July 13, 1926.

1,592,806

L. W. BRUNELL

ART OF PRINTING

Filed June 16, 1924

2 Sheets-Sheet 1

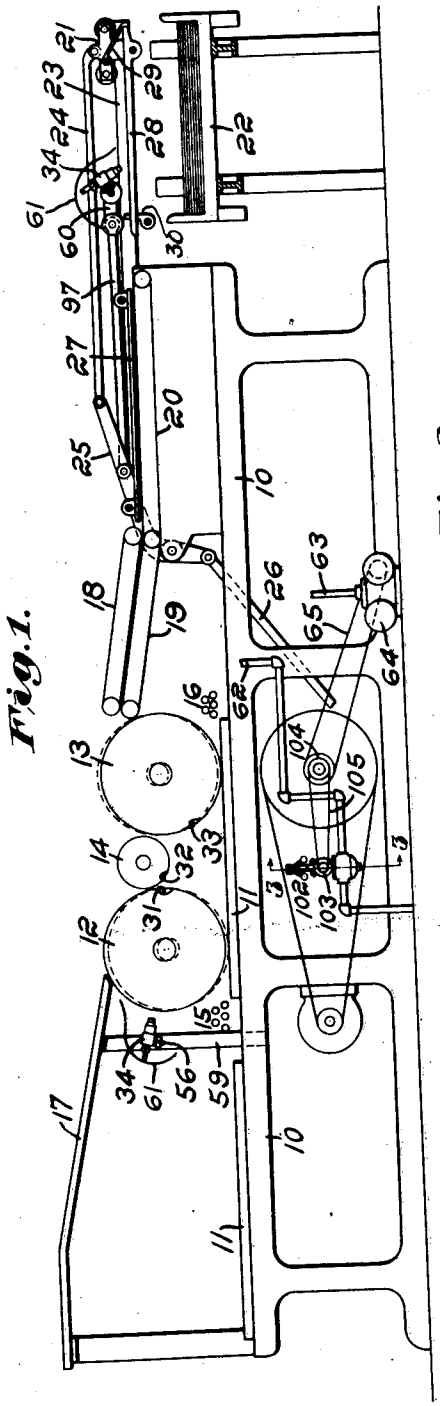


Fig. 1.

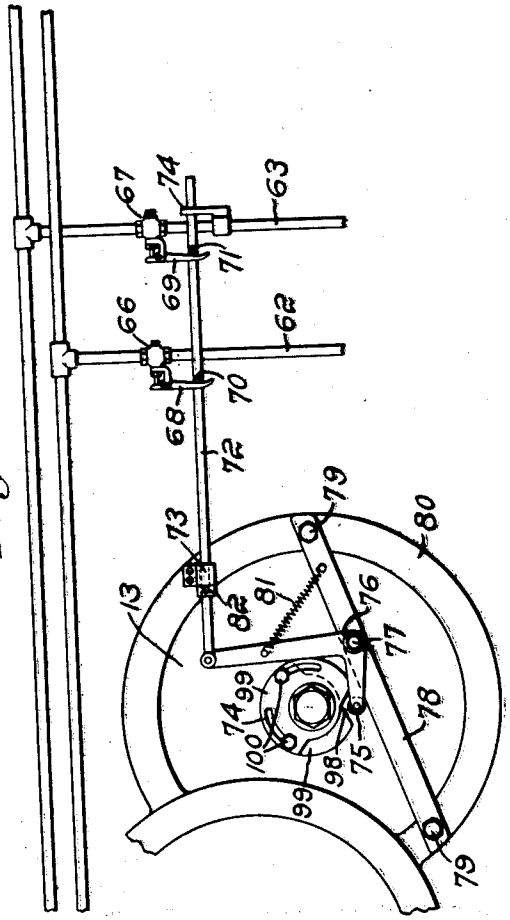


Fig. 2.

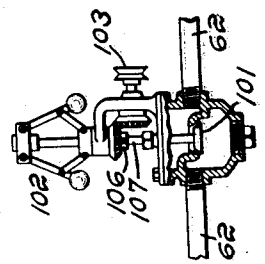


Fig. 3.

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2 Sheets-Sheet 2

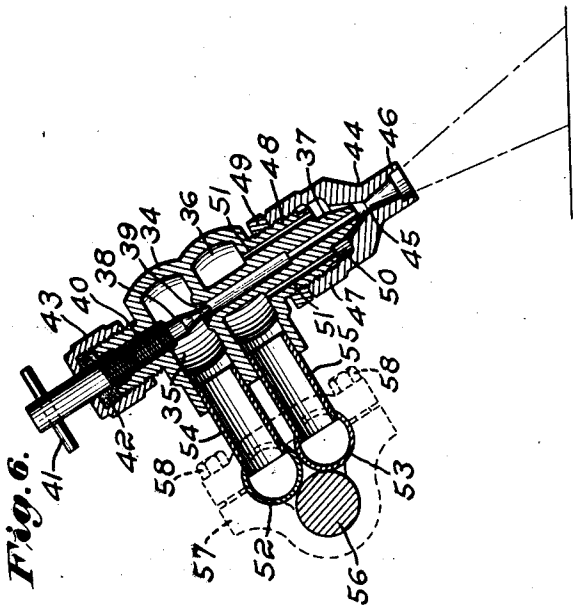


Fig. 6.

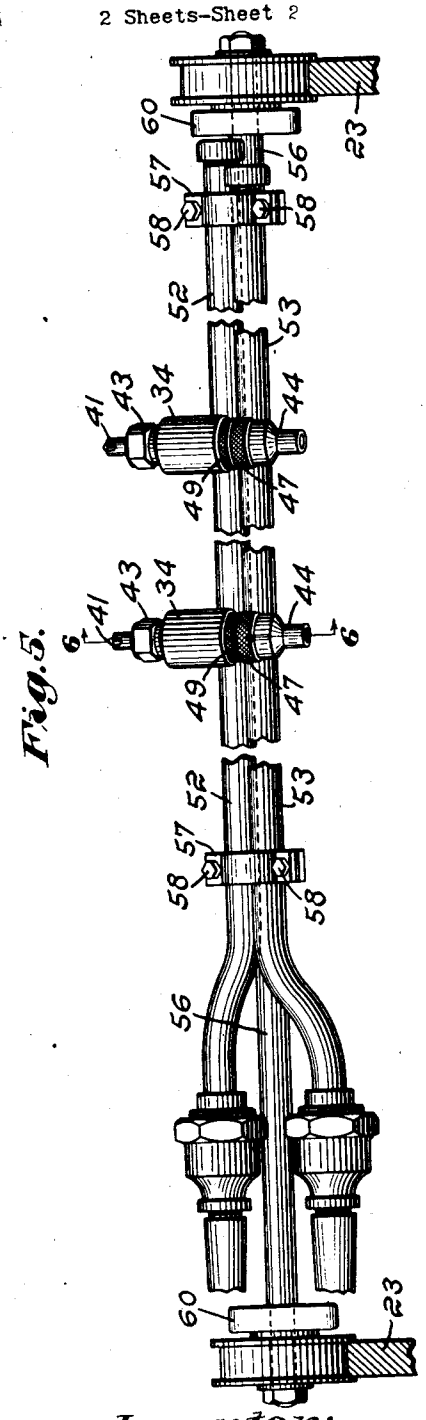


Fig. 5.

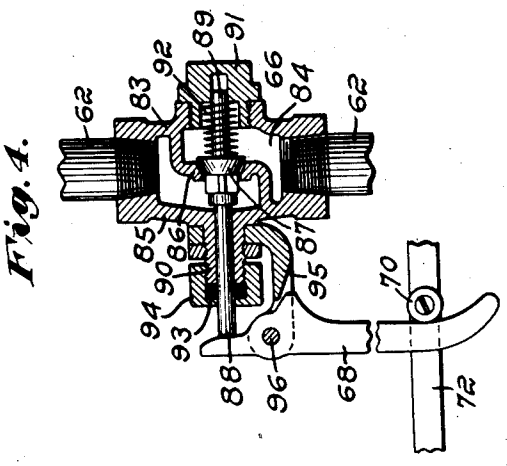


Fig. 4.

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Patented July 13, 1926. 1,592,806

UNITED STATES PATENT OFFICE.

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ART OF PRINTING.

Application filed June 16, 1924. Serial No. 720,149.

This invention relates to the art of printing, and aims to provide a novel and improved method of and means for treating freshly printed sheets to dry the same, and to eliminate static charge therefrom.

The invention will be best understood by reference to the following description, when taken in connection with the accompanying drawings of one specific embodiment by which the method may be carried out, while its scope will be more particularly pointed out in the appended claims.

In the drawings:

Fig. 1 is a skeletonized, conventional representation of a two-color printing press equipped with means for carrying out the method, some of the parts of my apparatus, however, being omitted for the sake of clearness, and because of the small scale of the view;

Fig. 2 is an elevation, on an enlarged scale, of the parts omitted from Fig. 1;

Fig. 3 is a sectional view on an enlarged scale on line 3—3 of Fig. 1, showing the fuel controlling valve which is responsive to the speed of the press;

Fig. 4 is a vertical, sectional view on an enlarged scale of the fuel controlling valve, which is synchronized with the press to furnish maximum and minimum amounts of fuel at different times in the cycle of the press;

Fig. 5 is a front elevation of some of the burners, their mounting, and the air and fuel supply conduits, on an enlarged scale; and

Fig. 6 is a sectional view, on an enlarged scale, on line 6—6 of Fig. 5.

Referring to the drawings, and to the embodiment of the invention which is selected for exemplification, there is shown a two-color press of common form, having a frame 10, a type bed 11, impression cylinders 12 and 13, a transfer cylinder 14, two sets of inking rollers 15 and 16, a feed table 17, and delivery mechanism including two sets of upper and lower feed tapes 18 and 19, another set of feed tapes 20, to which the tapes 18 and 19 deliver the sheets, and a reciprocating carriage 21, which receives the sheets from the tapes 20 and delivers them one by one onto a lowering table 22. The carriage is supported by rails 23, and is reciprocated by mechanism including links 24, levers 25, and links 26, the latter being actuated by a usual crank mechanism not shown. When the sheet is travelling along the tapes 20, it is guided by guides 27, which keep it flat, and it is taken from the tapes by supports 28 carried by the carriage, which also carries movable stops 29 for the front edge of the sheet. The rear edge is positioned by swinging arms 30, which are lowered at the moment that the sheet strikes the stops 29, and are raised afterward to prevent the sheet from travelling backward.

The sheets are fed one by one from the feed table 17 to the first impression cylinder, and the sheet is seized by grippers 31. The cylinder makes one full revolution to wrap the sheet about the cylinder, and then during the next revolution, when the leading edge of the sheet is adjacent the first set of color plates carried by the bed, the cylinder is lowered and the first impression is made. The sheet is then carried to and seized by grippers 32 carried by the transfer cylinder, and is carried to and seized by grippers 33 carried by the second impression cylinder. The second impression is then made by the lowering of the second cylinder to bring the sheet into contact with the second set of plates carried by the bed, after which the sheet is delivered to the tapes 18 and 19, whence it passes along the tapes 20 and onto the guides 28, which at that moment are positioned to receive the same. The forward movement of the sheet brings it against the stops 29, and the carriage starts forward, bringing the sheet into position above the lowering table 22. The arms 30 then swing into place, and prevent backward movement of the sheet during the backward movement of the carriage which now takes place, at which time the front stops 29 lift and allow the sheet to pass off the guides 28 onto the lowering table.

The present invention contemplates the use of flame directed onto the printed face of the sheet at one or more points during the travel through the press, thereby to dry, or more properly crystalize, the ink, and to eliminate static charge from the sheet. In the present example, flame is employed at two points, namely: first, at the first impression cylinder shortly following completion of the first impression, and second, as the sheet is being delivered onto the lowering

table. At each of these points, there are several burners, one of which is shown in Fig. 6. The burner in its preferred form comprises a casing 34, presenting an air inlet chamber 35 and a fuel inlet chamber 36. Communicating with the air inlet chamber is an air nozzle 37, to which air is supplied under the control of appropriate valve means, herein a needle valve 38 cooperating with a seat 39, and having a stem 40 threaded into the casing 34, the outer end of the stem presenting a handle 41. Leakage of air about the stem is prevented by a packing ring 42 and gland 43, the latter being adjustably threaded onto the casing 34. By means of this valve, the proportion of air to the fuel may be varied at will.

Associated with the air nozzle and in the present example disposed about the latter is a fuel nozzle 44, having a contracted throat 45 adjacent the outlet of the air nozzle 37. Outwardly beyond this throat, the outlet is widened, and terminates in an annular groove 46, which prevents the flame from being accidentally extinguished when it is burning at minimum intensity, Adjustment of the fuel supply nozzle to vary the fuel output may be effected by moving the same axially with relation to the air supply nozzle, this being conveniently accomplished in the present example by providing the fuel nozzle with a sleeve 47 threaded on and about a nipple 48 presented by the casing 34. A lock-nut 49, also threaded onto the nipple, serves to maintain the adjustment of the fuel nozzle. Inwardly beyond the throat 45, the fuel nozzle presents a chamber 50, to which fuel is supplied from the chamber 36 through one or more, herein a plurality of, passages 51, two of which are shown in Fig. 5. Thus it will be seen that by the use of these adjustments, the amount and the relative proportions of air and fuel may be varied at will. In practice, the burners are rather closely placed, so that the flames which they project form a continuous sheet of flame from one edge of the paper to the other.

Air and fuel are supplied to the burners by supply pipes 52 and 53, extending transversely of the press and having branches 54 and 55 (see Fig. 6) at intervals leading into the chambers 35 and 36, respectively. These supply pipes in the present example are supported on a transverse rod 56, to which they are appropriately secured, as by clamping collars 57 provided with clamping screws 58. By this means, the burners may be adjusted bodily, both longitudinally of and radially about the axis of the supporting rod, thereby to position the entire group of burners properly with relation to the edges of the paper, and to present the burners at the best angle to the surface of the paper. In the case of the burners associated with the first impression cylinder, the supporting rod is conveniently mounted on uprights 59 (see Fig. 1), while in the case of the burners adjacent the lowering table, the supporting rod is mounted on a carriage 60 (see Fig. 5), which rests on the same rails 23 which support the carriage 21. To conserve heat, there may be associated with each set of burners a shield or hood 61, whose internal surface may, if desired, be polished or otherwise treated to present a reflector.

The fuel, such as common illuminating gas, is supplied to the two sets of burners by a common supply pipe 62 (see Fig. 2), while the air is supplied to both sets of burners by a common supply pipe 63, the latter being connected to and supplied by a blower 64, appropriately driven by the press as by a chain or belt 65. While the blower might be driven by a separate source of power, it is preferred to have it driven by the press itself, so that when the press is stopped, the supply of air will cease, and the flame will therefore be reduced.

The gas and air supply pipes 62 and 63 are controlled by automatically operated valves 66 and 67, both of which are controlled by and operate in timed relation to the press, so as to produce a maximum flame at each set of burners, just as the sheet is passing by, and to produce a minimum flame when no sheet is passing. To this end, the valves are provided with actuating levers 68 and 69 cooperating with rollers 70 and 71 carried by an operating rod 72 extending longitudinally of the press, and mounted to slide in appropriate guides 73 and 74. This rod is operated by a suitable part of the press, such as the second impression cylinder 13, which, as shown in Fig. 2 carries a cam 74 cooperating with a wiper, herein a roller 75 carried by one arm of a lever 76, whose other arm is pivotally connected to the rod 72. This lever is conveniently fulcrumed on a pivot 77 on a bar 78, whose ends are secured, as by screws 79, to a usual gear casing or guard 80 for the gear (not shown), which drives the cylinder. A spring 81, herein attached at one end to the lever and at its other end to the supporting bar, constantly tends to maintain the roller in contact with the cam, and to move the rollers 70 and 71 out of engagement with their respective valve operating levers 68 and 69. In the case of the air controlling valve, it is desirable that the valve shall be completely closed when no sheet is travelling past the burners, and to that end, the roller 71, as shown in Fig. 2, at such time clears the lever 69, which it actuates. In the case of the gas valve, however, it is desirable that the same shall remain partly open, thereby to maintain a low flame, except at such times as a sheet is actually passing the burners.

One convenient way of accomplishing this is to provide the actuating rod 72 with a stop collar 82, adapted to engage the guide 73, and thus limit the movement of the rod toward the right, under the influence of the spring. In this way, the roller 70 carried by the rod, cooperating with the lever 68, prevents the gas valve from closing entirely.

One convenient form of valve for the gas and air supplies will now be described, reference being had to Fig. 4, which shows the gas valve. This valve comprises a casing 83, presenting inlet and outlet chambers 84 and 85, and an intervening seat 86 for a valve 87 having oppositely projecting stems 88 and 89, one guided by a threaded nipple 90 presented by the valve casing, and the other guided by a cap 91 threaded into the casing. A spring 92, encircling the stem 89 and bearing at one end against the valve and at its other end against the cap, tends to seat the valve, which however, as previously stated, is normally held slightly open. Leakage of gas about the stem 88 is prevented by a packing ring 93 and a gland 94, the latter being threaded onto the nipple 90, which also affords a convenient support for a bracket 95, on which the lever 68 is fulcrumed on a pivot 96. The air valve, being of the same construction, though normally entirely closed, is not shown in detail.

The operation of the machine as thus far described will be reviewed briefly, reference being had to Figs. 1 and 2. The sheet to be printed is fed from the feed board to the grippers of the first impression cylinder, which makes one full revolution to wrap the sheet about the cylinder, and then, during the next revolution, when the leading edge of the sheet is adjacent the first set of color plates, the cylinder is lowered to bring the sheet in contact with the plates, thus making the first impression. When the leading edge of the sheet reaches a point adjacent the first set of burners, the automatically operated valves cause air and gas to be supplied to operate the burners at maximum capacity. At this point, it may be mentioned that, with the particular press selected for illustration, it happens that a sheet is being carried past the second set, and it follows that a single set of controls suffices for both sets of valves.

While the flames are of sufficient intensity to ignite the sheets if the latter were not moved at a sufficient speed, yet the surface speed of an ordinary press is ample to prevent the sheet from being scorched ever so slightly, although the heat from the flame is so intense that long after the sheet has reached the lowering table, it is too hot for one's hand to rest upon with comfort. This intense heat dries, or more properly speaking, crystalizes the ink, and at the same time eliminates static which heretofore has been a troublesome factor. Owing to the drying action, the printer is enabled to adjust the ink fountain to supply a full body of ink without serious danger of smutching, commonly called offsetting.

To resume the operation, the sheet is next taken by the grippers of the transfer cylinder, and is immediately transferred to the grippers of the second impression cylinder, by which it is brought into contact with the second set of plates carried by the bed, after which the sheet is stripped from the cylinder, and passes first between the tapes 18 and 19, and then between the tapes 20 and guides 27. The carriage 21 being in its rearward position, the tapes 20 propel the sheet into engagement with the front stops 29, and the carriage then starts forward. At this instant, the automatic valves open fully, and air and gas are supplied to the second set of burners to cause a flame of maximum intensity to be directed onto the sheet just at the point where it leaves the tapes 20.

While these burners might remain stationary, yet in a press having a surface speed of, say, one hundred seventy feet per minute, it is desirable to move the burners forward at a lower speed than that of the sheet, so that the actual relative surface speed of the sheet is the difference between that of the sheet and that of the burners. An actual surface speed, possibly as low as fifty feet per minute, can be maintained with safety and without danger of burning, or even scorching, the sheet. Of course, the lower the surface speed the greater will be the heating of the sheet, and the consequent drying effect. In the present example, the carriage 60 for the second set of burners is connected by links 97 to the levers 25 about midway between the fulcrums of the levers and the pivoted connections of the links 24 which reciprocate the carriage 21. It follows that the actual relative surface speed of the burners and sheets is about half that of the sheet.

In the present example, the sheet carriage 21 travels forward only far enough to deposit the sheet on the lowering table 22,—hence it follows that the burner carriage 60 must not go forward a distance equal to the travel of the sheet carriage 21,—otherwise, they would collide. In this embodiment, therefore, the burner carriage is caused to reverse its movement after the burners have traversed a part only of the sheet (see Fig. 1). However, the remaining surface of the sheet is thus traversed by the burners during their rearward movement, and of course, inasmuch as the sheet is now stationary, the relative surface speed of the burners to the sheet is the same as before. When a crank is used to supply the necesary motion of the burner carriage, the latter is moving

very slowly for a short time, as its direction is reversed. In case this slowing down should tend to scorch the sheet, the form of the cam 74 may be such as to reduce the flame for an instant, as by providing the cam path with a drop or indentation 98, which allows the spring 81 to assert itself to operate the valves as before described.

As sheets of various dimensions are printed in the same press, provision is made to vary the duration of the maximum flame, so that it shall be maximum only during the traversing of the burners by the sheet. This is conveniently accomplished in the present example by making the depression in the cam adjustable, as by making the cam in two relatively adjustable parts 99, one of which is slotted to receive clamping screws 100 threaded into the other part, so that by simply lowering these screws, turning one part relatively to the other, and then tightening the screws, the cam may be caused to furnish the desired duration of maximum flame. It will be remembered that in the present example, the cam is carried by a vertically movable impression cylinder. This being so, it is evident that provision should be made to compensate for this movement,—otherwise, it would affect the operation of the burners. This compensation is conveniently accomplished, herein, by mounting the cam eccentrically with relation to the cylinder (see Fig. 2) by an amount equal to the vertical travel of the cylinder, the effect being to keep the cam path in the same position which it would occupy if the cam were concentric with a vertically stationary cylinder.

When the press, for any reason, slows down or stops, the blower, being driven by the press, correspondingly slows down or stops, and correspondingly reduces or stops the forced air supply to the burners. When this happens, in the case of the burners on the carriage 60, the flames simply flicker in an upward direction, owing to the absence of the air blast, and do no harm, but in the case of the burners adjacent the first impression cylinder, reduction or stoppage of the air blast is insufficient to keep the flames from burning the sheet. To take care of this condition, I have provided a gas valve 101 (see Fig. 3), which is responsive to the speed of the press as by the use of a speed-responsive device such as a centrifugal governor 102, of common form, suitably driven by the press, as by pulleys 103 and 104, and a belt 105. This valve, like the valve 66, is provided with means for preventing it from closing entirely, it being provided, for this purpose, with a stop collar 106 secured to a spindle 107, which constitutes the stem of the valve, as well as the shaft of the governor.

The general operation should be evident from the foregoing without further description, except to emphasize the fact that the controls of the air blast and gas are such as to furnish maximum and minimum heat at the proper times, thus not only avoiding any possibility of setting fire to the printed sheet or to the tympan sheet, but also effecting a marked economy in the use of gas.

Having thus described one embodiment of the invention, and one means for carrying out the method, but without limiting myself thereto, what I claim and desire by Letters Patent to secure is:

1. The method of treating a freshly printed sheet, characterized by directing flame at the moist ink while imparting a relative movement to the sheet and flame to cause the printed surface to be traversed by the flame.

2. In a printing press, the combination of means for printing the sheet, means for producing a flame and directing the same onto the printed surface of the sheet, and means for causing a relative movement of the sheet and the flame to prevent ignition of the sheet.

3. The combination with a printing press, of a burner for producing a flame to which the printed face of the sheet is exposed during its travel, means operated by the press for causing a periodic reduction of the flame while the press is running, and means operated by said press for reducing said flame when said press stops.

4. The combination with a printing press, comprising reciprocating sheet-feeding means having a sheet-feeding movement and a non-feeding movement, of a burner for producing a flame to which the printed face of the sheet is exposed during its travel, and means for causing reduction of said flame during the non-feeding movement of said sheet-feeding means.

5. The combination with a printing press comprising reciprocating sheet-feeding means having a sheet-feeding movement and a non-feeding movement, of a burner, means for supplying said burner with air and fuel, and means for causing a cessation of the supply of air and a reduction of the supply of fuel during the non-feeding movement of said sheet-feeding means.

6. The combination with a printing press comprising reciprocating sheet feeding means having a sheet-feeding movement and a non-feeding movement, of a burner, means for supplying said burner with air and fuel, an air-controlling valve, a fuel-controlling valve, and means operated by said press for causing said valves to open for the sheet-feeding movement and to move toward their closed positions for the non-feeding movement of said sheet-feeding means.

7. In a printing press, the combination of sheet-feeding means, means for subject-

ing the printed sheet to the action of flame while the sheet is being moved, means responsive to the speed of the press for controlling the flame, and means for causing reduction of the flame during idle movement of said sheet-feeding means.

8. In a printing press, the combination of sheet-feeding means, means for subjecting the printed sheet to the action of flame while the sheet is being moved, means for causing reduction of the flame during idle movement of said sheet-feeding means, and means for causing reduction of the flame when the press stops.

9. In a printing press, the combination of sheet feeding means, means for subjecting the printed sheet to the action of flame while the sheet is being moved, means for causing the flame to burn with maximum intensity during feeding movement of said sheet feeding means and to burn with less intensity during non-feeding movement of said feeding means, and means for causing the flame to diminish as the speed of the press diminishes and to burn at minimum intensity when the press stops.

10. In a printing press, the combination of sheet-feeding means, a heater for subjecting the sheet to the action of heat, and means for causing said heater to travel along the sheet in the same direction but at a speed lower than that of the sheet.

11. In a printing press, the combination of sheet-feeding means, a heater for subjecting the sheet to the action of heat, and means to cause said heater to travel along the moving sheet in the same direction at a lower speed than that of the sheet and to travel along the sheet in the opposite direction during inaction of the sheet.

12. In a printing press, the combination of reciprocating sheet-feeding means which feeds the sheet in one direction and has an idle movement in the opposite direction, a heater for subjecting the sheet to the action of heat, and reciprocating heater moving means to cause said heater to travel along the travelling sheet in the same direction at a lower speed than that of the sheet, and to travel along the sheet in the opposite direction during the idle movement of said sheet-feeding means.

13. In a printing press, the combination of a heater for subjecting the sheet to the action of heat, means for producing relative movement of said heater and the sheet to cause said heater to traverse the sheet part way across the latter and for producing movement of said heater in the opposite direction to cause said heater to traverse the remainder of the sheet, and means for causing temporary reduction of the heat produced by said heater during reversal of movement of said heater.

14. In a printing press, the combination of a heater for subjecting the sheet to the action of heat, means for producing relative movement of said heater and the sheet to cause one to traverse the other, and heater controlling instrumentalities including means of adjustment to sheets of different widths to cause a certain heating effect of said heater during different predetermined portions of said movement corresponding to the widths of sheets and to cause a lesser heating effect of said heater during other predetermined portions of said movement.

15. In a printing press, the combination of a heater for subjecting the sheet to the action of heat, means for producing relative movement of said heater and the sheet to cause one to traverse the other, and heater controlling instrumentalities including a cam having means of adjustment to sheets of different widths to cause a certain heating effect of said heater during different predetermined portions of said movement corresponding to the widths of sheets and to cause a lesser heating effect of said heater during other predetermined portions of said movement.

In testimony whereof, I have signed my name to this specification.

LEO W. BRUNELL.