Aug. 29, 1961 W. F. HUCK 2,997,951

WIPING AND POLISHING DEVICE FOR INTAGLIO PRINTING PRESSES

Filed Nov. 1, 1957 4 Sheets-Sheet 1

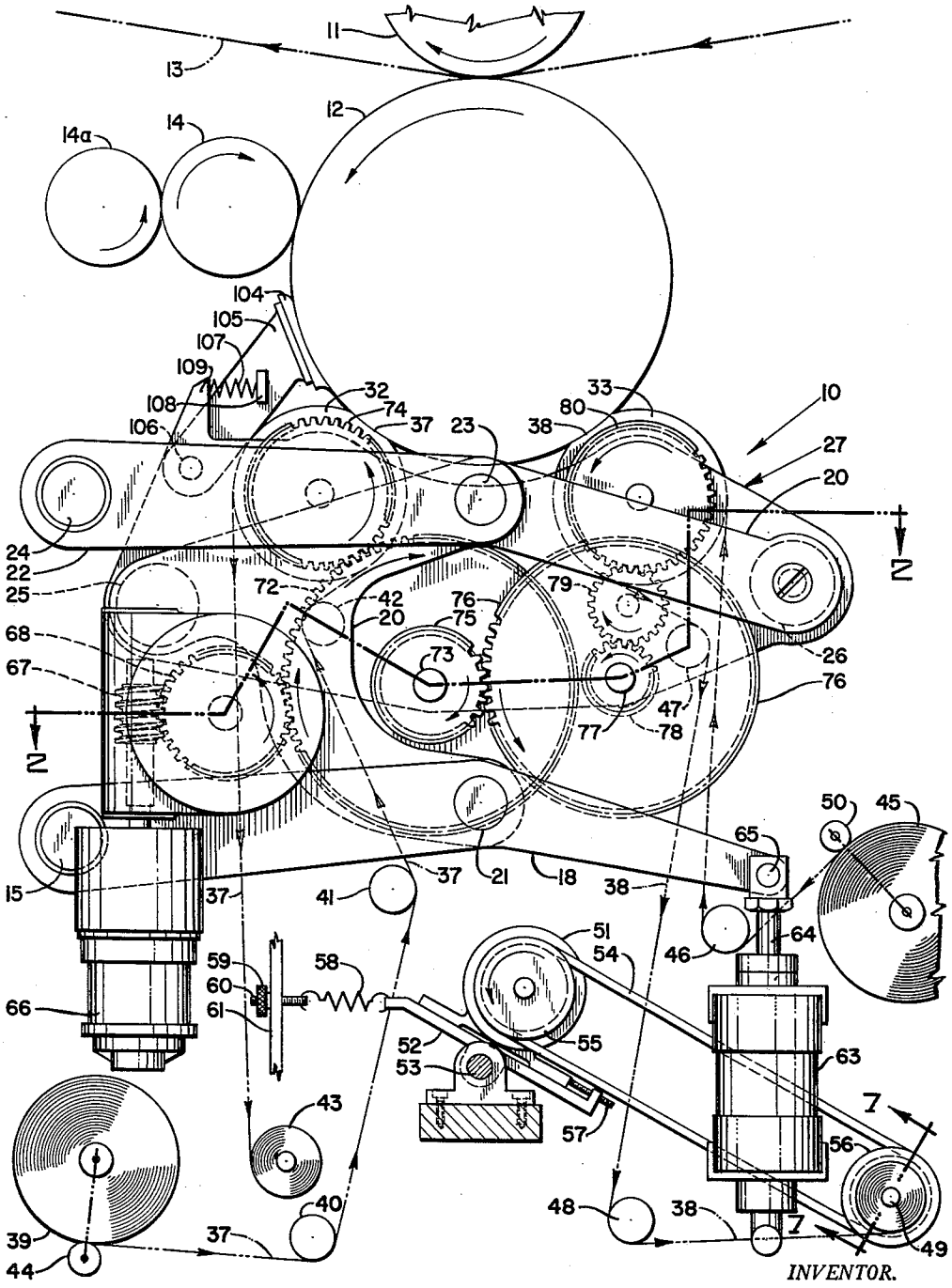


FIG. 1

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WIPING AND POLISHING DEVICE FOR INTAGLIO PRINTING PRESSES

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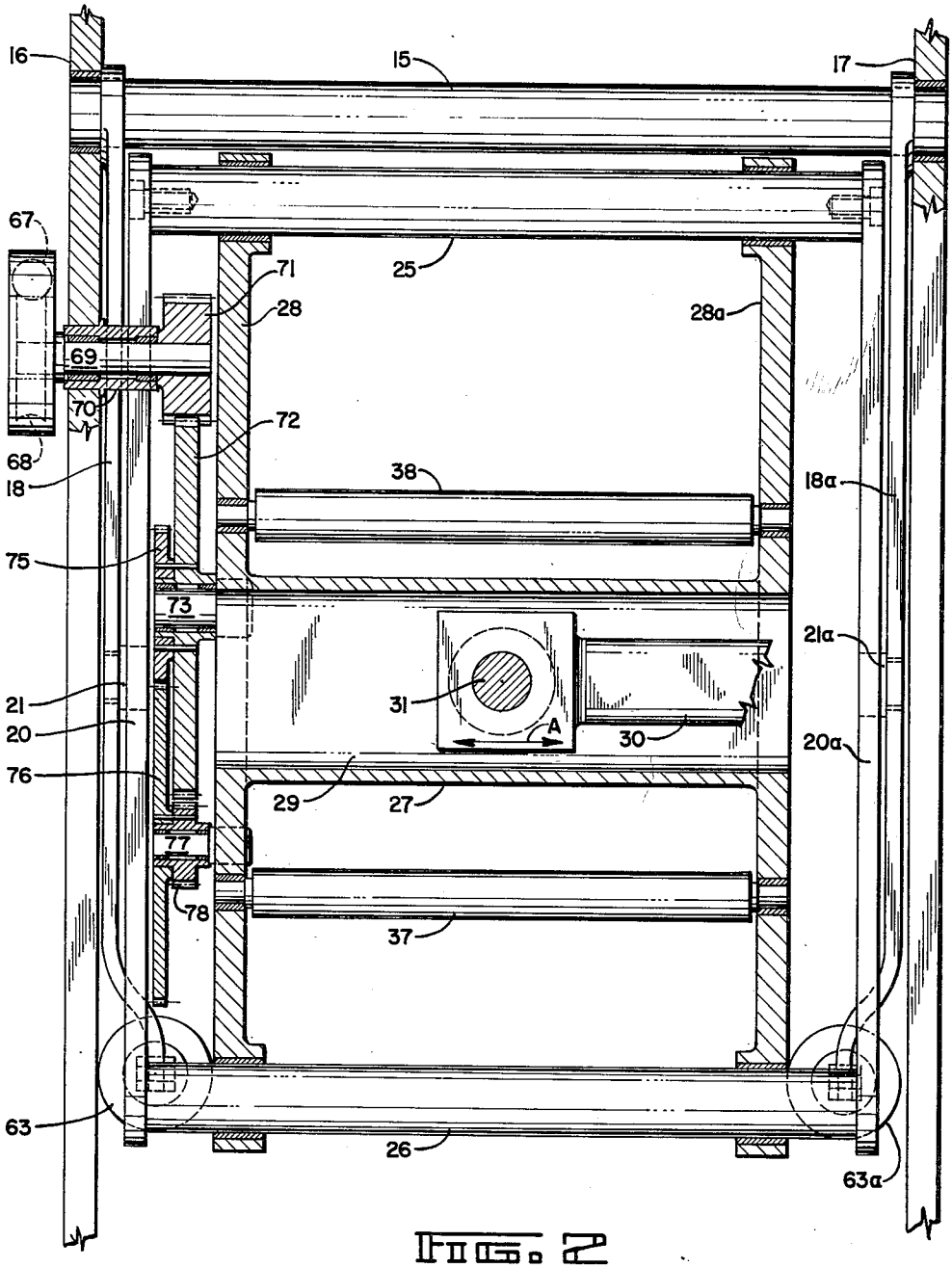


FIG. 2

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WIPING AND POLISHING DEVICE FOR INTAGLIO PRINTING PRESSES

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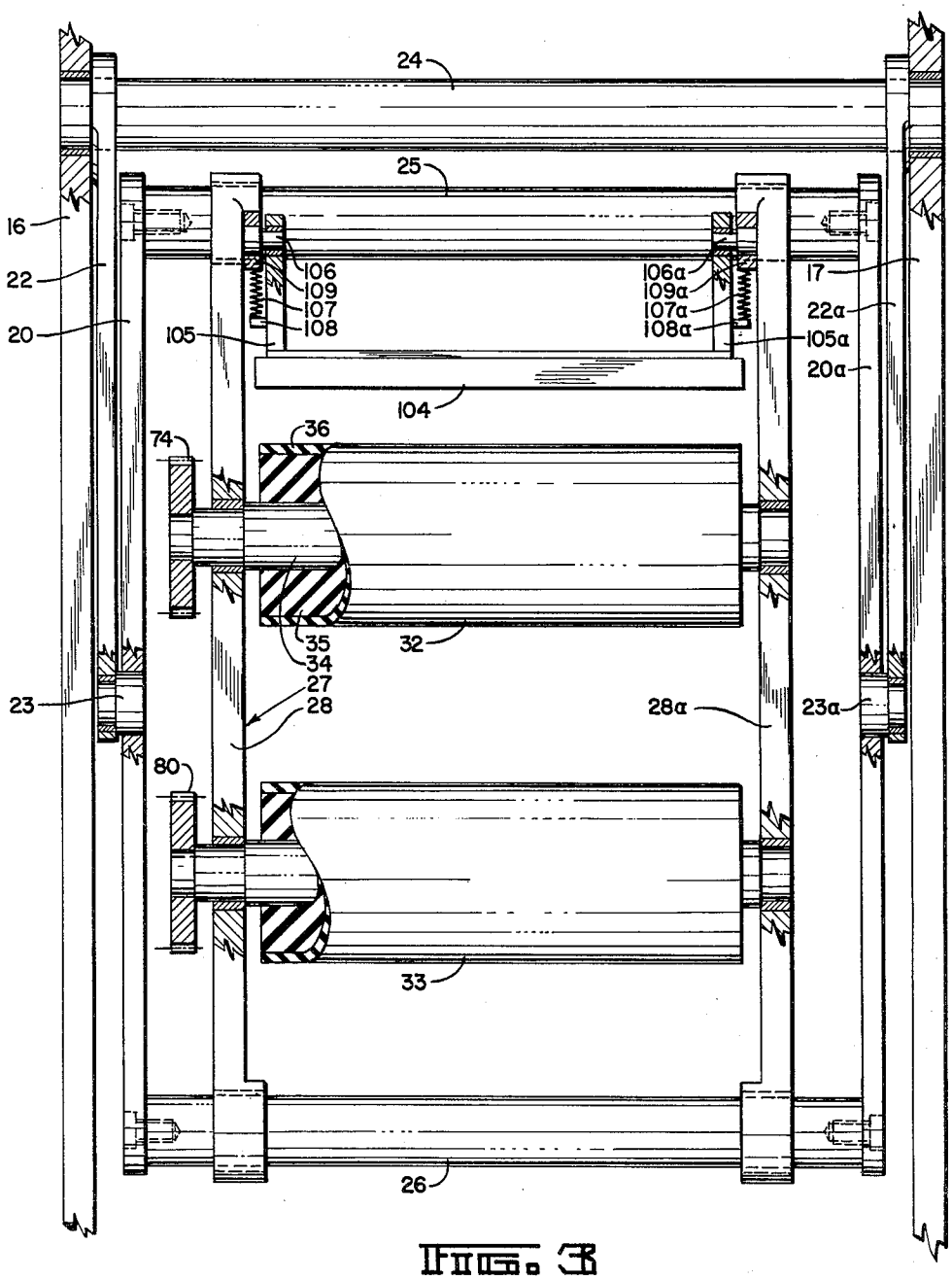


FIG. 3

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WIPING AND POLISHING DEVICE FOR INTAGLIO PRINTING PRESSES

Filed Nov. 1, 1957 4 Sheets-Sheet 4

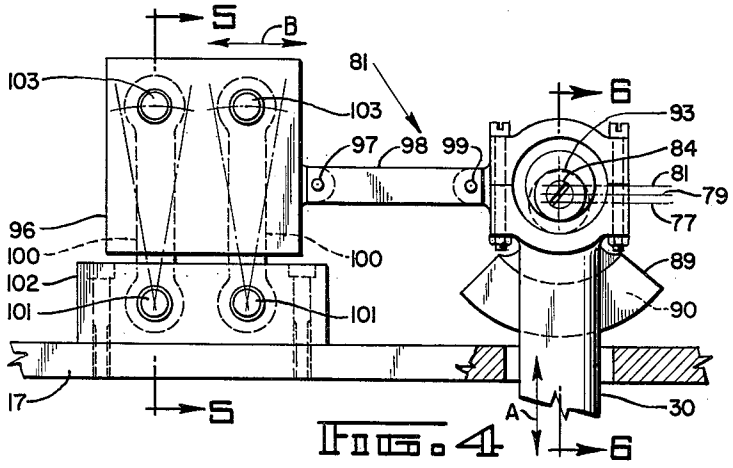


FIG. 4

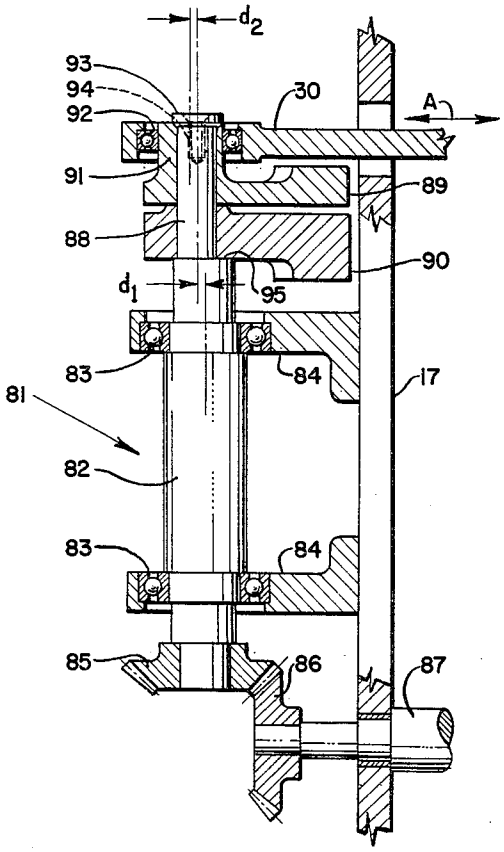


FIG. 6

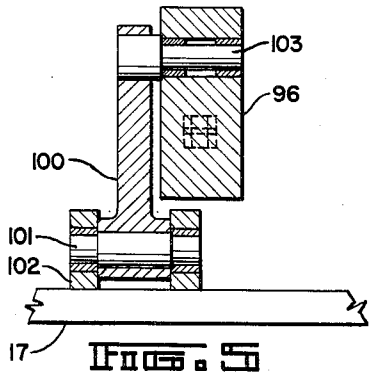


FIG. 5

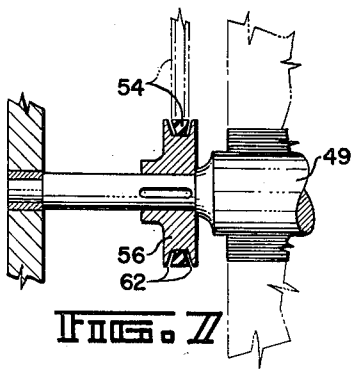


FIG. 7

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United States Patent Office 2,997,951 Patented Aug. 29, 1961

2,997,951

WIPING AND POLISHING DEVICE FOR INTAGLIO PRINTING PRESSES

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Filed Nov. 1, 1957, Ser. No. 693,924
22 Claims. (Cl. 101—156)

This invention relates generally to intaglio printing presses, and more particularly is directed to a wiping and polishing device for use in connection with such presses.

In presses employing the intaglio printing method, for example, presses of the kind used for printing bonds, currency, stamps and the like, the printing cylinder or plate has engraved lines in the printing area of the surface thereof to carry the printing ink in such engraved lines below the cleaned surface of the printing area, and the paper is pressed against the printing area so that the ink in the engraved lines is lifted by the contact of the paper therewith.

In order to provide ink in the engraved lines of the printing plate or cylinder for transfer, as a design, to the paper subsequently pressed thereagainst, a layer of ink is first applied to the entire printing area, and this ink is wiped clean from the surface of the plate or cylinder to leave ink only in the engraved lines below the surface. However, since intaglio printing usually requires an ink of heavy consistency and viscosity, it is necessary to apply a relatively thick layer of such ink to the printing surface and to exert a considerable pressure upon the layer of ink in order to fill the engraved lines. Furthermore, the removal of the relatively thick layer of viscous ink from the non-printing portions of the surface presents difficulties, in that a considerable force is required to wipe the ink from the surface and, by reason of such force, there is a tendency to pull some of the ink out of the engraved lines.

In some existing intaglio printing presses, mechanical cleaning of the cylinder surface, as distinguished from cleaning with solvents, is effected by pads or belts which force wiping material, for example, wiping rags or paper, against the printing surface. This wiping material is advanced to avoid saturation thereof with ink, and is also reciprocated laterally with respect to the direction of advancement in order to wipe more completely. The wiping material is usually unwound from a supply roll and, after use, is rewound on a take-up roll for convenience in subsequent handling. In these existing arrangements, the means employed for moving the wiping material past the printing surface varies. In many cases, the wiping material is pulled past the printing surface by a traction force acting directly on this material and, since there usually are gaps between adjacent printing areas on the cylinder, provision is usually made for interrupting or relieving the pressure of the wiping material against the printing surface during advancement of the wiping material past such gaps. In other existing devices, the printing area of the intaglio printing cylinder is wiped by a roller or belt which, in turn, is cleaned by wiping material pulled past such roller or belt. In these existing arrangements for wiping ink from an intaglio printing cylinder, the wiping material frequently breaks under the tension necessary for effecting advancement thereof by a pull exerted directly on the wiping material, and, if the pressure and tension are reduced in order to avoid breaking of the wiping material, the printing surface is not adequately cleaned. Further, with the existing arrangements, much expensive ink is wasted by wiping because it must be applied in an excessively heavy layer in order to properly fill the deepest engraved lines of the printing area.

In those existing arrangements where the wiping material is advanced intermittently, that is, is brought to rest during passage of the gaps between successive plates or printing areas on the cylinder, then a variation of color strength results, because the ink in the engraved lines at the start of a printing area is wiped by clean wiping material and is therefore lighter, while the wiping material is more saturated with ink when it reaches the end of the corresponding printing area so that heavier deposits of ink remain in the engraved lines.

Accordingly, it is an object of this invention to provide improved means for wiping clean the printing surface of an intaglio printing cylinder, which avoids the above mentioned disadvantages of existing wiping arrangements and which is effective to reduce the waste of ink and to better fill the engraved lines of the printing area.

Another object is to provide means for cleaning the surface of the printing area of an intaglio printing cylinder by directly contacting wiping material therewith, while avoiding any tendency of such wiping material to break under tension and yet ensuring a completely clean orienting surface with the ink uniformly filling the engraved lines over the entire printing area.

In accordance with an aspect of this invention, a strip or web of wiping material is pressed against the surface of the intaglio printing cylinder by a resilient, rotatably driven roller which serves to continuously and smoothly advance the wiping material and to move the latter relative to the surface of the printing cylinder so that superfluous ink will be wiped clean from the printing surface and the remaining printing ink in the engraved lines of such surface will be of uniform consistency.

Still another object of the invention is to provide a wiping and polishing device for intaglio printing presses wherein wiping material is pressed against the printing surface of the intaglio printing cylinder by a resilient roller in order to effect initial wiping of the printing surface, and the roller is rotated to frictionally advance the wiping material so that clean or unused portions of the latter are presented for use to obtain a uniform wiping action, and wherein other wiping material is similarly pressed against the printing surface and advanced at a different speed in order to effect finish wiping or polishing of the printing surface.

A further object is to provide wiping means of the described character, wherein the wiping material is drawn from a supply roll and is rewound, after use, upon a suitable take-up roll, with the unwinding of the unused wiping material and the rewinding of the used material being effected under conditions of controlled tension thereby to avoid any possibility of breaking of the wiping material.

The above, and other objects, features and advantages of invention will be apparent in the following detailed description of an illustrative embodiment thereof which is to be read in connection with the accompanying drawings forming a part hereof, and wherein:

FIG. 1 is a side elevational view of a wiping and polishing device embodying this invention for use in an intaglio printing press, but with the main frames of the press being removed in order to better expose the structure embodying this invention;

FIG. 2 is a horizontal sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a top plan view of the device embodying this invention, shown partly broken away and in section;

FIG. 4 is a top plan view of a reciprocation producing device in the wiping and polishing device embodying the present invention;

FIG. 5 is a detail sectional view taken along the line 5—5 of FIG. 4;

FIG. 6 is a detail sectional view taken along the line 6—6 of FIG. 4; and

FIG. 7 is a detail sectional view taken along the line 7—7 of FIG. 1.

Referring to the drawings in detail, and initially to FIG. 1 thereof, it will be seen that a wiping and polishing device embodying the present invention, and there generally identified by the reference numeral **10**, is intended for use with an intaglio printing press that includes a printing couple consisting of an impression cylinder **11** and an engraved plate cylinder **12** which are rotatably mounted for passage of a web **13** of paper therebetween. The usual ink rollers **14** and **14***a* are provided for applying printing ink to the surface of the plate cylinder **12**.

The wiping and polishing device **10** includes a shaft **15** extending horizontally and rotatably mounted between opposite side frames **16** and **17**. Arms **18** and **18***a* (FIG. 2) extend generally radially from the shaft **15** and are clamped or secured to the latter adjacent the frames **16** and **17**, respectively. Generally C-shaped members **20** and **20***a* are pivotally connected, at their lower ends, to arms **18** and **18***a*, respectively, by means of pivots **21** and **21***a* which are carried by the latter intermediate the ends thereof. A second pair of arms **22** and **22***a* are arranged above arms **18** and **18***a*, respectively, and are secured, at one end, to a shaft **24** which extends horizontally above the shaft **14** and is also rotatably mounted, at its opposite ends, in frames **16** and **17**. The free ends of arms **22** and **22***a* are connected, by pivots **23** and **23***a*, respectively, to the upper portions of the related C-shaped members **20** and **20***a* so that, as the arms **18** and **18***a* and the arms **22** and **22***a* swing about the axes of the shafts **15** and **24**, respectively, the members **20** and **20***a* are moved generally vertically toward and away from the plate or printing cylinder **12**.

Parallel, round spacer bars **25** and **26** (FIGS. 1 and 3) extend horizontally between the C-shaped members **20** and **20***a* and are suitably secured, at their opposite ends, to the latter. A carriage **27** of generally H-shaped configuration (FIG. 2) includes parallel side members **28** and **28***a* and a cross piece **29** connecting the central portions of the side members **28** and **28***a*. The opposite ends of side members **28** and **28***a* carry suitable bearings which slidably engage the spacer bars **25** and **26** so that carriage **27** is mounted on the spacer bars for vertical movement with the C-shaped members **20** and **20***a* and for lateral movement in the direction of the arrows A on FIG. 2, relative to the assembly of the members **20** and **20***a* and the spacer bars **25** and **26**. A reciprocation producing device, hereinafter described in detail, includes a connecting rod **30** which, at one end, is pivotally connected to a pin **31** (FIG. 2) on the cross piece **29** of carriage **27** for reciprocating the latter in the direction of the arrows A.

A wiper roller **32** and a polisher roller **33** are rotatably mounted, at their opposite ends, in suitable sleeve bearings carried by side members **28** and **28***a* of carriage **27** (FIG. 3), with the axes of rotation of the rollers **32** and **33** preferably being disposed at opposite sides of the vertical plane containing the axis of rotation of plate cylinder **12** (FIG. 1). As seen in FIG. 3, each of rollers **32** and **33** includes a rigid central shaft **34**, a cylindrical body **35** of resilient material, for example, rubber and the like, and an outer shell or covering **36** of a resilient material, for example, rubber and the like, having a hardness which is greater than that of the cylindrical body **35**. By virtue of this construction of each roller, the relatively hard covering **36** will maintain substantially the same area of wiping action against the plate cylinder when the pressure of the roller against the cylinder is varied, the change of pressure being attended by a displacement of the covering **36** relative to the softer body **35** and shaft **34**.

In accordance with the present invention, webs **37** and **38** of wiping and polishing paper are resiliently pressed against the surface of the plate cylinder **12** by the rollers **32** and **33**, respectively, for effecting wiping and then polishing of such surface. The web **37** of wiping paper is drawn from a supply or feed roll **39** thereof which is suitably mounted below the carriage **27** (FIG. 1). The web **37** passes from the supply roll **39** under a guide roller **40** and then upwardly past a guide roller **41** and a guide roller **42** which is rotatably mounted between the side members of carriage **27**. After passing around the resilient wiping roller **32** the used web **37** of wiping paper moves downwardly to a take-up roll **43** which is suitably mounted for rotation below the carriage **27**. A pressure roller **44** is yieldably urged against the surface of the supply roll **39** in order to maintain tension in the web **37** as the latter is drawn from the supply roll **39** by the wiping roller **32**.

Similarly, the web **38** of polishing paper is drawn from a supply roll **45** and passes under a guide roller **46** before traveling around the polishing roller **33**. The used web **38** of polishing paper passes from the roller **33** around a guide roller **47** which is rotatably mounted between the side pieces of the carriage **27**, and then passes under a guide roller **48** on its way to a take-up roll **49** which is suitably rotatably mounted at a location near the bottom of the printing press. A pressure roller **50** is also yieldably urged against the surface of the supply roll **45** in order to maintain tension in the web **38** between the supply roll and the polishing roller **33**.

Since the wiping and polishing rollers **32** and **33** are pressed against the surface of the plate cylinder **12** and are continuously rotated, in a manner hereinafter described in detail, the webs **37** and **38** are frictionally gripped by the rollers **32** and **33** so that feeding of the webs from the supply rolls **39** and **45** is smoothly effected in response to rotation of the wiping and polishing rolls **32** and **33**, respectively.

The take-up rolls **43** and **49** for the used webs of wiping and polishing paper preferably have adjustable slip drives associated therewith so that an adjustably constant tension can be maintained in each of used webs **37** and **38** between the related resilient rollers **32** and **33** and the take-up rolls. As shown in FIG. 1, a suitable adjustable slip drive for the take-up roll **49** includes an electric motor **51** embodying reduction gearing and slidably mounted on a base plate **52** which is pivoted on a support shaft **53**. A V-belt **54** connects a pulley **55** on the output shaft of the reduction gearing of motor **51** with a pulley **56** which is secured on the take-up roll **49** for the used web of polishing paper. A set screw **57** is provided on the motor base **52** for adjusting the motor **51** along the latter, thereby to vary the distance between the centers of the pulleys **55** and **56**. A tension spring **58** is connected, at one end, to the pivoted motor base **52** and, at its other end, to a threaded stud **60** which extends through an abutment **61** and is adjusted relative to the latter by a knurled nut **59** on the threaded stud **60**. Thus, by turning the nut **59**, the tension in spring **58** can be varied for adjusting the tension in the belt **54**. As shown in FIG. 7, the groove **62** of the pulley **56** preferably has a larger cross-section than the belt **54** so that, when the tension in the web **38** of used polishing paper reaches a value determined by the adjustment of the tension in spring **58**, the belt **54** can slip relative to the pulley **56** to prevent ripping or tearing of the polishing paper during operation.

Although the adjustable slip drive of the take-up roll **43** for the web **37** of used wiping paper is not illustrated in the drawings, it is to be understood that such adjustable slip drive is identical with that described above in connection with the take-up roll **49** for the web **38**.

As seen in FIGS. 1 and 2, fluid pressure operated cylinders **63** and **63***a* are suitably mounted below the free ends of arms **18** and **18***a*, respectively, and have piston rods **64** and **64***a* extending upwardly therefrom which are pivotally connected, at their upper ends, as at **65** (FIG. 1), to the free ends of arms **18** and **18***a*. Fluid under pres-

sure is suitably admitted to cylinders 63 and 63*a* so that piston rods 64 and 64*a* exert upwardly directed forces against the arms 18 and 18*a*, respectively. These upward forces are transmitted, through C-shaped members 20 and 20*a*, spacer bars 25 and 26 and carriage 27, to the rollers 32 and 33. The dimensions of the arms 18 and 18*a*, the arms 22 and 22*a*, the members 20 and 20*a* and the carriage 27, and the dispositions of the pivotal connections therebetween are selected so that upward displacement of the piston rods 64 and 64*a* results in upward linear displacement of rollers 32 and 33, thereby to maintain a uniform pressure between the webs 37 and 38 of wiping and polishing paper, respectively, and the surface of plate cylinder 12.

Since the rollers 32 and 33 each have a relatively soft resilient body 35 and a harder resilient covering 36, the surfaces of the rollers 32 and 33 will have substantially the same area of pressure against the surface of plate cylinder 12 when pressed against the latter under different pressures by the action of the fluid pressure operated cylinders 63 and 63*a*.

In order to drive the rollers 32 and 33, the wiping and polishing device 10 embodying the present invention includes a variable speed motor 66 mounted on frame 16 and driving a worm 67 which meshes with a worm gear 68 (FIG. 2) on a shaft 69 rotatable in a bearing 70 carried by the frame 16. A spur gear 71 is also secured on the shaft 69 and meshes with a relatively large spur gear 72 which is rotatable on a stub shaft 73 extending from the adjacent side member 28 of carriage 27 (FIG. 2). Spur gear 72 meshes with a spur gear 74 secured on the shaft 34 of roller 32 for rotating the latter (FIGS. 1 and 3), while a spur gear 75 having a relatively small pitch diameter is secured to the gear 72 for rotation with the latter and meshes with a relatively large spur gear 76 (FIG. 2) which is rotatable on a stub shaft 77 extending from side member 28 of carriage 27. A relatively small spur gear 78 is secured to the gear 76 for rotation with the latter and meshes with a spur gear 79 (FIG. 1) rotatably carried by side member 28 and, in turn, meshing with a spur gear 80 on the adjacent end of the shaft of roller 33. The gear train formed by the gears 75, 76, 78, 79 and 80 provides for rotation of the roller 33 in the same direction as the roller 32, as indicated by the arrows on FIG. 1, while the enumerated gears are dimensioned so that the polisher roller 33 will be rotated at a much slower speed than the wiping roller 32. Further, the above described rotational drive for the rollers 32 and 33 is arranged so that even the relatively rapidly rotated roller 32 will have a surface speed which is lower than that of the plate cylinder 12. By reason of the pressure of the rolls 32 and 33 against the webs 37 and 38 at the surface of the plate cylinder 12, and by reason of the relatively high coefficient of friction existing between the resilient covering of the rollers 32 and 33 and the related webs 37 and 38, such webs, which successively wipe and polish the surface of cylinder 12, will be continuously and smoothly advanced at the surface speeds of the related rollers 32 and 33, that is, at different speeds. Preferably, as indicated by the arrows on FIG. 1, rollers 32 and 33 and plate cylinder 12 are all rotated in the same direction, for example, in the counter-clockwise direction, as shown, so that, following the application of printing ink to the surface of cylinder 12, such surface first moves past web 37 at the location of roller 32, thereby to initially effect removal of the major portion of the excess ink, and thereafter the surface of the plate cylinder moves past web 38 at the location of roller 33 for removing any remaining ink from the non-printing surface of the cylinder 12, thereby to ensure that ink will remain only in the engraved lines of the intaglio printing plate or cylinder. Since the web 37 is relied upon to remove the major portion of the ink layer from the non-printing surface of the plate cylinder 12, while the web 38 merely provides a final wiping or polishing action to remove that ink which is left on the non-printing surface by the web 37, it is apparent that the web 37 will become more quickly saturated with ink and must be advanced over the roller 32 at a higher speed than that of the advancement of web 38 over roller 33, in order to ensure that a uniform wiping and polishing action will be obtained, and this relative difference in the advancing speeds of the webs 37 and 38 is achieved by the difference in rotational speeds of the rollers 32 and 33, as described above.

Further, as previously indicated, connecting rod 30 serves to impart lateral reciprocation to carriage 27 so that, as webs 37 and 38 advance over the resilient rollers 32 and 33 and wipe the surface of plate cylinder 12, such webs are also laterally reciprocated relative to the plate cylinder, thereby to improve the wiping and polishing actions thereof.

Preferably, the lateral reciprocation of carriage 27 is effected by a device which is illustrated in FIGS. 4, 5 and 6 and there generally identified by the reference numeral 81. The reciprocation producing device 81 includes a vertically extending shaft 82 which is rotatably mounted in bearings 83 carried by supports 84 extending from the frame 17. At its lower end, shaft 82 carries a bevel gear 85 meshing with a bevel gear 86 on a horizontal drive shaft 87 which is rotated by a suitable motor (not shown). At its upper end, shaft 82 has a reduced diameter extension 88 which is eccentrically offset relative to the axis of rotation of shaft 82 by a distance d_1. Counterweights 89 and 90 are mounted on eccentric extension 88 of shaft 82, and counterweight 89 has a hub 91 formed with a cylindrical outer surface which is eccentric relative to the axis of the extension 88 by a radial distance d_2 and which carries a ball bearing 92 by which the end of connecting rod 30 remote from the pin 31 (FIG. 2) is connected to the hub 91. In order to secure the counterweights 89 and 90 on the extension 88, the combined axial lengths of the hubs of the counterweights are preferably greater than the length of the extension 88, and a clamping plate 93 is provided to abut against the upper end of the hub 91 and to receive a screw 94 which extends into a tapped axial bore in the upper end of extension 88. Thus, when screw 94 is tightened, the hubs of counterweights 89 and 90 are axially clamped between the plate 93 and a radial shoulder 95 defined at the transition of shaft 82 into extension 88.

The reciprocation producing device 81 further includes an oscillating mass 96 pivotally connected, as at 97, to one end of a connecting link 98 which is, in turn, pivotally connected to the connecting rod 30, as at 99, so that the mass 96 is reciprocated in the direction of the arrows B (FIG. 4) extending at right angles to the direction of reciprocation of carriage 27, as indicated by the arrows A, and 90° out of phase with respect to the reciprocation of the carriage. The mass 96 may be mounted for reciprocation generally in the direction of the arrows B by parallel arms 100 which, at one end, are rockably mounted on vertical pins 101 carried by a support 102 on the frame 17 and, at the other end, carry vertical pins 103 received in suitable bearings in the mass 96.

It will be seen that the reciprocating motion of carriage 27 is balanced and counter-balanced by means of counterweights 89 and 90 on the extension of shaft 82 and by the reciprocating mass 96 which receives its motion from the connecting rod 30 through the connecting link 98.

In the described reciprocation producing device 81, the distances d_1 and d_2 are equal so that, by turning the counterweight 89 relative to the eccentric extension 88, the total eccentricity of the bearing 92 with respect to the axis of shaft 82 may be varied between a maximum value equal to the sum of the distances d_1 and d_2 and a minimum value of zero, thereby to permit adjustment of the length of the reciprocating stroke of carriage 27. The counterweight 89 is proportioned so that its movement about the center of the eccentric extension 88 automatically pro-

vides a condition of dynamic balance for any adjusted length of the reciprocating stroke of carriage **27**. Following such adjustment, the counterweight **89** is locked in position by means of the clamping plate **93** and screw **94**, as previously described. Thus, the length of the reciprocating stroke of carriage **27** may be freely adjusted for values between zero and the maximum stroke without disturbing the dynamic balance of the device.

The wiping and polishing device **10** embodying this invention further preferably includes a smear bar **104** (FIGS. 1 and 3) extending parallel to the axis of plate cylinder **12** and, being carried adjacent its opposite ends, by arms **105** and **105***a* which are pivotally mounted, as at **106** and **106***a*, on side members **28** and **28***a* of carriage **27**. The smear bar **104** is disposed between the ink supplying roller **14** and the wiping roller **32** and has a surface conforming to the curvature of the surface of cylinder **12**. The bar is also formed, along its edge leading into that concave surface, with an ink-entrance surface sloping into its concave surface so that ink brought to it in a thin layer on the surface of cylinder **12** will be carried between it and the cylinder surface and smeared evenly over the latter and into the engraved lines therein without being scraped off the cylinder. The bar **104** is urged against the surface of plate cylinder **12** by compression springs **107** and **107***a* which are interposed between lugs **108** and **108***a* on the arms **105** and **105***a* and abutments **109** and **109***a* on the side members of carriage **27**. The smear bar **104** operates to distribute and work ink into the engraved lines of the plate cylinder **12** thereby reducing the amount of ink that needs to be applied by the roller **14** to the plate cylinder **12** in order to fill the engraved lines, and correspondingly facilitating the wiping and polishing operations and economizing on the amount of wiping and polishing paper required to effect cleaning of the nonprinting surface. Since the bar **104** is mounted on the carriage **27**, it is apparent that the smear bar will also be reciprocated in the direction of the axis of cylinder **12**.

It will be apparent that, in the above described embodiment of the invention, the resilient rollers **32** and **33** press the related webs **37** and **38** of wiping material against the printing surface of cylinder **12** which moves past the rollers **32** and **33** in response to rotation of cylinder **12**, while the rollers and webs are reciprocated in the direction of the axis of the plate cylinder, so that the web **37** first urges the major portion of the ink layer from the moving printing surface and the web **38** then completes the removal of the ink from that surface. Further, by reason of the rotation of rollers **32** and **33** in frictional engagement with webs **37** and **38**, the latter are advanced at different speeds to ensure that clean sections of the webs will be brought to the operative positions at the related rollers as ink is removed by the webs, thereby to obtain uniform wiping and polishing actions. It will also be seen that the variable speed motor **66** for driving the rollers **32** and **33** can be suitably controlled so that the speeds of advancement of webs **37** and **38** will correspond to requirements for proper removal of ink from the printing surface of cylinder **12**. Thus, assuming a constant rotational speed for the cylinder **12**, it will be apparent that an increase in the thickness of the layer of ink applied to the printing surface will require corresponding increases in the speeds of advancement of webs **37** and **38** so that ink saturated sections of such webs will not remain in contact with the printing surface. Similarly, if the thickness of the layer of ink is assumed to be constant, but the rotational speed of cylinder **12** is increased, the rate at which ink has to be removed from the printing surface will be again increased, and corresponding increases in the speeds of advancement of webs **37** and **38** will be required to maintain the uniformity of the wiping and polishing actions.

It will also be apparent that the pressure of the fluid supplied to cylinders **63** and **63***a* may be adjusted thereby to vary the pressures exerted by rollers **32** and **33** against webs **37** and **38** for accommodating the respective wiping and polishing actions to various inking conditions. Thus, if a heavy, viscous ink is applied to the printing surface of cylinder **12**, the pressures of rollers **32** and **33** against webs **37** and **38** are increased to ensure the proper removal of such heavy, viscous ink from the printing surface.

Although an illustrative embodiment of the invention has been described in detail herein with reference to the accompanying drawings, it is to be understood that the invention is not limited to that precise embodiment, and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention, except as defined in the appended claims.

What is claimed is:

1. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent the path of movement of the printing surface for applying ink to the latter; the combination of at least one rotatable roller having a resilient surface and disposed adjacent said path of movement with the axis of said roller extending laterally with respect to the direction of movement of the printing surface along said path, a continuous web of wiping material in the form of a rotatable supply roll, a rotatable take-up roll, means guiding said web from said supply roll, around said roller and to said take-up roll, means urging said roller toward the printing surface to press said web against the latter for removing ink from the printing surface, said roller surface having sufficient frictional engagement with said web to move said web with and at the peripheral speed of said roller surface, and being sufficiently hard to maintain a substantially uniform area of contact between said web and said cylinder surface, means continuously and positively rotating said roller to effect advancement of said web with the roller by reason of the frictional contact of the latter with said web, thereby to draw the web from said supply roll, and drive means rotating said take-up roll with a predetermined torque to avoid excess tension in said web between said roller and said take-up roll.

2. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent the path of movement of the printing surface for applying ink to the latter; the combination of at least one rotatable roller having a resilient surface axis of said roller extending laterally with respect to the and disposed adjacent said path of movement with the direction of movement of the printing surface along said path, a continuous web of wiping material in the form of a rotatable supply roll, a rotatable take-up roll, means guiding said web from said supply roll, around said roller and to said take-up roll, means urging said roller toward the printing surface to press said web against the latter for removing ink from the printing surface, said roller surface having sufficient frictional engagement with said web to move said web with and at the peripheral speed of said roller surface, and being sufficiently hard to maintain a substantially uniform area of contact between said web and said cylinder surface, means continuously and positively rotating said roller to effect advancement of said web with the roller by reason of the frictional contact of the latter with said web, thereby to draw the web from said supply roll, means yieldably resisting withdrawal of said web from said supply roll to establish a predetermined tension in said web between said supply roll and said roller, and adjustable slip-drive means rotating said take-up roll with a limited torque to avoid excess tension in said web between said roller and said take-up roll.

3. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent the path of movement of the printing surface for applying ink to the latter; the combination as in claim 2, wherein said adjustable slip-drive means includes a first pulley on said take-up roll, a drive motor, a second pulley driven by said motor, a drive belt connecting said first and second pulleys and being capable of slipping relative to at least one of said pulleys, and

means for adjustably determining the tension in said belt, thereby to determine the limited torque transmitted to said take-up roll.

4. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent the path of movement of the printing surface for applying ink to the latter; the combination of a carriage disposed adjacent said path of movement and movable toward and away from the printing surface and reciprocable laterally with respect to the direction of movement of the printing surface, at least one roller having a resilient surface and being rotatably mounted on said carriage with its axis extending laterally with respect to said direction of movement of the printing surface, a web of wiping material passing around said roller, means urging said carriage toward the printing surface so that said roller presses said web thereon against the printing surface to wipe ink from the latter, means reciprocating said carriage so that said web also moves laterally relative to the printing surface and including means dynamically balancing and counter-balancing the reciprocations of said carriage, and means rotating said roller so that said web is advanced to continuously present clean, unused portions of the web for contact with the printing surface at said roller.

5. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent the path of movement of the printing surface for applying ink to the latter; the combination as in claim 4, wherein said means reciprocating the carriage includes a driven shaft, an adjustable eccentric on said shaft, a connecting rod between said eccentric and said carriage for converting rotation of said driven shaft into reciprocation of said carriage, and wherein said balancing and counter-balancing means includes at least one counterweight mass rotating with said driven shaft, an auxiliary mass mounted for reciprocation in directions at right angles to the reciprocations of said carriage, and means actuated by said eccentric and connected to said auxiliary mass to reciprocate the latter ninety degrees out of phase with respect to the reciprocations of said carriage.

6. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent the path of movement of the printing surface for applying ink to the latter; the combination as in claim 5, wherein said adjustable eccentric includes an eccentric extension on said shaft and a hub turnable on said extension and having an eccentric outer surface receiving said connecting rod so that the total eccentricity of said outer surface of the hub relative to the axis of said shaft varies in response to turning of said hub relative to said extension, and wherein said balancing and counter-balancing means further includes a counterweight integral with said hub to turn with the latter relative to said extension for maintaining the dynamic balance with any total eccentricity of said hub relative to said axis of the shaft.

7. In an intanglio printing press including a printing couple consisting of a plate cylinder having a printing surface with engraved lines therein and an impression cylinder above the plate cylinder, and means at one side of the plate cylinder applying ink to the printing surface; the combination of frame means, a support mechanism below the plate cylinder including bars extending parallel to the axis of the plate cylinder and link means pivoted on said frame means and carrying said bars for substantially vertical movement of the latter, a carriage mounted on said bars and slidable along the latter, means operative to reciprocate said carriage along said bars, first and second rollers rotatably mounted on said carriage with their axes parallel to the axis of the plate cylinder and disposed at opposite sides of the vertical plane containing said axis of the plate cylinder, first and second webs passed around said first and second rollers, respectively, fluid pressure responsive means acting on said link means to urge said carriage upwardly so that said rollers press the related webs against the printing surface for successively removing ink from the areas of the latter between the engraved lines, and means rotating said rollers so that the related webs are advanced to continuously present clean, unused portions thereof for contact with the printing surface at said rollers, the roller closest to the means for applying ink to the printing surface being rotated at higher speed than the other of said rollers so that the speeds of advancement of said webs correspond to the rates at which the webs become saturated with ink removed from the printing surface.

8. In an intaglio printing press having a printing surface with engraved lines therein and means disposed adjacent to the path of movement of the printing surface for applying ink to the latter; the combination of a carriage disposed adjacent to said path of movement and movable toward and away from the printing surface and reciprocable laterally with respect to the direction of movement of the printing surface, at least one roller having a resilient surface and being rotatably mounted on said carriage with its axis extending laterally with respect to said direction of movement of the printing surface, a web of wiping material passing around said roller, means urging said carriage toward the printing surface so that said roller presses said web thereon against the printing surface to wipe ink from the latter, means for reciprocating said carriage so that said web also moves laterally with respect to said direction and including means adjustable to vary the reciprocating stroke of said carriage and means for balancing and counter-balancing the reciprocation of said carriage for any stroke thereof produced by said reciprocating means, and means for rotating said roller so that said web is advanced to continuously present clean, unused portions of the web for contact with the printing surface.

9. In an intaglio printing press having a printing surface with engraved lines therein and means disposed adjacent to the path of movement of the printing surface for applying ink to the latter, the combination of a carriage disposed adjacent to said path of movement and movable toward and away from the printing surface and reciprocable laterally with respect to the direction of movement of the printing surface, two spaced rollers rotatably mounted on said carriage and movable with said carriage toward and away from the printing surface and laterally with respect to the direction of movement of the printing surface, each of said rollers having a resilient surface and a web of absorbent material passing thereover, means urging said carriage toward the printing surface so that said rollers press the respective web passing thereover against the printing surface to wipe and to polish said surface, means for reciprocating said carriage so that said webs also move laterally with respect to said direction, said reciprocating means including means adjustable to vary the reciprocating stroke of said carriage and means dynamically balancing and counter-balancing both linear and rotational forces of said carriage and said rollers for any stroke thereof produced by said reciprocating means, and means for rotating said rollers so that said webs are advanced to continuously present clean, unused portions thereof for contact with the printing surface.

10. In an intaglio printing press having a rotary plate cylinder with engraved lines in the surface thereof and means for applying a layer of ink to the surface; a device for removing ink from the surface of the plate cylinder while leaving ink in the engraved lines thereof, said device comprising at least one rotatable roller disposed with its axis parallel to the axis of the plate cylinder and having a resilient surface, a web of wiping material trained over said roller surface between it and said cylinder surface, means for urging said roller toward said cylinder surface under any desired pressure within a range of wiping pressures so that said wiping material will be pressed against said cylinder surface to remove superfluous ink therefrom, said roller surface having sufficient

frictional engagement with said web of wiping material to move said web with and at the peripheral speed of said roller surface, and being sufficiently hard to maintain a substantially uniform area of contact between said web and said cylinder surface under varied pressures within said range, and driving means for continuously and positively rotating said roller so that said web is advanced solely by said roller and always at the peripheral speed imparted to said roller by said driving means to bring unused portions of the wiping material into wiping contact with the surface of the plate cylinder.

11. In an intaglio printing press having a rotary plate cylinder with engraved lines in the surface thereof and means for applying a layer of ink to the surface; a device for removing ink from the surface of the plate cylinder while leaving the ink in the engraved lines thereof, said device comprising at least one rotatable roller with its axis parallel to the axis of the plate cylinder and having a resilient surface, a web of wiping material trained over said roller surface between it and said cylinder surface, means for urging said roller toward said cylinder surface under any desired pressure within a range of wiping pressures so that said wiping material will be pressed against said cylinder surface to remove superfluous ink therefrom, said roller surface having sufficient frictional engagement with said web of wiping material to move said web with and at the peripheral speed of said roller surface, and being sufficiently hard to maintain a substantially uniform area of contact between said web and said cylinder surface under varied pressures within said range, and driving means for continuously and positively rotating said roller so that said web is advanced solely by said roller and always at the peripheral speed imparted to said roller by said driving means to bring unused portions of the wiping material into wiping contact with the surface of the plate cylinder, said driving means moving said roller surface in a direction opposite to the direction of movement of the cylinder surface at the area of contact.

12. In an intaglio printing press having a rotary plate cylinder with engraved lines in the surface thereof and means for applying a layer of ink to the surface; a device for removing ink from the surface of the plate cylinder while leaving ink in the engraved lines thereof, said device comprising at least one rotatable roller disposed with its axis parallel to the axis of the plate cylinder and having a resilient surface, a web of wiping material trained over said roller surface between it and said cylinder surface, means for urging said roller toward said cylinder surface under any desired pressure within a range of wiping pressures so that said wiping material will be pressed against said cylinder surface to remove superfluous ink therefrom, said roller surface having sufficient frictional engagement with said web of wiping material to move said web with and at the peripheral speed of said roller surface, and being sufficiently hard to maintain a substantially uniform area of contact between said web and said cylinder surface under varied pressures within said range, and driving means for continuously and positively rotating said roller so that said web is advanced solely by said roller and always at the peripheral speed imparted to said roller by said driving means to bring unused portions of the wiping material into wiping contact with the surface of the plate cylinder, said driving means being operative to rotate said roller at any of a variety of speeds.

13. In an intaglio printing press having a rotary plate cylinder with engraved lines in the surface thereof and means for applying a layer of ink to the surface; a device for removing ink from the surface of the plate cylinder while leaving ink in the engraved lines thereof, said device comprising at least one rotatable roller disposed with its axis parallel to the axis of the plate cylinder and having a resilient surface, a web of wiping material trained over said roller surface between it and said cylinder surface, means for urging said roller toward said cylinder surface under any desired pressure within a range of wiping pressures so that said wiping material will be pressed against said cylinder surface to remove superfluous ink therefrom, said roller surface having sufficient frictional engagement with said web of wiping material to move said web with and at the peripheral speed of said roller surface, and being sufficiently hard to maintain a substantially uniform area of contact between said web and said cylinder surface under varied pressures within said range, driving means connected to said roller for continuously and positively rotating said roller so that said web is advanced solely by said roller and always at the peripheral speed imparted to said roller by said driving means to bring unused portions of the wiping material into wiping contact with the surface of the plate cylinder, and means for reciprocating said roller and the wiping material trained thereover in the direction of the axis of said roller during rotation of the roller by said driving means so that said wiping material and the surface of the plate cylinder move relative to each other both in the direction of the circumference of the plate cylinder and in the direction of the axis thereof.

14. In an intaglio printing press having a rotary plate cylinder with engraved lines in the surface thereof and means for applying a layer of ink to the surface; a device for removing ink from the surface of the plate cylinder while leaving ink in the engraved lines thereof, said device comprising at least one rotatable roller disposed with its axis parallel to the axis of the plate cylinder and having a resilient surface, means supporting said roller for movement bodily relative to the surface of said cylinder, a web of wiping material trained over said roller surface between it and said cylinder surface, fluid pressure responsive means acting continuously on said supporting means for urging said roller against the plate cylinder under a predetermined pressure, said web being frictionally engaged by said roller surface to advance in response to rotation of the roller and being pressed by the roller surface against the surface of the plate cylinder to wipe superfluous ink therefrom, driving means connected directly with said roller for continuously and positively rotating said roller so that said web is advanced solely by said roller and always at the peripheral speed imparted to said roller by said driving means, said wiping material being advanced in a circumferential direction relative to said cylinder surface by the rotation of said roller to bring unused portions of the web into wiping contact with the surface of the plate cylinder, and means acting on said supporting means for reciprocating said roller and said web in the direction of the axis of said roller during the rotation of said roller by said driving means so that the web of wiping material and the surface of the plate cylinder move relative to each other in the direction of the circumference of the plate cylinder and in the direction of the axis of the plate cylinder.

15. In an intaglio printing press having a rotary plate cylinder with engraved lines in the surface thereof and means for applying a layer of ink to the surface; a device for removing ink from the surface of the plate cylinder while leaving ink in the engraved lines thereof, said device comprising at least one rotatable roller disposed with its axis parallel to the axis of the plate cylinder and having a resilient surface, a web of wiping material trained over said roller surface between it and said cylinder surface, means for urging said roller toward said cylinder surface under any desired pressure within a range of wiping pressures so that said wiping material will be pressed against said cylinder surface to remove superfluous ink therefrom, said roller surface having sufficient frictional engagement with said web of wiping material to move said web with and at the peripheral speed of said roller surface, and being sufficiently hard to maintain a substantially uniform area of contact between said web and said cylinder surface under varied pressures within said range, driving means for continuously and positively rotating said roller so that said web is advanced solely by said roller and always at the peripheral speed imparted to said roller by said driving means to bring

unused portions of the wiping material into wiping contact with the surface of the plate cylinder, said driving means being operative to rotate said roller at any of a variety of speeds, means for reciprocating said roller and the wiping material trained thereover in the direction of the axis of said roller during rotation of said roller by said driving means, and means for varying the speed and the stroke of the reciprocation effected by said reciprocating means so that said wiping material and the surface of the plate cylinder move relative to each other both in the direction of the circumference of the plate cylinder and in the direction of the axis thereof.

16. In an intaglio printing press having a rotary plate cylinder with engraved lines in the surface thereof and means for applying a layer of ink to the surface; a device for removing ink from the surface of the plate cylinder while leaving ink in the engraved lines thereof, said device comprising at least one rotatable roller disposed with its axis parallel to the axis of the plate cylinder, said roller having a relatively soft resilient body that is yieldable under pressure and a relatively hard resilient cover thereon to bridge said lines and maintain an approximately uniform area of pressure against said surface, a web of wiping material trained over said roller surface between it and said cylinder surface, means for yieldably urging said roller toward said cylinder surface under a desired pressure so that said web will be pressed against the cylinder surface to remove ink therefrom, and driving means connected directly with said roller for continuously and positively rotating said roller to advance said web with the roller surface so that clean, unused portions of the web are brought successively into contact with the moving plate cylinder surface.

17. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent to the path of movement of the printing surface for applying ink to the surface; the combination of a first rotatable roller and a second rotatable roller disposed adjacent to said path of movement of the printing surface at spaced apart locations successively following the location of the ink applying means, considered in the direction of movement of the printing surface, and with the axes of said first and second rollers extending laterally with respect to said path of movement, each of said rollers having a resilient surface, first and second webs of wiping material trained over the surfaces of said first and second rollers, respectively, between said surfaces and the printing surface, means for urging said rollers toward the printing surface under any desired pressure within a range of wiping pressures so that said first and second webs will be pressed by the related rollers against the printing surface to successively wipe ink from the printing surface and polish the printing surface, respectively, the surfaces of said rollers having sufficient frictional engagement with their respective webs of wiping material to move said webs with and at the peripheral speeds of said roller surfaces, and being sufficiently hard to maintain a substantially uniform area of contact between said webs and the printing surface under varied pressures within said range, and driving means for continuously and positively rotating said first and second rollers at relatively high and low speeds, respectively, so that said first and second webs are advanced at relatively high and low speeds, respectively, solely by said rollers and always at the respective peripheral speeds imparted to said rollers by said driving means to bring unused portions of the webs into wiping contact with the printing surface as the material of the webs absorbs ink from the printing surface.

18. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent to the path of movement of the printing surface for applying ink to the surface; the combination of a first rotatable roller and a second rotatable roller disposed adjacent to said path of movement of the printing surface at spaced apart locations successively following the location of the ink applying means, considered in the direction of movement of the printing surface, and with the axes of said first and second rollers extending laterally with respect to said path of movement, each of said rollers having a resilient surface, first and second webs of wiping material trained over the surfaces of said first and second rollers, respectively, between said surfaces and the printing surface, means for urging said rollers toward the printing surface under any desired pressure within a range of wiping pressures so that said first and second webs will be pressed by the related rollers against the printing surface to successively wipe ink from the printing surface and polish the printing surface, respectively, the surfaces of said rollers having sufficient frictional engagement with their respective webs of wiping material to move said webs with and at the peripheral speeds of said roller surfaces, and being sufficiently hard to maintain a substantially uniform area of contact between said webs and the printing surface under varied pressures within said range, driving means for continuously and positively rotating said first and second rollers at relatively high and low speeds, repectively, so that said first and second webs are advanced at relatively high and low speeds, respectively, solely by said rollers and always at the respective peripheral speeds imparted to said rollers by said driving means to bring unused portions of the webs into wiping contact with the printing surface as the material of the webs absorbs ink from the printing surface, and means for reciprocating together said rollers and said webs in the direction of the axes of said rollers during rotation of said rollers by said driving means so that the webs of wiping material and the printing surface move relative to each other both in the direction of the path of movement of the printing surface and in a direction lateral with respect to said path of movement.

19. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent to the path of movement of the printing surface for applying ink to the surface; the combination of a bar having a concave surface in the form of a cylindrical arc conforming to the printing surface and adapted to bear against the same, said bar having an ink-entrance surface sloping into said concave surface to guide ink into the latter so that the bar will smear ink over but will not doctor ink off the printing surface, means yieldably urging said bar against the printing surface, and means reciprocating said bar transversely to the direction of movement of said printing surface to distribute ink over the printing surface and to fill said engraved lines with ink drawn from areas of said printing surface outside said lines.

20. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent to the path of movement of the printing surface for applying ink to the surface; the combination of a bar having a concave surface in the form of a cylindrical arc conforming to the printing surface and adapted to bear against the same, said bar having an ink-entrance surface sloping into said concave surface to guide ink into the latter so that the bar will smear ink over but will not doctor ink off the printing surface, means yieldably urging said bar against the printing surface, and means reciprocating said bar transversely to the direction of movement of said printing surface to distribute ink over the printing surface and to fill said engraved lines with ink drawn from areas of said printing surface outside said lines, at least one rotatable roller disposed at a location following that of said bar in the direction of movement of said cylinder and with the axis of said roller extending laterally with respect to said direction of movement, said roller having a surface adapted to frictionally engage and move wiping material, a web of wiping material trained over said roller, means urging said roller toward the printing surface so that said web is

pressed against the printing surface to remove ink from the areas of the latter outside the engraved lines, and means rotating said roller to advance said web over said roller surface so that clean unused portions of the web are brought successively into contact with the printing surface at said roller.

21. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent to the path of movement of the printing surface for applying ink to the surface; the combination of a bar having a concave surface in the form of a cylindrical arc conforming to the printing surface and adapted to bear against the same, said bar having an ink-entrance surface sloping into said concave surface to guide ink into the latter so that the bar will smear ink over but will not doctor ink off the printing surface, means yieldably urging said bar against the printing surface, at least one rotatable roller disposed at a location following that of said bar in the direction of the path of movement of said cylinder and with the axis of the roller extending laterally with respect to the direction of movement along said path, said roller having a surface adapted to frictionally engage and move wiping material, a web of wiping material trained over said roller, means urging said roller toward the printing surface so that said web is pressed against the printing surface to remove ink from the areas of the latter outside the engraved lines, means simultaneously reciprocating said bar and said roller transversely to the direction of movement of the printing surface so that said bar distributes ink over the printing surface and forces ink into its engraved lines from areas of said printing surface outside said lines, and means rotating said roller to advance said web over said roller surface so that clean, unused portions of the web are successively presented for contact with the printing surface at said roller.

22. In an intaglio printing press having a moving printing surface with engraved lines therein and means disposed adjacent to the path of movement of the printing surface for applying ink to the surface; the combination of a bar having a surface in the form of a cylindrical arc conforming to the printing surface and adapted to bear against the same, at a location beyond that of said ink applying means, means yieldably urging said bar against the printing surface, a first rotatable roller and a second rotatable roller disposed adjacent to said path of movement of the printing surface at spaced apart locations successively beyond the location of said bar, considered in the direction of movement of the printing surface, and with the axes of said first and second rollers extending laterally with respect to said path of movement, each of said rollers having a resilient surface, first and second webs of wiping material trained over the surfaces of said first and second rollers, respectively, between them and the printing surface, means for urging said rollers toward the printing surface under any desired pressure within a range of wiping pressures so that said first and second webs will be pressed by the related rollers against the printing surface to successively wipe ink from the printing surface and polish the printing surface, respectively, the surfaces of said rollers having sufficient frictional engagement with their respective webs to move said webs with and at the peripheral speeds of said roller surfaces, and being sufficiently hard to maintain a substantially uniform area of contact between said webs and the printing surface under varied pressures within said range, driving means for continuously and positively rotating said first and second rollers at relatively high and low speeds, respectively, so that said webs are advanced at relatively high and low speeds, respectively, solely by said rollers and always at the respective peripheral speeds imparted to said rollers by said driving means to bring unused portions of the webs into wiping contact wtih the printing surface as the materials of the webs absorb ink from the printing surface, and means for reciprocating together said bar, said rollers and said webs in the direction of the axes of said rollers during rotation of said rollers by said driving means so that said bar distributes ink over the printing surface and forces ink into its engraved lines from areas of said printing surface outside said lines while said webs and the printing surface move relative to each other both in the direction of said path of movement and in a direction transverse thereto.

References Cited in the file of this patent

UNITED STATES PATENTS

77,896	Lewis et al.	May 12, 1868
917,861	Green	Apr. 13, 1909
952,060	Wood	Mar. 15, 1910
1,115,127	Stickney	Oct. 27, 1914
1,692,914	Wintzer	Nov. 27, 1928
1,968,980	Aitchison	Aug. 7, 1934
2,359,770	Lundbye	Oct. 10, 1944
2,610,524	Maust	Sept. 16, 1952

FOREIGN PATENTS

474,850	Great Britain	Nov. 9, 1937

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,997,951 August 29, 1961

William F. Huck

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 8, lines 44 and 45, for "axis of said roller extending laterally with respect to the and disposed adjacent said path of movement with the" read -- and disposed adjacent said path of movement with the axis of said roller extending laterally with respect to the --.

Signed and sealed this 6th day of February 1962.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
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