normally until about the middle of the summer of 1930. Its flow gradually slowed up until it finally stopped in September, 1931. During the fall of 1931, a new well was drilled, 100 feet deep. The initial flow was .44 gallons per minute, which increased to 4 gallons per minute by March, 1932.

Lake levels in Ohio furnish us with another body of facts concerning the fluctuations of the ground water level during 1930 and 1931. Not far from Loudonville, Ohio, are located several lakes. Careful investigation was made of the levels of these lakes from 1929 to 1932. All observations indicate that the lake levels were lowest during October and November of 1931. One of these lakes, Round Lake, overflowed through its outlet in 1929. In January, 1931, a stake was placed to indicate the water level. On November 10, 1931, the level had fallen 20 inches below the stake. On February 27, 1932, the surface was still 8 inches below the stake. The three largest lakes in Ohio, Buckeye, St. Marys and Indian Lakes, all show the lowest water level in the late summer and fall of 1931. The level of St. Marys Lake fell steadily from April, 1930, reaching its lowest points in September, October and November, 1931; the lowest point recorded was in September, 1931. Buckeye Lake fell to its lowest level in November of the same year.

The evidence is conclusive that the ground water level was lower during the summer and fall of 1931 than at the peak of the drought in the summer, fall and winter of 1930–1931. The ground water level sank steadily from April, 1930, until the fall of 1931. The facts indicate that, although the rainfall was normal from April, 1931, on, the ground water level did not stop its downward movement until seven months later, during the later part of November and December, 1931, when it started to rise gradually. It is evident that a series of rains may have no immediate effect on the ground water level, although temporarily the run-off may cause the streams to flow vigorously.

KARL VER STEEG

COLLEGE OF WOOSTER

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A NEW TECHNIQUE FOR THE PREPARATION OF VITAMIN A-FREE CASEIN[1]

THE basal diet for vitamin A experiments has been investigated extensively. Sherman and Smith[2] have discussed fully the common method used in basal diet preparation in their book "The Vitamins." The vitamin A-free diet used in the Sherman laboratories is as follows:

	Per cent.
Casein vitamin A-free	18
Salt mixture, Osborne and Mendel	4
Dried brewers' yeast	10
Sodium chloride	1
Cornstarch	67

It includes also a satisfactory source of vitamin D.

This diet was used for the vitamin A experiments in the author's laboratory during 1930–31, the casein being rendered free of vitamin A by the alcohol extraction method.[1] This method involves a long tedious process. The long time of preparation, together with the large quantities of alcohol required, makes this vitamin A-free casein very expensive.

Preliminary experiments were started early in 1931 in an attempt to develop a more economical method for preparation of vitamin A-free casein. Ground commercial casein was heated in 500 to 600 gram quantities and spread on shallow trays to a depth of one and one half inches. A temperature of 110° C. was maintained in a thermostatically controlled electric oven for seven days. The casein was stirred daily to secure better air exposure.

Since the depletion records in the preliminary study indicated that the air-heated casein was as free of vitamin A as alcohol extracted casein, all vitamin A experiments for the year of 1931 and 1932 were conducted with this air-heat-treated form in the basal vitamin A-free ration.

A summary of the depletion records of vitamin A reserves in rats shows that the air-heat-treated form of casein does not carry vitamin A. An average 44-day depletion period was required for 57 animals receiving the vitamin A basal diet in which the casein had been treated by the alcohol extraction method. The average initial weight of these rats was 42 grams with a depletion weight of 116 grams, thus showing a weekly gain of 11.8 grams. The average depletion period of 131 rats which were on the vitamin A basal ration containing the air-heat-treated casein was 34 days. The average initial weight for this group of rats was 45 grams, depletion weight 112 grams, and the average weekly gain was 9 grams. Both series of animals appeared to be equally satisfactory for vitamin A tests. The longer period required for depletion of the animals on the alcohol extracted form of casein is to be explained by a modification in the stock diet. The stock diet used in the laboratory during 1931–32 was not as rich a source of

[1] Published as Scientific Paper No. 228, College of Agriculture and Experiment Station, State College of Washington.

[2] H. C. Sherman and S. L. Smith, "The Vitamins," 2d Ed., pp. 256–258, 1931.

vitamin A as the diet employed for the stock animals which supplied the vitamin A experiments of 1930–31.

The records of the negative control animals show another favorable comparison between the two vitamin A-free basal rations. Averages of 11 rats placed after depletion on the vitamin A diet containing alcohol extracted casein show a loss of 28 grams in weight during their survival period of 22 days, or an average weekly loss of 8.9 grams. A similar study of 16 negative rats on the vitamin A diet with air-heat-treated casein shows a loss of 20 grams in their survival period of 16 days, or a weekly loss of 8.8 grams.

The Sherman-Munsell vitamin A-free basal diet has been proved by many workers to be adequate for growth when vitamins A and D are supplied. The growth records of 14 positive control rats that were fed a ration composed of 90 per cent. of the basal diet containing air-heat-treated casein, 10 per cent. butter fat, and 3 drops of viosterol weekly, gained 14 grams per week during an experimental period of 5 weeks. This excellent gain in weight of the positive animals would indicate that the casein had not been modified sufficiently by the action of heat to cause the nutritive value of the basal ration to be changed.

The matter of economy has already been mentioned. Because of the economical production of the heat-treated casein its use will naturally rest upon its being equal in vital respects to the alcohol-treated form. The above experimental data seem to establish the reliability of the air-heat-treated form of casein for the basal diet used in vitamin A studies.

MYRA T. POTTER,
Research Specialist in Nutrition in Home Economics

AUTOMATIC CONTROL FOR VACUUM APPARATUS

To those operating vacuum ovens with electric pumps, the need for automatic control has probably presented itself. If nothing more, the annoyance from noise due to continuous operation over long periods would be enough to suggest some means of control that would cut down the time of operation of the pump. Added to this is the economy in current consumed and the added life of the pump itself. Certainly, if a device that can cut down the time of operation to five or even ten minutes out of an hour can be installed, it is worth while, provided its original cost is not too high. Nothing within reason seems to be on the market, but a very simple and yet efficient one may be made at small cost.

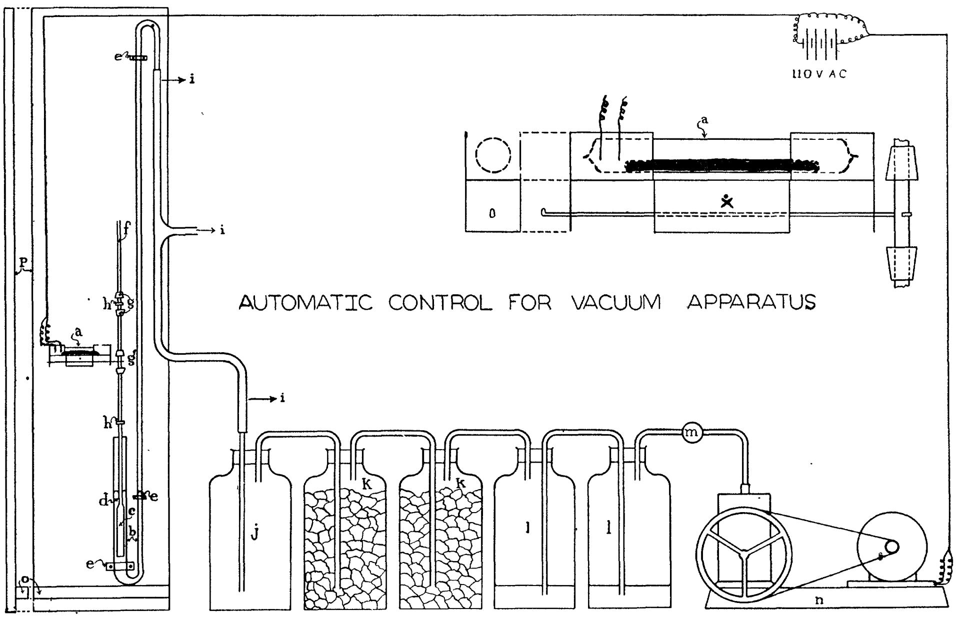

FIG. 1. p, board $\frac{7}{8}''$ x 10″ x 38″; o, shelf on p $\frac{7}{8}''$ x $1\frac{1}{2}''$ x 10″; b, S-shaped glass tube; large arm, 1″ bore 12″ long, middle $\frac{1}{3}''$ bore 36″ long, short arm $\frac{1}{3}''$ bore 3″ long; c, glass float $\frac{3}{4}''$ dia. (outside) $3\frac{1}{2}''$ long; f, stem of float $\frac{1}{4}''$ dia. (outside) 24″ long; e, clips to fasten b to board; h, $\frac{1}{4}''$ screw eyes 12″ apart; g, one hole rubber stoppers on f; a, mercury trip switch and cradle in which it rocks; x, screw fulcrum on which "a" rocks; d, mercury in glass tube; i, hose connections to glass tube, oven and moisture collecting jar; j, moisture collecting jar; k, calcium chloride jars; l, oil jars containing a little oil same as in pump; m, check valve (not needed if pump has one); n, electric pump and connections. Screw eyes "h" are to guide float and stem to prevent friction between float and tube; a few pointed papillae on the float will also prevent friction and avoid the use of the lower screw eye.

The accompanying figure will show the set-up.

Switch (a) can be bought or made. Its length should be about 3 inches. In such a switch the weight of mercury helps to operate it. If one is made, use a $\frac{1}{2}$-inch glass tube and fuse platinum wires about $\frac{1}{4}$-inch apart near one end and reaching within $\frac{1}{8}$-inch