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MEDICAL PROGRESS IN THE LAST HUNDRED YEARS[1]

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IN the final analysis, however we may view the passage of the last one hundred years, what we here set down constitutes the recountal of a chapter in history. Not the formal stodgy detailing of name, date and place; not the mere description of men and of movements; not a philosophical interpretation of the causes and effects of events, but in the truest sense of the words the outlining of a pageantry of progress. During the past century, the mills of God have woven no other fabric so shot through, in both warp and woof, with the incomparably brilliant, gold and scarlet and royal purple as is the tapestry of medicine.

Your and my difficulty lies not in conceding the wonders of accomplishment of this century, but rather in setting down the facts on which they rest, without ending up with a mere catalogue of assets. And if we are to escape the dilemma of piling discovery on discovery and of glorifying discoverer after discoverer, then we must recognize in the first instance that, like man himself, medicine can not thrive detached, but waxes and wanes in direct proportion to the inspirational impetus furnished her by the times in which she works. This is a truth, the generality of which is in no way invalidated by the fact that, on occasion, there comes from within the realm of medicine itself the stimulus that energizes and colors an entire era. Such was the case, for example, in the instances of Hippocrates and Galen, of Vesalius and his followers and of Harvey, to mention only a noted few.

Centuries, like men, have souls; but the perspective of time is required for their evaluation. Who among us would be bold enough to predict with assurance the final judgment of history on these hectic days through which you and I are elbowing our ways?

The seventeenth century was a time of individualism run riot. There were great writers—Shakespeare and

[1] Address before the St. Louis Medical Society centennial celebration, on April 6, 1937.

rotational speed. Next, the liquid to be centrifuged is injected (by a hypodermic syringe) into I until C is filled, that is, until a slight amount of liquid overflows into the tubes A and B. Following this, the centrifuge is run at a constant speed until the required separation has taken place. More liquid is then injected into the tube I and the resultant forces push the heavier fraction out of A into the collector K and the lighter fraction out of B into a second collector K′. Immediately upon entering C, the liquid mixture begins to separate so that as the successive amounts are introduced into I the separated fractions are collected in K and K′. Upon inspection of Fig. 1 it might appear that all the liquid would flow out of A, since the diameter of A is greater than that of B. However, in practice this is not the case because the material emerging through A has a slightly increased density, the diameter of I is less than that of B, and the liquid mixture is introduced rapidly for short times instead of continuously. The amount of material introduced at one time in this manner must not be great enough to alter appreciably the rotational speed of C. If it is desired to introduce the liquid mixture continuously at I and at the same time accurately control the amount of heavy to light fractions, the vacuum or liquid-tight gland G_4 may be added as shown in Fig. 2. This arrangement of Fig. 2 is used in the separation of gases.

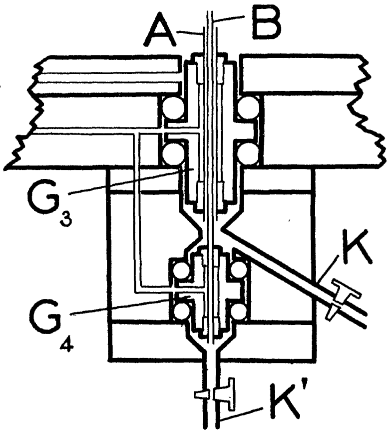

FIG. 2.

In the above apparatus, the quantity of liquid which can be separated in a given interval of time is directly proportional to the length of the rotating cylinder C. Furthermore, it can be shown that the rate of separation is greater the smaller the diameter of the tube C, provided C is spun to almost its bursting speed. Since the maximum speed to which C may be spun is set only by the bursting strength of C, it is advantageous to employ long small-diameter tubes for the centrifuge. Two-inch cylinders two feet in length have been spun successfully.

With the apparatus of Fig. 1, we obtained an easily observable separation of hemoglobin (kindly prepared by Professor Alfred Chanutin) from the solution when it was introduced at the rate of from 20 to 30 cc per hour with C spinning only 1000 r.p.s.

Unfortunately, the tubular rotor is not as strong as certain other shapes. However, by employing high strength alloy steels and special construction, it is probable that tubular rotors may be built, the bursting speed of which can be made to approach the best rotors of the same effective diameter that have been in practical use. Also the efficiency of C might be increased by mounting properly designed plates or discs inside it.

It is of course possible to replace the tube C in Fig. 1 by other shapes (the angle centrifuge, for example) obtaining, with a slight change in internal construction, the advantage of continuous quantity separation. Further, the use of three or more hollow, concentric flexible shafts and vacuum-tight glands similar to those in Fig. 2 would make it possible to adapt the ordinary type of air-driven ultracentrifuge to continuous operation.

We are greatly indebted to the Division of Natural Sciences of the Rockefeller Foundation for a grant to one of us (J. W. B.) which has made part of this work possible.

J. W. BEAMS
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BOOKS RECEIVED

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GALDSTON, IAGO. *Maternal Deaths—the Ways to Prevention.* Pp. 115. Commonwealth Fund, New York. $0.75.

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WESTAWAY, F. W. *Scientific Method.* Pp. xix + 588. 37 figures. Hillman-Curl. $3.75.

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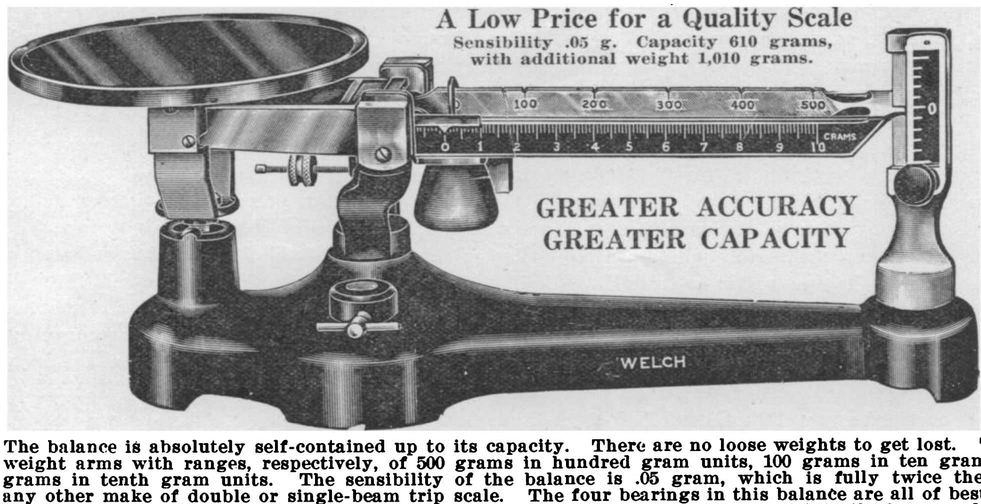

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