Aug. 12, 1930. G. W. HOPKINS 1,772,834

FILM DEVELOPING APPARATUS

Filed Aug. 31, 1927 2 Sheets-Sheet 1

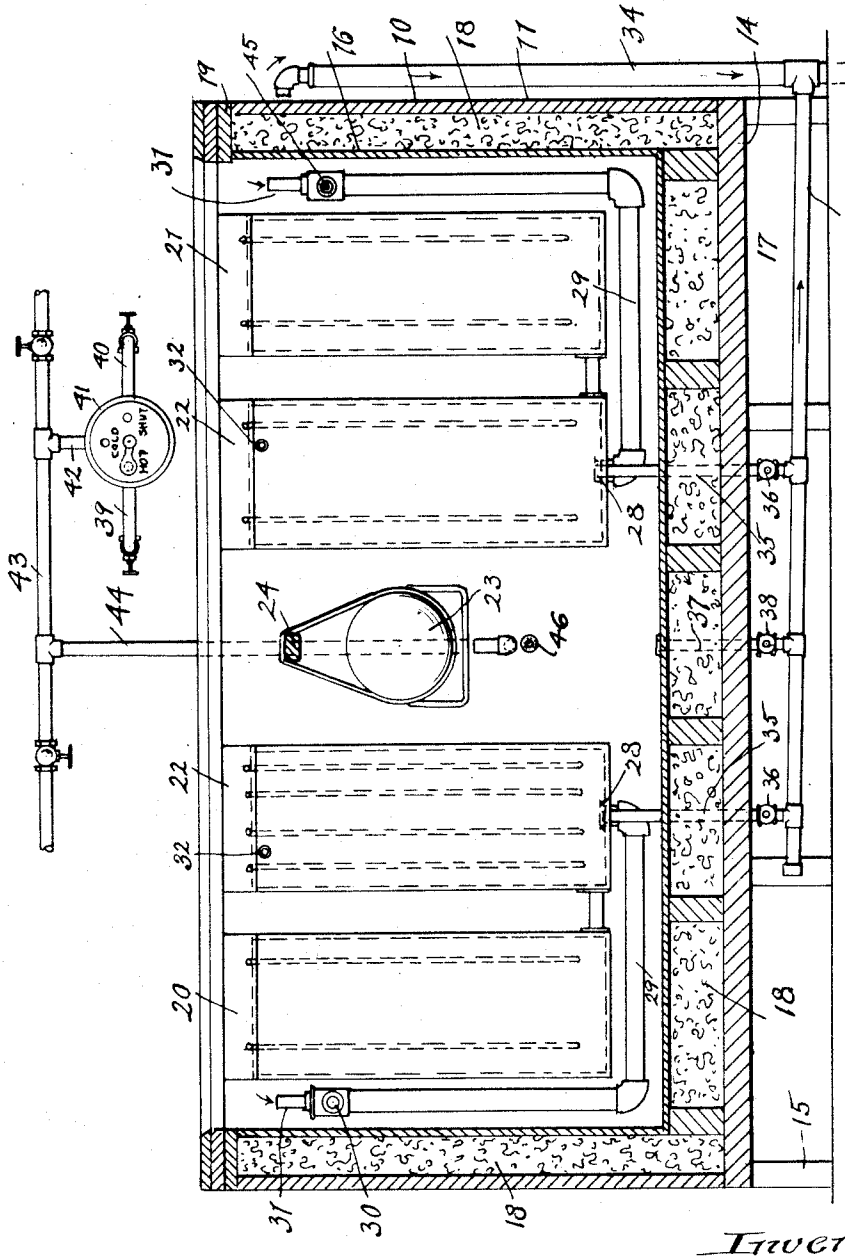


Fig. 1.

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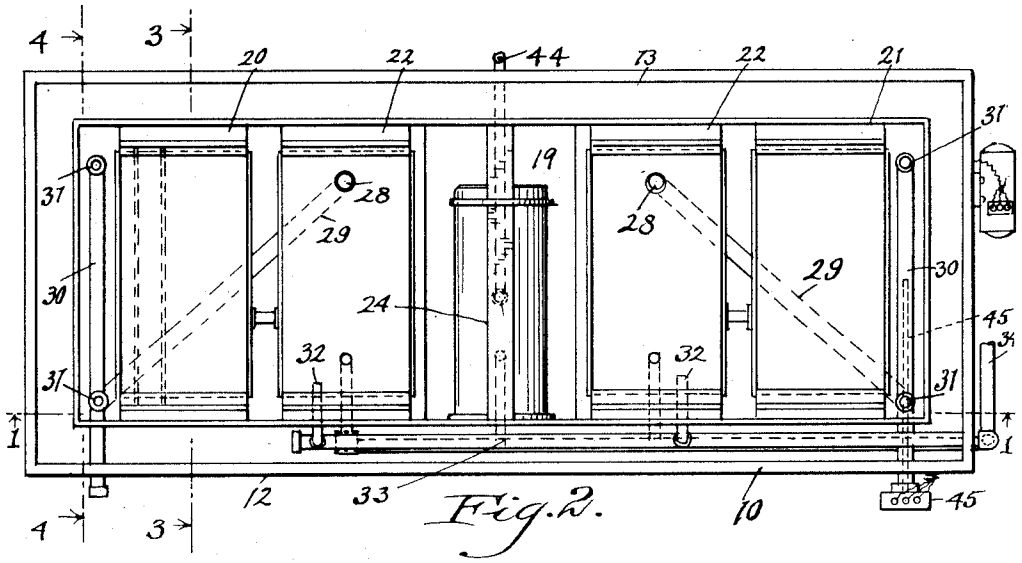


Fig. 2.

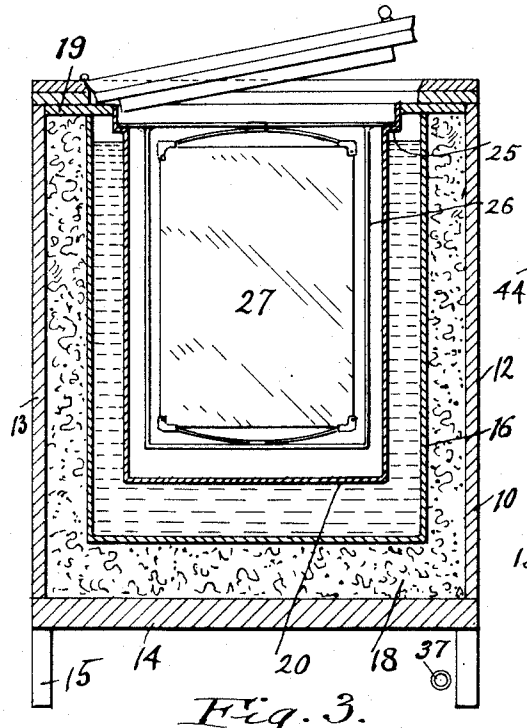


Fig. 3.

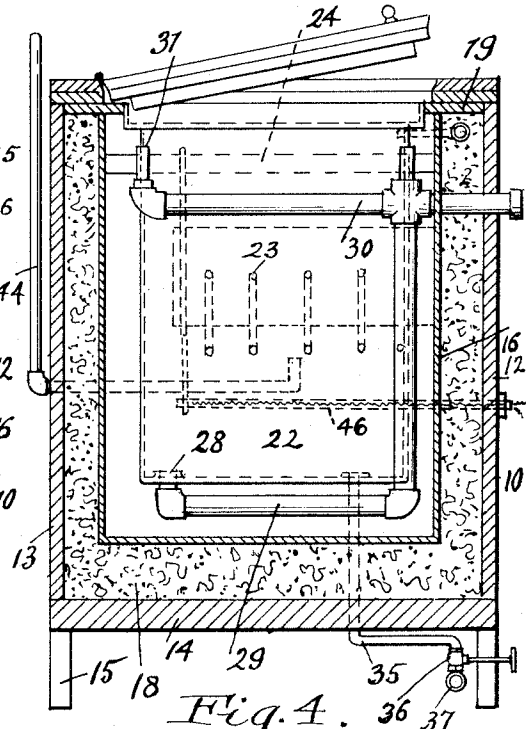


Fig. 4.

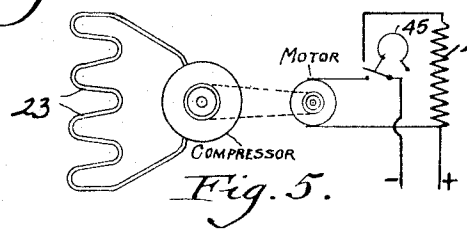


Fig. 5.

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UNITED STATES PATENT OFFICE

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FILM-DEVELOPING APPARATUS

Application filed August 31, 1927. Serial No. 216,556.

This invention relates to a photographic film developing and fixing apparatus and has for one of its objects to provide an apparatus which is simple in construction, efficient in operation and exceptionally inexpensive in cost.

In the developing of photographic films after exposure, it is customary to submerge the film in a developing solution for a suitable length of time or until the subject upon the film is clearly visible, at which time the film is transferred to a wash water and then to a fixing bath or solution. After the film has remained in the fixing solution or bath for a suitable length of time, it is thereafter transferred to a water wash or bath and permitted to remain there until the film is thoroughly fixed, after which it is removed and suitably dried for interpretation.

Considerable difficulty has been experienced in developing films, particularly during hot weather, inasmuch as the developing and fixing solutions become too warm, due to the surrounding atmospheric conditions, and, as a result, the photographic films, during the stage of development, are very often stained and sometimes ruined. Similar difficulties are experienced during cold weather inasmuch as the developing solutions are considerably colder, which materially retards the developing of the films, and various methods have been employed to reduce the temperature of the developing solutions in hot weather and to raise the temperature in cold weather. One of these methods of lowering the temperature of the developing solutions in hot weather is to place the developing tank in a tray of water containing ice, but this is very unsatisfactory inasmuch as the temperature is continually changing as the ice becomes melted or when new ice is introduced into the tray of water.

It is, therefore, one of the primary objects of this invention to provide an apparatus having a developing solution, a fixing solution and running wash water, all of which can be predeterminately maintained at any desired temperature irrespective of surrounding atmospheric conditions. It has been found that a temperature of about 65° Fahrenheit is the most satisfactory temperature at which to work with these solutions, inasmuch as the best results are obtainable under that temperature condition.

A further object of the invention is to provide an apparatus of the type referred to in which running water is continually fed around the developing and fixing tanks to maintain the solutions contained therein at a predetermined temperature and then causing the water to flow through wash water tanks adapted to support the photographic films after the latter have been developed and fixed, so as to wash the solutions from the films before drying.

A further object of the invention is to provide a novel structure and arrangement whereby the photographic films, during the process of development, can be efficiently handled and the films developed with greater speed than is now possible when resorting to the customary methods of developing photographic films.

With the objects above indicated and other objects hereinafter explained in view, my invention consists in the construction and combination of elements hereinafter defined and claimed.

Referring to the drawings:—

Fig. 1 is a vertical sectional view taken on line 1—1 of Fig. 2.

Fig. 2 is a top plan view of the apparatus with the cover removed showing the arrangement of the developing and fixing tanks and the wash water tank.

Fig. 3 is a vertical cross sectional view taken on line 3—3 of Fig. 2 and showing the manner in which the photographic film is supported within the developing tank.

Fig. 4 is a vertical cross sectional view taken on line 4—4 of Fig. 2 and showing the manner in which the wash water tanks are supplied with running water.

Fig. 5 is a diagrammatic view of the wiring diagram and the refrigerating unit.

In the drawings, 10 represents a box-like structure adapted to enclose and support the entire apparatus which will be described in detail. This box-like structure which is preferably formed of wood has end walls 11 of

suitable depth and front and back walls 12 and 13, respectively, of suitable length, all securely joined together by nails or other means, and having a bottom member 14 also of wood, or other suitable material, secured thereto. This box-like structure 10 is supported upon a floor by a plurality of depending legs 15 secured to the underside of the bottom member 14. The box-like structure 10 can be of any suitable height but should be of such a height that a person can conveniently reach within the interior while developing the photographic films.

Positioned centrally within the box-like structure 10 and spaced apart from the walls thereof is a water receptacle 16 supported upon and spaced from the bottom member 14 by a plurality of transversely extending supporting members 17 which can be secured, respectively, to the bottom member 14 and the receptacle 16, if so desired. The space between the receptacle 16 and the box-like structure 10 is filled with cork insulation 18, or other suitable insulating material, to reduce, as much as possible, temperature changes of the water within the receptacle 16 by the surrounding atmosphere. The upper ends of the receptacle 16 and the structure 10 terminate in substantially a horizontal plane and are joined together by a horizontally positioned rectangular frame member 19 which closes the opening at the upper portion between the two receptacles.

Positioned transversely within the receptacle 16 and supported from the rectangular frame 19 are a plurality of tanks, the developing tank being indicated at 20, the fixing tank by 21 and the wash water tanks by 22. These four tanks are spaced apart and grouped with the developing tank 20 and one water wash tank 22 at one end of the receptacle 16, and the fixing tank 21 and the other wash tank 22 at the opposite end of the receptacle 16. The two water wash tanks are spaced apart sufficiently to accommodate a refrigerating unit 23 suspended within the receptacle 16 by a horizontally extending transverse rod 24 connected to the front and back walls, respectively, of the receptacle 16, and for a purpose which will be later described.

The tanks 20, 21 and 22 are of the same construction and are preferably formed of highly conductive metal having at their upper opposite edges outwardly offset portions 25 which are adapted to support frames 26 to which the photographic films are secured, the frames being suspended in vertical position, as clearly shown in Fig. 3. The various tanks are wide enough to receive a number of frames containing photographic films and these tanks can be made of any desirable width, depending upon the number of films it is desired to handle at any one time. The developing tank 20 and fixing tank 21 are filled by hand, or otherwise, with developing and fixing solutions, respectively, from the top of the tanks and do not contain any outlet other than the opening in the top of each tank. The water wash tanks 22 are provided with inlet openings 28 in the bottoms thereof through which water is continuously supplied to the tanks by a pipe 29, connected to a horizontally extending pipe 30 supported in the upper portion of the receptacle 16 between the end walls and the developing and fixing tanks 20 and 21. At the front and back ends of the pipe 30 are overflow pipes 31 which extend upwardly within the receptacle 16 but terminate slightly below the tops of the respective tanks. The water which is introduced into the receptacle 16 rises until it reaches the top of the overflow pipes 31 which act to maintain the water within the receptacle 16 at a predetermined level. The water, however, being continually fed into the receptacle 16 results in the overflow being carried off through the overflow pipes 31, which communicate through the pipes 30 and the pipes 29 with the wash water tanks 22 through the openings 28 in the bottoms of the tanks. The water within the tanks 22 will rise until it reaches the outlet pipes 32 secured in the upper portions of the tanks 22 and will be carried off through a drain pipe 33 and subsequently through the drain pipe 34 to any suitable sewerage system.

The wash water tanks 22 are provided with independent drains 35 connected to the bottom of the tanks and communicating through manually operated valves 36 with a drain pipe 37 leading to the drain pipe 34. By operation of the valves 36, the water within the wash water tanks 22 can be drained out and the system emptied for cleaning or repair. The receptacle 16 can likewise be drained through the pipe 37 communicating through the manually operated valve 38 with the drain pipe 37.

The fresh water is fed to the receptacle 16 through a hot water supply line 39 and a cold water supply line 40 into a manually controlled mixing chamber 41 having a discharge pipe 42 communicating with a pipe 43 through a T-section with the pipe 44 extending down the back of the apparatus and through suitable openings in the back 13 of the box structure 10 and receptacle 16 to a position adjacent the coils of the refrigerating unit 23, as clearly shown in Fig. 4. The water, therefore, which is fed into the receptacle 16 is directed against the coils of the refrigerating unit 23. The operation of this refrigerating unit 23 is controlled by a thermostat 45 supported in the end of one of the overflow pipes 30 and in contact with the water.

A heating unit 46 is positioned adjacent the water inlet pipe 44 within the receptacle

16 and preferably supported from the supporting member 24. This unit is suitably connected in the circuit which controls the operation of the refrigerating unit 23 and is employed to raise the temperature of the water within the receptacle up to a certain degree. The operation of the unit is controlled by the thermostat 45 as, for instance, when the temperature of the water within the receptacle 16 drops a predetermined amount the thermostat 45 is affected which causes a switch in the circuit with the heating unit 46 to be closed and the water is thereby brought up to the desired temperature.

The thermostat 45 is located within easy reach of the person working at the developing apparatus and has a portion extending into the end of the pipe 30 which receives the water overflow from the receptacle 16. It is therefore apparent that the thermostat is affected by the changes in temperature of this water with which it is in contact and by connecting the thermostat to a suitable switch in a circuit with a motor connected to the compressor of the refrigerating unit, the effective operation of the latter can be controlled. For instance, if the thermostat is adjusted to maintain the water within the receptacle 16 at a temperature of 65° F., which is the desirable temperature at which to develop photographic films, any change in the temperature of the water in the receptacle, due to the fresh incoming water or to atmospheric conditions, will affect the thermostat to an extent of either opening or closing the switch of the motor circuit, thereby causing operation or non-operation of the compressor of the refrigerating unit.

In employing the apparatus for the development of photographic films, the receptacle is continuously supplied with water through the inlet pipe 44. When the level of the water rises to the overflow pipes 31, the overflow of water is carried off therethrough and to the wash water tanks 22 with which the overflow pipes communicate. The water in the tanks 22 reaching the level of the outlet pipes 32 passes out therethrough into the drain 33. It will be observed that a continual circulation of water around the tanks 20, 21 and 22, through the wash water tanks 22 and thence out of the apparatus by way of the outlet pipes 32 is therefore established.

The circulating water can be maintained at any desired temperature, but preferably 65° F., by properly adjusting the thermostat and, due to the high conductivity of the metal of the developing and fixing tanks 20 and 21, the solutions contained therein will be maintained at substantially the same temperature. This results in better developing conditions and improved developed films.

While I have described the preferred arrangement embodied in my invention, it should be understood that changes and modifications may be made thereto without departing from the spirit of the invention as defined in the appended claims.

Having thus described my invention, I claim:

1. In an apparatus of the type described, a water receptacle, means for continuously supplying water thereto, a developing tank adapted to contain a developing solution and positioned in said receptacle in contact with said water, a wash water tank positioned in said receptacle, a pipe in said receptacle communicating with said wash water tank for continuously supplying said latter tank with water from said receptacle, means for carrying off the surplus water from said wash water tank, and means for automatically maintaining said water at predetermined temperatures.

2. In an apparatus of the type described, a water receptacle, means for continuously supplying water thereto, a developing tank adapted to contain a developing solution and positioned in said receptacle in contact with said water, a wash water tank positioned in said receptacle, a pipe in said receptacle communicating with said wash water tank for continuously supplying said latter tank with water from said receptacle, means for carrying off the surplus water from said wash water tank, a temperature control unit in contact with said water, and means for automatically actuating said unit upon a change in temperature of said water.

3. In an apparatus of the type described, a receptacle adapted to contain water, means for supplying water thereto, a developing tank, a fixing tank, and a wash tank, means for supplying water to said wash tank from said receptacle, each of said tanks being positioned in said receptacle and partially submerged in the water, and means for maintaining said water at a predetermined temperature.

4. In an apparatus of the type described, a receptacle, means for continuously supplying water thereto, a developing tank of conductive metal positioned in said receptacle in contact with said water, a fixing tank positioned in said receptacle in contact with said water, a wash water tank positioned in said receptacle in contact with said water and continuously supplied with water from said receptacle, means for carrying off the oversupply of water from said wash water tank, and means for automatically controlling the temperature of said water within said receptacle.

5. In an apparatus of the type described, a receptacle, means for continuously supplying water thereto, a developing tank of conductive metal positioned in said receptacle in contact with said water, a fixing tank positioned in said receptacle in contact with said water, a wash water tank positioned in said

receptacle in contact with said water and continuously supplied with water from said receptacle, means for carrying off the oversupply of water from said wash water tank, a temperature control unit associated with said water, and means for automatically actuating said unit upon a change in degree of temperature of said water.

6. In an apparatus of the type described, a box-like structure, a receptacle supported therein and insulated therefrom, a developing tank, a fixing tank, and a wash water tank associated with each of said tanks supported in said receptacle, means for continuously supplying water to said receptacle so as to freely circulate around said tanks, means for continuously supplying water to said wash water tanks from said receptacle, outlets for the water in said wash water tanks, and means for controlling the temperature of the water in said receptacle.

7. In an apparatus of the type described, a box-like structure, a receptacle supported therein and insulated therefrom, a developing tank, a fixing tank, and a wash water tank associated with each of said tanks supported in said receptacle, means for continuously supplying water to said receptacle so as to freely circulate around said tanks, means for continuously supplying water to said wash water tanks from said receptacle, outlets for the water in said wash water tanks, a temperature control unit associated with said water, and means for automatically actuating said unit upon a change in degree of temperature of said water.

8. In an apparatus of the type described, a receptacle, a developing tank, a fixing tank, and a wash water tank associated with each of said tanks supported in said receptacle, means for continuously supplying water to said receptacle so as to freely circulate around said tanks, means for continuously supplying water to said wash water tanks from said receptacle, outlets for the water in said wash water tanks, a temperature regulating unit associated with said water, and means including a thermostat for actuating said unit upon a predetermined drop in the temperature of said water.

9. In an apparatus of the type described, a receptacle, means for continuously supplying water thereto, a developing tank positioned in said receptacle in contact with said water, a wash water tank positioned in said receptacle in contact with said water, conducting means for continuously supplying water to said wash tank from said receptacle, and control means positioned in said conducting means for automatically controlling the temperature of the water within said receptacle.

10. In an apparatus of the type described, a receptacle, means for continuously supplying water thereto, a developing tank positioned in said receptacle in contact with said water, a wash water tank positioned in said receptacle in contact with said water, conducting means for continuously supplying water to said wash water tank from said receptacle, a heating unit associated with said receptacle, a refrigerating unit associated with said receptacle, and means positioned in said conducting means for selectively controlling the operation of said units.

In testimony whereof, I hereunto affix my signature.

GEORGE W. HOPKINS.