Aug. 6, 1940. J. CERNY ET AL 2,210,445

PORTABLE APPARATUS FOR DEVELOPING AND PRINTING FILMS IN DAYLIGHT

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FIG. 1

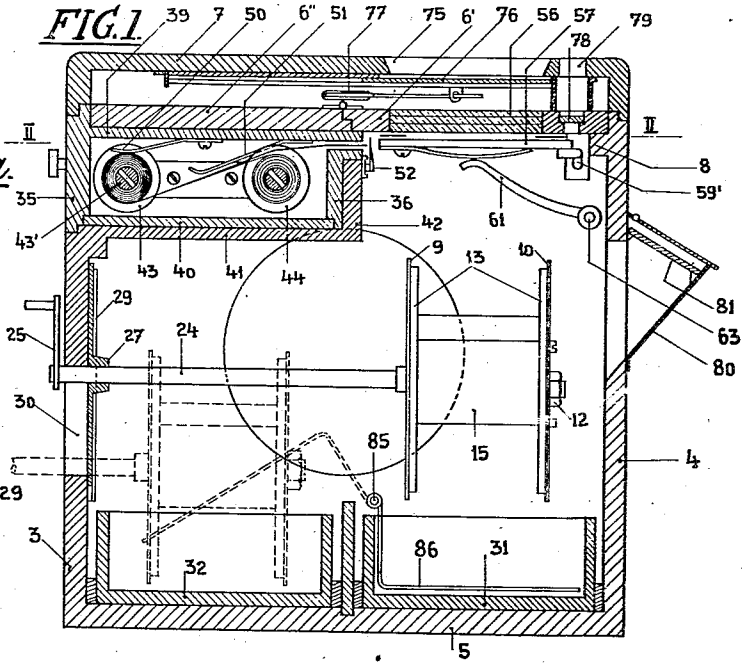


FIG. 8a.

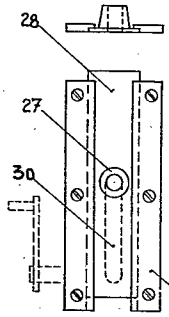
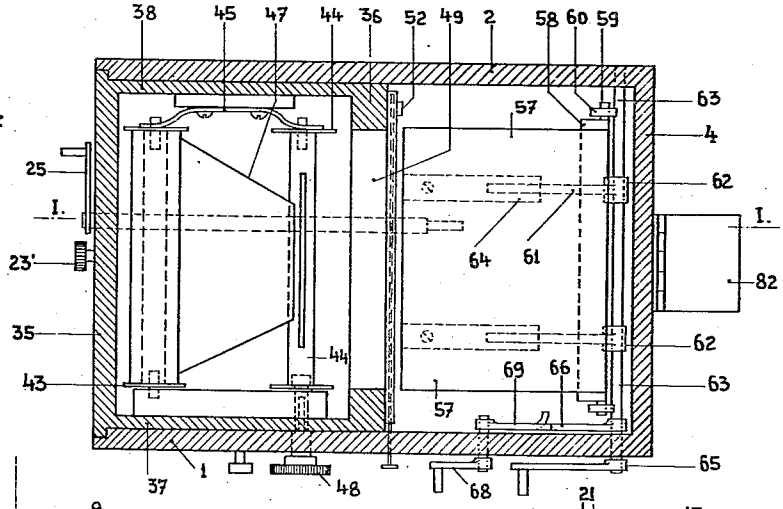


FIG. 8.

FIG. 2.



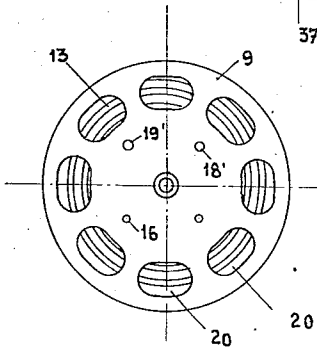


FIG. 5

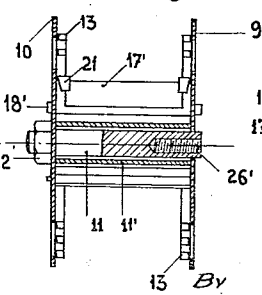


FIG. 6.

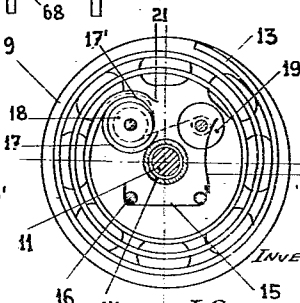


FIG. 7.

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FIG. 3.

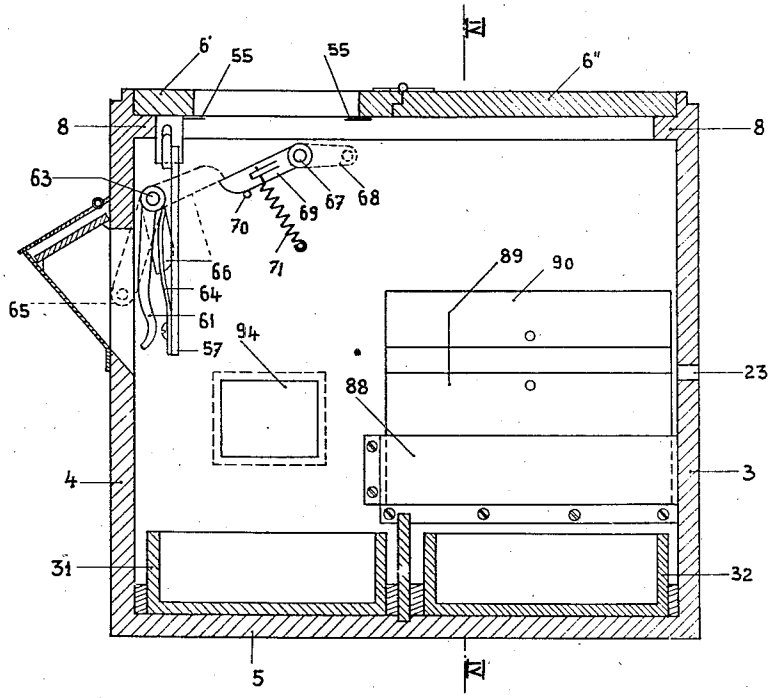


FIG. 4

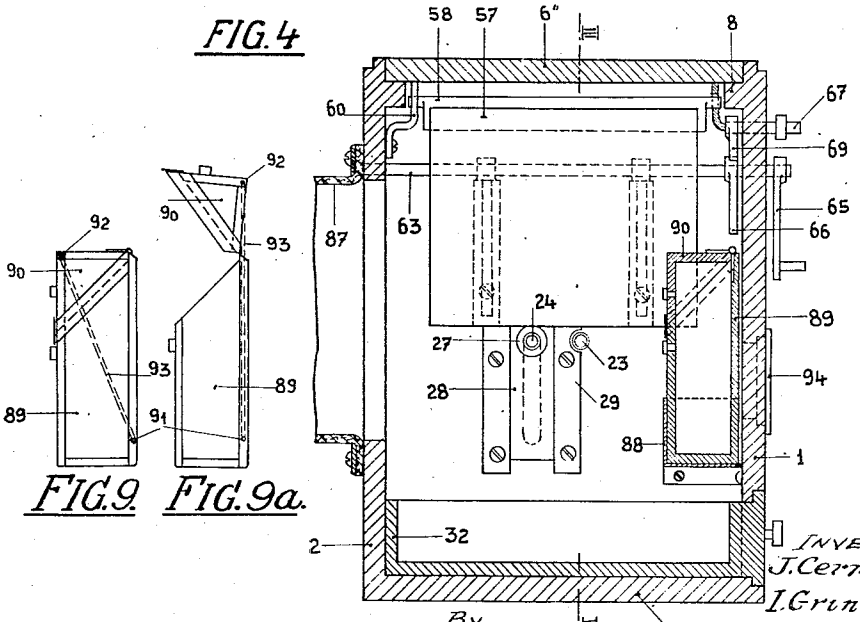


FIG. 9 FIG. 9a.

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PORTABLE APPARATUS FOR DEVELOPING AND PRINTING FILMS IN DAYLIGHT

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11 Claims. (Cl. 95—90.5)

The object of the present invention is a portable apparatus for developing and printing films, in daylight, which apparatus comprises certain parts used in various kinds of apparatus designed for other purposes, a series of new devices having special destinations as well as a novel arrangement of all these devices and parts.

An embodiment of the apparatus given as example is represented in the accompanying drawings of which

Fig. 1 shows a longitudinal section of a complete apparatus through plane II of Fig. 2;

Fig. 2 a horizontal section along plane II—II of Fig. 1;

Fig. 3 a longitudinal section of an alternative embodiment along plane III—III of Fig. 4;

Fig. 4 a cross section of this alternative embodiment, along plane IV—IV of Fig. 3;

Fig. 5 a side elevation of the developing drum;

Fig. 6 a section of this drum along a diametral plane;

Fig. 7 a section along a plane at right angles to the axis of this drum;

Fig. 8 a structural detail;

Fig. 8*a* is a plan view of the detail shown in Fig. 8;

Fig. 9 a box for sensitised paper in closed state;

Fig. 9*a* is a side elevational view showing the box in open position.

The apparatus consists of a case or dark chamber containing all devices to be described farther on and it is formed of side walls 1, 2, 3 and 4, bottom 5, cover proper 7, and intermediate cover 6, which rests on the projecting shoulders 8 of the side walls and is formed of two articulated halves 6' and 6'', of which one is fixed and the other movable.

On the bottom of the case there are located two tanks 31 and 32; one for the developing bath and the other for the fixing bath, which may be withdrawn from the case together with drawers wherein they are located.

The developing and fixing operations of the film take place within a special drum, which is introduced into the case by lifting the cover proper 7 and by lifting the intermediate cover 6''.

This developing drum made of metal or any other suitable material is represented in Figs. 5, 6 and 7 and it allows to unroll in its inner space the film so as to provide between its loops free space to permit the circulation of the bath liquids. The drum comprises two circular side walls, the wall 9 integral with the shaft 11 and wall 10, which is detachable and may be fixed by screw bolt 12. Either wall has on its inner face a spiral groove having a U-shaped cross section; these symmetrical spiral grooves are intended to support and to guide the film edges. In order to maintain the exact distance between the walls 9 and 10 there is provided a tube 11' which surrounds the shaft 11 and distance pieces 16 maintained by a plate 15.

In the central portion of the developing drum there is introduced on one hand the spool 18 carrying the exposed film and on the other hand an identical, but empty, spool 19, the pivots 18' and 19' of these spools entering into the corresponding holes of walls 9 and 10. Integral and parallel with said tube 11' is disposed a sleeve 17 formed of a plate curved so as to have a spiral profile with a wing 17' curved toward the axis of the sleeve and intended to exert between the walls of the spool 18 an elastic pressure upon the film, respectively upon the protective accompanying it. On said plate 15 is fastened on the other hand a spring blade which rests on the shaft of the empty spool 19, respectively on the protective paper wound on it. The wing 17' of the sleeve carries on its outer face at either end, i. e. near the walls 9 and 10 of the drum, a short groove 21 having a U-shaped cross section, both these grooves being connected with the spiral grooves 13, when sleeve 17 is put in position.

In order to introduce the film into the drum, the tube 11 with sleeve 17 is withdrawn therefrom and into this sleeve is introduced the spool 18 with its exposed film. Then tube 11' is applied on shaft 11, so that the pivot 18' of this spool passes through the corresponding opening of wall 9, and an empty spool 19 is placed in such manner that its pivot 19' passes also through the corresponding opening in wall 9. Then the end of the protective paper accompanying the film is drawn and is fastened in the slot of the shaft of the empty spool and the drum is put together by means of screw bolt 12. It is obvious that by rotating the empty spool 19 the paper accompanying the film will be wound upon this spool, while the film, which has the tendency to unroll, will enter the short grooves located on the back of wing 17' of sleeve 17 and therefrom it will continue to advance within the spiral grooves 13 until it will be completely unrolled between the drum walls, while the paper will be wound up and maintained by spring 22 on spool 19. In order to admit the bath liquids between the loose loops of spirals 13 the drum walls 9 and 10 are provided with apertures 20.

Of course the unrolling of the film within the drum will not take place in daylight but within

the dark chamber, as will be described farther on. The assembled drum, with only the free end of the paper fastened on the empty spool 19, will be introduced into the dark chamber by lifting the cover 6''. Through the wall 3 of this chamber extends a shaft 24 provided at its outer end with a crank 25 and at its inner end with a screw thread which enters the threaded hole of the drum shaft. Through an aperture 23 of the wall passes a key 23' which engages the pivot 19' of the empty spool. By turning this key the unrolling of the film is effected in the drum protected from daylight.

Said shaft 24 is journalled in a bearing 27 wherein it can rotate and slide in axial direction, while this bearing 27 is integral with a slide 28 (Fig. 8) which may slide upwards and downwards between two guides 29, the wall 3 of the case having an elongated aperture allowing the upward and downward movement of shaft 24. Owing to this arrangement the drum can be pushed over the tanks 31 and 32, it can be lifted, lowered into the bath within the tanks and rotated to develop and fix the films, after which operations the drum is withdrawn from the apparatus to wash and dry the film.

The apparatus comprises following devices for printing the film:

In the intermediate cover 6'' is provided a rectangular window having the size of the negative, surrounded on the lower face by a frame 55 made of very thin metal, on which rests the negative to be printed, above which are applied and fastened one or several plates of clear or opal glass. The sensitised paper must be pressed from the lower side upon the negative. To this end the apparatus comprises a swinging rectangular plate 57 which carries near its edge a metal band 58 provided with two pivots 59 which may turn in the oval bearings of brackets 60, so that the axis round which the plate 57 is swinging has a certain play in its vertical plane. A horizontal shaft parallel to pivots 59 carries at the exterior of the apparatus a crank 65 and within arms 61, which, when turning the crank, press with their free ends on springs 64 fastened beneath said plate 57, lifting it in a horizontal plane and pressing it together with the sensitised paper against the negative to be printed.

In order to maintain the device consisting of plate 57, arms 61 and shaft 63 in its lifted position, the latter carries within the apparatus an arm 67, while a pawl 69 is fastened on a horizontal pivot 67, which extends through the wall of the apparatus and carries at its outer end a crank 68. This pawl is pressed against a fixed abutment 70 by a spring 71. When lifting the plate 57 the arm 66 lifts the pawl 69 and gets locked thereby. When the crank 68 is moved against the action of spring 71, then pawl 69 is raised and all members holding plate 57 in its horizontal position are unlocked. This plate drops into its vertical position (Figs. 3 and 4) while the paper maintained thereby pressed against the negative drops into tank 31.

In order to be able to print the negatives in the apparatus it contains sensitised paper which must be introduced closed in a box protected against light.

The invention provides two forms of paper boxes; one represented in Figs. 1 and 2 and the other one in Figs. 3, 4 and 9.

The box according to Figs. 1 and 2 consists of a closed drawer, having a front wall 35, a back wall 36, two side walls 37 and 38, a bottom 39 and a removable lid 40. In this box is a spool 43 on which is rolled a sensitised paper band, together with a protective paper band, exactly as used for film spools and another identical, but empty spool 44. These spools 43 and 44 are mounted in the box by means of their axles or pivots 43' and 44' and by means of an elastic means for instance a spring 45. The lengthened end of the protective paper is fastened in the slot of shaft 44' of the empty spool and the sensitised paper is introduced into a slot of the case. Then the cover 40 is applied on the box and the latter is introduced like a drawer, but with the cover downward into the apparatus, where there is provided a compartment limited by fixed partitions 41 and 42. Through wall 1 of the apparatus extends a key 48 engaging the pivot 44' of the empty spool. Within said box there is also a spring blade 50, which presses against spool 43 and a fixed screen 51, while between its back wall 36 and its bottom there is provided said slot provided with velvet, which has the size strictly necessary in order to let pass the sensitised paper. It is obvious that by turning the key 48 and consequently the empty spool 44 the protective paper will be wound on the latter, while the sensitised paper guided by screen 51 will leave the box by said slot. In order to bring the paper under the negative, the plate 57 is lifted at first almost in its horizontal position and the sensitised paper is advanced by turning key 48. Two small windows 78 and 79 provided in covers 6 and 7 respectively and equipped with coloured glasses allow to follow the movement of the paper. Then by turning crank 65 the plate 57 is locked in its horizontal position and the portion of sensitised paper pressed against the negative is detached by means of a sharpened tooth 52 fastened to a sliding blade operated from the exterior and passing in front of the slot through which the sensitised paper band is fed.

In order to permit to print the negative in daylight, the cover proper 7 has a window 75 above that of the intermediate cover 6''. Under this window 75 is located a shutter of any suitable type, which in the illustrated instance consists of a plate 76 slidable between guides fastened under the cover 7 and which is operated from without by a lever 77 extending beneath the cover 7.

The exposed paper drops into the bath of the tank 31 as has been described above, and from this tank it may be carried into the tank containing the fixing solution by means of a device consisting of a horizontal shaft 85 carrying several parallel arms made of thin metal plate curved according to the profile of the tank or of a metal fabric. By turning from without this shaft 85 the photograph is carried to tank 32.

The box according to Figs. 3, 4 and 9 is designed to be charged with sensitised paper cut into sheets of the size of the negative. This simplified box is intended to be used in an equally simplified apparatus represented in Figs. 3 and 4 which is provided in the wall 2 with an opening equipped with a sleeve 87, so that one may introduce the hand into its inner space, to open the box, withdraw a paper sheet and introduce it beneath the negative, fastening it afterwards by lifting the plate 57. The simplified apparatus need not have the observation windows 78 and 79. This box, which remains permanently within the apparatus in a pocket 88 fastened to the wall 1 has the shape of a box 89 provided with

a lid **90**, the joint between the box and the lid being located in a plane inclined under 45° and protected by a gasket against light. The axis round which the lid swings is located in the plane of the inner face of the back wall of the box, so that when the lid is open, it describes an angle greater than 90°, i. e. its upper surface moves beyond the vertical plane passing through the axis of rotation. This arrangement is made in order to permit that an elastic member, for instance a rubber thread fastened diagonally between two pivots, one in the upper front corner of the lid and the other one near the lower back corner of the box, has the double effect of maintaining the lid secured in its closed as well in its open position, allowing thus to operate the box and the paper with only one hand.

The apparatus has also two windows equipped with red or yellow glasses; a window **94** in wall **1** admitting the daylight into the apparatus and another one **81** located in a funnel **80**, allowing to observe the negative in the developing bath of tank **31**, there existing the possibility to shut both windows by drawers or lids.

Finally the apparatus according to the invention can serve also to obtain enlarged prints after the negative by applying upon the opening **75** of cover **7** an enlarging cone. The negative to be enlarged is placed above the cone, while the sensitised paper is placed on plate **57** and is covered by a clear glass plate. The paper is then treated in the manner described with reference to the printing of the negative.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:

1. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, a shaft extending through one of the side walls of said receptacle, a drum mounted upon said shaft, one of the side walls of said drum being fixed to said shaft, the other side wall of said drum being removable therefrom, said side walls of said drum having spiral grooves therein with a U-shaped cross section for guiding the edges of a film, a sleeve located between the side walls of said drum adapted to receive a spool of film, means on said sleeve for guiding the edges of said film into said spiral grooves, means for mounting a second spool between the side walls of said drum and means for actuating said second spool so as to unwind the protective paper accompanying the film and thereby feed the film into said spiral grooves.

2. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, a shaft extending through one of the side walls of said receptacle, a drum mounted upon said shaft, one of the side walls of said drum being fixed to said shaft, the other side wall of said drum being removable therefrom, said side walls of said drum having spiral grooves therein with a U-shaped cross section for guiding the edges of a film, a sleeve located between the side walls of said drum adapted to receive a spool of film, means on said sleeve for guiding the edges of said film into said spiral grooves, means for mounting a second spool between the side walls of said drum, means for actuating said second spool so as to unwind the protective paper accompanying the film and thereby feed the film into said spiral grooves, means for rotating said shaft and means for axially displacing said shaft.

3. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, a shaft extending through one of the side walls of said receptacle, a drum mounted upon said shaft, one of the side walls of said drum being fixed to said shaft, the other side wall of said drum being removable therefrom, said side walls of said drum having spiral grooves therein with a U-shaped cross section for guiding the edges of a film, a sleeve located between the side walls of said drum adapted to receive a spool of film, means on said sleeve for guiding the edges of said film into said spiral grooves, means for mounting a second spool between the side walls of said drum, means for actuating said second spool so as to unwind the protective paper accompanying the film and thereby feed the film into said spiral grooves, a slidable plate mounted upon one of the side walls of said receptacle and a bearing for said shaft carried by said slidable plate.

4. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, a shaft extending through one of the side walls of said receptacle, a drum mounted upon said shaft, one of the side walls of said drum being fixed to said shaft, the other side wall of said drum being removable therefrom, said side walls of said drum having spiral grooves therein with a U-shaped cross section for guiding the edges of a film, a sleeve located between the side walls of said drum adapted to receive a spool of film, means on said sleeve for guiding the edges of said film into said spiral grooves, means for mounting a second spool between the side walls of said drum, means for actuating said second spool so as to unwind the protective paper accompanying the film and thereby feed the film into said spiral grooves and spring means mounted between the side walls of said drum bearing upon said second spool for ensuring a tight winding thereon of said protective paper.

5. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, a shaft extending through one of the side walls of said receptacle, a drum mounted upon said shaft, one of the side walls of said drum being fixed to said shaft, the other side wall of said drum being removable therefrom, said side walls of said drum having spiral grooves therein with a U-shaped cross section for guiding the edges of a film, a sleeve located between the side walls of said drum adapted to receive a spool of film, means on said sleeve for guiding the edges of said film into said spiral grooves, means for mounting a second spool between the side walls of said drum, means for actuating said second spool so as to unwind the protective paper accompanying the film and thereby feed the film into said spiral grooves, a receptacle for a developing bath located on the bottom of said first-named receptacle, a second receptacle for a fixing bath also placed on the bottom of said first named receptacle and means for moving said drum into either said developing bath or said fixing bath.

6. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, an intermediate removable cover located below said first mentioned cover, said intermediate cover being provided with a window upon which a negative to be printed may be secured, a compartment located below said intermediate cover,

means for removably securing a spool of sensitized paper within said compartment, means for securing within said compartment a second spool spaced from said first mentioned spool upon which the protective covering of the sensitized paper may be wound, means for rotating said second spool, said compartment having an aperture therein, means for guiding the sensitized paper from said first mentioned spool through said aperture and below said window, a pivoted plate located within said receptacle, means for pivoting said plate so as to carry a portion of the sensitized paper directly below the negative and means for severing said sensitized paper located adjacent said aperture.

7. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, an intermediate removable cover located below said first mentioned cover, said intermediate cover being provided with a window upon which a negative to be printed may be secured, a compartment located below said intermediate cover, means for removably securing a spool of sensitized paper within said compartment, means for securing within said compartment a second spool spaced from said first mentioned spool upon which the protective covering of the sensitized paper may be wound, means for rotating said second spool, said compartment having an aperture therein, means for guiding the sensitized paper from said first mentioned spool through said aperture and below said window, a pivoted plate located within said receptacle, a pivoted lever cooperating with said plate, means at the outside of said receptacle for actuating said lever and thereby moving said plate so as to carry a portion of the sensitized paper directly below the negative and means for severing said sensitized paper located adjacent said aperture.

8. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, an intermediate removable cover located below said first mentioned cover, said intermediate cover being provided with a window upon which a negative to be printed may be secured, a compartment located below said intermediate cover, means for removably securing a spool of sensitized paper within said compartment, means for securing within said compartment a second spool spaced from said first mentioned spool upon which the protective covering of the sensitized paper may be wound, means for rotating said second spool, said compartment having an aperture therein, means for guiding the sensitized paper from said first mentioned spool through said aperture and below said window, a pivoted plate located within said receptacle, and means for locking said plate below said negative.

9. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, an intermediate removable cover located below said first mentioned cover, said intermediate cover being provided with a window upon which a negative to be printed may be secured, a compartment located below said intermediate cover, means for removably securing a spool of sensitized paper within said compartment, means for securing within said compartment a second spool spaced from said first mentioned spool upon which the protective covering of the sensitized paper may be wound, means for rotating said second spool, said compartment having an aperture therein, means for guiding the sensitized paper from said first mentioned spool through said aperture and below said window, a pivoted plate located within said receptacle, a developing bath located below said window and said plate for receiving the exposed sensitive paper, a fixing bath located adjacent said developing bath and means for transferring the sensitive paper from said developing bath to said fixing bath.

10. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, a shaft extending through one of the side walls of said receptacle, a drum mounted upon said shaft, one of the side walls of said drum being fixed to said shaft, the other side wall of said drum being removable therefrom, said side walls of said drum having spiral grooves therein with a U-shaped cross section for guiding the edges of a film, a sleeve located between the side walls of said drum adapted to receive a spool of film, means on said sleeve for guiding the edges of said film into said spiral grooves, means for mounting a second spool between the wide walls of said drum, means for actuating said second spool so as to unwind the protective paper accompanying the film and thereby feed the film into said spiral grooves, an intermediate removable cover located below said first mentioned cover, said intermediate cover being provided with a window upon which a negative to be printed may be secured, a compartment located below said intermediate cover, means for removably securing a spool of sensitized paper within said compartment, means for securing within said compartment a second spool spaced from said first mentioned spool upon which the protective covering of the sensitized paper may be wound, means for rotating said second spool in said compartment, said compartment having an aperture therein, means for guiding the sensitized paper from said first mentioned spool in said compartment through said aperture and below said window, a pivoted plate located within said receptacle, means for pivoting said plate so as to carry a portion of the sensitized paper directly below the negative and means for severing said sensitized paper located adjacent said aperture.

11. A portable photographic apparatus comprising a receptacle having side walls and a bottom, a removable cover for said receptacle, an intermediate removable cover located below said first mentioned cover, said intermediate cover being provided with a window upon which a negative to be printed may be secured, a pivoted plate within said receptacle operative from the exterior thereof so as to bring a sensitized paper adjacent said negative, a compartment for individual sheets of sensitized paper located within said receptacle and secured to one of the side walls thereof, a cover upon said compartment, resilient means for securing said cover in open and shut position and said receptacle having an aperture therein screened from the light whereby access may be had to said compartment.

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