April 29, 1958 C. A. HARLESS 2,832,288

PRINTING PLATE CYLINDER

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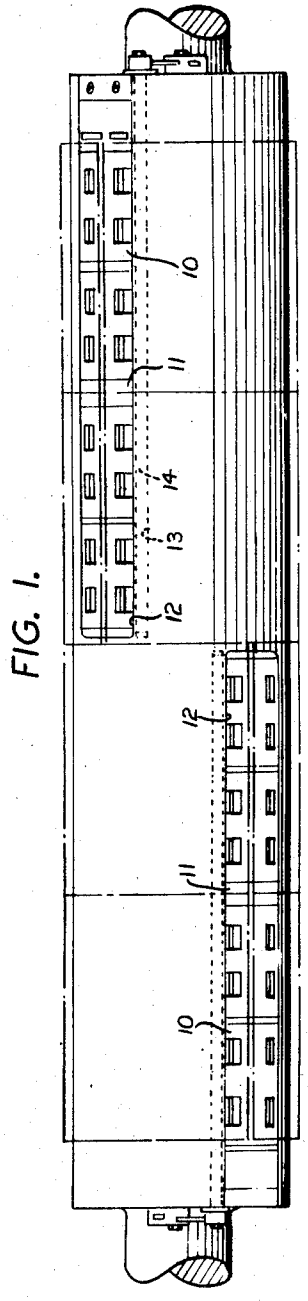


FIG. 1.

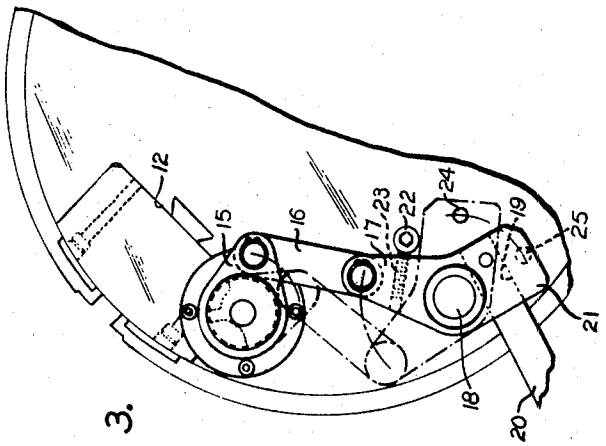


FIG. 3.

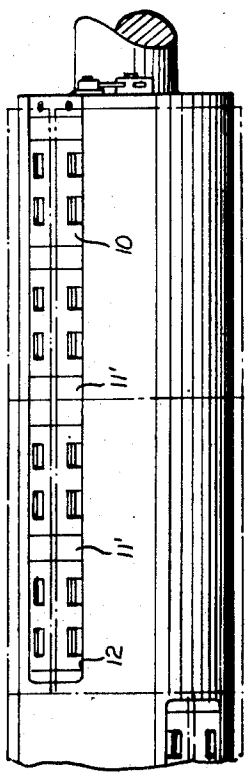


FIG. 2.

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FIG. 4.

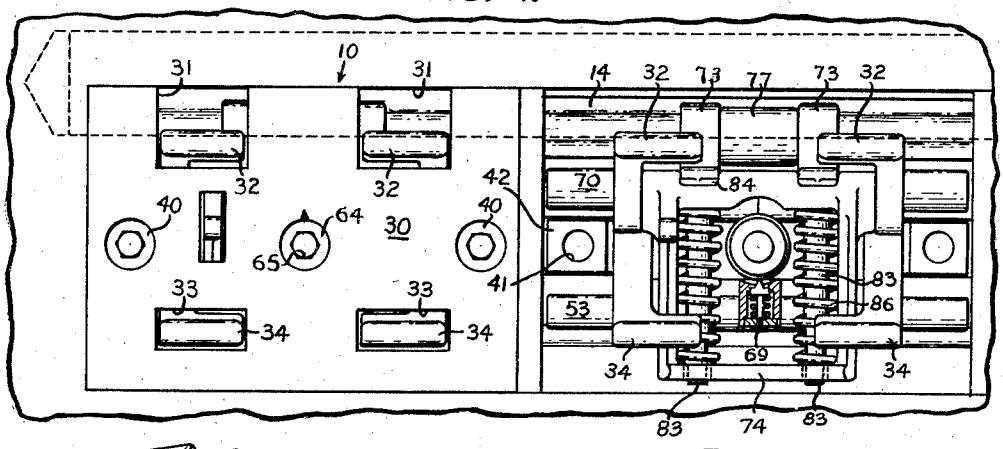


FIG. 4-A.

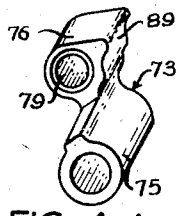


FIG. 4-B.

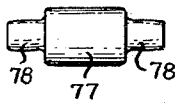


FIG. 4-C.

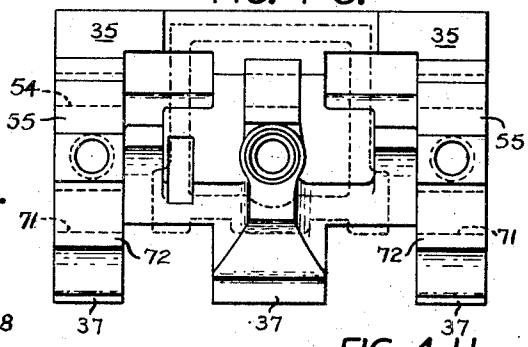


FIG. 4-D.

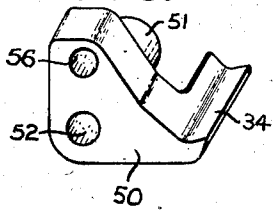


FIG. 4-E.

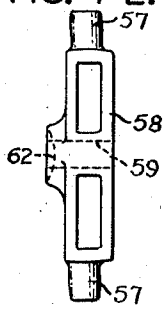


FIG. 4-F.

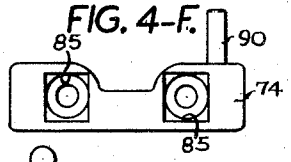


FIG. 4-G.

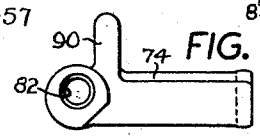


FIG. 4-H.

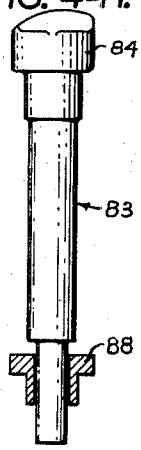


FIG. 4-I.

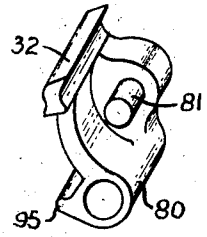


FIG. 4-J.

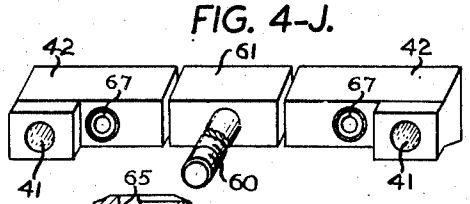
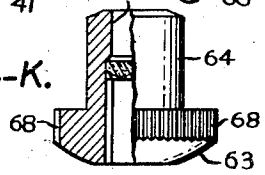


FIG. 4-K.



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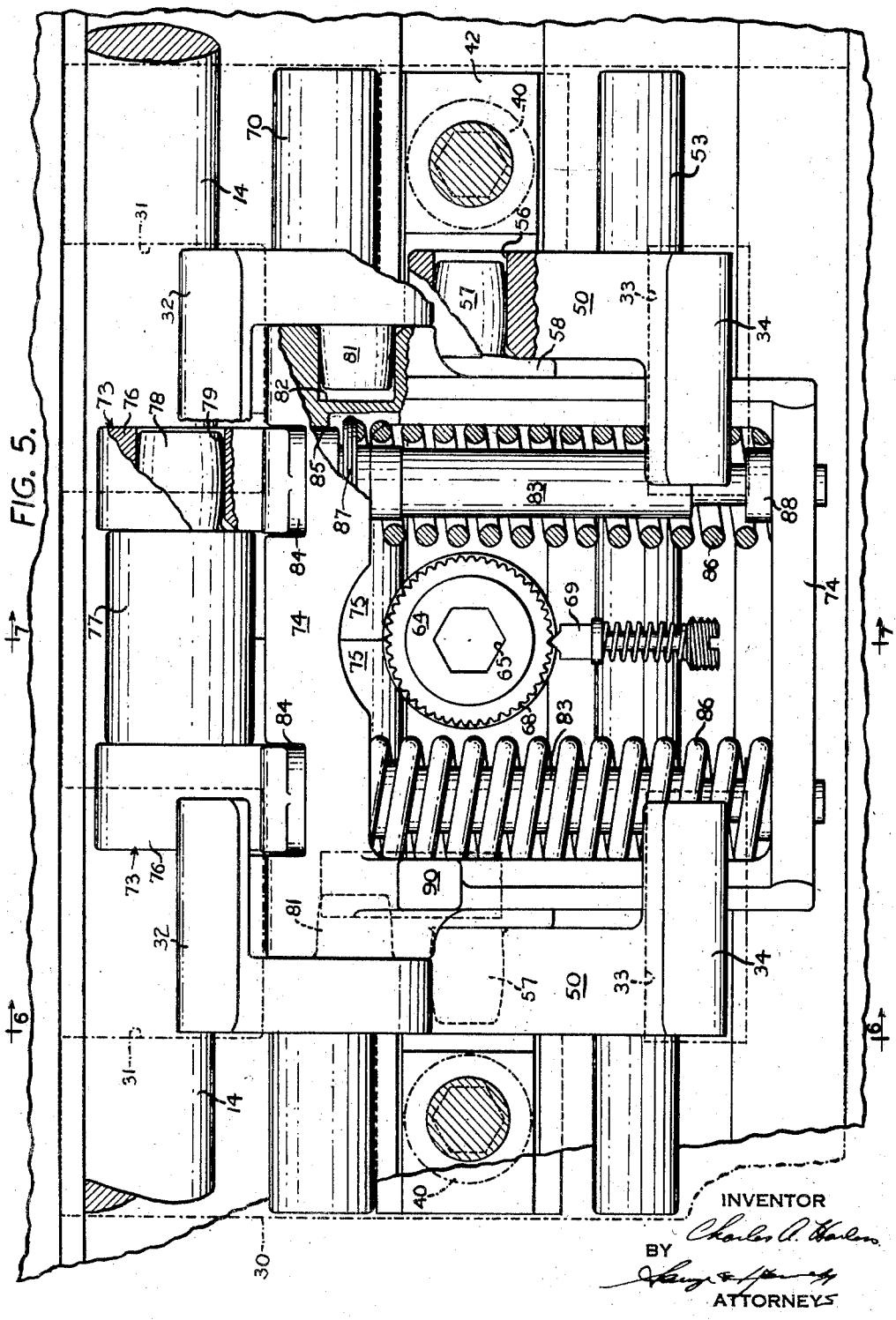


FIG. 5.

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FIG. 6.

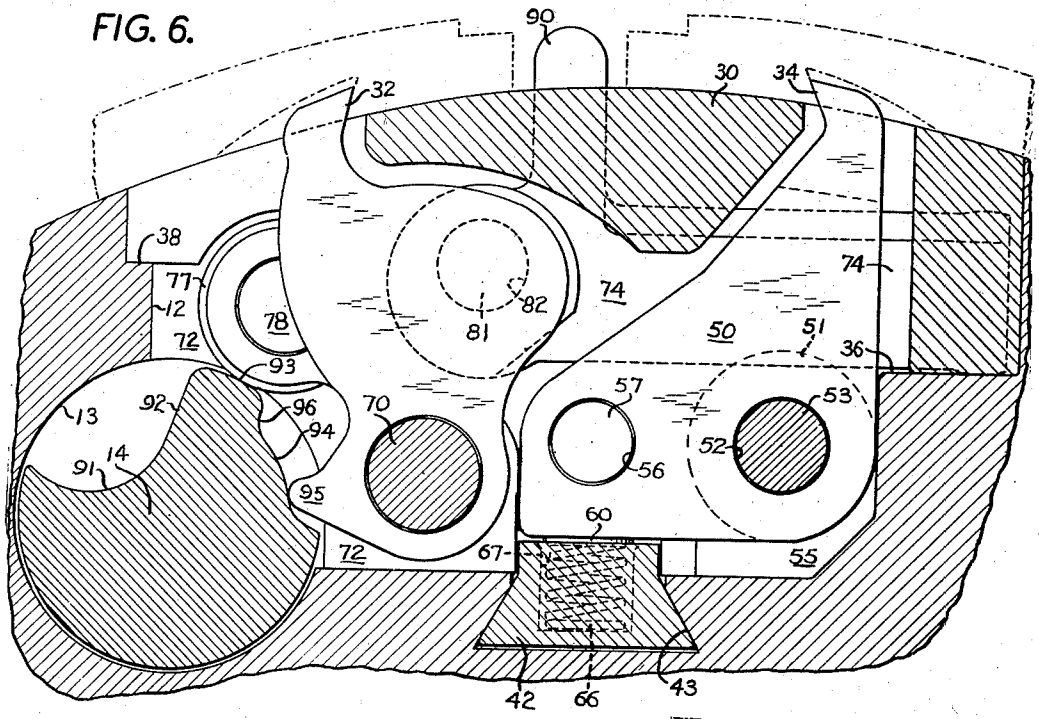
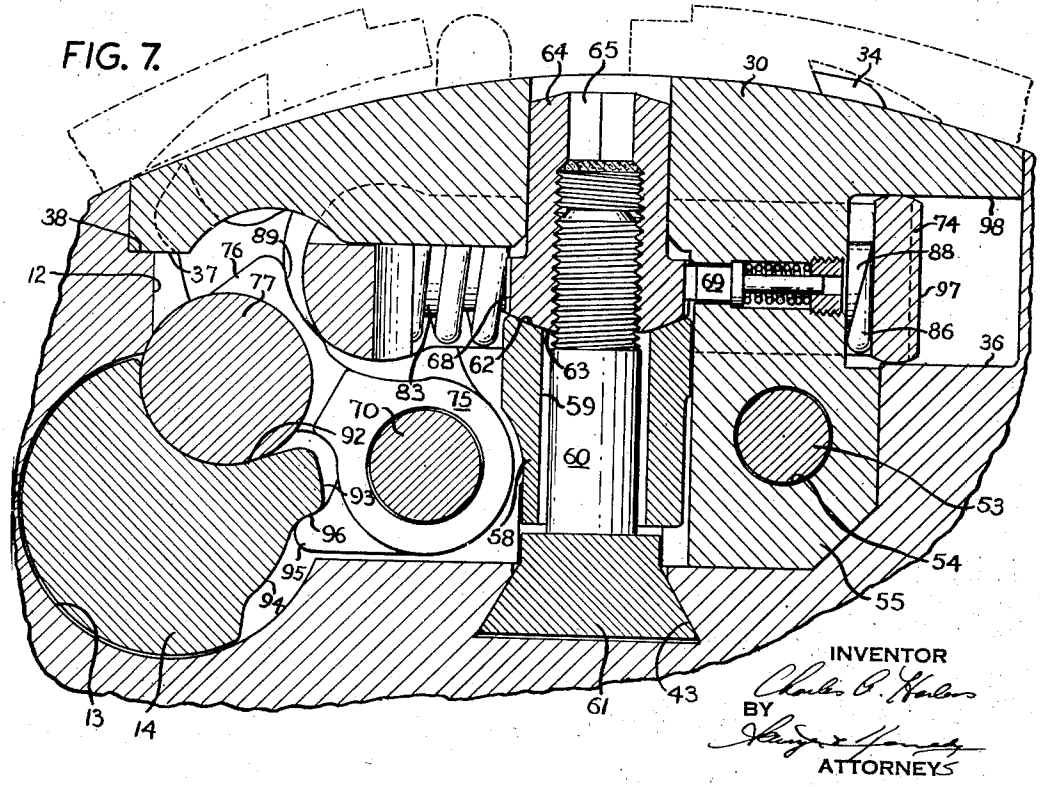


FIG. 7.



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Patented Apr. 29, 1958

2,832,288

PRINTING PLATE CYLINDER

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Application January 20, 1956, Serial No. 560,342

8 Claims. (Cl. 101—378)

This invention relates to printing machine plate cylinders, and, more particularly, to plate clamping mechanism for attaching stereotype or similar printing plates to such cylinders.

The invention is concerned with cylinders of the type in which the plates are held by clips or hooks engaging underneath the plates for holding them on the cylinder. Prior Harless Patent 2,708,875 shows a cylinder of this type, which is adjustable for plates of different widths by providing a number of plate clamping assemblies or units together with means for shifting them axially of the cylinder, and the present invention is, in one aspect, an improvement upon the disclosure of that patent, being concerned with improvements in the individual clamping assemblies or units and also in the operating mechanism therefor. Prior copending Harless application Serial No. 336,236, filed February 11, 1953, for Printing Plate Cylinder also discloses a cylinder of this type and the present application is a continuation in part or improvement thereon.

One object of the invention is to provide a plate clamping mechanism which requires minimum exertion in locking up the plates or moving the hooks into plate holding position, while, at the same time, the major part of the movement to and from clamping position may be very rapid.

A second object is to provide plate clamping units which will exert even clamping pressure on a plurality of hooks despite irregularities in the cooperating plate recesses or deliberate cocking of the plates for obtaining color registry.

Another object is to provide plate clamping mechanism of an exceptionally rugged character in which wear is reduced to a minimum and the effects of such wear as may occur are also minimized.

With the foregoing objects in mind, as well as still other objects which will appear in the course of the description, a mechanism embodying the invention in a preferred form will now first be described with reference to the accompanying drawing and the features forming the invention will then be pointed out in the appended claims.

In the drawing:

Fig. 1 is a largely schematic plan view of a printing plate cylinder embodying the invention in a preferred form;

Fig. 2 is a fragmentary view similar to Fig. 1, but showing only one end of the cylinder and showing the same arranged for plates of a different width;

Fig. 3 is an enlarged fragmentary end elevation of the cylinder, showing operating mechanism for the plate clamping mechanism;

Fig. 4 is an enlarged fragmentary plan view showing part of the mechanism of Fig. 1 and with parts removed to show the internal construction more clearly;

Figs. 4–A—4–K, inclusive, are detail views showing various parts forming a plate clamping assembly in Fig. 4;

Fig. 5 is a rather enlarged plan view showing a single plate clamping assembly in plan view and with parts

broken away to show the construction more clearly; and

Figs. 6 and 7 are, respectively, sections on the lines 6—6 and 7—7 of Fig. 5, and respectively show the parts in plate clamping and plate releasing position.

The structure of the cylinder in general is similar to that of prior Harless Patent 2,708,875 and application Serial No. 336,236, filed February 11, 1953 for Improvements in Printing Plate Cylinder, in that it utilizes a number of plate clamping units or assemblies indicated generally by the numeral **10**, together with spacer blocks **11** which fit in grooves **12** in the plate cylinder. As in the structure of the said patent and application, the cylinder has a bore **13** within which there is rotatably carried a continuous cam shaft **14** by turning which the various plate clamping mechanisms are operated. As shown in Fig. 3 there is fixed to the end of this shaft **14** and arm **15** pivotally connected to a link **16** which in turn is pivotally connected to a crank arm **17** carried on a stub shaft **18** and having a socket **19** for receiving a wrench **20**. The full line position of the parts in Fig. 3 is the plate locking position and the phantom position shows the same in released position. It will be noted that in the plate locking position, the pivot centers are aligned so that there is no torque exerted upon the crank. The end **21** which receives the wrench **20** may also be made sufficiently heavy by comparison with the crank arm and link **16** so that centrifugal force will tend to urge the parts toward lock up position. A stop **22** cooperating with an adjustable screw threaded element **23** serves to limit movement of the parts in the plate clamping direction and a spring detent **24** cooperating with a recess **25** under the crank end **21** may be provided for holding the elements in unclamping position. In Fig. 2 the parts are shown as associated with spacer blocks **11'**, which are larger than the blocks **11** of Fig. 1, and it will be observed that the plates indicated in phantom are wired. As in the above mentioned patent, provision is thus made for accommodating with the same mechanism and by very simple adjustments plates of various sizes. The mechanisms shown are, as will be understood, normally reduplicated at the opposite side of the cylinder, so that the cylinder shown is adapted to taking two plates around and four plates across, or a total of eight plates in all. As will be apparent, however, the invention is not restricted to a cylinder of this type but the plate clamping mechanism may be used with cylinders having practically any desired number of plates around or plates across the cylinder.

As will appear from the following description, the various parts of a plate clamping assembly or unit **10** are, by comparison with prior structures, of a very massive character, while the unit itself is very compact. This result is achieved by a shaping and interfitting of parts for utilizing the available space to best advantage, making structure somewhat difficult to show in a drawing. For this reason, a number of different views have been provided, which will now be described rather fully, for convenience of reference:

Fig. 4 shows a pair of clamping units **10**, in place in the cylinder, and slightly separated, but with spacer block omitted to show the bottom of the cylinder groove. In the right hand clamping unit **10**, a block member **30**, shown on the left hand clamping unit has been removed, to show the parts it carries, in their operating position.

Fig. 4–C is a bottom plan view of the block member **30** removed from the right hand unit **10** of Fig. 4 and is shown projected directly beneath this member in Fig. 4.

The remaining figures, 4–A, 4–B and 4–D—4–K, are perspectives and elevational views on convenient scales and are intended to supplement the other views by clarifying the shape of the various elements.

Fig. 5 is a plan view, generally similar to the right

hand part of Fig. 4, but further enlarged and broken away, as later described in detal, to further clarify the construction. The block member **30** is there shown in phantom.

Fig. 6 is a section on line **6**—**6** of Fig. 5, showing the parts in the same position, which is the plate clamping position, as in that figure, and showing the block member **30** in solid lines.

Fig. 7 is a similar section on line **7**—**7** of Fig. 5, but showing the parts in plate releasing position, and is projected directly beneath Fig. 6 to aid in locating the parts and following their movement.

As appears most clearly from Figs. 6 and 7, the cam shaft bore **13** overlaps the generally rectangular cylinder groove **12** to the extent of about 90° of the bore **13**, so that the center of bore **13** is located just about at the intersection of a continuation of the floor and side wall of groove **12**. This leaves about 270° of support for cam shaft **14** by the wall of bore **13** and exposes about 90° of the cam shaft for operating the clamping units **10**.

The block member **30** has a configuration, when viewed from the top, which is substantially rectangular (left side of Fig. 4) and an upper surface which continues the surface of the cylinder generally (Figs. 6 and 7). Openings **31** are provided for spring pressed hooks **32** as well as openings **33** for rigid hooks **34**. Edge surfaces **35** of block **30** sit on a ledge or shoulder **36** at one side of groove **12** (Figs. 4 to 7) and edge surfaces **37** sit on a ledge or shoulder **38** at the other side of the groove **12**. Block **30** is held down in the groove **12** by means of screws **40** having their heads countersunk in the block **30**, and their screw threaded ends are received in bores **41** and dovetail bars **42** (Figs. 4, 4–I and 6) which fit slidably in dovetail groove **43** at the bottom of cylinder groove **12**. As in the previous Harless patent, abovementioned, this permits locating the units **10** anywhere along the groove **12**. The block **30**, except where cut away to accommodate the parts, as later described, fits and fills the groove **12**.

The rigid hooks **34** are formed on bell crank members **50** (see Fig. 4–D for shape), the hubs **51** of which have bores **52** receiving a shaft **53** (Figs. 4–7) which is fitted in bores **54** in downwardly projecting parts **55** (Figs. 4, 6, 7) of the block **30**. Bores **56** in the other arms of the bell crank members **50** receive crowned or rounded trunnions **57** (Fig. 5 and 6) at the end of a bar **58** (Fig. 4–E) which bar has a central bore **59** receiving a threaded stud **60** fixed to a dovetail shaped head **61** (Fig. 4–J) fitting the dovetail groove **43** (Fig. 7). The upper part of bar **58** around bore **59** is formed as a spherical seat **62** receiving the correspondingly spherical head **63** of a nut **64** (Figs. 7 and 4–K) which fits the threaded top of stud **60**. A hexagon recess **65** in nut **64** takes the usual Allen wrench for turning the nut **64**, and thereby depressing bar **58** to any desired extent. Springs **66** are provided in bores **67** in dovetail bars **42** (Fig. 4–J and 6) for engaging bell cranks **50** to urge bar **58** upward against nut **64**. Since trunnions **57** are crowned and the seat **62** is spherical, the bar **58** may tilt or rock, advancing one hook **34** and moving back the other, circumferentially of the cylinder. A point midway between the two hooks **34** will, however, be accurately fixed, so that the mechanism permits accurate registry while taking plates with misaligned hook receiving pockets or while taking plates in cocked position on the cylinder. The rim of nut **64** is notched as at **68** (Figs. 4–K, 5 and 7) and a spring pressed detent **69** engages in the notches for holding the nut **64** in adjusted position. The turning of nut **64** from notch to notch past the detent **69** makes an audible click, so that by counting these clicks the pressman is able to advance or move back a pair of hooks **34** through an accurately determined distance.

The hooks **32** are operated by a mechanism generally similar to that of the above-mentioned Harless application, but improved in many respects. A shaft **70** fixed in bores **71** in downward projections **72** of the block member **30** (Fig. 4–C) carries hooks **32** (shown in perspective in Fig. 4–I) and also operating arms **73** (shown in perspective in Fig. 4–A). A preloaded spring frame **74** (Fig. 5) serves as a connecting member for applying clamping pressure.

A pair (right and left hand) of arms **73** are positioned on shaft **70** with their hubs **75** against each other (Fig. 5) and carry between their heads **76** a roller **77** which has crowned or barreled trunnions **78** received in bores **79** in the arm heads **76**. This roller follows the cam shaft **14**, as later described. The hubs **80** of hooks **32** (also right and left hand) are likewise carried on shaft **70** outside the hubs **75** of the arms **73** so the hubs **75** and **80** fill the space between frame projections **72**, apart from operating clearances. Each hook **32** has a crowned or barreled stub shaft or trunnion **81** received in a bore **82** in the spring frame **74** (Fig. 5), and coupling the hook to the spring frame for application of clamping pressure.

Spring frame **74** surrounds the nut **64**, previously mentioned (Fig. 5) and contains a pair of poppet rods **83** (Fig. 4–H). Spring frame **74** is substantially rectangular. Figs. 4–F and 4–G are, respectively, an end elevation and side elevation of this element, shown as removed from the mechanism, and serve, in conjunction with the other views, to complete the showing as to the shape of this element. The enlarged heads **84** of rods **83** are cylindrical and fit slidably in bores **85** in the spring frame **74**. Springs **86** thrust against heads **84** through washers **87**, the other ends of springs **86** reacting against the frame **74**, as shown. At their opposite ends, the rods **83** are reduced and are slidably received in bushings **88**. As viewed in a plane at right angles to the cylinder axis the heads of rods **83** have the configuration shown in Figs. 4–H and 7, being cylindrical about the axis of bores **82** when the parts are in fully clamped position. Heads **76** of the operating arms engage the heads **84**, having at **89** (Figs. 4–A and 7) correspondingly cylindrical but concave surfaces for engaging the heads **84**. Frame **74** carries a projection **90** (Figs. 4–7) for dislodging a plate while unlocking the same.

The cam shaft **14** has a recess **91** (Fig. 6) which receives roller **77** (Fig. 7) in unclamping position and has a rise **92** for forcing the roller from the unclamped position of Fig. 7 to the clamping position of Fig. 6. A substantial high dwell **93** is provided, and may occupy about 20°, as shown. A recess **94** receives a projection or toe **95** in each of the hooks **32**, abutment **96** at one side of the recess serving to engage the toe **95** for retracting the parts from clamped position.

In operation, and starting from the unclamped position of Fig. 7, cam shaft **14** is rotated counter-clockwise, forcing roller **77** from the position of Fig. 7 to that of Fig. 6, and correspondingly pivoting arms **73** which carry the roller. During most of this movement, rods **84**, frame **74** and hook arms **32** move as a unit, the end **97** of the frame **74** sliding in the space between ledge **36** and surface **98** of the block **30**. Since springs **86** are not compressed during most of this movement, but little force is required to turn the cam **14**. Toward the end of the clamping movement, hooks **32** will engage in the plate recesses, substantially stopping further movement of these hooks and also of frame **74** attached to them by stub shafts **81**. Thereafter, further rotation of the cam **14** will push poppet rods **83** into frame **74**, compressing springs **86**. Springs **86** are preferably "long" so that the precise amount of unseating of the poppet rods **83** does not greatly change the clamping pressure applied, this pressure remaining close to the preload value, in any case. Once the roller **77** is on the high dwell **93**, the clamping force exerted by the hook **32** exerts no torque against cam shaft **14**. In unclamping, or moving from the position of Fig. 6 to that of Fig. 7, the initial movement of cam

shaft 14 permits springs 86 to expand to their limit. Thereafter, when abutment 96 engages toe 95 further rotation of cam shaft 14 turns the hook arms 32 from the position of Fig. 6 to that of Fig. 7. The frame 74 being coupled to the arms 32 will follow and in so doing will push the operating arms 73, so that all parts move to the position of Fig. 7.

The recesses 91 and 94 are preferably slightly tapered in form, so that the rollers 77 move in sequence, instead of simultaneously, as they approach the final clamping position. Once a roller 77 is on the high dwell 93, it does not further resist turning of the cam shaft 14, so that this sequential operation cuts the force required to turn the shaft 14 in locking up to a fraction of what would otherwise be needed. Roller 77 can accommodate to a slightly tapered cam by reason of its crowned trunnions 78 and the mounting of its carrying arms 73 for independent turning on the shaft 70. Similarly, the rods 83 may compress independently and frame 74 may swing slightly, permitting one hook 32 to engage fully slightly ahead of the other.

What is claimed is:

1. In a printing machine plate cylinder, a plurality of plate clamping mechanisms arranged in axial alignment along the cylinder, each plate clamping mechanism including a cam follower for actuating it, operating mechanism therefor comprising a continuous cam shaft having a cylindrical high dwell for engaging the said cam followers in axially aligned position, and a rise for forcing the said followers radially outward from the center of the cam shaft upon rotation thereof so as to bring them on the high dwell, the said rise having a slightly tapered configuration, whereby a plurality of followers engaging the said cam shaft will be successively forced onto the high dwell thereof upon rotary movement of the said cam shaft.

2. A printing machine plate cylinder comprising a plurality of plate clamping mechanisms arranged in axial alignment along the cylinder, each plate clamping mechanism including a cam follower roller for actuating it, operating mechanism therefor comprising a continuous cam shaft having a cylindrical high dwell for engaging the said cam follower rollers in axially aligned position, and a rise for forcing the said rollers radially outward from the center of the cam shaft upon rotation thereof so as to bring them on the high dwell, the said rise having a slightly tapered configuration, whereby a plurality of follower rollers engaging the said cam shaft will be successively forced onto the high dwell thereof upon rotary movement of the said cam shaft.

3. A printing machine plate cylinder according to claim 2, comprising means mounting the said cam follower rollers for tilting movement with respect to the cam shaft, whereby the cam follower rollers are enabled to

engage substantially normal to both the surface of the tapered rise and the surface of the cylindrical high dwell.

4. A printing machine plate cylinder according to claim 3, in which the said means mounting a cam follower roller comprises a pair of arms supporting the roller and means pivotally mounting the arms for independent rotary movement.

5. A printing machine plate cylinder according to claim 4, in which the follower roller is mounted in the pair of arms by means of self-aligning bearings.

6. A printing machine plate cylinder according to claim 5, in which the self-aligning bearings comprise trunnions having convex curvation in planes through the roller axis.

7. In a printing cylinder plate clamping mechanism comprising an operating arm, a pair of hooks for entering in recesses under a plate and clamping it to a cylinder, a pair of operating arms, a shaft rotatably supporting the said hooks and operating arms for independent pivotal movement, a roller carried by the two said operating arms for engaging the said operating cam, and spring means connecting the operating arms and hooks, whereby the said roller is capacitated to engage a cam surface slanted with reference to the axis of the said shaft and also to engage a cam surface parallel thereto, and the hooks are capacitated for engaging in recesses in alignment with the said shaft and also in recesses out of alignment therewith.

8. In a printing cylinder plate clamping mechanism, a hook for engaging in a recess under a plate to clamp the same to a cylinder, means pivotally mounting the hook, an operating arm and means for pivotally mounting the operating arm coaxial with the hook, a spring assembly connecting the operating arm and hook for moving the latter and comprising a frame, means pivotally connecting one end of the frame to the hook, a spring poppet rod slidably carried by the frame and having a head engaging the operating arm, the said head being curved in a plane at right angles to the pivotal axis about a point substantially coaxial with the pivotal connection between frame and hook when the spring poppet rod is pushed into its limit, whereby at intermediate compression, the force exerted by the said poppet rod exerts a turning moment on the frame in a constant direction about the said pivotal axis.

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