

Nov. 17. 1942.

F. W. VON MEISTER

2,302,277

DIAZOTYPE DRY DEVELOPMENT APPARATUS

Filed July 25, 1940

3 Sheets-Sheet 1

Fig. 1

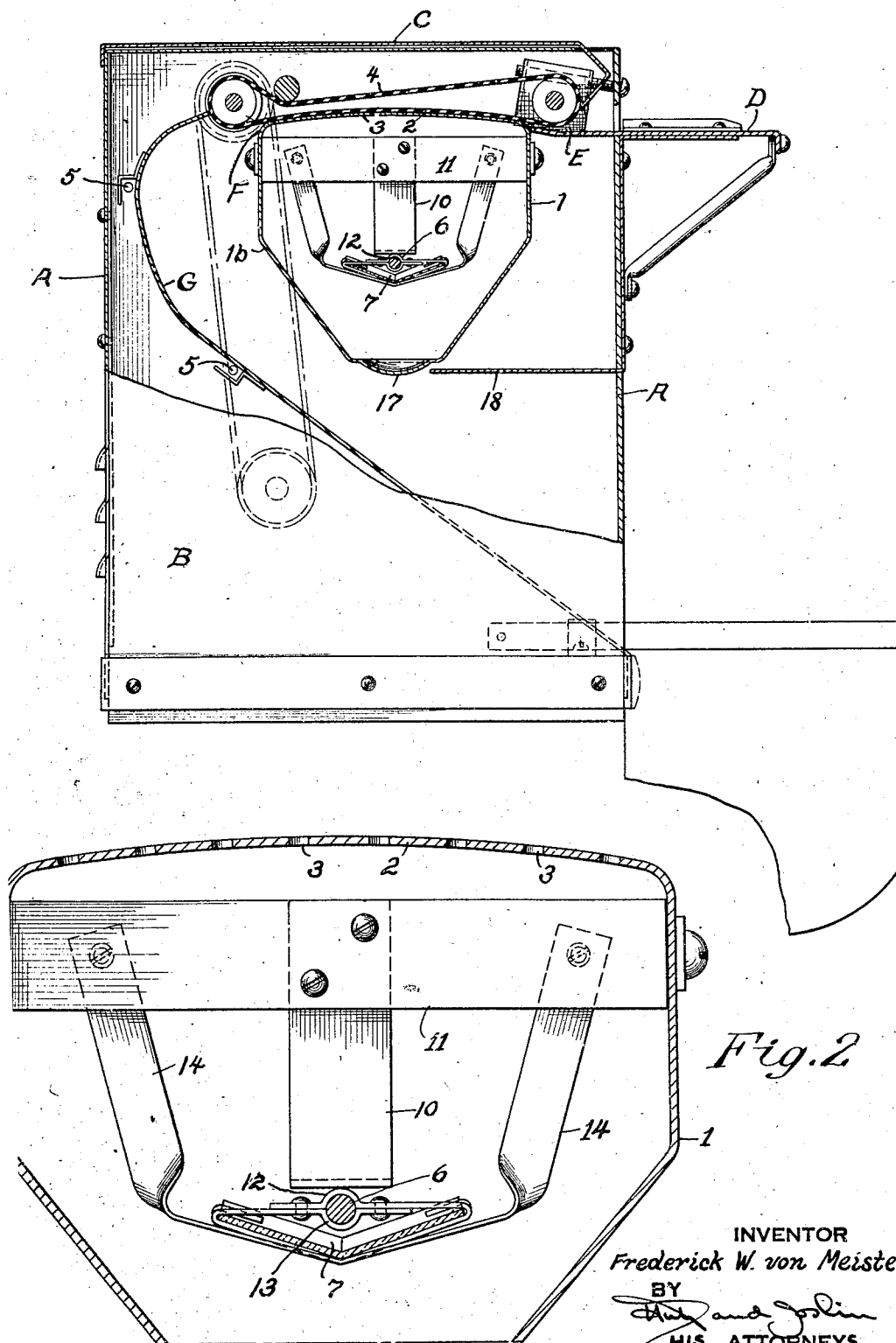


Fig. 2

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3 Sheets-Sheet 2

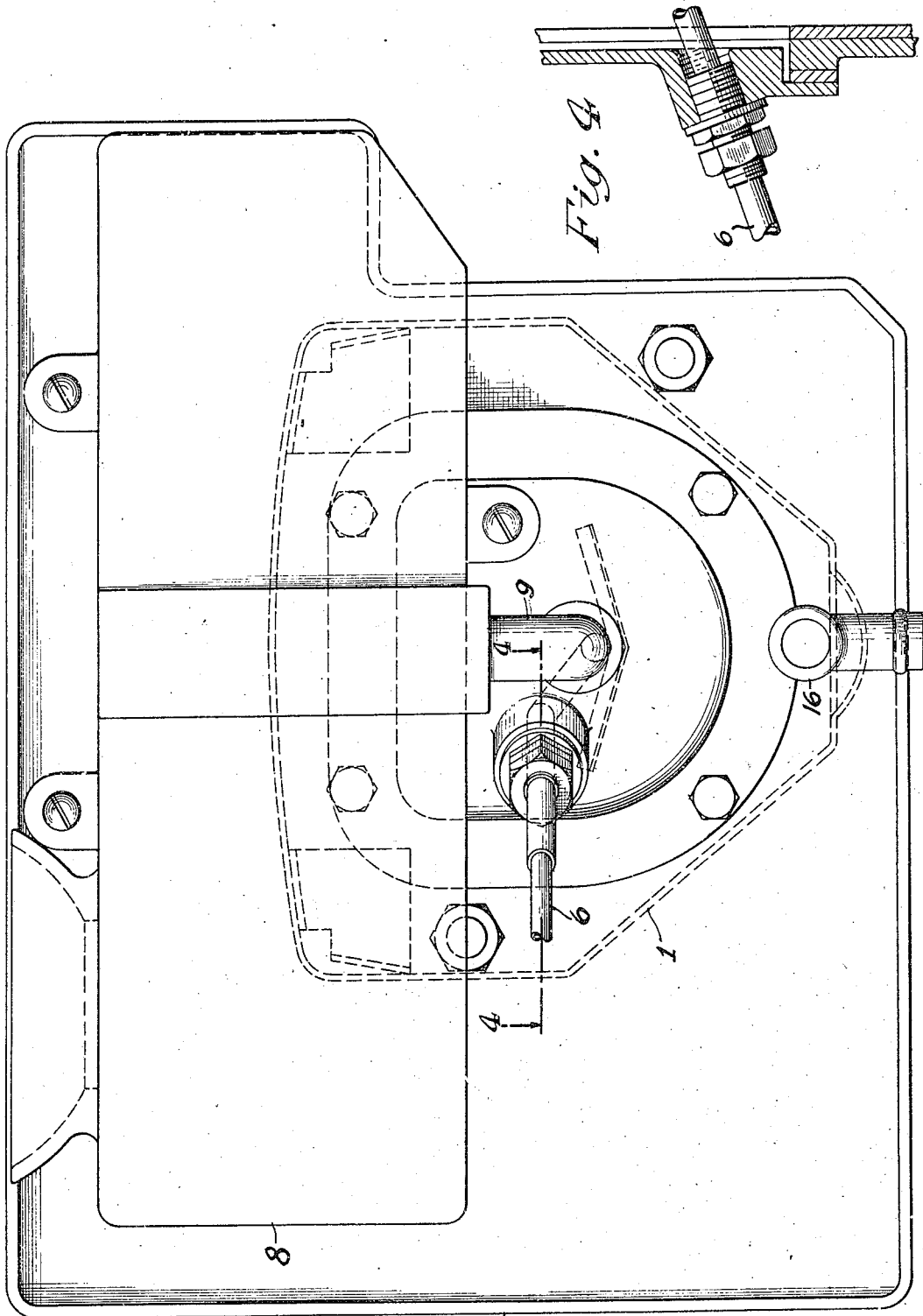


Fig. 3

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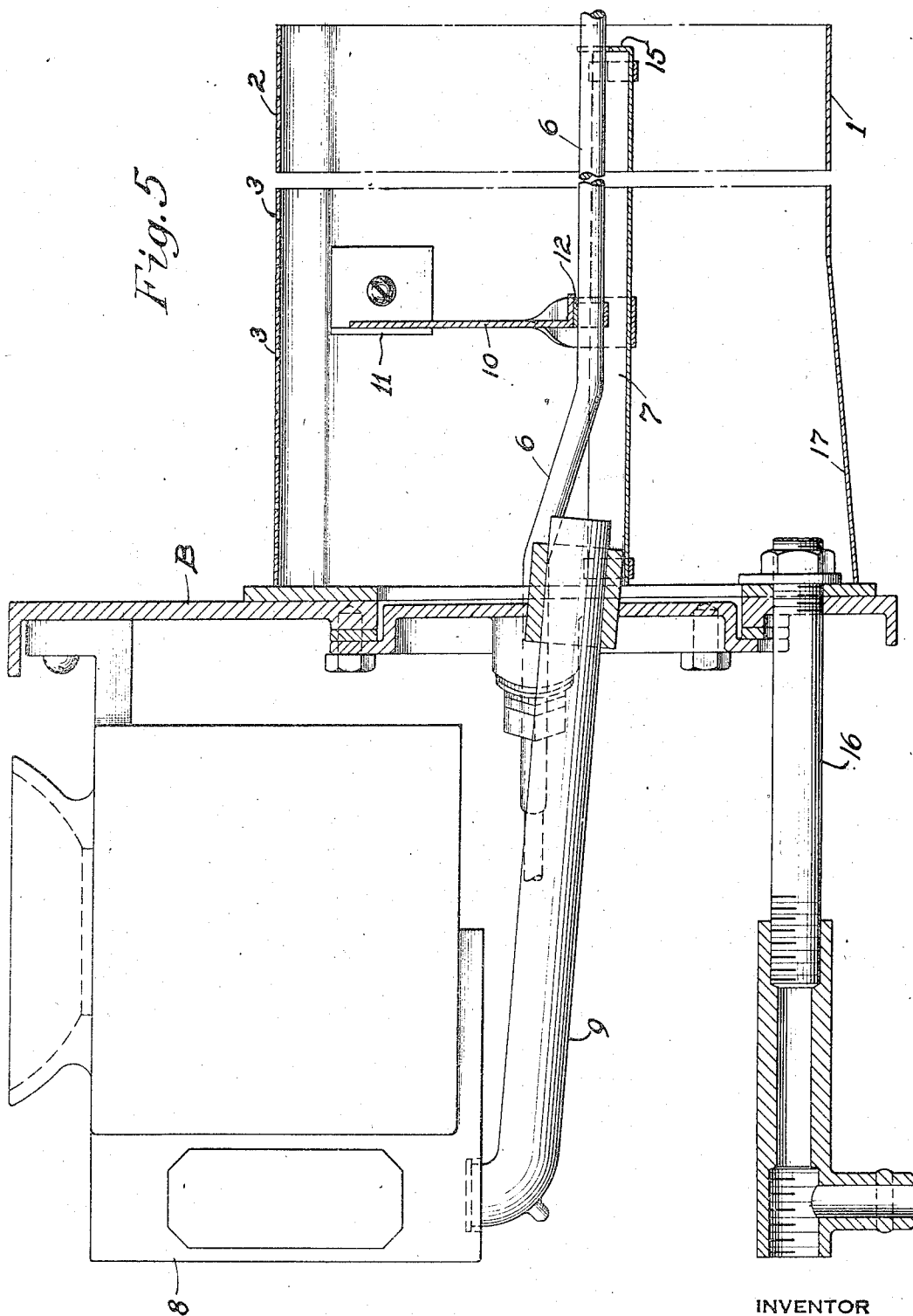
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DIAZOTYPE DRY DEVELOPMENT APPARATUS

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3 Sheets-Sheet 3



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2,302,277

DIAZOTYPE DRY DEVELOPMENT
APPARATUS

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4 Claims. (Cl. 95—89)

This invention relates to apparatus for developing light-sensitive materials by application of a gaseous developing medium, such as ammonia gas. More particularly, it relates to that type of such apparatus wherein the light-sensitive material to be developed is carried by an endless gas tight belt over a perforated plate through which the ammonia or other gaseous developing medium passes and contacts the light-sensitive material.

It has been found that, in apparatus of this type, unless the ammonia vapor is kept at a temperature above its dew point, condensation takes place on the light-sensitive material or on the perforated plate over which it is passing. Such condensation causes smearing of the lines of the reproduced image, wrinkling of the light-sensitive material, and the occurrence of blotches of color in the background. To prevent condensation of the ammonia vapor and, hence, to overcome these attendant difficulties it has been suggested to place heaters in the vapor space immediately adjacent the under side of the perforated plate. These heaters super-heat the ammonia vapor which has been liberated from an aqueous solution of ammonia by the heat of a separate heater or set of heaters, located in or immediately under a tank holding the ammonia solution or under the plate over which the ammonia solution is flowing. Such an arrangement for the prevention of condensation tends to direct most of the heat against concentrated areas of the light-sensitive material. Since heat accelerates the developing action, these areas will show an uneven development as compared with unaffected areas. Such an arrangement of heaters is also relatively expensive of construction, since a multiple number of heater units must be provided.

The object of this invention is, therefore, to provide a simple inexpensive heater arrangement which will keep the ammonia vapor above the dew point, uniformly heat the surface of the light-sensitive material during its entire travel across the perforated plate, and evaporate just the right amount of ammonia for proper development.

With this and other objects in mind, I have provided a developing apparatus having, in the developing chamber, a single bar heater, as the sole source of heat. This and other cooperating means serve to create the proper flow of ammonia vapor and maintain it at such a temperature that no water vapor will condense on the perforated plate of the developing chamber. The construction and arrangement of the parts which cooperate to accomplish the objects of the inven-

tion will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming part of this specification, with the understanding, however, that the invention is not confined to any strict conformity with the showing of the drawings which are for the purpose of illustrative disclosure and contemplate various changes in practice within the scope of the claims appended to this specification.

In the drawings:

Fig. 1 is an end view, partly in section, of the developing apparatus.

Fig. 2 is an enlarged sectional view of the top part of the developing chamber.

Fig. 3 is an end view of the developing apparatus.

Fig. 4 is a section taken on the line 4—4 of Fig. 3, showing the heater conduits leading into the developing chamber.

Fig. 5 is a sectional elevation of a part of the developing apparatus.

Referring now to the drawings:

A and B are side and end walls, respectively, which are made of any suitable material and are adapted to enclose the developing chamber, driving mechanism, and ancillary operating parts. C is the top or cover plate which completes the housing for the operating parts, and D is an apron adapted to receive work pieces for delivery to the developing chamber. The arrangement of the elements A, B, and C forming the enclosure is such that they may be removed to afford ready access to the working parts.

The developing chamber 1 is of the type having a curved top 2 having perforations 3 therein to permit the passage of fumes of developing media. A gas tight continuous blanket type belt 4 travels over the curved top 2 of the developing chamber 1. This belt engages the work piece at the entrance E and conducts it across the top of the developing chamber where it comes in contact with the developing media issuing through the perforations, becomes developed, and is ejected at the exit F onto the return chute G, which delivers the developed work piece to the operator. External heaters 5 are provided on the under side of the return chute G for the purpose of driving off any residual fumes of developing media, which may have adhered to the work piece.

A single bar heater 6 running the length of the developing chamber and spaced adjacent to and immediately above the evaporating tray 7 provides the heat necessary to evaporate ammonia from the aqueous ammonia which drips onto the

evaporating tray 7 from the ammonia supply tank 8 through delivery conduit 9. 10 is a suspension strap which is bolted to the horizontal bar 11 at one end and attached to collar member 12 at the other. Collar members 12 and 13, which are bolted to each other in order to firmly enclose the heater 6, are spring attached to the evaporating tray 7 which, in turn, is supported by the U-shaped strap member 14, fixedly attached at both ends to the horizontal bar 11. Heater bar 6 is further supported in order to maintain a spaced relation between it and the evaporating tray 7 at intermediate points by support member 15. 16 is a drain pipe, adapted to remove the spent ammonia solution which is delivered from the exit end of the evaporating tray 7 to the bottom of the tank and the condensate which collects on the back wall of the developing chamber 1-b and collects on the inclined bottom 17 of the developing chamber.

The evaporation of the ammonia from the ammonia solution which drips onto or flows across the evaporating tray 7 is caused by heat radiated from the under side of single bar heater 6. The heater 6 is not submerged in nor does it in any way contact the ammonia solution. Heat emanating from the upper side of the heater 6 is radiated into the vapor space of the developing chamber 1. Excess heat not needed for evaporation purposes is also reflected from the evaporating tray 7 into the vapor space. This heat which is radiated into or reflected into the vapor space against the perforated top 2 of the developing chamber is utilized to maintain the ammonia vapor above its dew point and thus prevent condensation on the perforated top 2 of the developing chamber or in proximity to the light-sensitive material being developed.

To accomplish an even distribution of the ammonia vapor over the surface of the perforated plate and also to effect such a distribution of the radiated heat that sufficient ammonia is evaporated for the development, but does not become so superheated that an absolutely dry vapor results, it is of importance that the single bar heater 6 be so spaced in relation to the evaporating tray 7 that it slopes slightly up away from the center line of said tray 7 in a direction away from the ammonia inlet end of the developing chamber. This inclination for a distance of 45" between the end plates of the developing chamber would be approximately $19/32$ ". It is also of importance that the evaporation assembly consisting of the single bar heater 6 and the evaporating tray 7 be so placed in the developing chamber that its center on a vertical line is approximately $1/3$ the distance from the bottom of the developing chamber to the perforated top on a vertical line through the geometrical center of the developing chamber. These dimensions for the placement of the heater with respect to the tray and the evaporating assembly with respect to the bottom and top of the developing chamber cannot be reduced to a simple formula. Each machine must be adjusted to the exact dimensions under operating conditions. However, the approximate relationships must be observed in the design, in order to facilitate adjustments.

18 is a horizontal partition bolted to the front side wall A in a manner which permits it to project into the space surrounding the developing chamber to a point at the bottom of the developing chamber. This partition 18 together with that part of the front side wall A which is above it and that part of apron D which projects

into the casing effects a closing off of the front side of the developing chamber 1. Thus, cool air is prevented from circulating around the front side of the developing chamber and, hence, a temperature differential is set up between the said front side of the developing chamber and the rear side 1-b. This temperature differential between the two sides of the developing chamber is desirable, in order to further insure against condensation of water vapor on the perforated top 2 of the developing chamber. Without desiring to be limited to any particular theory regarding the operation of this factor in my apparatus, I believe that a convection current of the heated gases is established by virtue of the temperature differential between the closed off front side of the developing chamber and the open rear side, which current flows from the heater 6 to the front side of the chamber in an upwardly direction, thence back along the perforated top and down along the rear side of the chamber. Condensation does not take place until the cool rear side of the chamber is reached. The condensed vapors collect on the rear wall 1-b and flow down to the sloping bottom 17 of the chamber and are discharged through the drain 16.

Having now particularly described my invention, what I claim is:

1. In an apparatus for developing light-sensitive materials of the type described, the combination of a developing chamber having a perforated top surface over which the light-sensitive material is conducted, an evaporating unit consisting of a tray upon which to flow developing liquid delivered from an ammonia inlet and a single bar heater, as the sole source of heat, disposed substantially along the entire length of and immediately above the tray on a slight incline away from the horizontal center line of the tray in a direction away from the ammonia inlet and so spaced from the tray that at no point does the heater contact the developing liquid, said evaporating unit being so disposed in the developing chamber that its center is located at a point on a vertical line through the geometrical center of the developing chamber approximately one-third the distance measured from the bottom of the developing chamber to the perforated top, and means for creating a temperature differential between the two opposite sides of the developing chamber.

2. In an apparatus for developing light-sensitive materials of the type described, the combination of a developing chamber having a perforated top surface over which the light-sensitive material is conducted, an evaporating unit consisting of a tray upon which to flow developing liquid delivered from an ammonia inlet and a single bar heater, as the sole source of heat, disposed substantially along the entire length of and immediately above the tray on a slight incline away from the horizontal center line of the tray in a direction away from the ammonia inlet and so spaced from the tray that at no point does the heater contact the developing liquid, said evaporating unit being so disposed in the developing chamber that its center is located at a point on a vertical line through the geometrical center of the developing chamber approximately one-third the distance measured from the bottom of the developing chamber to the perforated top, a casing enclosing the developing chamber, and a partition projecting from a side wall of said casing to the bottom of the developing chamber.

3. In an apparatus for developing light-sensitive materials of the type described, the combination of a developing chamber having a perforated top surface over which the light-sensitive material is conducted, an evaporating unit consisting of a tray upon which to flow developing liquid delivered from an ammonia inlet and a single bar heater, as the sole source of heat, disposed substantially along the entire length of and immediately above the tray on a slight incline away from the horizontal center line of the tray in a direction away from the ammonia inlet and so spaced from the tray that at no point does the heater contact the developing liquid, said evaporating unit being so disposed in the developing chamber that its center is located at a point on a vertical line through the geometrical center of the developing chamber approximately one-third the distance measured from the bottom of the developing chamber to the perforated top. 20

4. In an apparatus for developing light-sensitive materials of the type described, the combination in a developing chamber having a perforated top as developing surface and an ammonia inlet of an evaporating unit consisting of a tray upon which to flow developing liquid and a single bar heater, as the sole source of heat, disposed substantially along the entire length of and immediately above the tray and so spaced from the tray that at no point does the heater contact the developing liquid, said evaporating unit being so disposed in the developing chamber that its center is located at a point on a vertical line through the geometrical center of the developing chamber approximately one-third the distance measured from the bottom of the developing chamber to the perforated top.

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