

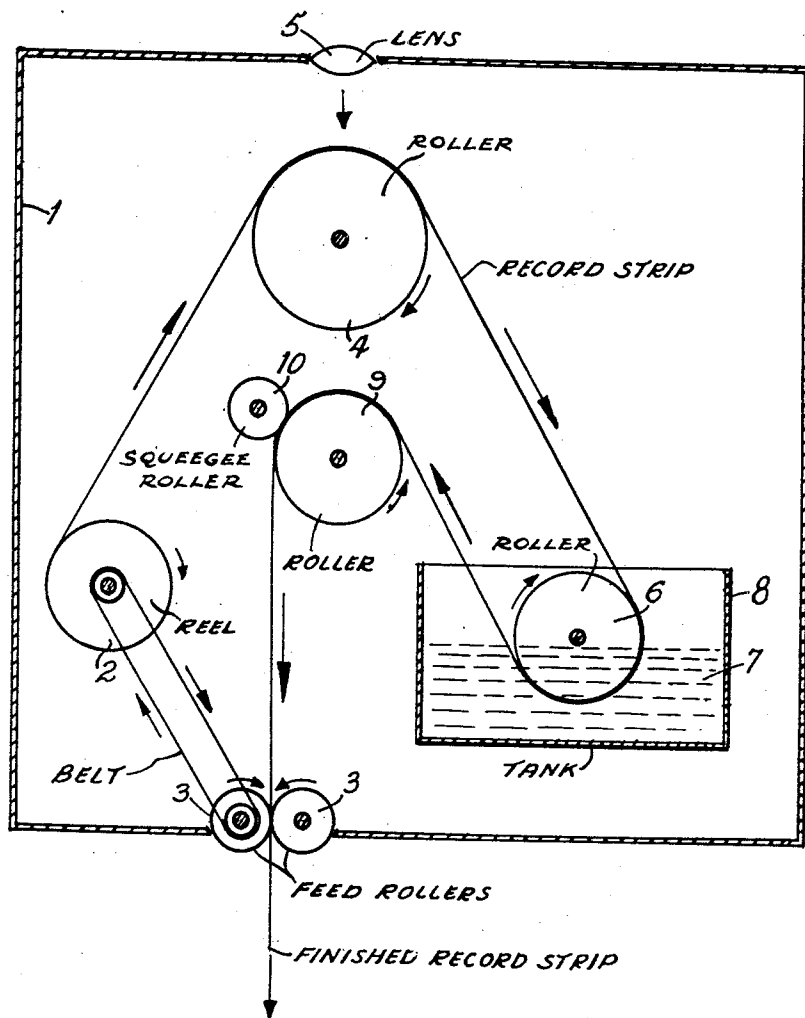
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PHOTOGRAPHIC DEVELOPING METHOD AND APPARATUS

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PHOTOGRAPHIC DEVELOPING METHOD
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The present invention is directed to a method and apparatus for developing images on sensitized paper or film.

There are many operations in which it is desired to produce quickly a permanent record of some value undergoing change. Typical cases are found in the art of oil prospecting and well logging. In oil prospecting by the seismic method seismic waves reflected from the subsurface are picked up at the surface, converted into electrical quantities and recorded conventionally by the use of a recording galvanometer. This procedure produces on a film or sensitized paper a latent image of the record which must then be developed to render it visible. The ordinary photographic developing procedure involves chemical developing, fixing, washing and drying. This operation requires a period varying from several minutes to perhaps an hour, depending upon various conditions.

In like manner, in the electric logging of wells there is produced a trace or traces on a sensitized strip by recording galvanometer. Again, the development of this trace requires the operations above enumerated with the consequent time consumption.

The principal object of the present invention is the provision of a method and apparatus primarily intended for field use in operations of the type above referred to which produce a developed record strip continuously as rapidly as the recording is made.

An additional object of the present invention is the provision of an apparatus of the type indicated which is simple, inexpensive and fool-proof in operation.

Briefly, the method of the present invention comprises dipping the exposed film or sensitized paper in a solution of a special electrolytic developing solution and then pressing the exposed film surface against a smooth, clean surface composed of a metal occurring higher in the electromotive series than silver. The most convenient metal and the most effective one for this purpose is copper. Excellent results are secured by using a dilute solution of ammonium hydroxide in water; for example, about a 2% solution, as the electrolyte. A better definition of the image is secured if a minute quantity of a mercury salt

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is incorporated in the solution of electrolyte. A preferred formula for the electrolyte solution is:

28% NH_4OH	ccs..	40
Formaldehyde	ccs..	5
H_2O	ccs..	2000
HgCl_2	gms..	0.5

The nature and objects of the present invention will be more clearly understood from the following detailed description of the accompanying drawing in which the single figure is a vertical section of one type of suitable apparatus.

Referring to the drawing in detail, numeral 1 indicates a camera box provided with a reel of film or sensitized paper 2 which is fed over a series of rollers by feed rolls 3 which eject the developed record from the box. The recording strip passes from the reel over a roller 4 with its sensitized surface exposed to a lens 5 through which the value to be recorded is focused on the sensitized strip. The record strip passes from roller 4 over a roller 6 partly immersed in a solution 7 of an electrolyte contained in tank 8. From roller 6 the sensitized strip is threaded over a roller 9, the surface of which is composed of or contains a metal higher in the electromotive series than silver. A convenient material of which to compose this roller is brass. In firm contact with the roller 9 is a squeegee roller 10 which serves to dry off or remove any moisture contained on the record strip. It will be observed that the sensitized side of the strip is exposed in turn to the electrolyte and then brought into close contact with the surface of the roller 9. In order to insure good contact the device is operated so that the strip is taut between rollers 6 and 9.

The present invention also contemplates the employment of the copper or other metal of the type indicated in finely divided powder form as a slurry in the electrolyte 7.

In this embodiment, roller 9 need not be composed of such metal but may form with roller 10 merely a squeegeeing and drying means.

The present invention also contemplates the employment of stationary bars or shims of brass or other metal of the type indicated which can be arranged in the path of the strip in such a way that the strip is pressed thereon. In other words,

instead of roller 9 there can be employed a stationary bar or shim of metal.

The present invention also contemplates the use of a silver halide type light-sensitive emulsion paper, the emulsion and paper base of which are impregnated with copper or other suitable metal powder. In this embodiment, development of the exposed strip merely involves immersion of the strip in the above described electrolyte developing solution and then in a dilute acid bath so that the development will cease before the film strip is ejected from the light-tight camera box.

The time of contact of the exposed sensitized surface with the electrolyte and with the copper or other metal need not be more than instantaneous, that is to say, there is no time lag involved in this operation. As a consequence, the developed film is fed out of the camera as rapidly as the desired value is recorded upon it and comes out sufficiently dry to be handled immediately. This constitutes a very substantial advantage in operations of the aforesaid type because often changes in technique are indicated to be desirable by the character of the record being produced and the sooner the operator can ascertain the desirability of such change in technique the more effective becomes the operation.

In addition, no thermal control is necessary for the practice of the process of the present invention. The need for an elaborate dark room is eliminated. Furthermore, the operator need possess no skill in photographic processes. All of these advantages are of extreme importance in field work where simplicity and operability by those having no special skill are attractive features.

The nature and objects of the present invention having been thus described and illustrated, what is claimed as new and useful and is desired to be secured by Letters Patent is:

1. A method for producing a permanent image on a sensitized strip containing a silver halide emulsion which comprises continuously exposing the emulsion side of the strip to a beam of light, continuously contacting the exposed emulsion side of the strip with an aqueous solution of ammonia and contacting the electrolyte-wet surface with

copper while simultaneously removing excess solution from said strip.

2. An apparatus for making continuous records comprising a reel carrying a silver halide emulsion, means for exposing the emulsion to a beam of light representing the value to be recorded, means for passing the exposed emulsion into contact with an aqueous solution of ammonia, means for pressing the electrolyte wet surface against a plate of copper and means for removing excess solution from said surface.

3. The method according to claim 1 in which the aqueous solution of ammonia contains a minute quantity of a soluble mercury salt.

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