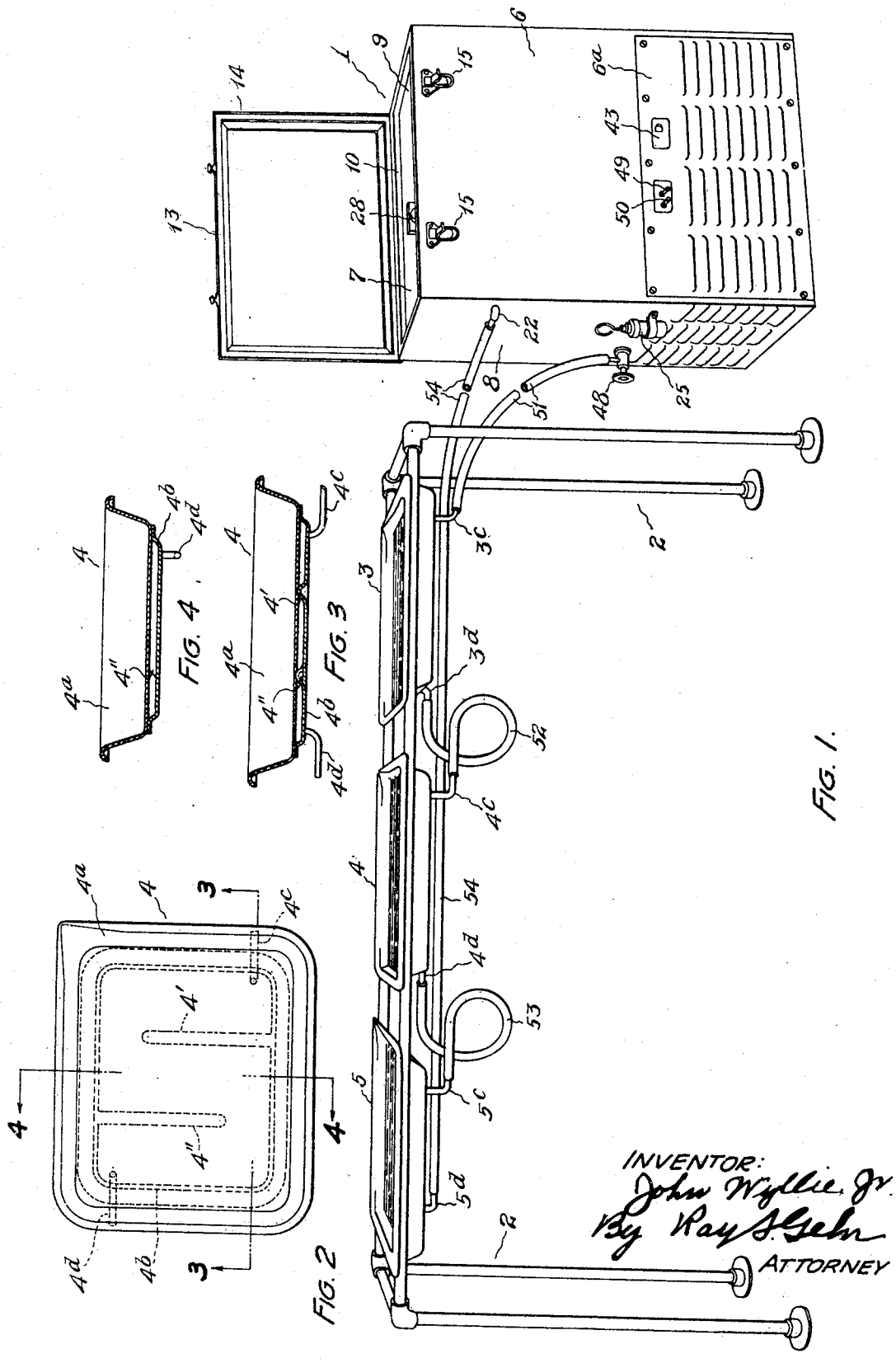
May 21, 1946. J. WYLLIE, JR 2,400,675

PHOTOGRAPHIC DEVELOPING APPARATUS

Original Filed Aug. 27, 1942 3 Sheets-Sheet 1



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PHOTOGRAPHIC DEVELOPING APPARATUS

Original Filed Aug. 27, 1942 3 Sheets-Sheet 2

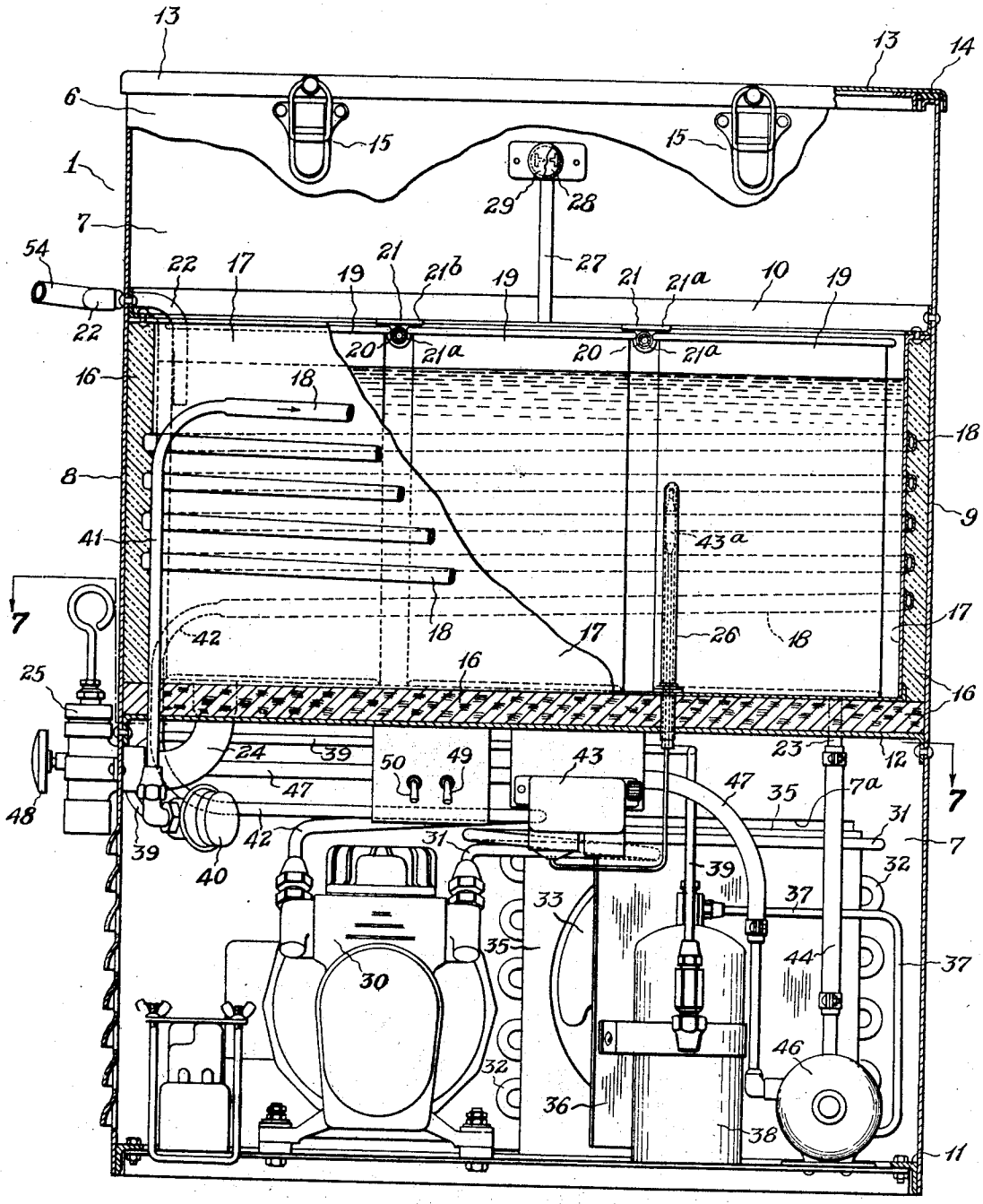


FIG. 5

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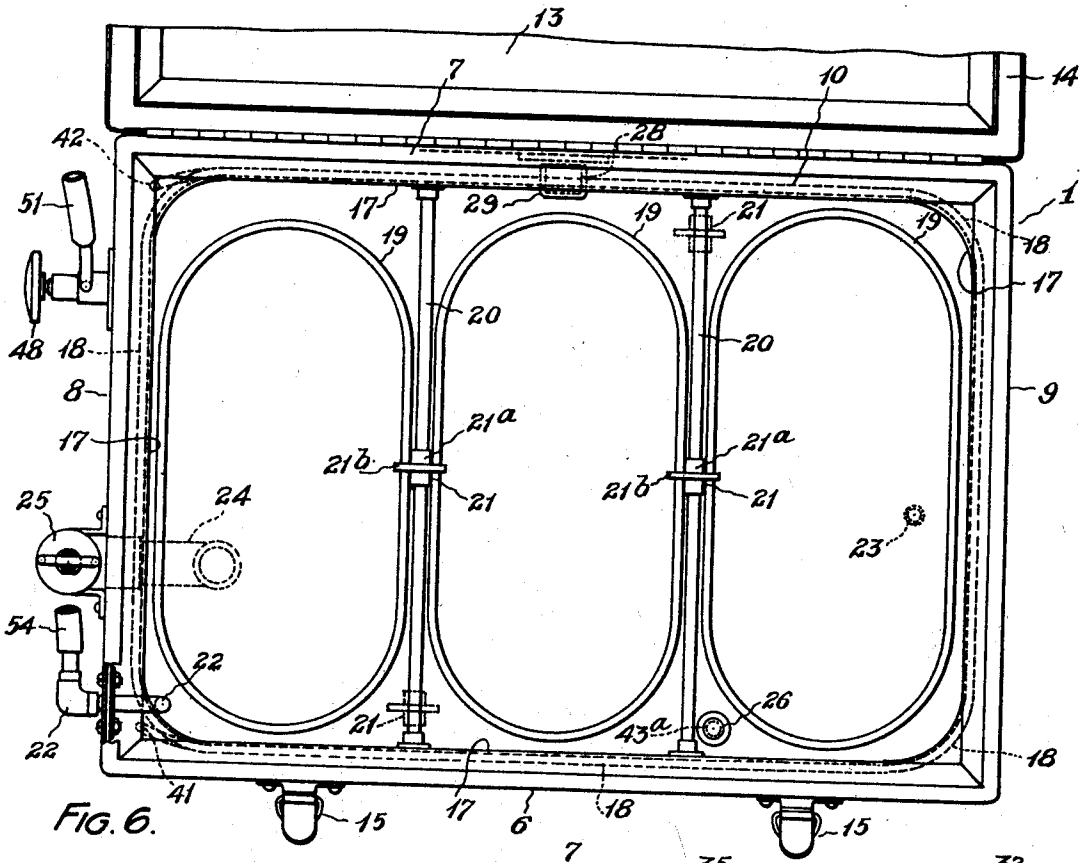


FIG. 6.

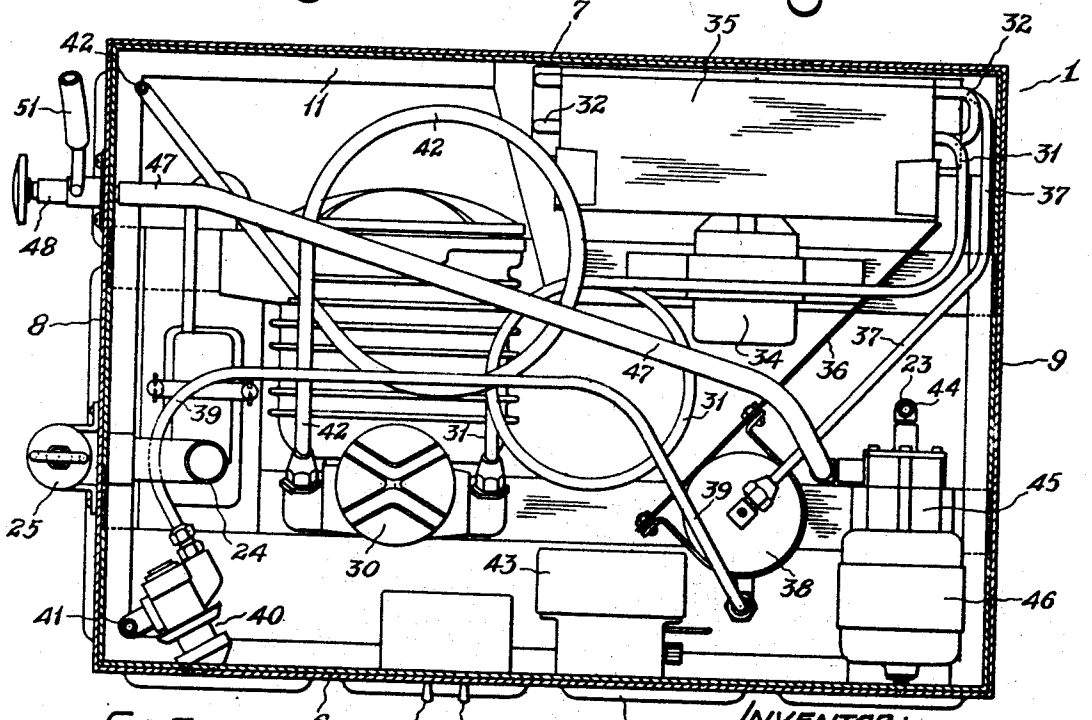


FIG. 7.

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UNITED STATES PATENT OFFICE

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PHOTOGRAPHIC DEVELOPING APPARATUS

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Original application August 27, 1942, Serial No. 456,327, now Patent No. 2,346,530, dated April 11, 1944. Divided and this application July 12, 1943, Serial No. 494,294

2 Claims. (Cl. 62—116)

The present application is a division of my application Serial No. 456,327, filed August 27, 1942.

The present invention relates to apparatus for developing photographic negatives and particularly to apparatus providing suitable temperature control of the working solutions with which the negatives are treated.

As it well known, it is desirable in the development of photographic negatives to maintain developer and fixing solutions and wash water at a suitable uniform temperature. Usually the temperature chosen is in the range of 65° to 70° F.

It is an object of the present invention to provide mechanically-refrigerated developing apparatus in which the means for treating the negatives and the refrigerating apparatus are combined in a unitary, portable cabinet structure in which the necessary devices are compactly arranged for convenient use and servicing which is relatively light in weight and reliable in operation so that the apparatus is well suited for military or other field use as well as for fixed location use.

A further object of the invention is the provision of apparatus of the character stated in which the various developing, fixing and washing solutions are held in containers immersed in a mechanically-refrigerated cooling bath and in which such bath can readily be drained when the solution containers are not in use so that the bath chamber may be employed as a dry refrigerated space.

Another object of the invention is the provision of a unitary, mechanically-refrigerated cabinet apparatus which comprises a compartment having a light-tight closure, open-topped solution containers in the compartment adapted to receive film-winding mechanism of the double-reel, motor-driven type and an electric outlet fitting mounted in a wall of the compartment to afford an electric outlet connection within the compartment for the motor of such film-winding mechanism.

Other objects of the invention, including some that are incidental or ancillary to those above noted, will be apparent from the description which follows.

With the various objects of the invention in view the invention consists in constructions, arrangements and combinations of parts as hereinafter explained in connection with the accompanying drawings showing a preferred embodiment of the invention and as particularly pointed out in the claims.

In the drawings,

Fig. 1 is a perspective view of the entire apparatus.

Fig. 2 is a plan view on an enlarged scale of one of the trays for developing prints.

Fig. 3 is a vertical section on the line 3—3 of Fig. 2.

Fig. 4 is a vertical section on the line 4—4 of Fig. 2.

Fig. 5 is an enlarged vertical section through the cabinet structure of the apparatus with some of the upper part of the structure shown in elevation and with some of the interior structure broken away to better illustrate details.

Fig. 6 is a plan view of the cabinet structure of the apparatus with its hinged lid or cover in open position.

Fig. 7 is a horizontal section taken through the cabinet structure at the top of the lower, machine compartment of the cabinet and showing the apparatus in said compartment in plan.

Referring in detail to the construction illustrated and first to Fig. 1, it will be noted that the apparatus comprises a cabinet structure designated as an entirety by 1 and comprising means for developing photographic negatives, and separate developing devices of the tray type comprising a tray support 2 and a series of trays 3, 4 and 5 mounted thereon. The trays are operatively associated with devices in the cabinet structure as will later be explained.

The cabinet 1 is constructed with front and rear walls 6 and 7 and end walls 8 and 9, all said walls being braced and strengthened by a horizontally-disposed angle iron frame 10 riveted to the side walls near the upper part thereof, by a similar angle iron frame 11 riveted or welded to the side walls at the bottoms thereof and by a horizontal sheet metal partition 12 which is rigidly riveted or otherwise secured to the side walls and which divides the cabinet into upper and lower compartments. The end wall 8 is provided with ventilating openings as shown and the front wall 6 is fitted with a large removable panel 6a also provided with ventilating openings. The open top of the cabinet, or of the upper compartment thereof, is closed by a hinged cover 13 which is provided with a soft rubber gasket 14 to engage the top edges of the side walls to effect a light and liquid-tight closure of the upper compartment, trunk type fastening devices 15 being provided to secure the cover in closed position. The bottom wall and a substantial part of the

side walls of the upper compartment of the cabinet are lined with heat-insulating material 16 and within this insulation lining is fitted a water-tight tank 17, the top flanged edges of which are secured to the frame 10. The tank 17 is preferably made of non-corrodible sheet metal and is surrounded by a refrigerant expansion coil 18, the turns of which are preferably soldered to the tank walls to secure good thermal contact therewith.

Within the tank 17 are arranged a series of three open-topped developing cans 19, 19 having flat bottoms and semi-circular end walls, as shown in Fig. 6, these cans being of the type adapted to receive a well-known, double-reel, motor-driven mechanism for the development of roll films.

Two tubular strut rods 20, 20 are mounted across the tank 17 near the top thereof in position to extend between the middle can 19 and the end cans, respectively. On each of these struts a clamp or holder 21 is slidably mounted, said clamp including a tubular part 21a to engage the strut 20 and a transverse rod 21b to engage the top edges of the adjacent cans 19, 19. When the clamps are in the central positions on struts 20 they serve to hold the cans 19 in position, but by sliding the clamps to the dotted line positions shown in Fig. 6 the cans are released for removal from tank 17.

A water inlet pipe for tank 17 is provided at 22 and an outlet pipe at 23. The tank is also provided with a large outlet drain pipe 24 which is fitted with a manual plug valve 25 which, when opened, permits the complete draining of the tank. The bottom wall of the tank 17 is fitted with a tubular housing 26 closed at its top and opening at its bottom through the bottom of the tank and horizontal wall 12, for a purpose which will later be explained.

It will be observed that the upper compartment of the cabinet extends substantially above the top of the tank 17 and this is to provide space or head room for the motor-driven reel devices previously referred to. To provide for the energizing of the reel motor, the cabinet is fitted within the upper compartment with an electric cable conduit 27 which at its upper end terminates in an electric socket 28 into which the electric cable of the reel motor may be plugged when roll films are to be developed. The socket outlet 28 is provided with a removable cap 29 to cover and protect the electric terminals from liquid which might otherwise accidentally enter the plug and short circuit the terminals.

In the lower compartment of the cabinet are arranged and mounted various refrigerating and water-circulating devices and accessories. 30 is a motor-driven refrigerant compressor of the hermetically sealed type suitably supported in known manner from the cabinet frame or wall structure. The refrigerant discharge opening of the compressor 30 is connected by means of conduit 31 with a condenser coil 32 which is mounted in front of an opening in the rear wall 7 of the cabinet. In front of the condenser coil 32 is arranged a fan 33 driven by motor 34 and the coil 32 and fan 33 are provided with a suitable casing 35 to insure effective action of the fan on the coil. An air shield or director plate 36 is disposed in an upright position as shown in Fig. 7 to insure that the current of air drawn through the lower compartment of the cabinet by the fan 33 will also pass effectively over the casing of the motor-compressor unit 30.

The discharge end of the condenser coil 32 is connected by a conduit 37 with a refrigerant receiver 38, the outlet of which is connected by conduit 39 with an automatic expansion valve 40 and this valve is, in turn, connected by conduit 41 with the inlet end of the expansion coil 18 surrounding the tank 17, the outlet end of the coil 18 being connected by conduit 42 with the suction opening of compressor 30. For automatic control of the refrigerating apparatus the compressor motor is provided with an adjustable, automatically-operating thermostatic switch 43 having a thermostatic bulb 43a disposed in the housing or well 26 of the tank 17.

The water-discharge conduit 23 of the tank 17 is connected by a flexible conduit section 44 with the inlet of a water-circulating pump 45 arranged to be driven by a motor 46. The outlet of the pump 45 is connected by a conduit 47 with a manually-operable throttle valve 48 mounted on the end wall 8 of the cabinet. The valve 48 is operatively connected with the tray developing devices as will presently be explained. Adjacent the automatic switch 43 at the front of the cabinet are arranged a manual switch 49 controlling the electric circuit of the compressor motor and a manual switch 50 controlling the pump motor 46.

Returning now to the tray developing devices shown in Fig. 1, all of the three trays, with one slight exception, are similar in construction and a description of the tray 4 shown in Figs. 2, 3 and 4 will suffice for all of them. The tray proper 4a is pressed from a single piece of corrosion-resistant metal and has one corner formed with a pouring lip in conventional manner. Nearly the entire bottom wall of the tray is covered by a water jacket provided by a shallow pan 4b which is attached as by welding and soldering with a water-tight joint to the bottom of the tray. At its right end, as viewed in Fig. 3, the water jacket is provided with a water inlet conduit 4c and at its other end with an outlet conduit 4d.

The pan element 4b is formed with upwardly-pressed ribs 4' and 4'' which are staggered as shown in Fig. 2 so that water entering the jacket through conduit 4c is given a circuitous path through the jacket to the discharge conduit 4d.

As stated, the three trays are substantially alike, the only difference being that in the case of tray 5 the outlet conduit of the water jacket is turned to the right instead of to the left as in the case of trays 3 and 4.

As is shown in Fig. 1, the water throttle valve 48 of the cabinet 1 is connected by a flexible rubber conduit 51 with the inlet conduit of the tray 3. The outlet conduit of tray 3 is connected by a flexible rubber tube 52 to the inlet conduit of tray 4 and the outlet conduit of tray 4 is similarly connected by a rubber tube 53 with the inlet conduit of tray 5. Finally the outlet conduit of tray 5 is connected by a long flexible tube 54 with the water inlet pipe 22 which is carried by cabinet 1 and discharges into the tank 17. With the water jackets of trays 3, 4 and 5 connected as described to the water conduits of cabinet 1, operation of the pump 45 serves to circulate water from tank 17, through the pump and the tray jackets and thence back to said tank.

It will be understood that the conduits 51 and 54 connecting the cabinet 1 with the tray apparatus may be of any suitable length to permit convenient disposition of the cabinet and tray equipment relative to each other. The apparatus is designed so that the cabinet and the tray ap-

paratus can be disposed in separate adjacent dark rooms so that development of prints may be carried on in one room quite independently of the development of films in the other room.

In the operation and use of the apparatus the tank 17 of the cabinet is supplied with an amount of water to submerge the developing cans 19 to a suitable depth and the cans 19, 19 are supplied with suitable working solutions constituting the developer, washing and fixing baths. The thermostatic switch 43 having been adjusted to provide the desired temperature for the water bath in the tank 17, the compressor motor is started by turning on the manual control switch 49. When the temperature of the water bath in tank 17 and of the working solutions in the cans 19 have all been lowered to the desired value (as shown by thermometer test), the apparatus is ready to receive and develop exposed photographic film. Assuming the use of motor-driven developing machines of the type hereinbefore referred to, the film, which is wound on the reels of the motor-driven machine, is lowered into the developer can, the electric cable of the machine motor is plugged into the socket 28 and the cover of the cabinet is then closed so that light may be snapped on in the dark room during the winding and re-winding of the film in the developer solution. During the processing of the film the latter is transferred from one solution to the other in the well known manner and throughout the processing the working solutions are maintained effectively at substantially uniform temperature, the automatic switch 43 serving to cut in and cut out the compressor motor as required.

During the development of films development of prints may be carried on in the adjoining dark room in the trays 3, 4 and 5 in which the usual or desired working solutions are placed. When such print development is to be carried on the operator starts the pump motor 46 by turning on the switch 50. After the refrigerating apparatus and the pump have been in operation for a sufficient length of time the circulation of cooled water through the water jackets of the trays 3, 4 and 5 lowers the temperature of the trays and the solutions therein to the desired working temperature. If this temperature is to be substantially the same as that for developing the films the throttle valve 48 will be opened wide to permit relatively free flow of water through the tray waterjackets. If, however, the operator prefers to work the print solutions at a somewhat higher temperature than the film solutions, such higher temperature may be maintained by a throttling adjustment of the valve 48. It will be understood that the flexible conduit connections for the trays 3, 4 and 5 permit them to be freely lifted, tipped and emptied in the usual manner.

It will be seen that the film developing apparatus is highly compact with resultant minimizing of weight, an especially low weight being attained if the structural parts of the cabinet are formed of light weight metal such as aluminum alloy. Furthermore, the advantage of close temperature regulation for the print developing trays is attained by the use of simple and convenient tray apparatus and without any substantial addition to the refrigeration apparatus for the cabinet other than the relatively simple motor-driven water-circulating devices.

The facility with which the cabinet and tray apparatus, respectively, can be installed in adjoining dark rooms or compartments and the compactness and comparatively light weight of the entire apparatus make it particularly well suited for installation in mobile truck or trailer units for use in the field. Also the efficient way in which the cabinet and tray apparatus, respectively, can be used independently and simultaneously results in a marked saving of time in developing negatives and prints and this is advantageous particularly in the case of mobile units for military use.

It will be understood that the invention is not limited to the specific construction illustrated in the drawings but may be embodied in a wide variety of constructions within the scope of the appended claims.

What is claimed is:

1. In photographic apparatus for developing roll film negatives, the combination of a cabinet structure having therein a lower compartment and an upper compartment which has a top opening and a lid for effecting a light-tight closure thereof, said upper compartment forming an open-topped tank to hold a liquid cooling bath; a plurality of open-topped solution containers disposed in the said upper compartment to be cooled by the liquid bath therein, said solution containers being of a depth greater than the width of the film to be developed and of horizontal dimensions to receive film-winding mechanism of the double-reel, motor-driven type; an electric outlet socket fitting mounted in a wall of the upper compartment to afford an electric outlet connection within the compartment for the motor of the said film-winding mechanism; mechanical refrigerating apparatus comprising compressor and condenser units housed in the lower compartment of the cabinet and a refrigerant expansion coil associated with the cooling bath tank.

2. Photographic apparatus as claimed in claim 1 in which the electric socket fitting comprises a detachable cover to protect the electric terminals of the fitting from liquid in the upper compartment of the cabinet.

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