MOTION PICTURE APPARATUS

A SMALL DEVELOPING MACHINE*

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It is the purpose of this paper to describe a small developing machine especially suitable for research work and for such cases wherein it is desirable to duplicate the conditions that exist in the largest film printing and developing establishments. In designing the machine, the first thought was compactness; not only for the purpose of saving space, but primarily to make it possible for the operator of the machine to watch at all times all the phases of development from the time of feeding the film into the machine to the final rewinding after the film leaves the drying cabinet.

The machine consists of the following units:

(1) The developing, hypo, and washing tanks.
(2) The cabinet, containing the motor drive, motor ventilator, high-pressure blower, electrical heating unit for the drying air, air filters, and a complete switchboard for all the thermostat relays and starters for the circulation pump motor.
(3) Drying cabinet.

In addition, there is a small unit containing the constant level tank, the circulation pump, and the coil and reheating unit controlling the temperature of the bath.

The dimensions of the smallest machine are 7 feet long, 6 feet high, and 3 feet wide. Its capacity, necessarily small, is 650 feet of film per hour, for a developing time of four minutes. A slightly larger machine has an output of 1300 feet per hour. The machine can be used for developing either positive or negative film.

The change from positive to negative bath can be effected in two different ways: The circulation pump can drain the positive developer from the developing tanks and return the bath to the storage tank. Then the negative storage tank would be connected to the circulation circuit. Another way to change the positive to a negative bath is to change the developing tubes. The tubes are instantly interchangeable, and such procedure may be preferable in many cases especially when it is intended to try various developing solutions as for picture and sound.

The temperature of the developing solution is thermostatically controlled. The film passes from one developing tank to the other with the least possible exposure to the air. The developing time can be regulated from 4 to 16 minutes, by changing from one to the other of the two speeds provided in the machine and by lengthening or shortening the film loops in the developing tanks. The developing time can be changed in each individual developing tank so that if it is

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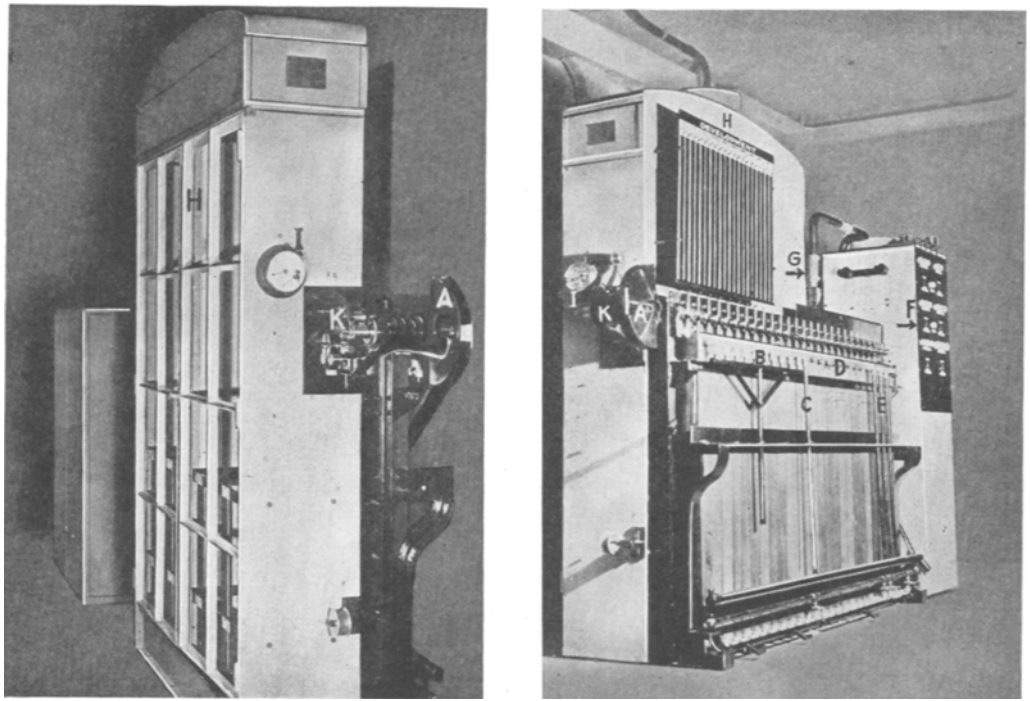

FIG. 1. (*Right*) Rear of developing machine; (*Left*) front view; (*A*) film feed; (*B*) developing tanks; (*C*) washing; (*D*) hypo tanks; (*E*) washing tanks; (*F*) cabinet containing air filters, motor ventilator, motor drive, air-heating unit, switchboard for motor circulation pump, and relays for thermostats; (*G*) blower; (*H*) drying cabinet; (*I*) thermostat; (*K*) film rewind.

discovered in the first or second developing tank that the developing time is either insufficient or excessive, it is possible to compensate for the condition in the last developing tank.

In the smallest model there are five developing tubes, followed by one washing tube, and finally by five hypo tubes and three washing tubes. At this point the film leaves the tubing, its direction of travel is changed, and it is immersed on the opposite side of the machine in three additional washing tubes. After leaving the last washing tube and before entering the drying cabinet, the film passes a high-pressure blower, which is so constructed that the water is blown off entirely without causing the undesirable spots produced by the so-called "squeegees." The film then enters the drying cabinet, forming four loops. The temperature of the drying cabinet is also thermostatically controlled. After leaving the drying cabinet, the film is rewound exactly at the same point where it was fed into the machine.

The machine is equipped with a system for filtering the air before heating it for the drying. For locations where it is necessary to control the humidity of the air, as is especially the case in the tropics, a refrigerating system and closed air circuit are provided. The air is cooled; the excess moisture is eliminated; it is then heated and passed through the drying cabinet, the same air being returned to the refrigerating unit. Such a procedure makes it possible to condition the air perfectly with a comparatively small refrigerating unit.

The temperature control of the bath, the circulation pump, and the constant-level tank are built in one unit. By a pipe connection, preferably of rubber or lead, the developing solution passes into the constant-level tank by gravity, the tank being so arranged that it automatically refills the developing tanks if the developing solution is reduced by evaporation or by being carried over into the washing and hypo tanks by the film. The tank supplies only fresh developer. Below the constant-level tank is the temperature control tank, which also contains the circulation pump. The temperature of the bath is controlled by a copper coil, which uses either city water or, if conditions make it necessary, artificially cooled water. This unit is equipped also with a heating unit and a very sensitive thermostatic control so that the temperature can be maintained constant within $^1/_2$ degree.

The machine has been designed so as to require a minimum of labor in installing it. Normally, the plumbing for the water system, and the pipe connections for the storage tanks and circulation unit must be provided by the purchaser. However, in the latest design, all connections to and from the storage tank and circulation unit are made by rubber pipes delivered with the machine, a procedure that greatly reduces the cost of installation. Only one feed line for the electrical current to the switch-board is necessary.

The material used in this machine is Monel, Allegheny, and hard rubber. The tanks are made of ebonite, and are easy to clean and, as mentioned above, to interchange.