tension lockup for use with a series of arcuate printing plates arranged side by side and having pockets at the leading and trailing edges thereof for placing the plates in tension comprising, in combination, a cylinder, spaced fingers arranged on said cylinder at the leading edges and trailing edges respectively of the plates, cams associated with said spaced fingers for adjusting peripheral position and skew at the leading edge of each of the plates, cams associated with the fingers at the trailing edges of the plates for clamping the same in tension, the cams along a given edge being arranged in general alinement with one another in said cylinder, a series of hollow telescoped shafts lying longitudinally in the cylinder and having their inner ends coupled to said cams, and manually operated dials connected to respective ones of said shafts and arranged in stacked relation at one end of said cylinder for permitting independent manual registered adjustment and clamping of said plates.

4. A tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension comprising, in combination, a cylinder, gripping fingers mounted on the surface of said cylinder for movement with respect thereto and for pocketed reception in the leading edge of the plate, means including a pivot on said cylinder for pivoting the plate about its center, means including first and second cam members coupled to gripping fingers located at spaced points along the leading edge of the plate, means for manually moving the cam members in unison to produce peripheral movement of the plate and differentially to produce skewing of the plate about the center of pivoting to locate the same in a desired position of register, and clamping means including fingers for engaging the pockets along the trailing edge of the plate to lock the plate in tension on the cylinder.

5. A tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension comprising, in combination, a cylinder, gripping fingers mounted on the surface of said cylinder for movement with respect thereto and for pocketed reception in the leading edge of the plate for gripping the same, axially shiftable means for engaging said plate at its center for manual adjustment of side-lay,

means including first and second cam members coupled to gripping fingers located at spaced points along the leading edge of the plate, means for manually moving the cam members in unison to produce peripheral movement of the plate and differentially to produce skewing of the plate to locate the same in a desired position of register, and clamping means including fingers for engaging the pockets along the trailing edge of the plate to lock the plate in tension on the cylinder.

6. A tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension comprising, in combination, a cylinder, fingers arranged for movement on the surface of said cylinder for engaging pockets along the leading edge of the plate, means including first and second cam members coupled to fingers at spaced points along the leading edge of the plate, means including a threaded shaft threadedly engaging one of said cam members and having a captive sleeve connection with the other, manually operated means for alternatively rotating said shaft and for translating it endwise for producing movement of said cam members differentially or in unison to effect peripheral movement and skewing of the plate, and clamping means including fingers for engaging the pockets along the trailing edge of the plate to lock the plate in tension on the cylinder.

7. A tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension comprising, in combination, a cylinder, fingers arranged for movement on the surfaces of said cylinder for engaging pockets along the leading edge of the plate, means including first and second cam members coupled to fingers at spaced points along the leading edge of the plate, means including a shaft having a threaded connection with one of said cam members and a captive axial connection with the other, manually operated means for screwing said shaft axially in said cylinder or alternatively for subjecting it to pure endwise translation for producing peripheral movement and skewing of the plate, and clamping means including fingers for engaging the pockets along the trailing edge of the plate to lock the plate in tension on the cylinder.

8. A tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension comprising, in combination, a cylinder, a finger bar arranged at the surfaces of said cylinder parallel to the leading edge thereof and having fingers thereon engaging the pockets along said leading edge, means including first and second cam members coupled to the ends of the finger bar, means including a rotatable shaft having a thread for engaging one of said cam members and having a captive sleeve connection with the other, manually operated means for subjecting said shaft to pure endwise movement for producing movement of the cam members in the same direction for skewing of the plate, manually operated means including a thread having one-half the pitch of the thread in the threadedly engaged cam member and of the same hand for screwing the shaft axially in said cylinder to produce movement of the cam members in opposite directions for peripheral adjustment of the plate, and clamping means including fingers for engaging the pockets along the trailing edge of the plate to lock the plate in tension on the cylinder.

9. A tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension comprising, in combination, a cylinder, a finger bar extending parallel to the leading edge of the plate and mounted on the surface of said cylinder for broadwise movement and for limited skewing with respect to the axis of the cylinder, said finger bar having fingers integral therewith and projecting above the surface of the cylinder for reception in registering pockets in said plate, said finger bar having first and second cam surfaces at spaced points along the underside thereof, means including cam members having surfaces thereon for cooperating with the cam surfaces on said finger bar and axially slidable in said cylinder, means for manually moving the cam members in unison to produce peripheral movement of the plate, means for manually moving said cam members differentially to produce skewing of the plate, both said manual moving means being adapted to locate the plate in a desired position of register, and means including fingers for engaging the pockets along the trailing edge of the plate to lock the plate in tension on the cylinder.

10. A tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension comprising, in combination, a cylinder, means including a finger bar mounted on the surface of said cylinder parallel to the leading edge of the plate and having provision for limited broadwise movement as well as skewing movement, said finger bar providing first and second cam surfaces at spaced points along the underside thereof, first and second cam blocks recessed in said cylinder under said finger bar and arranged for axial sliding movement, said cam blocks having cam surfaces thereon for cooperating with the cam surfaces on said finger bar, a shaft extending through said cam blocks, means on said shaft providing a threaded engagement with one of said blocks and a captive sleeve engagement with the other, manually operated means for producing endwise translation of said shaft for movement of both of said cam blocks in the same direction, and means including both a single pitch thread for screwing said shaft axially of said cylinder and a double pitch thread in one of said cam blocks for moving said cam blocks simultaneously in opposite directions, and clamping means including fingers for engaging the pockets along the trailing edge of the plate to lock the plate in tension on the cylinder.

11. A tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension comprising, in combination, a cylinder, means including a finger bar mounted on the surface of said cylinder parallel to the leading edge of the plate and having provision for limited broadwise movement as well as skewing movement, said finger bar providing first and second cam surfaces at spaced points along the underside thereof, first and second cam blocks recessed in said cylinder under said finger bar and arranged for axial sliding movement, said cam blocks having cam surfaces thereon for cooperating with the cam surfaces on said finger bar, a shaft extending through said cam blocks, means on said shaft providing a threaded engagement with one of said blocks and a captive sleeve engagement with the other, means including a manually operated nut threaded to said shaft and in abutting engagement with the cylinder so that upon rotation thereof endwise translation of said shaft is produced with movement of both of said cam blocks in the same direction, and means for screwing said shaft axially of said cylinder in said nut for combined translation and rotation, the thread in said cam block having a double pitch relative to the thread in said nut so that said screwing causes the cam blocks to be moved simultaneously in opposite directions, and clamping means including fingers for engaging the pockets along the trailing edge of the plate to lock the plate in tension on the cylinder.

12. A tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension comprising, in combination, a cylinder, gripping fingers mounted on the surface of said cylinder for movement with respect thereto and for pocketed reception in the leading edge of said plate, means including first and second cam members coupled to gripping fingers located at spaced points along the leading edge of the plate, means for manually moving the cam members in the same sense to produce peripheral movement of the plate, means for manually moving the

cam members differentially to produce skewing of the plate, both said manual moving means being adapted to locate the plate in a desired position of register, and clamping means for locking the plate in tension on the cylinder, said clamping means including spring biased fingers for engaging widely spaced pockets along the trailing edge of the plate, said fingers being movable independently for even takeup of the plate for a wide range of skew adjustment.

13. A tension lockup for a printing press having pockets at the leading and trailing edges for placing the plate in tension, said lockup comprising, in combination, a cylinder, gripping fingers mounted on the surface of said cylinder for movement with respect thereto and for pocketed reception in the leading edge of the plate, means for manually moving the gripping fingers in the same direction to produce peripheral movement of the plate, means for manually moving the gripping fingers differentially to produce skewing of the plate, both said means being adapted to locate the plate in a desired position of register, clamping fingers on said cylinder for engaging spaced pockets at the trailing edge of the plate to place the plate in tension, means including camming surfaces disposed between said cylinder and said clamping fingers, said camming surfaces being biased into engagement for preventing retrograde movement of the clamping fingers, and means for manually retracting said fingers for installation and removal of said plate.

14. A tension lockup for a printing press for use with a plate having pockets at the leading and trailing edges for placing the plate in tension comprising, in combination, a cylinder, a leading edge finger bar mounted on said cylinder for limited movement with respect thereto and having fingers for reception in the pockets along the leading edge of the plate, means including first and second cam members coupled to fingers located at spaced points along the leading edge of the plate, means for manually moving the cam members in the same sense to produce peripheral movement of the plate, means for manually moving the cam members differentially to produce skewing of the plate, said manual moving means being adapted to locate the plate in a desired position of register, a second finger bar mounted on said cylinder for limited broadwise movement and having fingers thereon for engaging spaced pockets at the trailing edge of the plate, means including a pair of camming surfaces in wedging relation associated with said finger bar and disposed between the same and said cylinder for placing the plate in tension upon increased engagement of such surfaces, and means including a spring for maintaining said camming surfaces in engagement with one another for takeup of said plate.

15. In a tension lockup for a printing press for use with a plate having pockets adjacent its straight edges for placing the plate in tension, the combination comprising a cylinder, means thereon for engaging the pockets at one straight edge of the plate for maintaining the plate in a desired position of register on said cylinder, a clamping member movable generally circumferentially on said cylinder for engaging a pocket at the other straight edge of the plate to apply tension thereto, said clamping member having a first cam element movable circumferentially therewith, a second cam element engageable with said first cam element and movable on said cylinder transversely to the direction of movement of said first cam element for advancing and retracting said clamping member, one of said cam elements having a cam surface extending at a cam angle less than the limiting value for retrograde camming action between said cam elements as determined from the coefficient of friction between said cam elements so that forces applied to said clamping element by the plate will be ineffective to move said cam elements or said clamping member, a fixed stop on said cylinder, a spring acting between said stop and said second cam element for resiliently biasing said second cam element in a direction to cam said clamping member in a plate tensioning direction, a movable blocking member, and a manually movable positioning member for positively positioning the blocking member, said blocking member being arranged in the path of movement of the second cam element and having a one-way force-transmitting connection therewith so that manual movement of the positioning member in the plate-clamping direction is accompanied by progressive movement of the clamping member under the biasing force of the spring until the member is seated in the plate followed by separation between the blocking member and the second cam element.

References Cited in the file of this patent

UNITED STATES PATENTS

1,089,100	Adam	Mar. 3, 1914
1,943,902	Smith	Jan. 16, 1934
2,047,364	Foster	July 14, 1936
2,180,732	Durham	Nov. 21, 1939
2,187,293	Wood et al.	Jan. 16, 1940
2,639,668	Chase et al.	May 26, 1953
2,645,177	Dressel et al.	July 14, 1953