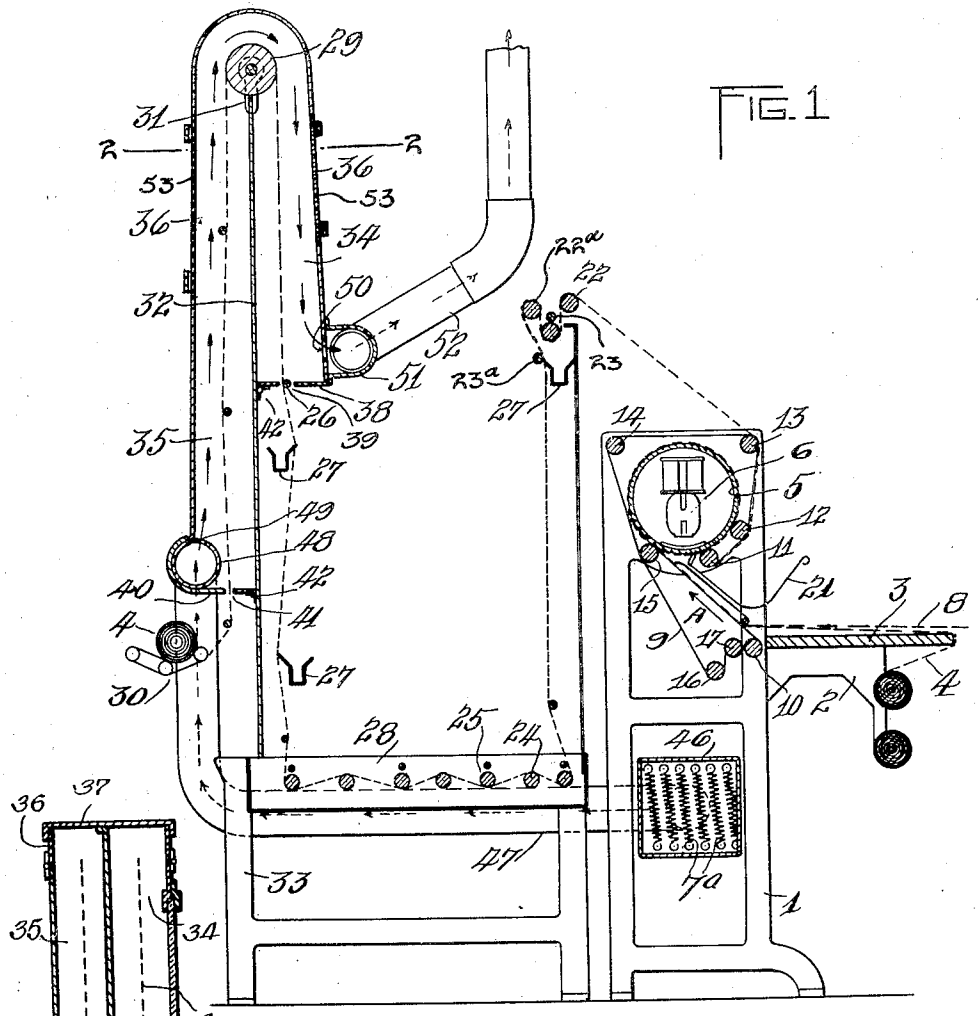
Aug. 29, 1933. H. H. SULLIVAN 1,924,758

AUTOMATIC BLUE PRINTING AND FINISHING MACHINE

Filed Oct. 21, 1931 2 Sheets-Sheet 1

FIG. 1



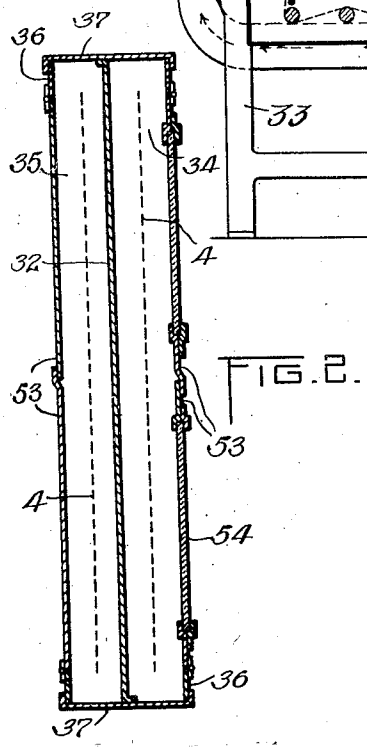


FIG. 2.

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AUTOMATIC BLUE PRINTING AND FINISHING MACHINE

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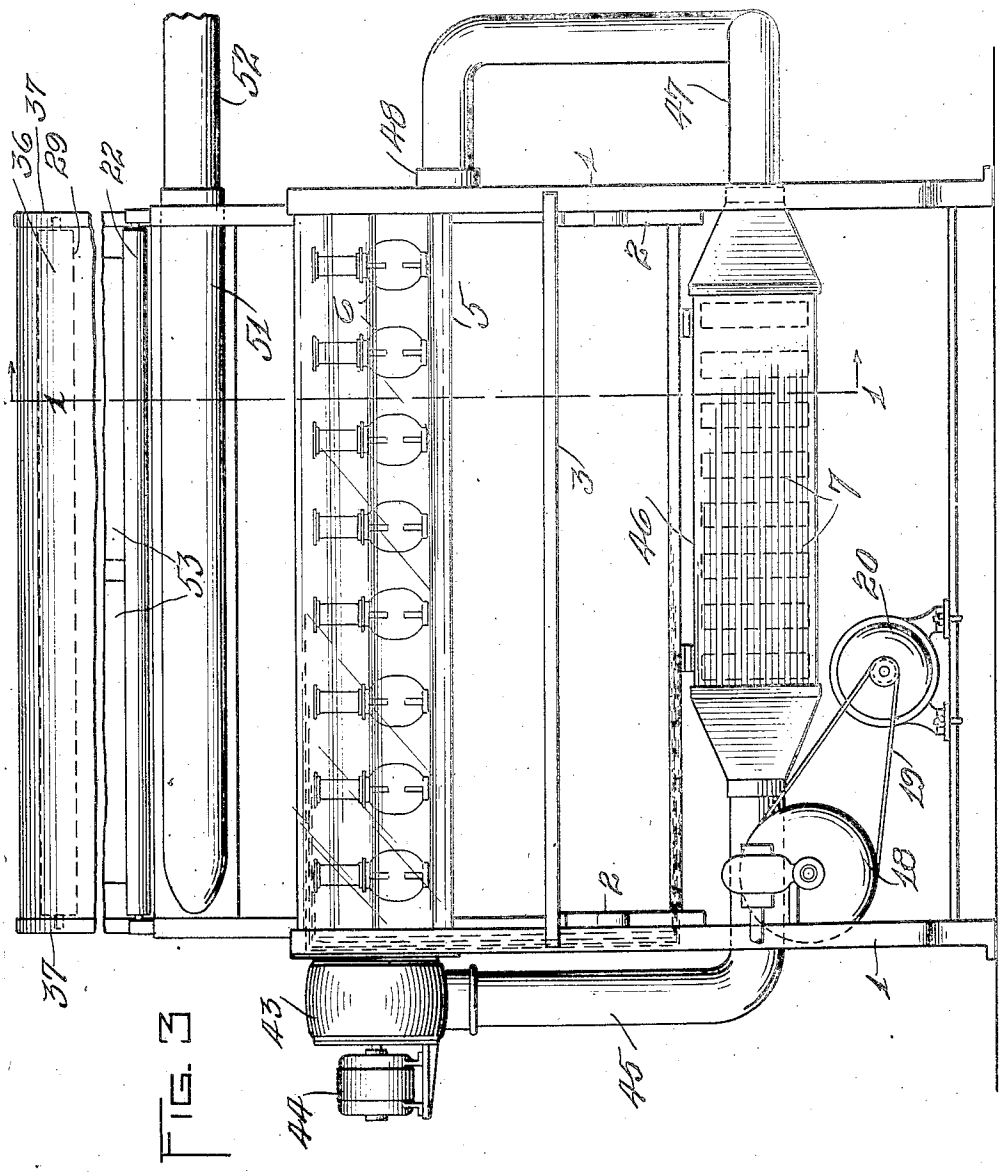


FIG. 3

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AUTOMATIC BLUE PRINTING AND FINISHING MACHINE

Harry Hewes Sullivan, Rochester, N. Y.

Application October 21, 1931. Serial No. 570,225

15 Claims. (Cl. 95—90.5)

The present invention relates to printing machines of the photographic type by means of which drawings, tracings and the like on translucent material are reproduced on a continuous sheet of sensitized paper, and to finishing apparatus associated with such machines, whereby the printed paper is washed by flood baths of water and chemicals, then conducted to a dryer and finally to a winding up device or trimming table.

More particularly the invention relates to the drying apparatus, and an object thereof is the provision of a simple and more economical means for effectively drying the paper than that embodied in machines of this character now in use, such machines, in most instances, employing gas or electricity as a means for heating a surface of considerable area in proximity to which the paper moves in traveling from the flood baths to the winding up device.

Another object of the invention is to provide a drier of this character in which the paper is dried by heated air and in which the humidity of the air may be readily maintained near the desired percentage.

In accomplishing the aforesaid objects, the gas or electrical heating units and the heating surface are eliminated, and substituted therefor is a chambered member or drier through which the paper is caused to travel and in which heated air is employed as the drying medium, another object of the invention being to utilize for this purpose the air heated by the lamps or other artificial light source of the printing machine and the resistances for electric lamps.

The invention is more especially adaptable to a printing and finishing machine in which the lamps producing the light to which the sensitized paper is exposed are mounted within a revoluble cylinder, the work being in positive contact with the cylinder and revolving therewith. The cylinder necessarily requires ventilation to prevent it from becoming overheated, and to this end an exhaust fan is arranged at one end thereof. This fan displaces a considerable amount of heated air, and it is a further object of the invention to employ this air as the paper drying medium and the fan as the means for forcing the air to and through the drier.

In circuit with the printing lamps are rheostats including resistance coils which generate considerable heat, and it is a further object of the invention to house these coils within the conduit leading from the fan to the drier so as to utilize to the full extent all of the heat generated by the printing machine.

A still further object of the invention is the provision of an improvement in printing and finishing machines of a drying apparatus which is of simple construction, of few parts, effective and economical in operation, and which employs as the drying medium heated air which would otherwise be discharged directly into a chimney flue.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts hereinafter fully described, illustrated in the accompanying drawings, and set forth in the claims hereto appended, it being understood that various changes in the form, proportion, and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In the accompanying drawings:

Figure 1 is partly an end elevation and partly a sectional view on the line 1—1 of Fig. 3, of a printing and finishing machine embodying the invention, all of the machine with the exception of the drier being shown only in outline and diagrammatically, and with operating mechanism removed.

Fig. 2 is a detail sectional view on the line 2—2 of Fig. 1.

Fig. 3 is a view in front elevation as seen from the right in Fig. 1.

Similar reference numerals refer to similar parts throughout the different views.

The particular construction and operation of the printing machine and the means for washing the printed paper are immaterial, so far as the present invention is concerned, with the exception, however, that the printing machine includes a revolubly supported printing cylinder within which are a plurality of lighting units, such as arc lamps, while arranged at one end of the cylinder is a centrifugal exhaust fan for effecting ventilation thereof.

Briefly described, the printing machine, shown only in outline, comprises upright end frames 1, on which are brackets 2 supporting a work shelf 3, and one or more rolls of sensitized print paper 4. Revolubly supported between the end frames 1 is a printing cylinder 5 made, preferably, of "Pyrex" glass and within which are a plurality of arc lamps 6 which produce the light to which the paper is exposed in the printing operation, the supporting means for the lamps not being

shown but forming the subject matter of a copending application. These lamps 6 are controlled by switch connections, not shown, and included in the electrical circuits are a like plurality of rheostats 7, the resistance coils of which are indicated at 7^a and arranged, in this instance, in parallel rows between the end frames 1.

The paper 4 and the tracings, the latter being indicated by the broken line 8, Fig. 1, are carried to the cylinder 5 on a plurality of spaced endless belts 9 which hold the work in positive contact with and constitute friction driving means for the cylinder. These belts 9, only one of which is shown, engage under a driving roller 10 and travel therefrom in the direction of the arrow A to the cylinder 5, with the work interposed between them and the cylinder, thence upwardly, rearwardly and downwardly in contact with rollers 11, 12, 13, 14, 15, and under a tension roller 16 to a roller 17 adjacent and in rear of the driivng roller 10, the latter being driven through a variable speed mechanism indicated at 18 and which includes a driving belt 19 connected to a motor 20, the connection between the mechanism 18 and the roller 10 not being shown as it forms no part of the invention.

The tracings 8 drop from the cylinder 5 onto a tray 21 from which they are removed by the operator, while the continuous sheet of sensitized paper is carried from the roller 11 again upwardly by the belts 9 over the rollers 12 and 13 and extended to a roller 22 above and in rear of the printing machine proper. Thereafter the paper is caused to travel through the finisher, which is a complete unit connected to and placed in back of the printer.

In passing through the finisher the exposed sensitized paper is fed downwardly through a clear water flood bath projected from a pipe 23, and then through a clear water spray projected from a pipe 23^a adjacent a guide roller 22^a. The exposed sensitized paper then travels downwardly to the washer and is carried horizontally alternately over and under a series of rollers 24 and under a series of pipes 25 alternating with the rollers 24 and from which the paper receives flood baths of both water and chemicals. The paper then travels vertically upward, getting an additional wash of clear water from the final spray pipe 26. Water not striking the paper is carried away by troughs 27, and a catch basin 28 is provided for the water and chemicals of the flood baths.

From the pipe 26 the paper continues to travel upward, thence over a roller 29 and vertically downwardly to a winding up device indicated generally by the numeral 30, or, if desired, to a trimming table, not shown, drying of the paper being effected during its travel from the final water spray 26 to the winding up device 30 or trimming table. The paper is guided in said vertical downward travel by means of a series of horizontal rods or rollers 29^a. The means for drying the paper is the particularly novel feature of the invention and will now be described.

The roller 29 is mounted in brackets 31 carried by the upper edge of a wall 32 extending upward from the washer frame 33 which supports the basin 28. Chambers or compartments 34 and 35 are formed on either side of this center partition wall 32 by a housing comprising outer side walls 36 and end walls 37, the two compartments communicating with each other above the roller 29. In this instance the compartment 35 extends below the compartment 34 with the partition member 32 also forming an outer wall for the lower part of the compartment 35. The compartment 34 is closed at the bottom by a wall 38 having an elongated opening 39 for receiving the paper 4 which travels upward through this compartment, over the roller 29 and downward through the compartment 35, the latter being closed at the bottom by a wall portion 40 slotted at 41 for the paper to pass therethrough. The inner sections of the bottoms 38 and 40, formed by their respective slots 39 and 41, may have hinge connection, as indicated at 42, with the wall 32, these sections being lowered to facilitate threading the paper through the drier.

At one end of the printing cylinder 5 is a centrifugal exhaust fan 43, driven, in this instance by a motor 44. This fan creates a current of air through the cylinder for the purpose of ventilation, the air absorbing a good portion of the heat generated by the lamps 6. To discharge this dry hot air into the work-room would make working conditions uncomfortable, and therefore it has hitherto been conducted into a chimney flue. To the end of putting this heated air to work as the drying medium for the paper, and thus eliminating the necessity of using other means of drying, such as gas or electricity, the fan 43 is caused to discharge into a conduit 45 which leads into a housing 46 enclosing the coils 7^a of the hereinabove mentioned rheostats, the other end of the housing communicating with a conductor pipe 47 which extends rearwardly, then upwardly and discharges into a duct 48 extending horizontally across the bottom of the air intake chamber or compartment 35 of the drier. This duct 48 has an elongated slot opening 49 through which the heated air passes into the compartment 35. Rising in the compartment 35, as indicated by the arrows, the air passes over the roller 29, then downward in the compartment 35, from which it is conducted through an outlet pipe 52 leading from one end of the duct 51 to a chimney flue or elsewhere.

Although any suitable means may be employed for removing the air heated from the light source of the printing member and conducting it to the drier, I prefer to use the means disclosed in the illustrated embodiment of the invention, that is, the exhaust fan 43 which not only draws air through the cylinder for the purpose of ventilation, but acts, also, as a means for driving such air to and through the drier.

The walls 36 of the drier are preferably separated along their vertical centers and hinged adjacent the end walls 37 to provide doors 53 which permit access to the paper so that it may be threaded through the openings at the bottoms of the two compartments 34 and 35 and through the drier, and also that the paper may be examined. If desirable, one or more or all of the doors 53 may be provided with windows 54 whereby the operator may view the condition of the prints on the paper passing through the drier.

Briefly summarized, the invention comprises, in combination with the printing and washing apparatus of a blue printing and finishing machine, a drier preferably vertically arranged and having a plurality of communicating air chambers through which the paper passes from the washing apparatus to a winding-up device or trimming table, the air employed as the drying medium being that used in ventilating the printing cylinder and which is heated by the lamps producing the light for the printing, this air being in continuous movement by the action of an

exhaust fan which draws the air through the printing cylinder and then forces it through suitable conductors to the drier, from which it escapes, after passing over the washed paper, into a chimney flue or elsewhere. Furthermore, the resistance coils of the rheostats employed in the printing machine are also used in giving additional heat to the air after it leaves the printing cylinder and while being conducted to the drier. Thus, heat that would otherwise be wasted is used for a purpose which results in a considerable financial saving in both the equipment and operation of a printing and finishing machine. It will also be observed that the air enters the drier at substantially the point where the papers leaves it and is discharged therefrom near the inlet for the paper, and that the passage of the heated air through the drier is in the reverse direction to that traversed by the paper. Any suitable means may be provided for conditioning the heated air as to humidity and maintaining the air passing through the drier at the desired humidity.

What I claim is:

1. In a machine of the character described, a drier in which is an air chamber having normal stationary walls and through which the paper is fed, an air duct extending along one end of said chamber having a slot opening in the wall of the air duct for the inlet of air to the chamber, and an air duct along the opposite end of the chamber having an opening in its wall for the discharge of air from said chamber, said chamber having openings adjacent said second and first named ducts, respectively, for the passage of the paper into and out of the chamber.

2. In a machine of the character described, a drier in which is an air chamber having an inlet and an outlet through which the paper is fed, an inlet for heated air, and a discharge opening for the air, a printing cylinder, a washing apparatus between the cylinder and the dryer, a conduit leading from the cylinder to the air inlet of said drier and having a discharge slot extending along one end of the drier for a distance substantially equal to the width of the paper, and means for forcing air from the cylinder through said conduit and said chamber.

3. In a machine of the character described, a drier including a vertical center wall, substantially vertical side and end walls forming vertical chambers one each side of the center wall, and closures for the bottoms of said chambers having openings through which the paper is fed, the two chambers being in communication at the top of said center wall, one of said chambers having an inlet for heated air and the other a discharge opening for the air.

4. In a machine of the character described, a housing forming a vertically extending chamber, a longitudinally extending vertical partition dividing the chamber into two compartments having communication at the top of the partition, the bottom of each compartment having an opening through which the paper is fed, a roller at the top of said partition over which the paper engages, a duct extending across the bottom of one compartment having an opening for the inlet of air to the compartment, a duct along the bottom of the other compartment having an opening for the discharge of air from such compartment, the paper entering the drier through the bottom of the compartment from which the heated air is discharged.

5. In a machine of the character described, a housing forming a vertically extending chamber, a vertical partition deviding said chamber longitudinally into two compartments communicating with each other at the top of said partition, a roller at the top of the partition, the two compartments having openings at the bottoms thereof through which the paper is fed, such paper travelling upward in one compartment, over said roller, and downward in the other compartment, a printing cylinder, a lamp in said cylinder, an air conductor leading from said cylinder and discharging into one of said compartments, the other compartment having an opening for the discharge of air, and an exhaust fan located at one end of the cylinder for drawing heated air from said cylinder and forcing it through the compartments of said drier, the passage of air through the drier being in a reverse direction to that of the paper.

6. A machine of the character described constructed in accordance with claim 5 and including doors in the wall of said housing for the purpose specified.

7. A machine of the character described constructed in accordance with claim 5 and including resistance coils housed within said air conductor, whereby the air is heated from two sources before reaching the paper.

8. In an automatic printing and finishing machine, means for feeding a continuous sheet of sensitized paper, a printing member, electric lamps therefor having a rheostat, means for washing the paper after leaving the printing member, a drier including an air chamber through which the paper is fed, and means for heating air by the heat of the resistances of the rheostats and for conducting such heated air to the said air chamber.

9. In an automatic printing and finishing machine, means for feeding a continuous sheet of sensitized paper, a printing member, electric lamps therefor having a rheostat, means for washing the paper after leaving the printing member, a drier including an air chamber through which the paper is fed, a housing for the rheostat for heating air by the resistances of the said rheostat, and an air conduit leading from the said housing to the air chamber.

10. In an automatic printing and finishing machine, means for feeding a continuous sheet of sensitized paper, a printing member, electric lamps therefor having a rheostat, means for washing the paper after leaving the printing member, a drier including an air chamber through which the paper is fed, a housing for the rheostat for heating air by the resistances of the said rheostat, an air conduit leading from the said housing to the air chamber, and a fan for forcing the heated air from the said housing through the conduit and through the air chamber.

11. In an automatic printing and finishing machine, means for feeding a continuous sheet of sensitized paper, a printing member, electric lamps therefor having a rheostat, means for washing the paper after leaving the printing member, a drier including an air chamber through which the paper is fed, a housing for the rheostat for heating air by the resistances of the said rheostat, an air conduit leading from the said housing to the air chamber, a fan for forcing the heated air from the said housing through the conduit and through the air chamber, and a discharge conduit extending from the air chamber for conducting air therefrom to the outside atmosphere.

12. In an automatic blueprinting and finishing

machine, means for feeding a continuous sheet of sensitized paper, a printing cylinder, lamps mounted within said cylinder, means for washing the paper after leaving the printing cylinder, a drier having an air chamber through which the paper is fed, an air conduit leading from said cylinder to said drier, and an exhaust fan located at one end of the cylinder for creating a current of air through the cylinder for heating the air and for forcing the heated air through the conduit to the drier.

13. In a machine of the character described, a printing cylinder, means for feeding a continuous sheet of sensitized paper to the printing cylinder, a drier for the paper, lamps within the cylinder having resistance coils, a conduit enclosing the resistance coils and leading from the cylinder to the drier, and means for causing a current of air to pass through the cylinder and through the conduit to the drier whereby the air is heated from two sources before reaching the paper.

14. In a machine of the character described, a printing cylinder, means for feeding a continuous sheet of sensitized paper to the printing cylinder, a drier for the paper, lamps within the cylinder having resistance coils, a conduit enclosing the resistance coils and leading from the cylinder to the drier, and an exhaust fan located at one end of the cylinder for producing a current of air through the cylinder to heat the air and for forcing the heated air through the conduit past the resistance coils to the drier, whereby the air is heated from two sources before reaching the paper.

15. In an automatic printing and finishing machine, means for feeding a continuous sheet of sensitized paper, a printing member, electric lamps therefor having a rheostat, means for washing the paper after leaving the printing member, a drier including an air chamber through which the paper is fed, a housing for the rheostat, an air conduit leading from the printing member to the drier and including the housing of the rheostat, and a fan for causing a current of air to pass over the said lamps for heating the air and for forcing the heated air through the conduit past the rheostat to the drier, whereby the air is heated from two sources before reaching the paper.

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