At Harvard the funnel-centrifuge, alluded to by Köthner, is made of platinum, but porcelain funnels and receivers may be used without danger if the rate of revolution is not too great. I have never dared to use glass funnels in this apparatus. The porcelain basket-centrifuges, of which several forms are on the market, will stand considerable strain; the speed at which they may safely run varies with the form and stoutness, and should be carefully determined for different loads and indicated by the manufacturer. The porcelain receiver surrounding them is never strong enough to hold the fragments if the basket should break; therefore this whole apparatus also should be surrounded by a strong guard-box. Both porcelain and glass should be supported on some kind of rubber cushion, so as to distribute the strain as evenly as possible.

It is not out of place to call attention to another somewhat less serious but nevertheless important precaution, namely, the equal distribution of the load. This is essential if the apparatus is to run smoothly and the strain is to be evenly distributed. In the case of the funnel-centrifuge the adjustment is very readily accomplished by hanging the opposite funnels upon the two arms of a common balance, and filling them to equilibrium with similar crystals about equally moist. In the case of the basket-centrifuge, the distribution must be made with a spatula, before the machine is started.

If these simple and obvious precautions are taken, the centrifuge will be found, as has been said before, a very valuable aid in the purification of small quantities of substance in the laboratory of the investigator. In the course of twenty years no serious accident has resulted from its use at Harvard, and much has been gained. As has been said before, the gain to be expected varies greatly in different cases; it is greatest in the case of very soluble substances which do not carry impurities in isomorphous solid solution with them into the solid state, and least in the case of slightly soluble substances, which contain isomorphous contamination.

To summarize the contents of this brief note—the value of centrifugal action in purifying substances has been once more emphasized, but the importance of equal distribution of the load, the danger of using glass or other very fragile material in the centrifuge, and the necessity of caution in regulating the speed and in always guarding the operator by a stout casing around the machine, is pointed out.

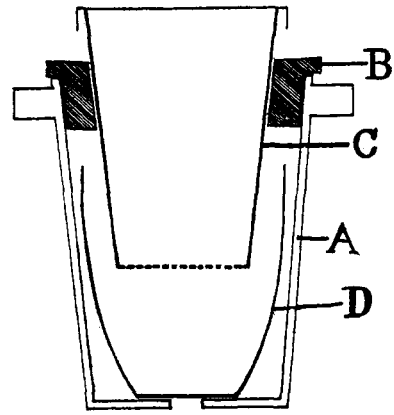
T. W. RICHARDS.

HARVARD UNIVERSITY,
November 25, 1907.

Apparatus for the Centrifugal Drainage of Small Quantities of Crystals.—The high efficiency and importance of centrifugal drainage in the removal of mother liquor in purification by crystallization has re-

cently been strongly emphasized by T. W. Richards,[1] who describes various convenient forms of apparatus for the purpose. The use of these devices in this laboratory has led to the construction of a new very convenient modification of centrifuge which not only makes possible the complete removal of mother liquor from small quantities of substance without undue loss of material and in a cleanly fashion, but also provides for the preservation of the mother liquor and rinsings from the crystals in an equally satisfactory manner. This latter point is frequently of importance to any chemist who is purifying small quantities of precious material, especially if the substance is very soluble.

The following diagram explains the construction of the device, which has already been briefly described:[2]



A is a cup, preferably of aluminum on account of its lightness and cleanliness, with trunnions by means of which it may be hung upon one end upon of a metallic arm attached to the head of a centrifugal machine. A similar cup, suitably weighted, serves as a convenient counterpoise. These cups are of the form commonly employed to contain the flasks used in the determination of fat in milk.[3] A hard rubber sleeve *B* fits loosely upon the top of the aluminum cup, the inside of the sleeve being turned to the proper size and angle to hold a platinum Gooch crucible *C*, of any desired size, which serves as the basket for the crystals. Sleeves of metal, platinum plated, might be used, but are objectionable on account of their weight. With a low-speed centrifuge, a porcelain Gooch crucible would probably be safe. For obvious reasons the top of the crucible should extend a few millimeters above the sleeve. The mother liquor drains into a platinum crucible *D*. Where platinum is unnecessary for the sake of purity of the mother liquor, the crucible *D* may be replaced by a suitable stout glass vessel. Thin beakers, however, are likely to be fractured by the weight of the liquid, if the speed of revolution is high. Although the surface of the aluminum cup may easily be kept bright and shows no tendency to abrade and thus contaminate the mother liquor, all possible danger from this source may be avoided by lining the inside of the cup with a cylinder of platinum

[1] This Journal, **27**, 210 (1905).

[2] Baxter and Coffin, *Ibid.*, **28**, 1582 (1906).

[3] Aluminum cups of this sort are made by the International Instrument Co., Cambridge, Mass.

foil turned over the upper edge of the cup. The latter precaution is of course more necessary when acid vapors are emitted by crystals or mother liquor. The Gooch crucible, or the whole top of the cup, may be covered with a circular piece of platinum foil, the edges of which have been turned down to hold it in place. A hole in the bottom of the aluminum cup facilitates the removal of the vessel containing the mother liquor.

It is, of course, possible to make the apparatus more elaborate, for instance, by providing the aluminum cup with an especial porcelain or platinum lining. The system as described above, however, has the great advantage that it may be constructed with materials available in most laboratories.

G. P. BAXTER.

CAMBRIDGE, MASS.,
November 25, 1907.

REVIEW.

RECENT PROGRESS IN PHYSICAL CHEMISTRY.

F. G. COTTRELL.

Received November 23, 1907.

The issuance by our Society this year of "Chemical Abstracts" has somewhat changed the requirements for the annual reviews of special topics. Heretofore their chief aim has been to present a brief synopsis of the more important foreign literature, to supplement the "Review of American Chemical Research" included in the monthly numbers of the Journal. Since, as far as collection of data is concerned, all of this field is now covered by the "Abstracts," the author has, in what follows, confined himself to the discussion of a few selected topics which have either attracted special attention of late or seem to open up or emphasize new or previously neglected fields of inquiry. In order to present some of these in their true perspective it has seemed necessary to trace the same line of thought back among the earlier workers, and in this respect there has been no attempt to limit the present article strictly to what has appeared during the past twelvemonth. As heretofore, the subject of radioactivity has been left for treatment in a separate article.

Perhaps the most significant trend of recent work is to be found in the concentration of effort toward narrowing the gap between molecular and molar phenomena. This field in which, among other important matters, the whole subject of colloids ultimately belongs, stands to-day in very much the same relation to physical chemistry and ordinary mechanics that physical chemistry stood to physics and chemistry twenty or thirty years ago. The classification of natural phenomena into sharply defined subjects may in most cases be interpreted simply as an admission that we are omitting a region between, in which, as we enter it from either side, the methods of treatment gradually fail us. Thus it was that the troublesome and outgrown distinction between chemical and physical combination was swept away by Gibbs, and under the broader conception of "phase" and "component" the two fields merged in one as far as hetero-