Dec. 15, 1925. 1,565,451

E. J. HOFFMANN

METHOD AND APPARATUS FOR FINISHING PHOTOGRAPHIC PRINTS

Filed April 29, 1925 2 Sheets-Sheet 1

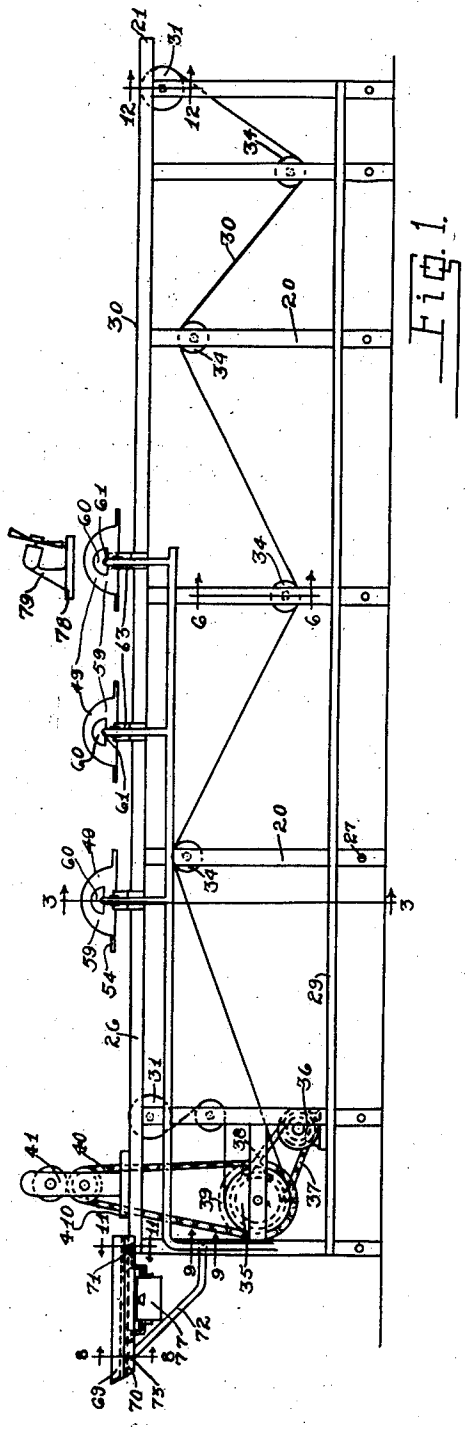


Fig. 1.

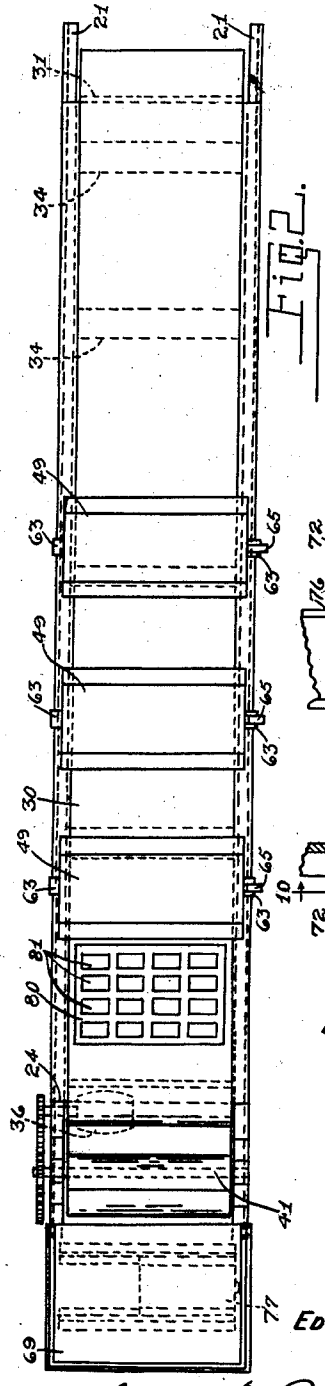


Fig. 2.

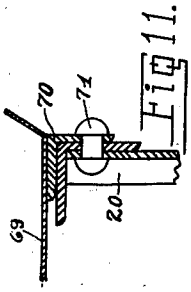


Fig. 11.

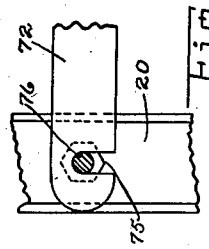


Fig. 10.

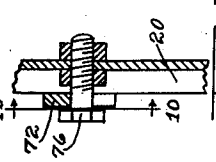


Fig. 9.

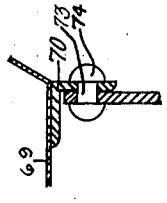


Fig. 8.

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METHOD AND APPARATUS FOR FINISHING PHOTOGRAPHIC PRINTS

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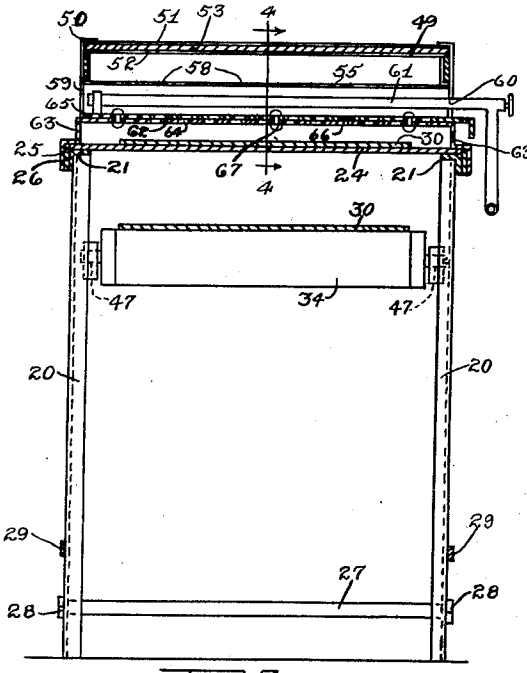


Fig. 3.

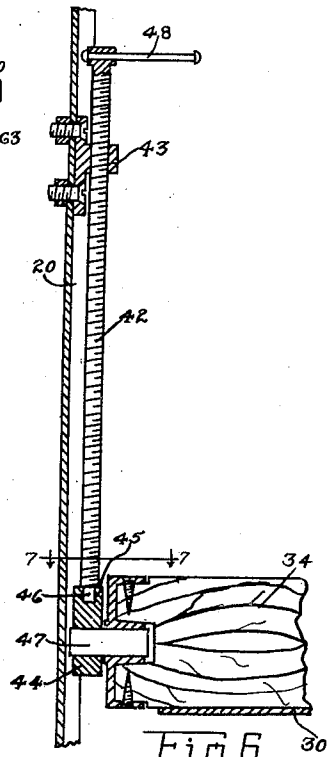


Fig. 6.

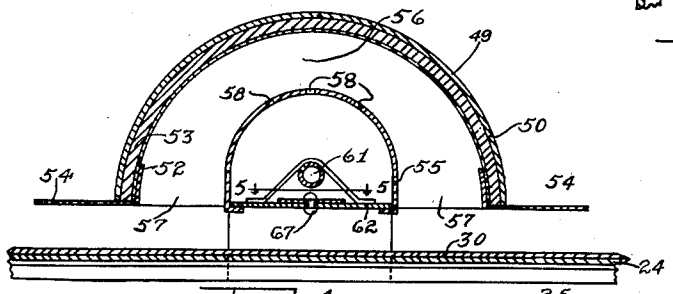


Fig. 4.

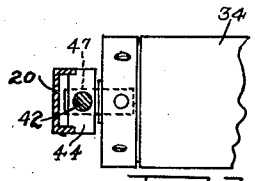


Fig. 7.

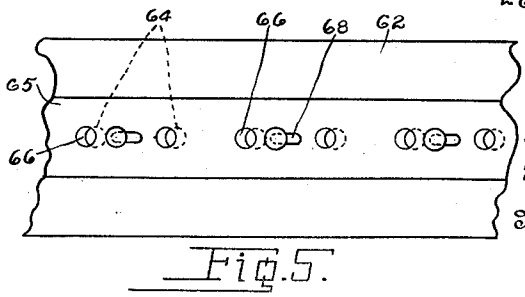


Fig. 5.

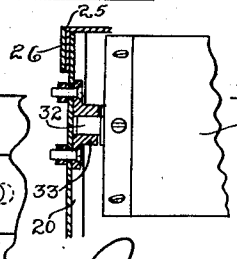


Fig. 12.

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Patented Dec. 15, 1925. 1,565,451

UNITED STATES PATENT OFFICE.

EDWARD J. HOFFMANN, OF CINCINNATI, OHIO.

METHOD AND APPARATUS FOR FINISHING PHOTOGRAPHIC PRINTS.

Application filed April 29, 1925. Serial No. 26,744.

To all whom it may concern:

Be it known that I, EDWARD J. HOFFMANN, a citizen of the United States of America, and a resident of Cincinnati, in the county of Hamilton and State of Ohio, have invented new and useful Improvements in a Method and Apparatus for Finishing Photographic Prints, of which the following is a specification.

This invention relates to a method of and apparatus for finishing photographic prints, and more particularly to the rapid drying and flattening of prints which have been developed, fixed and washed.

An object of my invention is to provide a device for the purpose stated that will receive prints from their final washing or bath and discharge them in a dry and perfectly flat state.

Another object is to provide a device of this kind which will perform the requisite operations for flattening, gloss finishing and drying within a minimum of time.

These and other objects are attained by the means and method described herein and disclosed in the accompanying drawings in which:

Fig. 1 is a longitudinal elevational view of a device of my invention.

Fig. 2 is a plan view of the device shown in Fig. 1.

Fig. 3 is a view taken on line 3—3 of Fig. 1, looking in the direction of the arrows.

Fig. 4 is an enlarged cross sectional view taken on line 4—4 of Fig. 3.

Fig. 5 is a fragmental view taken on line 5—5 of Fig. 4.

Fig. 6 is an enlarged fragmental cross sectional view taken on line 6—6 of Fig. 1.

Fig 7 is a view taken on line 7—7 of Fig. 6.

Fig. 8 is a view taken on line 8—8 of Fig. 1.

Fig. 9 is a view taken on line 9—9 of Fig. 1.

Fig. 10 is a view taken on line 10—10 of Fig. 9.

Fig. 11 is a view taken on line 11—11 of Fig. 1.

Fig. 12 is a view taken on line 12—12 of Fig. 1.

The device of my invention comprises a suitable table support structure having uprights or legs 20 which may conveniently take the form of channel irons which carry at their tops longitudinal angle irons 21 secured thereto by means of screws or rivets. Mounted upon the upper horizontal faces of the spaced angle irons 21 is a table 24 of sheet steel. The edges 25 of the table 24 are covered by a flat strip 26 mounted upon the vertical side of the angle irons 21 and extending above the top thereof for a distance substantially equal to the thickness of the sheet 24 of the table. Suitable shouldered spacing rods 27 have their opposite ends extending through suitable perforations in the channel irons 20 and are secured thereto by any suitable means such as nuts 28. Longitudinal braces 29 are secured to the legs 20 in order to provide a rigid support for the table and other mechanisms forming parts of the device. An endless conveyor belt 30 rests upon the top face of the table 24 and passes about the opposite longitudinal edges thereof where suitable rollers 31 are revolubly mounted by means of stud shafts 32 engaging in suitable bearing blocks 33 mounted upon the channel irons 20 (see Fig. 12). The portion of the belt 30 disposed beneath the table 24 is adapted to be held taut by being passed alternately beneath and above alternate adjustable rollers. Positioned at the forward end of the table is a suitable main drive roller 35 which is actuated from a suitable source of power such as a motor 36 through a suitable speed reducing device such as a worm drive (not shown) and a chain drive 37 passing about suitable sprocket 38 secured to the main drive roller 35. A second sprocket 39 is adapted by means of a suitable chain such as 40 to drive a wringer or pair of squilgee rollers 41 mounted upon a suitable base 410 positioned above the main drive roller 35. From the foregoing it will be seen that the endless belt 30 will ride upon the flat upper surface of the table 24, being actuated through the motor 36 and main drive roller 35 which also actuates the wringer 41. The vertical adjustment of the rollers 34 is attained as is shown in Fig. 6 by means of a threaded rod 42 engaging in a threaded block 43 secured to the channel iron 20. A bearing block 44 having a seat 45 therein is adapted to receive the smooth shouldered end 46 of the threaded rod 42 and also receives a stud 47 which forms a spindle or axle for the roller 34. From the foregoing it will be apparent that the threaded rod 42 which may be turned by any suitable means

such as a lever 48 will exert a downward force upon the bearing block 44 and the roller 34 carried thereby so that the belt 30 is moved away from the lower side of the table 24. The rollers 34 adjacent the one indicated in Fig. 6 have the mechanism shown in Fig. 6 in an inverted position and in this manner adjacent rollers are adapted to be actuated in opposite directions for effecting considerable adjustment of the belt. In this manner a belt when new may require that all of the rollers 34 are substantially in horizontal alignment and as the belt stretches in use, said rollers may be adjusted in opposite directions as heretofore explained.

Spacedly mounted above the table top 24 and belt 30 is a series of spaced heat reflectors of a peculiar novel structure for transmitting a gentle flow of heated air on to the belt. The heat reflectors indicated generally as 49 comprise an outer casing 50 which is substantially semicircular in cross section and is composed of three members, namely an outer metallic casing 51, an inner metallic casing 52 and an intermediate layer of heat resisting material such as asbestos 53. The outer casing 50 is imperforate and is provided along its longitudinal edges with outwardly extending flanges 54 disposed in substantial parallelism with the table 24 and belt 30. An inner casing 55 is also substantially semicircular in cross section and is disposed eccentrically of the center of the outer casing 50, to the end that the space between the outer casing 50 and inner casing 55 is somewhat restricted at its uppermost part 56 and gradually increases to provide a pair of enlarged discharge openings 57. The inner casing 55 is provided with a series of perforations 58 disposed adjacent the top thereof and affording communication into the restricted portion 56 of the heat reflectors 49. The reflectors 49 are provided with end walls 59, one of which is provided with a suitable opening 60 through which extends a suitable gas burner or other heating element 61 mounted in spaced relation from the base 62 which forms a closure for the bottom opening of the interior casing 55. The interior casing and its base, together with the burner 61 are all suitably supported on brackets 63 which are conveniently secured at the sides of the table 24. As shown in Fig. 5 the base 62 of the interior casing 55 is provided with perforations 64 which are adapted to be regulated by means of a sliding perforate plate 65 having perforations 66 which may be brought into registry with the perforations 64 in the base 62. Suitable studs 67 passing through elongated slots 68 in the base 62 and sliding member 65 serve to retain these parts in longitudinal alignment and to limit the relative movement thereof. The heat reflector structure just described is adapted to have heat from the burner 61 rise through the perforations 58 in the inner casing 55 and to pass into the restricted portion 56 of the reflector 49. The perforate sliding plate structure shown in Fig. 5 may be conveniently adjusted to insure movement of heat from the interior of the casing 55 through the perforations 58. The opening 60 in the end wall 59 may also be provided with a suitable air inlet adjustment in order to further regulate the flow of heat from the burner 61 to the restricted portion 56 of the reflector 49. The enlarged discharge openings 57 provided by the eccentric position of the inner and outer casings will cause a gentle downward discharge of heated air from such discharge opening because the gradually increasing space from the restricted portion 56 to the discharge openings 57 will permit the expanding heat to create such a movement. The outer casing 50 being heat insulated and the inner casing being adjustable to provide a regulated flow of heat, provide a very efficient means for creating a gentle flow of heated air of a suitable temperature from the discharge openings 57 on to the belt 30. In this way substantially all of the heat from the burner 61 is used in performing its work which will be further described hereafter.

A suitable work tray 69 is supported at its side edges by a pair of angle irons 70 pivoted as at 71 by any suitable means such as a rivet or the like, upon the ends of the longitudinal angle irons 21 of the table structure, (see Fig. 11). The forward end of the tray 69 is supported by means of a pair of suitable curved brackets 72 pivotally mounted as at 73 by means of a suitable headed stud or rivet 74. The ends of the brackets 72 are provided with suitable slots 75 engaging upon pins 76 which may conveniently take the form of a heated screw locked in position upon the channel iron 20 with its head in spaced relation thereto (see Figs. 9 and 10). By means of this structure the brackets 72 may be unlocked from the pins 76 and the work tray 69 may be permitted to move about its pivotal mounting 71 and to hang in substantially a vertical position when not in use. Slidably mounted upon the under side of the work tray 69 is an auxiliary slidable pan or tray 77 which may be pulled out at one side of the work tray 69 where it is conveniently accessible to the operator of the device. The sliding pan structure 77 is adapted to be disposed well beneath the body lines of the work tray 69 so that the entire structure may be swung about the pivotal mounting 71 when not in use.

Mounted upon a suitable support 78 disposed adjacent the heat reflector 49 farthest from the wringer 41 is a suitable fan 79 positioned to project a moderate blast of cool air on to and longitudinally of an end portion

of the table 24 and belt 30 riding thereover.

The operation of the device and the process of drying and flattening glossy prints therewith is as follows:

An operator stands at the work tray 69 at one end of the device after having started the motor 36 which drives the wringer or squilgee rollers 41 and also drives the belt 30 disposed on the top of table 24 in a direction away from said wringer. A large quantity of photographic prints which have been developed, fixed and washed are placed in a pan or container 77 which contains clear water. The prints are kept in water so that they may be readily picked up one at a time without any difficulty of adhesion between said wet prints. The operator is supplied with a plurality of ferro-type tins which are wiped clean and one of which is placed upon the work tray 69. The ferro-type tin 80 (see Fig. 2) is then ready to receive a plurality of photographic prints 81. These are rapidly placed close together and face down until the ferro-type tin is covered with such prints after which the operator starts the tin with the prints thereon between the rollers of the wringer 41 whereupon he takes another ferro-type tin and directs his attention to covering this tin with prints in the same manner. The tin 80 covered with prints 81 passes between the rollers of the wringer 41 which squeezes practically all of the excess water therefrom whereupon the tin will drop upon the belt 30 which is traveling along the table top 24. The belt is adapted to move at a predetermined rate of speed which may be varied to accommodate the weight or thickness of the paper and its consequent capacity to retain water and moisture. The heavier papers, having a greater capacity to retain moisture require a slower rate of travel of the belt. A normal weight print, if allowed to dry, naturally will require about four hours. If a glossy finish is desired, a squilgee plate which has been treated with a quantity of dissolved paraffin is usually employed and such plate must necessarily be kept free of any material degree of heat for the reason that the paraffin will melt. By using ferro-type tins and the device of my invention I am able to produce photographs with a glossy finish within a period of four minutes as opposed to the four hours required by the old process. After a ferro-type tin 80 with the prints 81 thereon has passed on to the belt 30, it is carried along said belt and passes slowly under the first heat reflector device 49 which emits a downward flow of heat on to the prints 81 and tin 80. The prints 81 at this time are carrying a considerable quantity of moisture and it is possible to expose them to a degree of heat which is somewhat below the point at which the emulsion of the prints would be attached. The first one of the reflectors 49 beneath which the tins and prints pass, is regulated to give off the greatest quantity of heat and each successive one of said reflectors 49 is adjusted to give off heat of a successively lower degree of temperature. While the prints on the tin 80 are passing under the first reflector 49 the moisture in said prints is being vaporized and the tin 80 itself becomes slightly heated. As the tin 80 and the prints 81 pass from beneath the first reflector 49, they are exposed to substantially normal atmospheric temperature and condition so that the moisture which has been liberated from the prints is free to escape and at the same time the prints and the tin are permitted to cool somewhat. The tin then passes beneath the next heat reflector 49 which, as previously mentioned, is regulated to a lower degree or temperature whereupon more moisture is liberated from the prints which, together with the tin 80, are again warmed. The second heating or warming, as previously explained, is not so great as the first one and the prints which are now free of a considerable quantity of their moisture are now relieved of another quantity of moisture without being damaged by the gentle flow of warmth from the second heat reflector. The tin 80 and prints 81, passing from beneath the second heat reflector 49, are again permitted to cool and to liberate the moisture, which will tend to remain close to the surface of the prints when there is any material pressure present. The prints on the tin 80 are then passed beneath a third heat reflector 49 which is regulated to a still lower degree of temperature whereupon substantially all of the moisture will be liberated from the prints. The tin 80 and prints are then permitted to travel over a considerable distance during which a gentle blast of cool air from the fan 79, sweeping longitudinally of the belt, will prevent a film of vaporized moisture from gathering upon the prints so that by the time the tins have reached the end of the table 24, the tins may drop into a suitable net or basket and the glossy prints are quite dry and have practically no adhesion upon the tin. The prints 81 may be liberated from the tin by a light sweeping motion of the hand or may be taken off one at a time as they are assorted. As is well understood by those versed in the art, various systems of placing identifying numbers upon the back of the print are used so that the prints may be taken from the trays without requiring the operator to look at the face side of the picture. When heavy weight paper is used, there is normally required seven hours of time to dry a glossy finished print by the old method. By changing the speed of the belt 30 so that it will make one revolution in a period of seven

minutes I am able to dry such heavy weight paper in a perfectly flat state and having a high gloss finish.

From the foregoing it will be noted that I have provided a method and apparatus by means of which all kinds of photographic prints, whether dull finish or glossy finish may be thoroughly dried and perfectly flattened within a minimum of time, and without any danger of burning them.

What I claim is:

1. In a device for drying photographic prints the combination with a conveyor, of a series of heat reflectors mounted in spaced relation above the conveyor adjacent one end thereof, and means for directing cooling air longitudinally of the conveyor.

2. In a device of the class described the combination with a wringer having a pair of squilgee rollers, of an endless conveyor adapted to travel away from and in alignment with said wringer, heat reflectors mounted above the conveyor and in spaced relation with one another, and means for directing a blast of cooling air longitudinally of the conveyor and beyond the heat deflectors.

3. In a device of the class described the combination with a base structure comprising upright channel irons and angle strips mounted horizontally along the tops of said channels, of a table top carried by the angle strips, an endless conveyor belt adapted to move over the top of the table, adjustment rollers for the conveyor belt mounted at their opposite ends upon the channel irons, a work tray and a wringer mechanism mounted adjacent one of the longitudinal ends of the table top, means for projecting reflected heat on to the conveyor belt at spaced intervals along the table, and means for directing a flow of cool air longitudinally of the table and belt extending beyond said heat projecting means.

4. In a device of the class described the combination with a base structure comprising upright channel irons and angle strips mounted horizontally along the tops of said channels, of a table top carried by the angle strips, an endless conveyor belt adapted to move over the top of the table, adjustment rollers for the conveyor belt mounted at their opposite ends upon the channel irons, a work tray and a wringer mechanism mounted adjacent one of the longitudinal ends of the table top, means for projecting reflected heat on to the conveyor belt at spaced intervals along the table, and means for directing a flow of cool air longitudinally of the table and belt extending beyond said heat projecting means whereby photographic prints placed upon ferro-type tins may be passed through the wringer for pressing water from the prints, and said prints carried by said tins may be exposed to a series of intermittent and gradually decreasing heat treatments and an alternate intermittent series of exposures to atmospheric temperature and finally to a flow of cooling air.

5. In a device of the class described the combination with a conveyor belt and supporting structure for moving ferro-type tins carrying photographic prints thereon, of a plurality of heat reflectors comprising pairs of substantially semi-circular casings mounted eccentrically with one another, said heat reflectors being spaced at a distance from one another along one end of the supporting structure, and blower means for directing a flow of air longitudinally of the opposite end portion of the conveyor belt.

6. In a heat reflector for drying photographic prints, the combination with an outer casing, of a perforate inner casing mounted eccentrically within the outer casing whereby a heat reflecting passage is formed, said heat reflecting passage being restricted at its uppermost portion and gradually increasing and terminating in enlarged discharge openings, a heating element disposed within the inner casing and adapted to reflect heat through the perforations in the inner casing toward the restricted portion of the passage between the casings, and means for regulating a flow of air into the inner casing.

7. In a heat reflecting device for drying photographic prints the combination with a table structure having an endless conveyor belt traveling thereover, of brackets mounted on opposite sides of said table structure, a substantially semi-circular outer casing comprising an asbestos lining member extending between the brackets, a substantially semi-circular inner casing having perforations therein and positioned radially and mounted eccentrically within the outer casing whereby a restricted passage is formed between said casings, closure means for the interior casing, and a heating element enclosed between the interior casing and the closure means.

8. A heat reflector for providing a flow of reflected heat comprising an arcuate inverted outer casing, an arcuate inverted perforate inner casing mounted in spaced relation with and eccentrically of the outer casing whereby a curved passage is formed having a restricted central portion and enlarged discharge portions, and a heating element disposed interiorly of the inner perforate casing.

9. A heat reflector for providing a flow of reflected heat comprising an arcuate inverted outer casing, an arcuate inverted inner casing mounted in spaced relation with and eccentrically of the outer casing whereby a curved passage is formed having a restricted central portion and enlarged discharge por-

tions, and a heating element disposed interiorly of the inner casing.

10. The method of flat drying glossy finish photographic prints comprising placing photographic prints face downwardly upon a sheet of ferro-type tin, passing said ferro-type tin and prints between a pair of squilgee rollers, exposing the ferro-type tin with the prints thereon to reflected heat of a relatively high temperature for a given period of time, exposing the prints and tin to substantially atmospheric conditions for substantially a like period of time, after which said prints and tin are again exposed to a reflected heat of relatively lower temperature which is followed by a second exposure to substantially atmospheric conditions, then exposing said prints and tin to a third and still lower degree of reflected heat following which said prints and tin are permitted to cool and finish drying for a period of time substantially equal to the combined periods of heating and atmospheric exposure previously noted whereupon the prints may be removed from the ferro-type tin in a flat, dry state.

11. The process of rapidly drying glossy prints in a flat state comprising placing the prints face downward upon a piece of ferro-type tin and in a thoroughly saturated state, passing the tin and prints between rollers to squeeze the water therefrom, and alternately exposing the tin and prints to reflected heat and to atmospheric conditions, each successive exposure to reflected heat being of a successively lower temperature.

12. In a device of the class described the combination with a conveyor belt for moving ferro-type tins having photographic prints thereon, of a plurality of heat reflectors spaced from one another above the upper face of the belt, and means for directing a flow of air longitudinally of the belt.

13. In a device of the class described the combination of a conveyor for carrying ferro-type tins, and a series of spaced heat reflectors mounted above the conveyor.

14. In a device of the class described the combination with means for pressing liquid from wet photographic prints, of conveyor means for receiving said prints from the pressing means, and heat reflectors mounted above the conveyor means and adapted to direct heat to the prints as they are carried beneath said reflectors by the conveyor means.

15. In a device for drying moist prints the combination of a plate for receiving prints and to which plate the prints are caused to adhere by virtue of their moist condition, a conveyor for the plates, and means mounted at spaced intervals along the conveyor for successively subjecting the prints carried by the plates to variations in temperature for drying the prints.

16. The method of drying glossy prints in a flat state comprising placing wet prints upon a plate, rolling the prints for removing liquid therefrom and for causing the prints to adhere to the plate and successively subjecting the prints to variations in temperature for drying the prints.

In testimony whereof, I have hereunto subscribed my name this 25th day of April, 1925.

EDWARD J. HOFFMANN.