

Oct. 30, 1934.

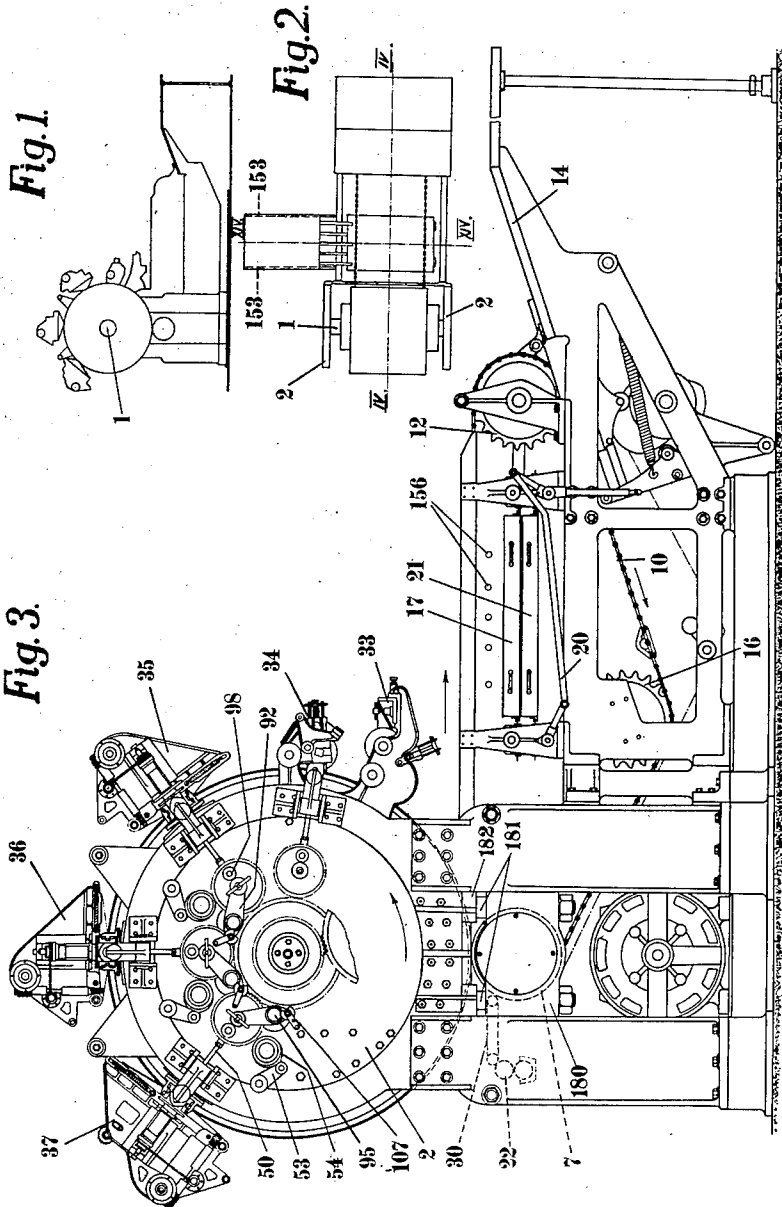
F. VON HEINRICH

1,979,086

ROTARY COPPER PLATE PRINTING PRESS

Filed June 17, 1931

7 Sheets-Sheet 1



Inventor:

Friedrich von Heinrich

By *Overman*
his ATT'Y.

Oct. 30, 1934.

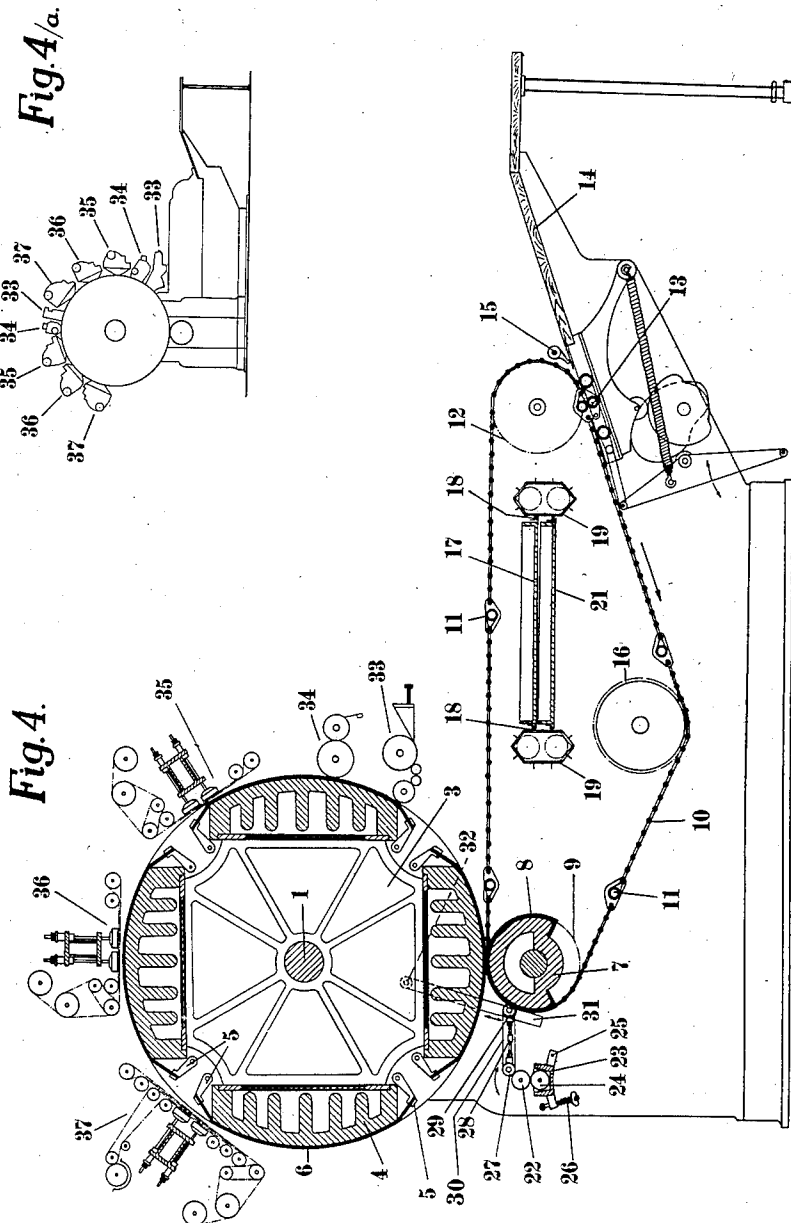
F. VON HEINRICH

1,979,086

ROTARY COPPER PLATE PRINTING PRESS

Filed June 17, 1931

7 Sheets-Sheet 2



Inventor:

Friedrich von Heinrich

By *O. Schenk*
his ATT'Y.

Oct. 30, 1934.

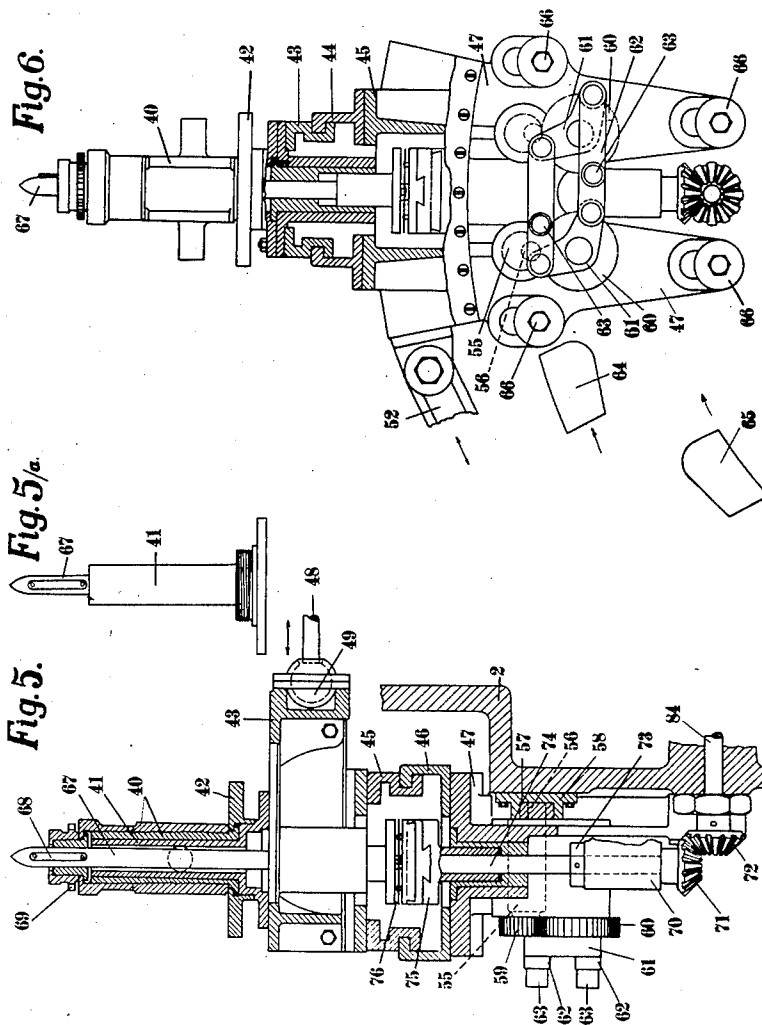
F. VON HEINRICH

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ROTARY COPPER PLATE PRINTING PRESS

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7 Sheets-Sheet 3



Inventor:

Friedrich von Heinrich

3. Ostrich

his Atty.

Oct. 30, 1934.

F. VON HEINRICH

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ROTARY COPPER PLATE PRINTING PRESS

Filed June 17, 1931

7 Sheets-Sheet 4

Fig. 8.

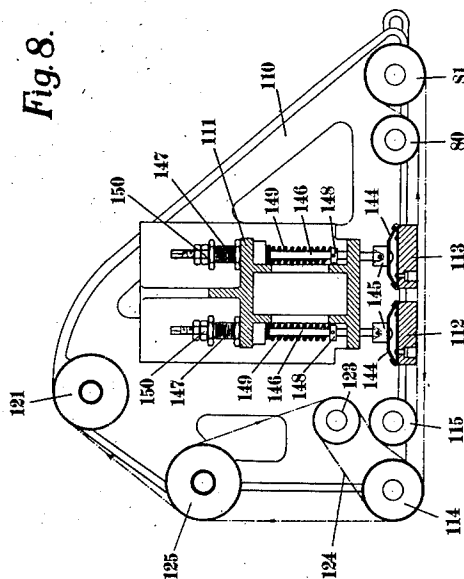
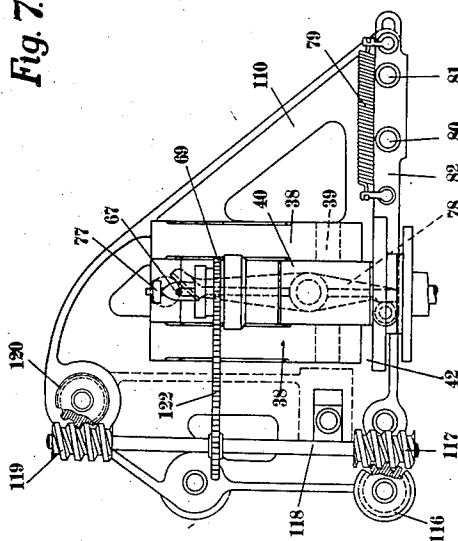


Fig. 7.



Inventor:

Friedrich von Heinrich

By *O. Schmitt*
his ATT'Y.

Oct. 30, 1934.

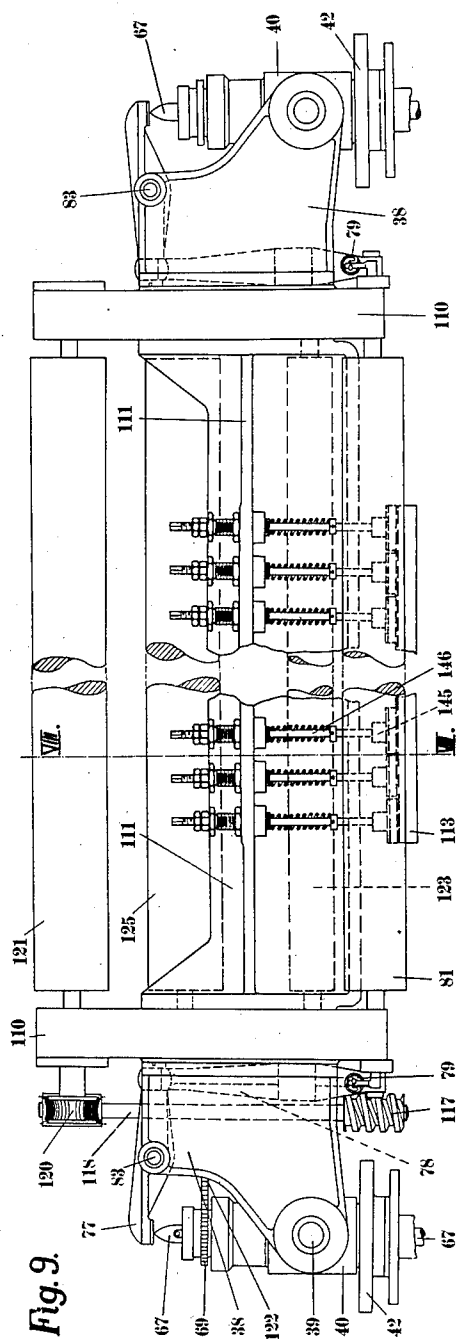
F. VON HEINRICH

1,979,086

ROTARY COPPER PLATE PRINTING PRESS

Filed June 17, 1931

7 Sheets-Sheet 5



Inventor:

Friedrich von Heinrich

By *Otto Wink*

his ATT'Y.

Oct. 30, 1934.

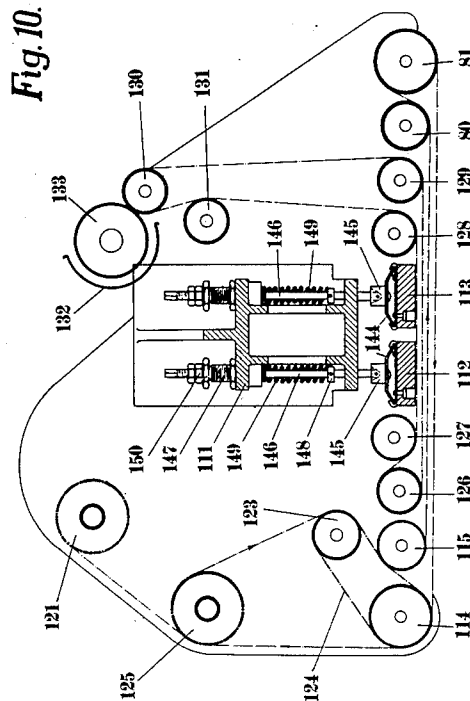
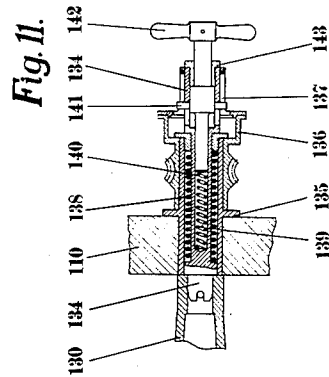
F. VON HEINRICH

1,979,086

ROTARY COPPER PLATE PRINTING PRESS

Filed June 17, 1931

7 Sheets-Sheet 6



Inventor:

Friedrich von Heinrich

By *Attorney*
his ATT'Y.

Oct. 30, 1934.

F. VON HEINRICH

1,979,086

ROTARY COPPER PLATE PRINTING PRESS

Filed June 17, 1931

7 Sheets-Sheet 7

Fig. 12.

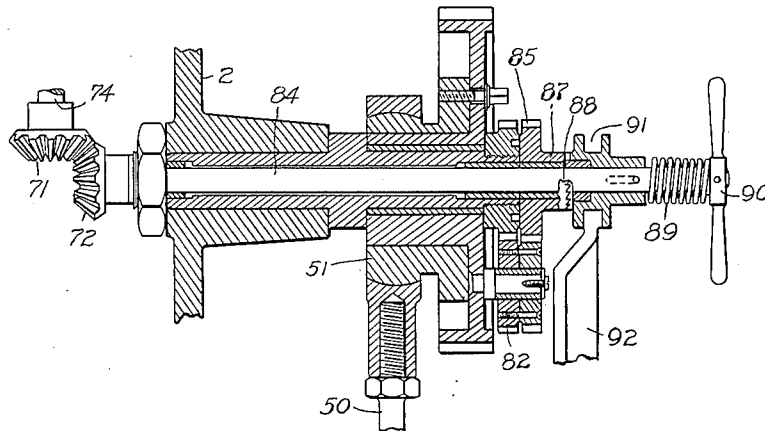


Fig. 13a

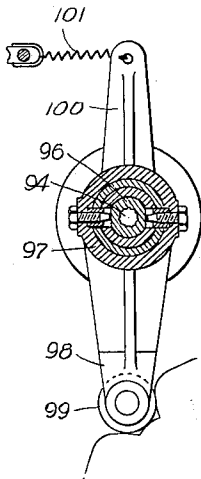
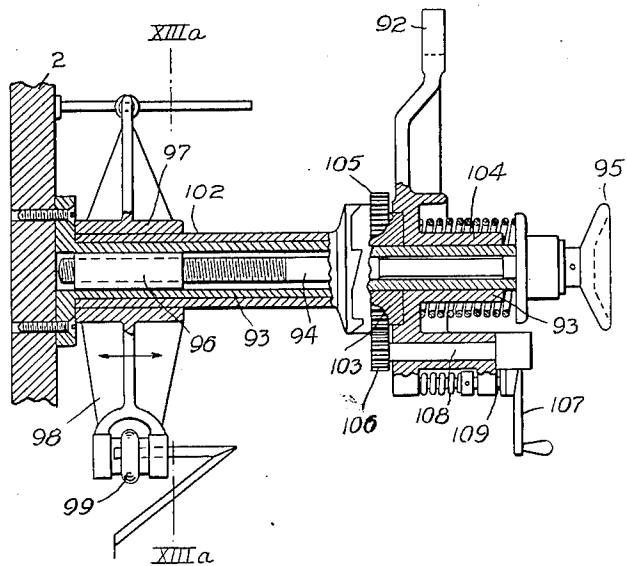


Fig. 13.



Friedrich Von Heinrich
INVENTOR

BY *Attorney*

his ATTORNEY

UNITED STATES PATENT OFFICE

1,979,086

ROTARY COPPER-PLATE PRINTING PRESS

Friedrich von Heinrich, Budapest, Hungary, assignor of one-half to Hungarian National Bank, Budapest, Hungary, a corporation of Hungary

Application June 17, 1931, Serial No. 544,951
In Germany December 29, 1930

9 Claims. (Cl. 101—156)

The object of the invention is to provide a rotary copper-plate printing press, which, while rendering the printing operation completely automatic, retains all the advantages of the existing methods of hand printing. These advantages include the possibility of controlling the inked and completely wiped plates, which can also be given a final wipe by hand at convenient working level. They also include means for precisely regulating the setting of the wiper material feeding, the damping of the damp wiper while the machine is running, further the tension of the wiper material is eased automatically when wiping. Owing to this arrangement the task of wiping is performed as in the manual operation, without tightening the pad, and so is the variable adjustability of the wiping pressure in each zone of the plate, and the adjustable inking in all zones of the plate. Other objects of the invention are; the possibility, as in the usual manual process, of being able to examine the prints directly after impression, and the provision of devices for placing an offset-sheet above each printed sheet. With certain precautions, this press is also applicable to rainbow-style copper-plate printing. It has been ascertained that certain kinds of paper can be damped, so as to be suitable for printing shortly before impression, so that printing can proceed without any expansion due to moisture. Accordingly, a further object of the invention is to provide a device for damping the paper shortly before printing, and a still further object of the invention is to ensure accurate register in printing.

According to the invention, there is disposed below the plate cylinder an impression cylinder. The perimeter of the plate cylinder is formed by several printing beds adapted to be heated. The diameter of the impression cylinder is such a part of the plate cylinder as there are printing beds on the latter. Chains carrying gripper rods are passed round the impression cylinder on both sides, said chains issuing from the impression zone of the cylinder and, by means of their gripper rods, laying the finished sheets on a tray underneath, thus leaving the sheets accessible and visible. The delivery tray can be removed while the machine is running, and another tray, situated underneath, may be raised by mechanical means into the position of the former. During their further course, the gripper rods are led over a pair of wheels to a feed table, on which the sheets are laid against the lay marks, and are taken over by rocking grippers and transferred to the gripper rods on the chains. The

chains convey them underneath the delivery trays and over jockey rollers to the impression cylinder. In order to enable an offset sheet to be placed above each printed sheet, reciprocating rods are arranged to move above the delivery tray and below the gripper chains. The rods bring the offset sheets from a lateral feed table into position above the tray by means of terminally mounted retractible grippers, and, during their return stroke, deliver the paper, which is retained by means of stops, on to the pile in the delivery tray.

The sheet fed to the impression cylinder by the gripper chains is damped, on reaching the cylinder, by means of a device mounted thereon, so that its surface is ready for the impression. The time elapsing between the damping of the surface of the paper and the attainment of the said state of readiness varies, and the damping device is accordingly arranged so that the damping member can be moved over the surface of the impression cylinder in the direction of, or away from, the printing zone.

The plate cylinder itself is built up of a number of printing beds which are adapted to be heated and on to which are clamped the printing plates—consisting of thin flexible metal sheets, such as offset plates. These plates are inked by an inking gear, which is mounted on that side of the plate cylinder which faces the sheet feed. The inking mechanism itself consists of an inking roller, which revolves in a direction opposite to the movement of the plate cylinder. The ink is transferred from the inking cylinder to the inking roller by intermediate rollers. The inking cylinder takes up ink from the ink duct, the amount being regulated in known manner. The inked plate passes to a rubbing-in roller, which also rotates in the opposite direction to the plate cylinder and describes, in addition, an axial reciprocating movement. The surplus ink is removed from this rubbing-in roller by means of a reciprocating roller which runs over the rubbing-in roller, and from which the ink is removed by a non-reciprocating scraper. The plate thus charged with ink next passes to the wiping devices which are preferably three in number, the first two operating with dry wiping material, while that of the third is damped with water.

If, in succession to the damp wiper, the series of printing preparing devices—inking gear, rubbing-in roller and three wipers,—is repeated round the periphery of the plate cylinder, the press is suitable for rainbow-style copper-plate

printing. In order to provide increased accommodation for these devices, the periphery of the plate cylinder may be enlarged, either by increasing the size of the printing beds or of the intervening gaps, or by employing a larger number of printing beds than for presses without the rainbow-style attachment.

Owing to the described disposition of the devices which make the plates ready for printing and, of the sheet feed and delivery devices, the prepared plates revolve in a readily accessible manner, and at a convenient working level, with respect to the impression cylinder. The wipers are actuated from the outside, that is to say, raising from, and lowering onto, the plates, as well as the actual wiping movement, are imparted to the wipers by means of bolts, on to which they are slipped and secured by screwing or locking means. These bolts are seated, at both sides, on slides which can be displaced parallel to the axis of the plate cylinder thus performing a transverse movement. The displacement, or reciprocatory movement, is imparted only to one of these slides, while the other, which is connected with the wiper mechanism, shares the reciprocatory movement and merely serves for guidance. This slide may be mounted on balls or rollers, and is actuated, by means of a variable-throw eccentric through balljointed drawbars, and a bell-crank lever pivoted on the machine frame. Circular slides, enabling the guides of the upper slide to oscillate in a path concentric with the axis of the plate cylinder, may be provided underneath the transverse slides. The circular slides must be actuated on both sides and, preferably at double the speed of the transverse slides. This movement, too, is produced by variable-throw eccentrics, through drawbars, and a lever mechanism mounted on the machine frame. The cross slides, which describe a sinoidal line as the resultant wiping movement, and also the circular slides if such be provided and which distort the sinoidal line, are mounted on rising and falling slides, which enable the entire system, and therefore the wipers, to be raised and lowered by means of guides disposed radially in relation to the plate cylinder. The movement is produced by strikers displaceably mounted on rings in two concentric annular zones on the cheeks of the plate cylinder.

Two short shafts, carrying eccentric pins on the ends facing the machine frame, are mounted in the rising and falling slides, so that the pins engage with a member which is slidable in a guide attached to the machine frame. By turning said shafts through 180°, the rising and falling slides may be brought into their highest or lowest positions. The rotation of the shafts through 180° is effected by teeth being provided thereupon which engage with pinions of larger pitch line and which are connected, by means of two bolts in each case, with two drawbars carrying the impact rollers encountered by the aforesaid strikers. As a result of this the angular displacements sustained by the larger pinions in turning the smaller ones through 180° bring said rollers alternately into the zone of the outer strikers, or into that of the inner strikers. By adjusting the impact rollers on the connecting bars between the larger pinions, the individual wiping devices can be raised and lowered at different intervals by the same strikers as the strikers revolve past them. In this manner, the first wiper can be lowered later and raised earlier in relation to the next in succession, and so on, so that the accumulations of ink, formed in setting a wiper on, and lifting

it from, the plate, are removed by the succeeding wiper.

The wipers themselves are composed of two cheek pieces in which the rollers are mounted and which are connected by a crossbar. The entire length of the crossbar carries the wiper pads by means of adjustable springs. Projecting outwards from the cheek pieces on both sides are brackets, between which the slip-on sleeves are movably mounted on pins. Two pairs of rollers are disposed one on each side of the wiper pad, the outer roller of one pair being actuated. Obliquely above this actuated roller and above the inner roller of the pair, is another roller. Over this roller and the underlying actuated roller is stretched a rubber-cloth which bears tightly against the inner roller of the pair. Above these three rollers is a detachably mounted spindle, and above this again is a second spindle also detachably mounted and actuated by means of a friction drive. The first detachable spindle carries the stock reel of wiper material which is drawn between the endless rubber-cloth and the inner roller of the relating pair. The stock reel receives a positive movement through the friction of the rubber-cloth. In its further course, the wiper material is drawn under the wiper-pads, under the inner and over the outer roller of the other pair, and then back under the wiper pad again turned outwards over the actuated roller and led to the frictionally-driven winding spindle.

If, instead of a double layer of wiper material on the pads, four or six layers are desired, the material, instead of passing directly to the winding spindle, is led once or twice in the same direction over the stock reel and only then fed to the winding spindle. That pair of rollers which does not include the actuated roller is mounted, on both ends, on slides adapted to move on the cheek pieces, said slides being urged outwards by springs. By means of lever mechanism, arranged in the lateral brackets on each side of the wiper, the pair of rollers mounted on the slide is moved by the compression of the springs, so that the ends of the lever mechanism bear, at both ends, against shaft ends which project from the tops of the slip-on spindles and do not share the rising and falling movement. This relative movement tensions and releases the spring which exerts an outward pull on the slide in which the second pair of rollers is mounted, so that, this movement automatically slackens the wiper material during the descent of the wiper, and tightens the material from, or in, the reel, during the ascending movement.

The third wiper operates with damped material. Two other pairs of rollers are inserted between each of the described pairs of rollers and the wiper pads, and in addition a roller and a tension roller are mounted in the upper part of the wiper. This roller is positively actuated, and a roller faced with absorbent material and mounted in a trough, is forced by spring pressure against it. An endless absorbent cloth is drawn over the actuated roller and over those pairs of rollers situated nearer the wiper pads. The insertion or removal of this endless cloth can be effected, without any dismantling, by reason of the fact that open bearings are provided and the actuated roller can be withdrawn easily by means of a locking device. The wiping water in the trough is transmitted to the endless cloth in an amount which is controllable, by spring pressure, and by the amplitude of movement of the actuated roller, and

thus passes, in controllable quantity, between the wiper pad and the wiper material. Under the pressure of the wiper, the liquid is transferred to the wiper material and damps it to the desired extent.

The feeding of the wiper material and of the cloth for damping the latter is effected by means of the shaft projecting from the upper end of the slip-on spindle which is actuated and drives a pinion or chain wheel. The pinion is mounted on the upper end of the slip-on sleeve by means of a feather key. In the case of the wipers operating with dry wiper material, this drive is provided on one side of the wiper only and, by means of worm and worm wheel, actuates the roller effecting the positive feed of the wiper material, and also the frictionally driven winding spindle. In the case of the wiper operating with damped material, the shaft projecting from the slip-on spindle is actuated on both sides, so that, on the one side, the described feed movement is imparted to the wiper material, and on the other side, the roller which feeds the damping cloth is actuated in a similar manner.

The shafts projecting from the slip-on spindle and effecting the slackening of the wiper material, are always mounted or secured in the axial direction in a bracket of the machine frame and below the rising and falling slide. In those cases where said shafts must also initiate a feed movement, they are passed outwards, under the brackets and through the machine frame in which they are mounted, and are there driven by bevel gearing. Owing to the wiping movement, these shafts must not be axially rigid. Therefore, an Oldham coupling is provided with sliding-contact surfaces which may run on balls or rollers. This coupling is between the rising-and-falling slide and the uppermost slide, or the slip-on spindle, between which the shaft is mounted. When circular slides are provided between the rising and falling slides and the cross slides, a small Hardy coupling must be provided above the Oldham coupling.

The shafts through which feed movements are effected, are actuated through the medium of a permanently driven pinion mounted coaxially of said shafts at the point where they project outside the machine frame. Said pinion may be driven either directly or, where an actuated eccentric for a wiper movement is situated coaxially of such a shaft from the rapidly moving wheel actuating the eccentric. The pinion is driven by means of epicyclic gearing. This last pinion carries one member of a saw-tooth clutch, the other member being slidably mounted on the end of the shaft, which it carries with it. The slidable member of the clutch is pressed towards the other member by one end of the spring the other end of which bears against the hub of a handle mounted on the end of the shaft. This permits the feed movement by hand. The rotation of the handle is also necessary when the wipers are slipped on to the slip-on spindles, in order that the feather key on the shaft end may enter the grooves of those wheels which are mounted in the slip-on sleeves.

The clutch effecting the feed movement is actuated by means of a de-clutching arm. The arm engages in a groove in the movable member of the clutch and allows this member to engage only in an intermittent manner with the permanently driven clutch member. This starts the feed movement. The de-clutching arm raises the movable member of the clutch, and thus suspends

the feed movement. It is actuated by a control device screwed on to the machine frame. Cams mounted on the shaft of the plate cylinder actuate a lever which enables the de-clutching arm to be raised and lowered. The lever, which makes contact with the cams by means of a roller, can be displaced in the axial direction, by means of a screwed spindle, in such a manner as to come on to a narrower or wider portion of the cams, and thus it is possible to vary the period during which the clutch is in or out of action, and consequently the extent of the feed movement. The clutch can at once be thrown out of action permanently by acting on a crank which turns an oblique surface provided in the control mechanism, and thus any desired feed of the wiper material can be effected at any time (the wipers being in the raised position) by turning the hand wheel.

One form of the invention will be described with reference to the accompanying drawings of which Figure 1 is a small diagrammatic side elevation of the press, and Figure 2 a diagrammatic plan corresponding with Figure 1, Figure 3 is a detailed side elevation to an enlarged scale of the press, Figure 4 is a section taken on the line IV—IV of Figure 2 to the same scale as Figure 3. Figure 4a is a small diagrammatic side elevation of the press arranged for rainbow-type printing, Figure 5 is a section through one of the rising and falling slides, with superimposed circular and cross slides, on the latter of which is mounted the slip-on spindle carrying the slip-on sleeve of the wiper device, Figure 5a is a side elevation of the slip-on spindle mentioned in Figure 5, Figure 6 is a left-hand elevation, in partial section, of Figure 5, Figure 7 is a side elevation of a wiper for dry wiper material, Figure 8 is a section taken on the line VIII—VIII of Figure 9, Figure 9 is a right-hand side-elevation of Figure 7, Figure 10 is a section through a wiper, which operates with damp material. Figure 11 shows a detail of the mechanism for actuating a roller of the wiper which may be easily detached and turned by hand when the automatic actuating mechanism is disconnected. Figure 12 shows one end of a shaft for transmitting the feed movements, with the clutch therefor and the driving wheel in combination with the eccentric wiper drive. Figure 13 is a longitudinal section of the adjustable control mechanism for actuating the clutch to effect the feed movement. Figure 13a is a section taken on the line XIIIa—XIIIa of Figure 13.

The plate cylinder shaft 1, Figure 1, which is mounted at both ends in the machine frame 2, Figure 3, carries heatable printing beds 4 mounted on two ribbed plates or cheeks 3, Figure 4, which are keyed onto the shaft; further flexible printing plates 6, are clamped, in the manner employed for offset plates, on to the printing beds 4 by means of tension devices 5. Below the plate cylinder is disposed an impression cylinder 7, the impression surface of which carries an elastic cover or blanket 8.

Chain wheels 9, carrying chains 10, are mounted on both sides of the impression cylinder, and gripper rods 11 are inserted between the two chains, at intervals corresponding to the periphery of the impression cylinder. The chains run from the impression cylinder to a second pair of chain driving wheels 12, at which, by means of rocking gripper rods 13, sheets of paper are transferred from a feed table 14 and lay marks 15, to the grippers of the gripper rods 11. In their further course, the chains 10 and gripper rods 11

pass over a jockey roller 16 and then return to the impression cylinder 7. Between the impression cylinder 7 and the chain wheels 12 where the sheets are fed-in, the printed sheets are delivered onto a tray 17, which moves in guides 18 attached to endless chains 19 running over two pairs of chain wheels 20. When the tray 17 is taken out, a second tray 21 is moved into the position previously occupied by the tray 17, due to the actuation of the chains 19 by the chain wheels 20 (Figure 3).

In front of the intake side of the impression cylinder is the paper-damping mechanism; a feed-roller 24 mounted in a trough 23, is disposed underneath a damping roller 22 which is mounted on the machine frame. The trough 23 is pivotally mounted on a spindle 25, and is forced upwardly by an adjustable spring 26, whereby the contact pressure between the rollers 24 and 22 may be varied. An endless band of cloth 30 extends around two parallel rollers 27 and 29. Roller 27 is disposed on an axis parallel with and rotatable about that of the damping roller 22 and the other 29 between a pair of levers 31 depending from a pivot 32, said rollers 27 and 29 being separated by means of tension rods 28 so as to stretch the band 30 therebetween.

The arrangement is such that the band 30, which is damped by its contact with the damping roller 22, is adapted to be moved during its passage around the roller 29. It is moved into and out of contact with the impression cylinder 7 and thus with the sheets of paper to be printed. This is accomplished by means of eccentrics (not shown) which act upon the levers 31. By altering the point of attachment of the ends of the roller 29 on the lever 31, the point of contact of the damped endless band 30 with the impression cylinder 7 can be adjusted to be nearer to or further from the impression point.

After having transmitted their ink to the paper during the impression, the plates 6, during their further course, are first inked again by means of an inker 33. During their further travel, the applied ink is rubbed into the recesses of the plates by a rubbing-in device 34. The inked plates then pass to wipers 35, 36 and 37, the first two of which, 35 and 36, operate with dry wiper material, and the third (37) with damped material.

For rainbow-style copperplate printing, the serial order of the specified arrangements for making the plates 6 ready for the impression, namely, the inker 33 (Figure 4a), the rubbing-in device 34, the two dry wipers 35, 36 and the wet wiper 37, is repeated over the periphery of the plate cylinder.

The wipers are mounted on slip-on spindles 41 (Figure 5a), by means of slip-on sleeves 40 mounted so as to swing about pivots 39, in brackets 38 (Figure 9) on both sides, and are secured in position by nuts 42 (Figure 5). The spindles 41 are each mounted on cross slides 43 which travel in guides 44 (Figure 6) on the upper part of circular slides 45 (Figure 5), the latter in turn moving in circular guides 46 mounted on rising and falling slides 47. The slides 43 are actuated by eccentrics 51, through bell-crank levers and drawbars 50 (Figure 12), by means of drawbars 48 which engage with the slides 43 by means of ball joints 49. The circular slide 45 (Figure 6) is actuated by a drawbar 52 by means of an eccentric 54 and lever mechanism 53 which extends through the machine frame 2 (Figure 3).

The rising and falling slide 47 (Figure 6) is capable of being raised and lowered by means of

shafts 55 and their eccentric pins 56. By means of a sliding block 57 (Figure 5), the pins engage a guide 58 mounted on the machine frame 2. Each of the shafts 55 (Figure 6) which are rotatable through 180°, are provided with a pinion 59 (Figure 5) meshing with larger pinions 60 which carry bell-crank levers 61, the extremities of which are jointed by rods 62. The connecting rods 62 carry impact rollers 63 which are alternately driven by strikers 64 and 65 (Figure 6). These are mounted on rotatable adjustable rings (not shown) in two annular zones on the outside of the cheeks 3 of the plate cylinder (Figure 4), into the central zone between the two stops, thus effecting the alternate raising and lowering of the wipers. The rising and falling slides 47 are mounted by means of guide slots on bolts 66 secured on the inside of the machine frame.

A shaft 67 mounted in the cross slide 43, projects, at the upper end beyond the slip-on spindle 41 (Figure 5) and, if the shaft is to transmit a feed movement, it carries on its end a feather key 68 engaging in grooves provided in a chain-wheel 69 mounted in the slip-on sleeve of the wiper. A downwardly extending part 74 of the said shaft 67 is supported coaxially in a bracket 70 bolted to the machine frame, and is slidably mounted in an aperture in the slide 47. If the shaft 67, 74 is to transmit a feed movement, it is actuated from outside by means of bevel gearing 71, 72. When this shaft is not intended to transmit a feed movement, the bevel gear 71 is replaced by a nut, so as to keep a collar 73 of the shaft tight up against the bracket 70 (Figure 5). The shaft part 67 mounted in the upper slide, and the shaft part 74 mounted in the rising and falling slide, are connected together in a cavity provided in the slide by an Oldham coupling 75 and a Hardy coupling 76 although, if the circular movement is not required, the Hardy coupling may be omitted.

That end of the shaft 67 which projects beyond the slip-on sleeve 40 and the chain wheel 69, does not share the rising and falling movement of the slide mechanism and wiper, and consequently causes a lever 77 pivoted at 83 to the wiper bracket 38 (Figure 9) and which bears against its extremity, to be actuated. By means of another lever 78, a spring 79 is tensioned whereby two rollers 80 and 81 (Figure 7) together with the slide 82 carrying the bearings of these rollers, are drawn back. During the descent of the wiper on to the plate, the wiper material is, therefore, automatically slackened. During the ascent of the wipers the slip-on sleeve rises accompanied by the pivot 83 (Figure 9) of the lever 77. When the spring 79 is released, the winding tension on the wiper material is automatically restored. The end of the shaft 67 must always discharge the function of automatically slackening the wiper material, whether said shaft is actuated for the transmission of a feed movement, or not.

When a feed movement in the wiper mechanism must be effected by the shaft 67, 74, (Figure 5), then a shaft 84, which extends through the machine frame 2 and on which the bevel gear 72 is mounted, is connected with a continuously driven gear wheel 85 (Figure 12) mounted on said shaft. In the special case in which a cross-motion driving eccentric 51 is mounted on the same axis, the wheel 85 may be driven by means of epicyclic gearing 86. The wheel 85 is furnished with a boss formed as one member 87 of a saw-tooth clutch the other member (88) of which is slidably mounted on the shaft 84. The wheel 85 is pressed

against the member 87 by a spring 89 the end of which bears against the collar 90 of a hand wheel. The clutch member 88 is provided with a circumferential groove 91 for engagement with a throw-off lever 92, which is actuated by control mechanism and allows the clutch 87, 88 to engage only at intervals determined by the control mechanism.

The control mechanism itself consists of a hollow pillar 93 (Figure 13), which is bolted to the machine frame 2 and accommodates in its bore a screw-threaded spindle 94 adapted to be rotated from outside by a hand wheel 95. The rotation of the spindle 94 moves a nut 96 to and fro in the hollow pillar thereby enabling an external sleeve 97 to be moved to and fro by means of lugs extending outwardly from the nut. Two diametrically opposite arms 98 and 100 project from the sleeve 97. One of these (98) has a roller 99 mounted at its extremity (Figure 13a) and the other (100) is under the influence of a spring 101 which causes the roller 99 to be retained in contact with cams carried by the shaft of the plate cylinder. The trailing of the roller 99 on the stops of the plate cylinder causes the turning of a sleeve 102, carried by the sleeve 97 (Figure 13). By displacing the sleeve 97 axially with respect to the plate cylinder, the roller 99 encounters broader or narrower zones of cams whereby the intervals at which the lever 98 moves are varied.

The upper end of the sleeve 102 is formed with a ratchet-like crown adapted to engage with a corresponding crown on a member 103 mounted in a sleeve 104 which is integral with the throw-off lever 92 and is adapted to slide on the axis of the hollow pillar 93. The member 103 is provided with teeth 105 engaging with those of a toothed pinion 106 on a shaft 108 which is adapted to be turned by a crank 107 adapted to be retained in definite positions by means of a stop 109. In the position in which the crowns of the member 103 and sleeve 102 are in engagement, rotation of the sleeve 102 raises the sleeve 104 and therefore the throw-off lever 92, thus disengaging the clutch 87, 88 (Figure 12). During the return movement of the sleeve 97 (Figure 13), which occurs when the roller 99 runs off the cam, the re-engagement of the crowns allows the sleeve 104, and therefore the throw-off lever 92, to pass into the position in which the clutch 87, 88 (Figure 13) is re-engaged. By turning the crank 107 (Figure 13), the member 103 is rotated in such a manner that the sleeve 104 and throw-off lever 92 keep the clutch 87, 88 (Figure 12) continuously out of action.

The wiping mechanism consists of two cheek plates 110 (Figure 9), connected together by a cross bar 111 and each having mounted on its outer side two brackets 38, between which the slip-on spindles 40 are oscillatingly mounted in pivots 39. Between the cheek plates 110 are disposed pairs of rollers 80, 81 and 114, 115, on opposite sides of the wiper pads 112, 113 (Figure 8), the rollers 80, 81 applying tension to the wiper material, as already described. The roller 114 is actuated (Figures 7 and 8) through the medium of a worm wheel 116 and worm 117, the latter being carried by a shaft 118 mounted on the outside of the cheek plate 110. The other end of shaft 118 carries a worm 119, which meshes with a worm wheel 120, and actuates the winding spindle 121 by means of a friction drive (Figure 8), being driven from the chain wheel 69 by means of a chain 122. Obliquely above the roller 114 (Figure 8) and above the roller 115, a tension roller 123 is mounted between the cheek plates

and an endless rubber cloth 124 passes over the rollers 114 and 123 and bears against the roller 115.

The wiper material unwinding from a stock reel 125 is led between the rubber cloth 124 and the roller 115 and is drawn along, at this point, by the rubber cloth 124 whereafter it passes round the roller 115, underneath the wiper pads 112, 113, under the roller 80, over the roller 81, then back again under the pads 112, 113, outwardly around the roller 114 and to the winding spindle 121. The double layer of wiper material under the wiper pads 112, 113 may also be increased to 4- or 6-fold by passing the material over the stock reel 125 and along the described path, once or twice more, and is only then led to the winding spindle 121.

At each wet wiper mechanism there are disposed, between the pairs of rollers 114, 115 and 80, 81 (Figure 10), two further pairs of rollers 126, 127 and 128, 129, which are mounted between the cheek plates of the wiper mechanism on each side of the wiper pads. A driven roller 130 and a jockey roller 131 are also provided in the upper part of the wiper mechanism. A roller 133 is mounted in a trough 132 and is pressed against the roller 130 by a spring. The roller 133 is coated with absorbent material and transfers liquid contained in the trough 132 to an endless band of cloth running over the roller 130, the amount transferred being regulated by spring pressure, the endless band of cloth passing then under the roller 128, under the wiper pads, under the roller 127, over the roller 126, again under the wiper pads, then over the roller 129 and back to the roller 130. The forward movement of the endless band is effected by the roller 130 in the same manner as that of the wiper material. The forward movement is effected in this case on the opposite side of the wiper material feeding. The endless cloth carries the moisture between the wiper pads and the wiper material, where it is transferred to the material by the wiping pressure.

The endless cloth can be removed from the wiper mechanism, without dismantling the latter, the lower rollers 126 and 129 being provided with open bearings, whilst the driven roller 130 is actuated by a removable driving pin 134 (Figure 11), mounted in a bush 135 mounted in the cheek plate 110. On the outside of this bush is mounted the driven worm wheel which surrounds the withdrawable driving pin 134 by means of its boss 136 and a sleeve 137, said pin being pressed inwards by a spring 138 housed in the bush 135. The pin 134 has a central bore 139, in which the spring 140 presses a block, provided with a cross pin 141 and handle 142, against a nut 143. Pulling out the handle 142 withdraws the driving pin 134, thereby enabling the roller 130, the other end of which is mounted on a conical bearing nipple, to be taken out of the wiper mechanism. On pushing the hand wheel 142 inward, the cross pin 141 enters the boss 136 and thus passes out of the guides in the sleeve 137, so that the roller 130 can be turned by hand by means of the hand wheel 142, the movement having been declutched by the pushing inward of said wheel.

In both the dry and the wet wiper mechanisms the wiper pads 112, 113 (Figure 10) consists of elastic strips, to the edges of which is secured, all the way along, a bent strip of flexible sheet metal 144 of such curvature that it bears only on the edges of the pad. The pres-

sure is, therefore, transmitted to the edges alone and, consequently, the elastic strip is able properly to adapt itself to the curvature of the plate. Blocks 145, riveted in the centre, are provided at definite intervals all along the metal strips 144, and are recessed on the upper face to receive the ends of the pressure pins 146 which are inserted loosely into the recessed blocks, so as to allow freedom of movement between the two.

The pressure pins 146 are mounted at two places in the crossbar 111 to be slidable in the direction of impression. The upper bearing is constituted by a screwed bush 147, which is adjustable in the crossbar, towards and away from a collar 148. The distance between said collar and the lower end of the screwed bush may be variably adjusted to vary the tension of the spring 149 and thereby the wiping pressure in each zone. The pressure pins 146 in the two successively disposed wiper pads 112, 113 are mounted alternately in the crossbar 111 to distribute the pressure as uniformly as possible over the surface. The pins 146 are threaded at their upper end, so that the downward movement of the pads can be restricted, the cheek nuts 150 being just clear of the screw 147 when the wipers bear against the plates.

The press operates in the following manner:

The paper to be printed is placed on the feed table 14 (Figure 4), in contact with the lay marks 15, and is transferred by the rocking gripper rod 13 to the chain gripper rods 11 which are advanced by the chain wheels 12. The chains 10 carry the sheets over the jockey rollers 16 to the impression cylinder 7 whereupon their surface is damped, and made ready for printing, by the endless band of cloth 30. The sheets are then printed and pass away from the printing zone, being carried onwards by the gripper rod chains 10, in the direction of the pair of wheels 12, and delivered into the delivery tray 17. An offset sheet is deposited, over each printed sheet, from the side by means of the offset-sheet feed mechanism (Figure 2), so that, in the printed pile, an offset sheet lies upon each printed sheet.

In order to prepare the printing plates 6 (Figure 4) for printing, they are first provided with the necessary amount of ink by the inking gear 33, the ink being then rubbed into the recesses in the plates by the succeeding rubbing-in mechanism 34. The succeeding wiper mechanisms 35, 36 operate with dry wiping material, and remove the surplus ink from the surface of the printing plates, leaving merely a thin film of ink behind. This film is removed by the wet wiper mechanism 37, thus leaving the plates quite ready for printing. In this condition, the plates move onward in a completely accessible manner and at a convenient working level, to the printing zone, so that any final wiping which may be necessary can be performed by hand.

When the press is arranged for rainbow-style printing, only separate streaks of ink are applied to the plates by the first inking gear, which is divided by means of cheeks. These streaks are rubbed into the recesses of the plate by the rubbing-in roller, which is adjusted for a very short stroke, and the resulting inked strips on the printing plates are then completely wiped. By means of the succeeding inking gear, which is also divided by means of cheeks, ink is applied to those portions of the plates which have not yet been inked. This ink is rubbed in, as already described, by the succeeding rubbing-in mechanism, and is removed from the plane surface by the

succeeding wipers. In this manner the plates are left coated along the lines of contact with parallel strips of differently coloured inks, which blend to form mixed shades. In this case also, the plates pass in a freely accessible manner and at a convenient working level, from the final wiper to the impression cylinder. Moreover, by carefully adjusting the press, rainbow-style impressions can be also obtained without duplicating the mechanisms which make the plates ready for printing.

The flexible thin metal plates employed in the press may be electros, the backs of which are planed, milled or ground parallel with the surface plane, the plates being secured on the machining bed by means of a vacuum.

The machining bed may also be a cylindrical surface onto which the plates are clamped, and are machined in that condition. When directly etched plates are employed, the planar-parallel surface is etched and used as such in the press. These thin intaglio plates may also be prepared by any other suitable process.

The described press is suitable for all kinds of intaglios. The press may be used for the printing of bonds of great value, treasury notes, shares etc.

I claim:

1. In a rotary copper plate printing press, a plate cylinder to receive the printing plates, an impression cylinder operatively associated with the plate cylinder, a paper damping device associated with the impression cylinder, a feed table, a conveyor mechanism operating to carry the paper from the feed table about the impression cylinder to be moistened by the damping device and then to receive an impression between the plate and impression cylinders, an inking device applying ink to the printing plates, a pressure arrangement to distribute the ink over the plates, wiping devices beyond the pressure arrangement to remove the excess ink from the plates and a delivery mechanism to receive the print from the conveyor.

2. A rotary copper plate printing press, as claimed in claim 20, in which there are a plurality of units associated with the plate cylinder, each unit consisting of the said ink device, pressure arrangement and wiper mechanism.

3. In a rotary copper plate printing press, having a plurality of rotary shafts, the combination of wiping mechanism comprising a pair of reciprocating spindles supported on two of said shafts, means supported on said spindles to carry a strip of wiping material, wiper elements arranged in said means to back the material during the wiping operation, and a tensioning device carried by said means and operated by the reciprocating movement of spindles to automatically release and tension the material over said wiper elements.

4. A wiper for a rotary copper plate printing press as claimed in claim 3, including a sleeve supported by one of said spindles, a sprocket wheel carried by the said sleeve, and actuated by the projecting end of the shaft, a reel carrying the wiping material, a chain connecting the reel and said sprocket to actuate the former, a pair of rollers, one thereof being actuated by the sprocket, an endless rubber cloth belt supported by the pair of rollers, a third roller bearing on the belt and cooperating therewith to advance the wiping material being unwound from the said reel.

5. In a rotary copper plate printing press, hav-

ing a plurality of rotary shafts, the combination of a wet wiping mechanism, comprising a pair of reciprocating spindles supported on two of said shafts, means supported on said spindles to carry a strip of wiping material, wiping elements arranged on said means to back the material during the wiping operation, an absorbent belt disposed between the wiping elements and the wiping material, means for advancing the belt, a sleeve mounted on one of said spindles having a sprocket and chain connection with the said belt advancing means, and a tensioning device carried by the said first means and operated by the reciprocating movement of the spindles to automatically release and tension the material over said wiper elements.

6. A device as claimed in claim 3, in which said wiping element comprises a plurality of wiping pads consisting of elastic strips, elastic bridge members holding said strips, marginally thereof, supporting members for the said pads, springs associated therewith, means to adjust the tension of said springs to control the wiping pressure of the pads.

7. A device as claimed in claim 3, comprising guides for the rotary and reciprocating movements of the wiping mechanism, supporting means engaging said guides and the wiping mechanism, a plurality of shafts for actuating said supporting means and wiping mechanism,

means eccentrically supporting the said second named shafts, the latter being capable of rotation for 180°, driving pinions for actuating the said second named shafts, connecting rods carried by the latter, impact rollers carried by the said rods and adjustable thereon, actuating strikers cooperating with the said impact rollers for timing the rotary and reciprocating movements of the wiping device.

8. A device as claimed in claim 3, including a slip-on spindle, a cross slide supporting the latter, guides for controlling the reciprocating movements of the said wiping mechanism, one of the said shafts being a two part member slidably mounted between said slip-on spindle and the said guides, a bracket supporting the said slidable shaft longitudinally thereof, the upper part of said slidable shaft being connected to the wiping mechanism by means of an Oldham and a Hardy coupling to produce participation of the said slidable shaft in the reciprocating and rotary wiping movements of the wiping mechanism.

9. In a rotary copper plate printing press provided with a wiping mechanism, a reel for the wiping material, a cam associated therewith, a striker cooperating with the said cam, the cam groove actuating the reel and timing the advance of material.

FRIEDRICH v. HEINRICH.