position, proofreading and make-up, all creditable. The publishers, following their usual custom, give the names of all who have contributed skill of hand or brain.

ALEXANDER MCADIE

SCIENTIFIC APPARATUS AND LABORATORY METHODS

CEMENT CASTS OF PETROGLYPHS

CASTS of petroglyphs may be successfully made of cement. I do not recall having seen such casts in museums, although I have frequently visited the largest museums in Canada and the United States. When I suggested trying to reproduce a petroglyph from Kispiox, B. C., in cement an engineer of many years' experience told me that it could not be done without breaking my plaster of Paris mould and producing a cast damaged by numerous air bubbles.

On trying the experiment an ordinary plaster of Paris mould was used and not only the first cast but all three that were tried were satisfactorily successful. These casts were sent one to the Victoria Memorial Museum—the national museum of Canada—at Ottawa; another to the Vancouver museum, and the third to the United States National Museum, Washington.

The well-shellacked mould was soaped liberally and allowed to dry. The cement was mixed, one of cement to two of sifted fine sand, by my foreman, Mr. W. C. Washburn, of Kitwanga, B. C., who flowed it with a spoon from one edge of the mould over the entire surface. When the surface was covered to a depth of about a quarter of an inch wire netting was laid on and covered with cement or in the case of the last cast strips of wire and iron were laid on to form a reinforcing grid. A wire loop was laid in the cement and allowed to project at the back near the upper end of the cast to serve in hanging the cast on a wall.

The next day the cast was easily lifted out of the mould, having shrunk sufficiently to lift more easily than the usual plaster of Paris cast. It might be well to allow the cast to remain in the mould longer to insure safety from being broken in lifting. The result greatly resembled the original rock. Such casts may be painted with diluted oil or water colors or various colored sands and pigments may be used to make them resemble various colored rocks. The texture can be modified, by using coarser sand or mixtures of less cement or less sand, thus making the cast resemble coarser or finer rock. It is possible that other materials than soap may be used to make the cast separate from the mould. But difficulty may be encountered in representing rock of finer texture than pure cement or of color much lighter than cement. It may be more difficult to cast by this process petroglyphs or other archeological objects that are very large or are not as flat as the Kispiox specimen but experiments seem worth trying since the success of the method leads me to advocate cement in place of plaster of Paris for making casts of flat petroglyphs up to four or five square feet in area.

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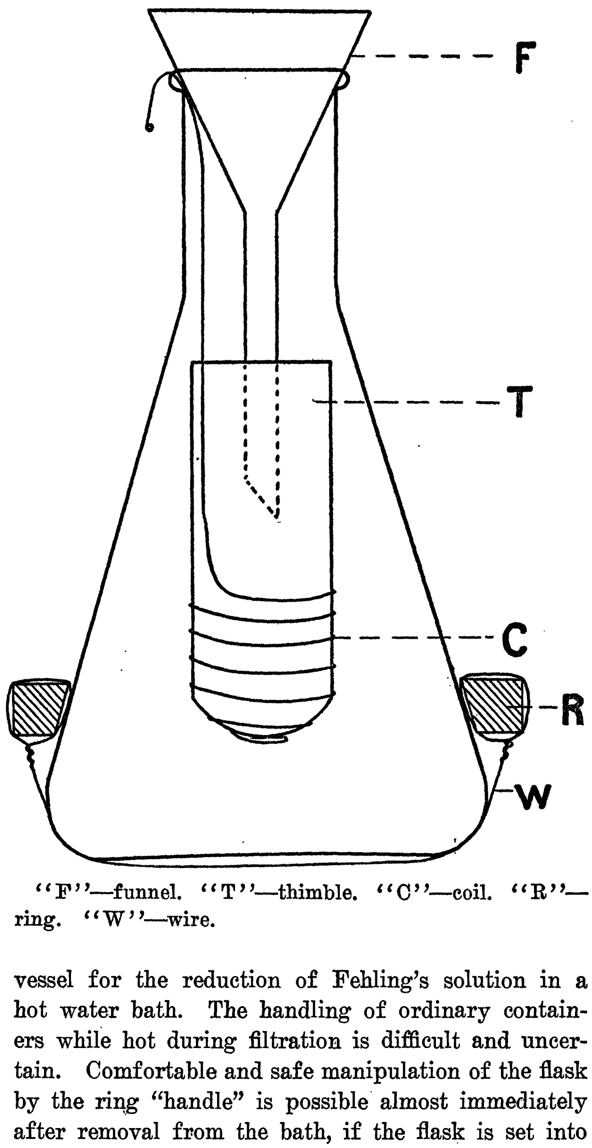
A SIMPLE DEVICE FOR EXTRACTION AND DIGESTION

THE Erlenmeyer flask is a convenient vessel for digestion of plant materials during their analysis. Although its equilibrium is rather unstable when set in water to any depth, this difficulty is overcome by a ring of lead, "R" as shown in the diagram, attached to the flask by a wire, "W," fastened to the ring at opposite sides and drawn taut under the bottom of the flask. The ring should be equal in weight to the total water displacement of the flask, and as shown in the diagram it should be located well below the normal center of gravity of the vessel. For extraction of substances where boiling temperatures are not permissible, the material can be placed in an ordinary thimble, "T." A piece of copper wire, partly wound into a coil "C" that is slightly larger than the thimble is lowered into the flask by the handle made from the unwound wire. A hook at the upper end of the handle slipped over the lip of the flask will hold the thimble above the liquid in the bottom. The funnel "F" inserted in the neck will serve to deliver the extracting liquid into the thimble, will act as a condenser for any that may evaporate and will keep the thimble upright if the coil is not sufficiently deep. For extractions by intermittent applications, when it is desirable to keep the extract away from the substance in the thimble, this apparatus has proved most satisfactory. Its cheapness and ready convertibility into a digester permits a large number of units to be put into operation at once, and with the coil and thimble removed the weighted flask makes an ideal vessel for sugar determination.

The chief advantages of the ring attachment to the flask when used as either an extractor or a digester lie in the safety and speed with which the flasks may be handled, in its compactness and in the elimination of clamps during all operations. The wire which keeps the ring firmly in place also raises the flask from the bottom of the bath and prevents superheating the material within.

This apparatus is especially useful as the digester



"F"—funnel. "T"—thimble. "C"—coil. "R"—ring. "W"—wire.

vessel for the reduction of Fehling's solution in a hot water bath. The handling of ordinary containers while hot during filtration is difficult and uncertain. Comfortable and safe manipulation of the flask by the ring "handle" is possible almost immediately after removal from the bath, if the flask is set into cold water, or held under the tap for a few seconds. Rinsing with hot water is accomplished with equal ease and safety. Nearly six hundred sugar determinations have been run without a single loss when this special "ringed flask" was used.

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SPECIAL ARTICLES

CORRECT VELOCITIES FOR ECHO SOUNDING IN THE PACIFIC OCEAN

SPECIAL Publication No. 108, United States Coast and Geodetic Survey, "Velocity of Sound in Sea Water," gives tables from which may be derived, by a method described in the publication, the proper velocity of sound to use in echo sounding, provided that the temperature and salinity of the water are known.

If we know the average annual conditions of temperature and salinity for any ocean for all depths, tables can be prepared which indicate regions throughout which the same velocities can be used for given depths without introducing material error. Determination of the extent of such regions and the velocities to be used in each is the purpose of this paper. The results show that the information can be given in a simple and easily used table for the entire Pacific Ocean.

Information as to mean annual temperature at the surface and at various depths was obtained from the publication "Die Warme Verteilung in den Tiefen des Stillen Ozeans" by Gerhardt Schott and Fritz Schu. The information was amplified from the Report of the Scientific Results of the Challenger Expedition, Physics and Chemistry, Vol. 1. Information regarding salinity was obtained from an atlas of thirty-one maps published by the Deutsche Seewarte in 1896 and from the Challenger report just mentioned.

For convenience, a map of the North Pacific was selected which gave the outlines of the land and meridians and parallels 10° apart. At each intersection the average temperature for each two hundred fathoms layer was entered and also the proper salinity to use, the same salinity being used for all depths. Seasonal changes of temperature were neglected, as these affect only the two upper layers and the second layer but slightly. While the variation of temperature at the surface during the season is considerable in the temperate zones, the average temperature of the upper layer does not vary much.

With the temperature and salinity fixed for each layer, the proper velocity for any desired depth was obtained from the tables of Special Publication No. 108, applying the adiabatic correction. The velocities were tabulated for 600 fathoms, 1,200, etc., to 5,400 fathoms, the greatest depth known.

The form of table adopted as most convenient was not a velocity table, but a percentage correction table. In practically all echo sounding now being carried on, all soundings are computed for a standard velocity and all that is needed is the correction to apply for the proper velocity. The percentage of correction to be applied is equal to the proper velocity divided by the standard velocity, minus one. Thus, if standard velocity is 800 fathoms per second and proper velocity is 824 fathoms per second, the percentage of correction is 3.0. The United States Navy and the Coast and Geodetic Survey have adopted the above