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PERFECTING PRINTING PRESS

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This invention relates to improvements in perfecting printing presses, particularly presses of the off-set type.

Various designs of sheet fed perfecting presses have been proposed. In one such design the sheet is carried by one of a pair of printing cylinders, each of which acts as an impression cylinder for the other, so that the sheet is printed on both sides simultaneously. Such procedure gives rise to smudged printing, double impressions or incomplete transfer of ink to the paper. In certain designs the inking mechanism for one form cylinder is underneath that cylinder. This arrangement is unsatisfactory due to the natural sag of the long slender inking rollers, inconvenience of location, exposure to falling paper lint, etc. In other designs, as applied to off-set presses, the plate and blanket cylinders which must be operated upon frequently by the pressman are obscured or inaccessible.

One of the objects of the present invention is the provision of means to overcome the above noted disadvantages and to provide a perfecting press which is constructed and operated according to printing and sheet handling principles which have been proven by experience to be satisfactory in connection with non-perfecting multi-color presses.

Another object is the provision of a press in which the sheets are positively conveyed by their leading edges during their travel upon and between the impression cylinders, so that accurate register is maintained.

Another object is the provision of a perfecting off-set press, each printing unit of which shall have substantially similar elements but shall be oriented differently, whereby the feeding and delivery mechanisms may be accommodated conveniently and the inking mechanisms may be most effectively applied.

A further object is the provision of a perfecting press wherein the elements of the two printing units are conveniently arranged and positioned to have work done upon them by the pressman.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawing, in which the single figure is a side elevational diagrammatic view of a rotary off-set perfecting press embodying the invention.

In the drawing the feed board of a press is in-

5 dicated at 10, at the forward end of which there are the usual front registering guides 101, side registering mechanism 102, and intermittently acting feed-in rollers 11 and 12 which are adapted to grip each sheet in turn and present it to the grippers 13 of a first impression cylinder 14. This cylinder constitutes one element of the first printing unit of the press which also comprises a blanket or off-set cylinder 15 and a plate cylinder 16, all of conventional form. Above the plate cylinder 16 there is an inking mechanism indicated generally by the reference numeral 17, while a dampening means to one side of the plate cylinder is indicated at 18.

15 As will be seen from the drawing, the axes of the three cylinders 14, 15 and 16 are located at the points of an isosceles triangle, the base of which connecting the axes of cylinders 14 and 16 is longer than the equal sides, and the triangle is so oriented that its base extends upwardly from the axis of the impression cylinder 14. The sheets in being operated upon by this first printing unit pass through the triangle base.

25 When the front edge of each sheet, after being imprinted, reaches the position illustrated in the drawing the grippers 13 release it to grippers 19 on a transfer cylinder 20. This cylinder in turn transfers the sheet to a second transfer cylinder 21 having a set of grippers 22, and from the latter cylinder the sheet is taken by grippers 23 on a second impression cylinder 24. There being an even number, two in this instance, of transfer cylinders, the sheets after being printed on the impression cylinder 14 are reversed, that is to say they are transferred to cylinder 24 with their previously printed surfaces facing toward the axis of cylinder 24, so that they may be "perfected" on the latter cylinder.

40 Cylinder 24 constitutes one element of the second printing unit which also comprises the blanket or off-set cylinder 25 and the plate cylinder 26. The three cylinders of this unit may be arranged relatively to each other precisely like those of the first unit, but the base of the isosceles triangle in this case extends laterally from the axis of impression cylinder 24, the triangle being inverted, so that plate cylinder 26 is disposed to one side of impression cylinder 24, leaving the upper side of the impression cylinder clear of any obstruction insofar as printing elements are concerned, and therefore free to cooperate with sheet delivery means presently to be described.

55 Above the plate cylinder 26 is an inking mech-

anism 27 which may be substantially identical with mechanism 17, and to the side of the cylinder there is dampening mechanism 28 which may be similar to mechanism 18 although it faces in the opposite direction, as must necessarily be the case inasmuch as the direction of rotation of cylinder 26 is the reverse of that of cylinder 16. The fact that the invention permits the use of similar inking and dampening mechanisms for the two units is an important factor from the standpoint of economy in production. The same thing is true, of course, of the printing cylinders themselves and of the two similar transfer cylinders. The cylinders are preferably all of one size except for the usual necessary slight differences and are driven with one rotation for each cycle of the press by interconnected gearing (not shown).

Directly above impression cylinder 24 I mount a transfer cylinder 29 having grippers 30 which are adapted to take sheets from the grippers 23 of impression cylinder 24 and carry the sheets upward for transfer to the grippers 31 of an endless delivery chain conveyor 32. The latter is suitably guided upward and over the plate cylinder 26 with its inking and dampening mechanisms 27 and 28, over the working space adjacent the latter, and then downwardly for depositing the sheets onto a pile 33 carried upon a delivery platform 34.

In some of its aspects the invention is applicable to rotary typographical printing presses, in which case each printing unit has two printing elements instead of three. Otherwise the general arrangement of parts remains approximately as shown in the figure. Also, it may be desirable in some instances to increase the number of transfer cylinders to four instead of two, or to make the two transfer cylinders of double size running at half the angular speed of the impression cylinders, each of the transfer cylinders having two sets of grippers instead of one, whereby the time required to transfer a sheet from the first impression cylinder to the second is doubled, giving an opportunity for increased drying of the first imprint before the sheet is transferred to the second impression cylinder.

A platform 35 is positioned between the printing units above the transfer cylinders, providing working space for the pressman adjacent the cylinders 15 and 16 and the inking mechanism 17. The delivery platform 34 is spaced sufficiently from the cylinders 25 and 26 and the inking and dampening mechanisms 27 and 28 to provide adequate working space from the floor upward for the pressman adjacent this unit.

Owing to the shortness of the time between printings, a part of the ink of the first printing may adhere to the surface of the second impression cylinder, forming a "set-off" image which prints on succeeding sheets. One of the advantages of my invention lies in the fact that, owing to the accuracy with which successive sheets are positioned on the second impression cylinder, the set-off image always appears in exactly the same location on the cylinder, which location corresponds to the position of the printing on the sheet. Thus under ordinary circumstances there will be no smearing or double printing of the first color and cylinder 24 may be of usual construction, similar to cylinder 14.

In some cases, however, it is desirable to avoid entirely the deposition of ink upon cylinder 24, and for this purpose I provide means for moistening the surface thereof with an ink-repellent

fluid. This means may be of any suitable construction and may employ any suitable moistening fluid. As illustrated, it comprises a dampening mechanism 36, similar to mechanisms 18 and 28, located below the level of platform 35 and arranged to engage the surface of cylinder 24 between the delivery point and taking point of the latter. Although the surface of the metal cylinder itself will usually be satisfactory for carrying the moistening fluid, in the illustration I have shown the cylinder 24 as comprising a plate 37, for example of zinc, aluminum, stainless steel, or other suitable material, grained as for lithographic usage, and secured to the cylinder by screws 38 and clamps 39. As moistening fluid the dampening solutions employed in lithographic printing may be used.

In the foregoing description I have necessarily gone somewhat into detail in order to explain fully the particular embodiments of the invention herein illustrated, but I desire it to be understood that such detail disclosures are not to be construed as amounting to limitations, except as they may be included in the appended claims.

Having thus described my invention, I claim:

1. A sheet fed rotary perfecting off-set printing press comprising first and second printing units each including a form cylinder, an off-set cylinder and an impression cylinder, the cylinders of one unit turning in opposite directions to the corresponding cylinders of the other unit, means for feeding sheets to the impression cylinder of the first unit, a delivery platform disposed at an end of the press opposite to the sheet feeding means and separated from the second printing unit by a working space, inking mechanism for each form cylinder disposed above the center of the latter, dampening mechanism for the form cylinder of the first printing unit disposed on the side thereof toward the sheet feeding means, dampening mechanism for the form cylinder of the second printing unit disposed on the side thereof toward said delivery platform, gripper means arranged to convey each sheet from the impression cylinder of the first unit and place it in register and in up-side-down relation on the impression cylinder of the second unit, and means for removing the sheets from the impression cylinder of the second unit and conveying them between the inking and dampening mechanisms of the two printing units and past the working space to said delivery platform.

2. A printing press as claimed in the preceding claim wherein the two impression cylinders are substantially the same in diameter and each is provided with a single set of sheet handling grippers and wherein the gripper means for removing a sheet from the first impression cylinder and placing it on the second comprises two transfer cylinders of substantially the same diameter as the impression cylinders, each including a single set of sheet handling grippers.

3. A sheet fed rotary perfecting offset printing press comprising first and second spaced printing units arranged to rotate in opposite directions, each unit including an impression cylinder, an offset cylinder, a form cylinder and inking mechanism therefor arranged above the form cylinder, and sheet gripper means for conveying each sheet by its front edge partly around each of said impression cylinders and toward a delivery point, said gripper means being arranged to convey the sheets under the first unit form cylinder and its associated inker, upwardly between

the form cylinders and over the second unit form cylinder and its associated inker.

4. A sheet fed rotary perfecting off-set printing press, comprising two separate printing units each having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of said cylinders intersecting the points of an isosceles triangle the base of which is longer than the equal sides thereof and joins the impression and plate cylinders, the triangle base at one end of the press extending in a generally vertical direction from the impression cylinder and the triangle base at the opposite end of the press extending in a lateral direction from the impression cylinder sheet transfer means between said impression cylinders, and sheet removing means above the last-named impression cylinder operatively associated with that cylinder.

5. A sheet fed rotary perfecting off-set printing press, comprising two separate printing units each having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of which intersect the points of a triangle the base of which joins the impression and plate cylinders, said triangle base at the feeding end of the press extending in a generally vertical direction from the impression cylinder and said triangle base at the delivery end extending in a lateral direction from the impression cylinder, and an even number of transfer cylinders between said impression cylinders.

6. A rotary perfecting off-set printing press comprising two separate printing units each having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of which intersect the points of an isosceles triangle having a base longer than the equal sides thereof, said base joining the impression and plate cylinders, the triangle base at the feeding end of the press extending in a generally vertical direction from the impression cylinder and the triangle base at the delivery end extending in a lateral direction from the impression cylinder, means for feeding sheets through the base of the first triangle to the first impression cylinder, means for delivering sheets from the second impression cylinder in a direction upwardly away from the base of the second triangle, and transfer means between said impression cylinders adapted to present sheets to the second impression cylinder with their surfaces reversed.

7. A sheet fed rotary perfecting off-set printing press, comprising two separate printing units each having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of said cylinders intersecting the points of an isosceles triangle the base of which is longer than the equal sides thereof and joins the impression and plate cylinders, said triangle base at the feeding end of the press extending upward from the impression cylinder and said triangle base at the delivery end extending in a lateral direction from the impression cylinder, sheet transfer means between said impression cylinders, and an inking mechanism arranged above each of the plate cylinders.

8. A sheet fed rotary perfecting off-set printing press, comprising two separate printing units each having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of said cylinders intersecting the points of an isosceles triangle the base of which is longer than the equal sides thereof and joins the impression and plate cylinders, said triangle base at the feeding end of the press extending upward from the im-

pression cylinder and said triangle base at the delivery end extending in a lateral direction from the impression cylinder, sheet transfer means between said impression cylinders, an inking mechanism arranged above each of the plate cylinders, means for feeding sheets to the upper side of the first impression cylinder and means for delivering sheets upwardly from the upper side of the second impression cylinder.

9. A sheet fed rotary perfecting off-set printing press, comprising two separate printing units each having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of said cylinders intersecting the points of an isosceles triangle the base of which is longer than the equal sides thereof and joins the impression and plate cylinders, the plate cylinder of the unit at the feeding end of the press being arranged above the impression cylinder, and the plate cylinder of the unit at the delivery end being arranged laterally of the impression cylinder with the off-set cylinder of that unit below the base of the triangle, sheet delivery means arranged above the second impression cylinder, and transfer means between the said impression cylinders adapted to present sheets to the second impression cylinder with their surfaces reversed.

10. A sheet fed rotary perfecting off-set printing press, comprising two separate printing units each having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of said cylinders intersecting the points of an isosceles triangle the base of which is longer than the equal sides thereof and joins the impression and plate cylinders, the plate cylinder at the feeding end of the press being arranged above the impression cylinder, and the plate cylinder at the delivery end being arranged laterally of the impression cylinder with the off-set cylinder of that unit below the base of the triangle, sheet delivery means arranged above the second impression cylinder, transfer means between the said impression cylinders adapted to present sheets to the second impression cylinder with their surfaces reversed, and inking mechanisms mounted above the respective plate cylinders.

11. In a sheet fed rotary perfecting printing press, first and second printing units spaced apart to form a working space between them, each unit including an impression cylinder, a platform in said working space, means for feeding sheets to the impression cylinder of the first unit, gripper means arranged to remove the sheets therefrom, convey them under said platform, and place them in register and in up-side-down relation on the impression cylinder of the second unit, means occupying a portion of said working space for removing the sheets from the impression cylinder of the second unit and conveying them to a delivery point, and means for applying offset preventing material to the last mentioned impression cylinder between the point where it delivers sheets to said sheet-removing means and the point where it receives sheets from said gripper means.

12. A sheet fed rotary off-set printing press comprising first and second printing units each including a plate cylinder, an off-set cylinder and an impression cylinder, the three cylinders of each printing unit being arranged with their axes at the apices of a triangle and the two triangles corresponding to the two printing units being substantially the same but so arranged that the plate cylinder of one unit is disposed above its impression cylinder while that of the

other unit is disposed laterally with respect to its impression cylinder, means for taking each sheet from the impression cylinder of the first unit and transferring it in register and in up-side-down relation to the impression cylinder of the second unit, sheet handling grippers on each of said impression cylinders and said transferring means, and means for removing the sheets from the impression cylinder of the second unit and conveying the same upwardly and over the second printing unit to a delivery point.

13. A sheet fed rotary off-set printing press comprising first and second printing units, each including a plate cylinder, an off-set cylinder and an impression cylinder, the three cylinders of each printing unit being arranged with their axes substantially at the apices of an isosceles triangle, and the two triangles corresponding to the two printing units being so arranged that the plate cylinder of one unit is disposed above its impression cylinder while that of the other unit is disposed laterally with respect to its impression cylinder, means for taking each sheet from the impression cylinder of the first unit and transferring it in register and in up-side-down relation to the impression cylinder of the second unit, sheet handling grippers on each of said impression cylinder and said transferring means, and means for removing the sheets from the impression cylinder of the second unit and conveying the same upwardly and over the second printing unit to a delivery point.

14. A sheet fed rotary off-set printing press comprising first and second printing units each including a plate cylinder, an off-set cylinder and an impression cylinder, and each printing unit also including inking mechanism arranged above the plate cylinder of that unit, the three cylinders of each printing unit being arranged with their axes at the apices of a triangle and the two triangles corresponding to the two printing units being substantially the same but so arranged that the plate cylinder of one unit is disposed above its impression cylinder while that of the other unit is disposed laterally with respect to its impression cylinder, means for taking each sheet from the impression cylinder of the first unit and transferring it in register and in up-side-down relation to the impression cylinder of the second unit, sheet handling grippers on each of said impression cylinders and said transferring means, and means for removing the sheets from the impression cylinder of the second unit and conveying the same upwardly and over the second printing unit to a delivery point.

15. A sheet fed rotary perfecting off-set printing press comprising first and second printing units each including a form cylinder, an off-set cylinder and an impression cylinder, the cylinders of one unit turning in opposite directions to the corresponding cylinders of the other unit, means for feeding sheets to the impression cylinder of the first unit, a delivery platform, inking mechanism for each form cylinder disposed in major part above the latter, dampening mechanism for the form cylinder of the first printing unit disposed on the side thereof toward the sheet feeding means, dampening mechanism for the form cylinder of the second printing unit disposed on the side thereof remote from the sheet feeding means, gripper means arranged to convey each sheet from the impression cylinder of the first unit and place it in register and in up-side-down relation on the impression cylinder of the second unit, and means for removing the

sheets from the impression cylinder of the second unit and conveying them between the inking and dampening mechanisms of the two printing units and over one of the printing units to the delivery platform.

16. A sheet fed rotary perfecting off-set printing press, comprising two separate printing units each having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of said cylinders intersecting the points of an isosceles triangle the base of which is longer than the equal sides thereof and joins the impression and plate cylinders, the plate cylinder of the unit at the feeding end of the press being arranged above the impression cylinder, and the plate cylinder of the unit at the delivery end being arranged laterally of the impression cylinder with the off-set cylinder of that unit below the base of the triangle, means for feeding a sheet into the press through the upstanding base of the first unit triangle before the printing operation is performed on that sheet by said first unit and for feeding a sheet upwardly through the base of the second unit triangle after a printing operation is performed upon the sheet by that unit, sheet delivery means arranged to remove sheets from the top of the second impression cylinder, and transfer means between the said impression cylinders adapted to present sheets to the second impression cylinder with their surfaces reversed.

17. A sheet fed rotary perfecting off-set printing press, comprising two separate printing units each having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of said cylinders intersecting the points of an isosceles triangle the base of which is longer than the equal sides thereof and joins the impression and plate cylinders, the off-set cylinder of each unit being disposed on that side of its impression cylinder which is remote from the feeding end of the press, means for feeding sheets into the press through the base of the first unit triangle toward the off-set cylinder of that unit, for transferring them from the first unit to the second unit and for feeding them through the base of the second triangle away from the off-set cylinder of that unit, and sheet delivery means arranged to convey the sheets upwardly between the units and over the second unit.

18. In a sheet fed rotary perfecting off-set printing press, first and second printing units spaced apart to form a working space between them, each unit having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of said cylinders in each unit intersecting the points of a triangle the base of which joins the impression and plate cylinders, the plate cylinder of the first unit being arranged above the impression cylinder and the plate cylinder of the second unit being arranged laterally of the impression cylinder with the off-set cylinder of that unit below the base of the triangle, sheet delivery means located in part above the impression cylinder of the second unit for taking sheets from the latter cylinder and conveying them over said second unit to a point of delivery, a platform in said working space between the first unit and that part of said sheet delivery means located above the impression cylinder of the second unit, means for feeding sheets to the first unit, and means for taking sheets from the first unit, conveying them below said platform and presenting them to the second unit with their surfaces reversed.

19. In a sheet feed rotary perfecting off-set printing press, first and second printing units spaced apart to form a working space between them, each unit having an impression cylinder, an off-set cylinder and a plate cylinder, the axes of said cylinders in each unit intersecting the points of an isosceles triangle the base of which is longer than the equal sides thereof and joins the impression and plate cylinders, the plate cylinder of the first unit being arranged above the impression cylinder and the plate cylinder of the second unit being arranged laterally of the impression cylinder with the off-set cylinder of that unit below the base of the triangle, a take-off cylinder above the impression cylinder of the second unit, a platform in said working space between said take-off cylinder and the first unit, means for feeding sheets to the first unit, means for taking sheets from the first unit, conveying them below said platform and presenting them to the second unit with their surfaces

reversed, and delivery means for taking sheets from said take-off cylinder and conveying them over said second unit to a point of delivery.

20. A sheet-fed rotary perfecting offset printing press, comprising two separate printing units each having an impression cylinder, an offset cylinder and a plate cylinder, the axes of said cylinders intersecting the points of an isosceles triangle, the base of which is longer than the equal sides thereof and joins the impression and plate cylinders, the offset cylinder of each unit being disposed on that side of its impression cylinder which is remote from the feeding end of the press, means for feeding sheets into the press through the base of the first unit triangle toward the offset cylinder of that unit, for transferring them from the first unit to the second unit, for feeding them through the base of the second triangle away from the offset cylinder of that unit, and for conveying them to a delivery point

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