March 2, 1943. R. L. ROWLAND 2,312,488

COAGULOMETER

Filed March 15, 1940

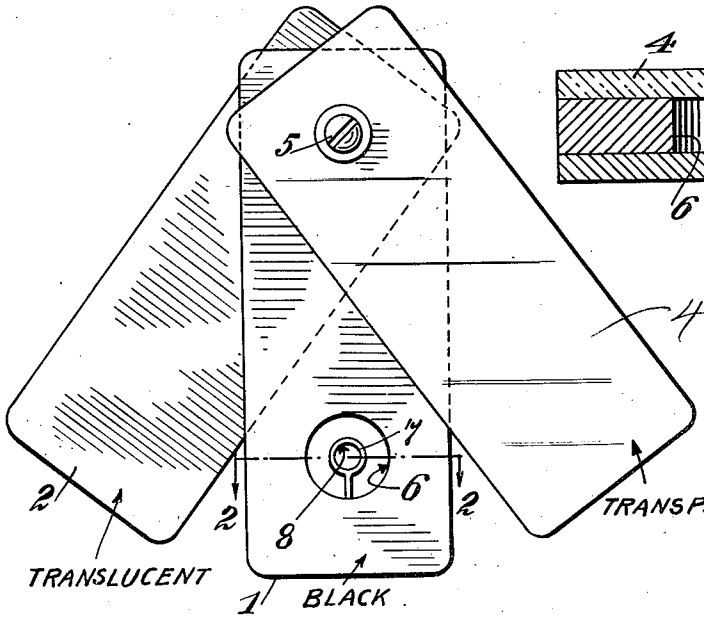

Fig. 1.

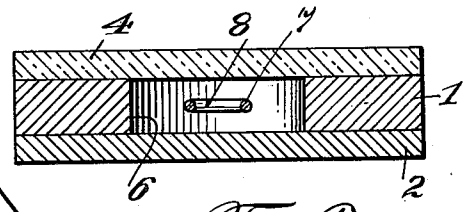

Fig. 2.

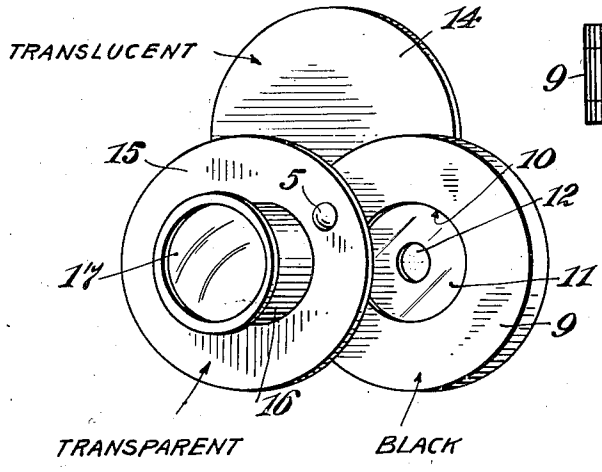

Fig. 3.

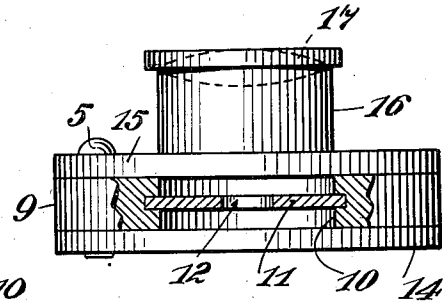

Fig. 4.

Fig. 5.

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COAGULOMETER

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6 Claims. (Cl. 88—14)

The present invention relates to the science of medicine and more particularly to an instrument for use by surgeons to determine the period of time required for the coagulation of the blood of a patient.

The instrument is especially useful in hospitals and in medical laboratories where various blood tests are being conducted.

The present invention and its use comprise providing a support having an opening therein of such size as to sustain a film of blood by surface tension, placing blood across the opening to form a film having a "thin spot" therein, oscillating the support on a substantially horizontal axis until the "thin spot" ceases to move and the blood film becomes immobile, and checking the time period from the procurement of the blood from the body of the patient to the moment when the film of blood ceases to be mobile.

An instrument comprising one form of device for carrying out the above specified method comprises a support provided with a small opening across which a film of blood may be stretched by surface tension. This support may comprise a washer having an opening therein or a wire loop of appropriate size carried by a main plate or ring of suitable material and of convenient size and shape for handling. Back and top plates are provided on each side of the main plate so as to enclose the film of blood in a substantially sealed chamber, thereby obviating excessive evaporation of the liquid content of the blood during the observation interval. Preferably, the back plate is of translucent material to pass diffused light or it may be adapted to reflect light, and the top is either provided with an opening or is transparent so that the condition of the specimen of blood film may be easily observed.

It is to be understood that the specific disclosures herewith are illustrative and are not to be considered in a limiting sense but comprise preferred embodiments of the present invention.

Fig. 1 is a plan view of one form of the apparatus showing the top and bottom plates moved aside in order to more clearly exhibit the same.

Fig. 2 is a section on line 2—2 of Fig. 1 with the cover plates closed.

Fig. 3 is a slightly different form of the invention mounted in a circular support.

Fig. 4 is an elevational view showing a section through the main plate of the device shown in Fig. 3.

Fig. 5 is an enlarged cross section of the supporting ring with a film of blood therein and shows the "thin spot" in the film.

Referring to the drawing and more especially to Figs. 1 and 2, the preferred form of the coagulometer comprises a main section 1, a back plate 2, and a top plate 4. These three members may be oblong or rectangular in form and may be pivoted together by means of a pivot rivet or screw 5. The main section 1 is provided with an opening 6 in which is mounted a ring or loop of wire 7 having a substantially circular opening 8 comprising the test opening.

The sections 1, 2, and 4 are preferably formed from synthetic resins, and may be constructed from a phenolic plastic resin known in the trade as "Insurok." The middle section 1 preferably is black in color and may be of a thickness of substantially one-eighth of an inch. The back plate 2 is preferably translucent and of a milk-white color and may be of a thickness of one-sixteenth of an inch. The top plate 4 is preferably the same thickness as the back plate and preferably is transparent. The color scheme specified provides contrasting shades which are well suited to the observations necessary in the use of the device and the back plate 2 acts more or less like a ground glass to diffuse the light. The wire comprising the loop 7 is preferably of material which does not oxidize easily, such as stainless steel or other metal which is resistant to attack either from the air or from any blood content. The blood film opening 8 is preferably one-eighth of an inch in diameter. It is to be understood that the dimensions given herewith are not critical except that the blood film opening must be sufficiently small to sustain a film of blood by its surface tension and sufficiently large to produce the "thin spot" and to permit of proper observation of the suspended film.

In the use of the device, the back and front plates are moved aside to expose the opening 6 in the main section in which is mounted the loop of wire 7. A drop of blood is obtained from the patient in the usual manner, from a finger puncture or otherwise, and the instant of time of obtaining the blood sample is noted. This drop of blood is placed upon the wire ring 7 in such manner as to form a film which is suspended from the ring. The back and top plates are now brought into position as indicated in Fig. 2 over the main plate so that the space provided by the circular opening 6 in the middle section 1 is substantially sealed, thereby preventing undue evaporation of the blood sample. When the instrument is properly held between the thumb and finger in a substantially horizontal position, it will be observed that there is a "thin spot" in the

center of the blood film stretched over the circular opening 7 in the loop of wire (see Fig. 5). This "thin spot" is where the blood film is so thin as to exclude most of the corpuscles and is in sharp contrast with the remainder of the film. Light readily passes through the "thin spot" so that any movement thereof is easily seen. The instrument is now oscillated slowly relative to the horizontal plane and it will be observed that the "thin spot" in the film moves from side to side relative to the loop of wire 7. The oscillation is continued and it will be noted that the spot referred to continues to move as long as the blood is uncoagulated. Just as soon as coagulation takes place, the "thin spot" becomes immobilized. This condition of coagulation occurs suddenly, thereby determining the end of the period of observation. As soon as the "thin spot" ceases to move when the instrument is oscillated, the operator notes the time and thereby determines the length of time of the period from the moment of obtaining a sample from the patent until coagulation has taken place. This determines the time factor of the patent's blood coagulation, which is a very important fact in connection with preparation for a surgical operation.

Figs. 3 and 4 illustrate a slight modification of the device in which the main body of the instrument is circular in form and the middle section 9 is provided with an opening 10 in which is set a washer or ring 11 provided with an opening 12 of proper size to support a film of blood. Back plate 14 is preferably translucent and of milk-white material while the top plate 15 preferably is provided with a tube 16 in which is mounted a lens 17 through which the "thin spot" is easily observed.

What I claim is:

1. An apparatus for determining the time period for the coagulation of a specimen of blood comprising, a main section provided with an opening, a film supporting member having an aperture therein, the edges of which are capable of supporting a blood film by surface tension and producing a thin spot in the film, said supporting member being carried by the main section within said opening, said member being of less thickness than said main section, a movable back section adapted to cover the lower end of said opening, and a top section adapted to cover the upper end of said opening whereby said back section and said top section cooperate with the main section, to seal a blood film on said film supporting member against evaporation.

2. An apparatus for determining the time period for the coagulation of a specimen of blood comprising, a supporting member having a small opening therein to support by surface tension the specimen of blood being tested to produce a thin spot and with the axis of said opening being normally substantially vertical, and sealing means to enclose said supporting member and to substantially seal said blood specimen on said supporting member from evaporation and with said specimen freely suspended within said supporting member, said sealing means having a portion thereof transparent whereby the opening in said supporting member is visible when said sealing means is effective.

3. An apparatus for determining the time period for the coagulation of a specimen of blood comprising, means to support a small film of blood by surface tension to produce a thin spot and with the edges of the film being in substantially a horizontal plane, and sealing means to prevent evaporation of said film of blood, said sealing means being out of contact with said film of blood and comprising a transparent portion through which said film of blood may be viewed.

4. An apparatus for determining the time period for the coagulation of a specimen of blood comprising, means to support a film of blood by surface tension to produce a thin spot and with the edges of the film being in a substantially horizontal plane, and sealing means to enclose said means to prevent evaporation of said film of blood, said sealing means being out of contact with said film of blood and being both above said film and below said film, the portion of the sealing means below said film being translucent to admit diffused light and the portion of the sealing means above the film being transparent whereby the film may be viewed.

5. An apparatus for determining the time period for the coagulation of a specimen of blood comprising, a body section provided with an opening, a blood film supporting member having an aperture therein and with the edges thereof capable of supporting a blood film by surface tension and producing a thin spot in the film, said supporting member being carried by said body section and located within said opening, said member being of less thickness than the body section and being spaced from the wall of said opening in such manner as to prevent the blood film from contacting the upper and lower ends of said opening in the body section, a translucent back member adapted to cover the lower end of said opening, and a top section through which said film may be viewed.

6. An apparatus for determining the time period for the coagulation of a specimen of blood comprising, a body section constituting a manually manipulable support, a blood film supporting member having an aperture therein with the edges thereof capable of supporting a blood film by surface tension and producing a thin spot in the film, said supporting member being of less thickness than the body section with the aperture therein spaced from said body section so as to prevent contact of the blood film with the body section.

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