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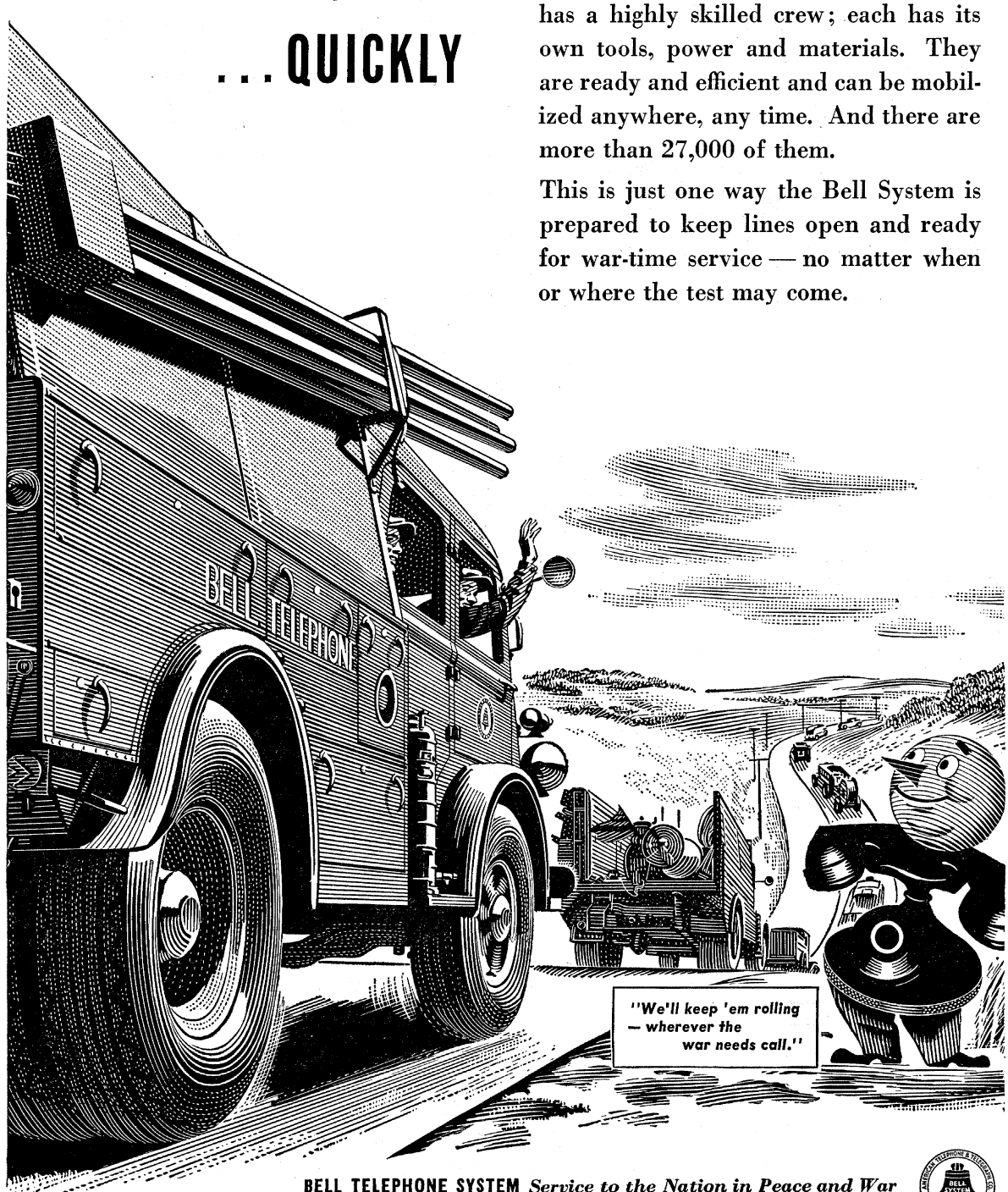

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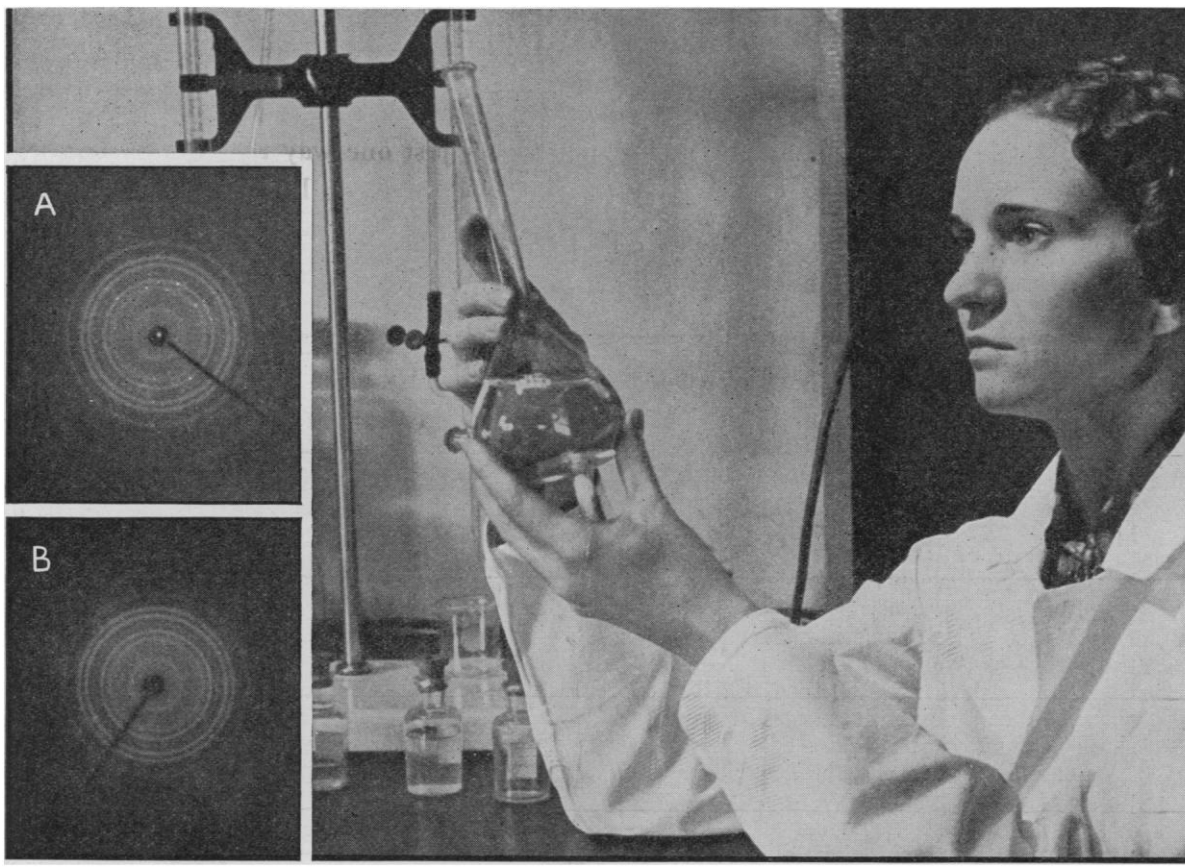

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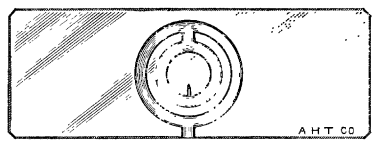
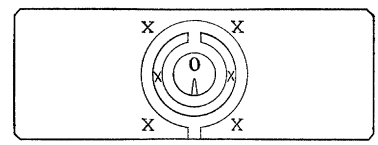


7045-J, Fig. 1



7045-J, Fig. 2

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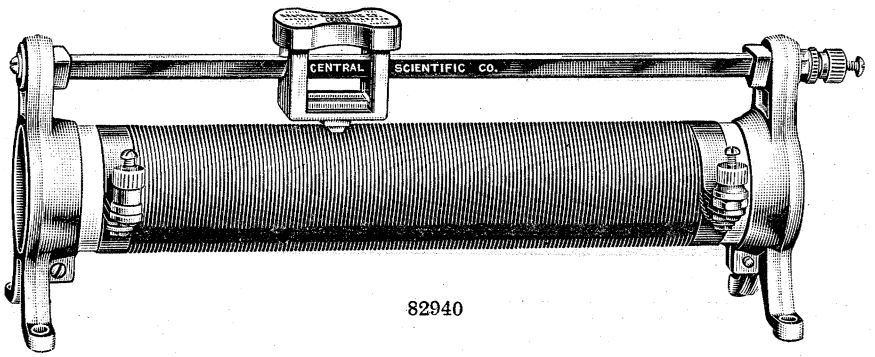

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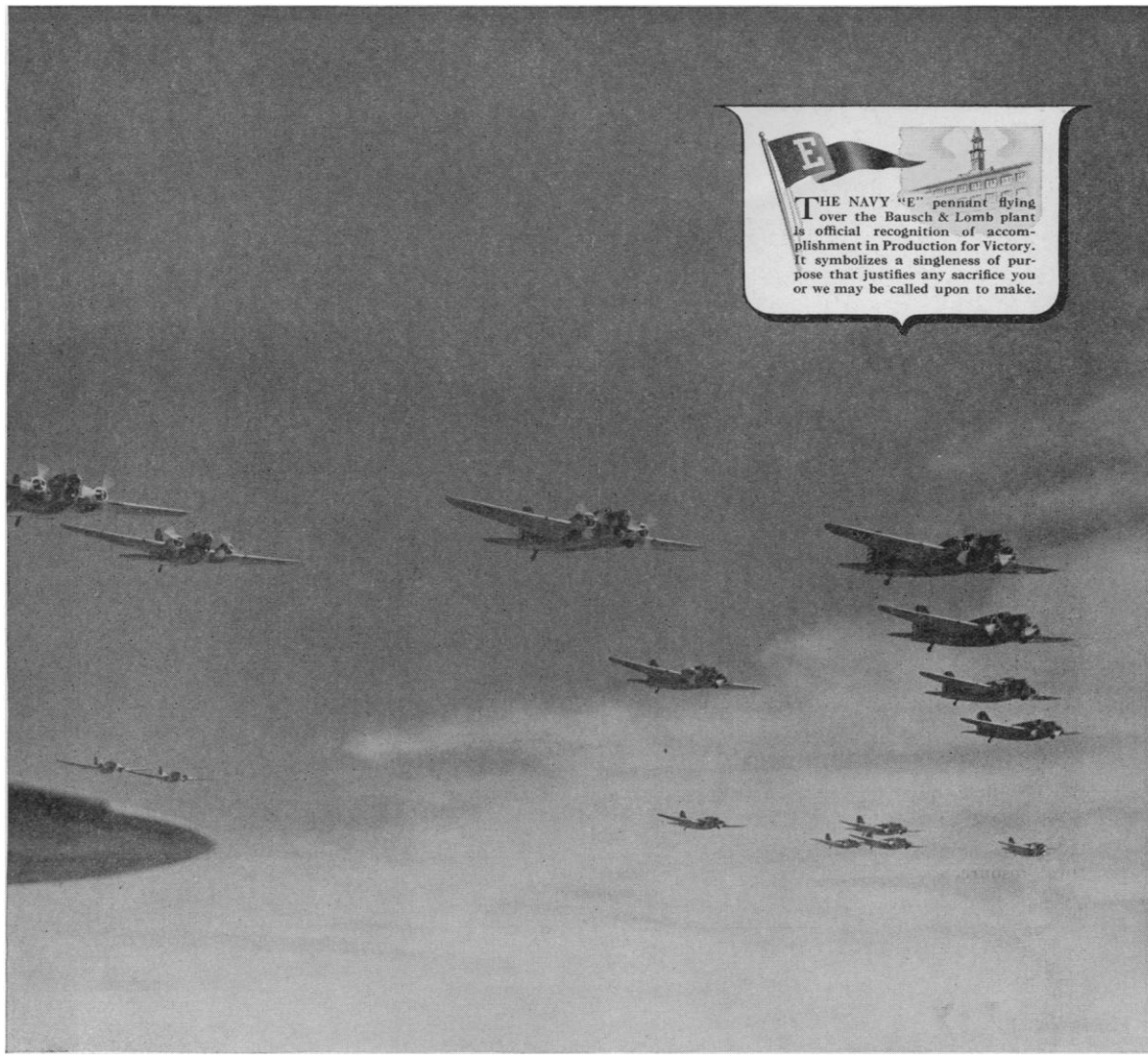

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VITAMINS IN THE FUTURE[1]

By Dr. ROBERT R. WILLIAMS

CHEMICAL DIRECTOR OF THE BELL TELEPHONE LABORATORIES, NEW YORK, N. Y.

AMONG the dusty reprints which I treasure is a yellow-backed one from the *Journal of Physiology* bearing the date of December, 1911, in which Casimir Funk first proposed the name "vitamine." As I had at that time been working with Vedder for more than a year on "the beriberi-preventing substance," I may, in a sense, claim to have been one of the midwives in attendance at that historic birth. Vedder and I were among the first, if not the first, authors to take up the use of the term in our first joint paper, published somewhat belatedly in 1913. In 1916 my testimony in refutation of the claims of the manufacturer of a cure-all was part of the first court record in which the term appeared. As the years have overtaken my plodding feet, the number of scientific papers which employ the word "vitamin" has grown from a paltry two or three to some thousands annually.

I have recently been reading some medical biographies and particularly Clapesattle's story of the Mayos. There one notes that, although Pasteur indicted the atmosphere as a source of infective organisms in 1864, although Lister announced his method of antiseptic surgery in 1867 and had achieved international acclaim for his work by 1879, Will Mayo appears to have graduated in medicine at Michigan in 1883 with only a superficial knowledge of Listerism and scant conviction of its merits. It was not till

[1] Address on the occasion of the presentation of the Charles Frederick Chandler Medal of Columbia University, February 26, 1942.

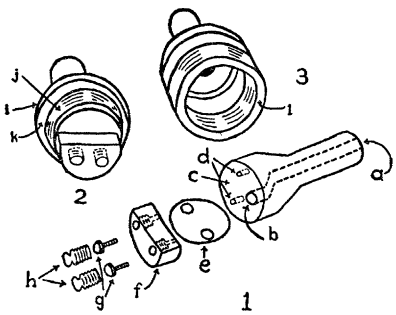

FIG. 2. The check valves. 1. Valve No. 1 shown unassembled. 2. Valve No. 2 shown assembled. 3. Cap for valve No. 2.

from near the edge of the head end so that it connected with (a). The rod was then turned down to the shape indicated in the figure, the head retaining its ¾-inch diameter and the small end being reduced to about 7/16 inch. The surface (c) was polished thoroughly. Two holes (d) were then drilled into the head as illustrated and tapped to accommodate No. 1–72 screws. A rubber diaphragm (e), about .01 inch thick, was cut to fit the surface (c), and holes were punched in it to correspond to those at (d) in the head. This diaphragm was fastened onto the head of the valve with "lucite" block (f), cut from a ¾-inch rod and held in place with two No. 1–72 brass screws (g). The holes in the block accommodating the screws were countersunk and threaded to take the "lucite" plugs (h). Valve No. 2, which is slightly more complicated than No. 1, is shown assembled. The rubber flap is shown resting against the opening of hole (b). A slight pressure from within will bend the diaphragm away, but a slight pressure in the opposite direction will cause the flap to cover the opening securely. Valve No. 1 can be used only on the end of a tube conducting liquid into some sort of reservoir. Valve 2, which is identical in principle, was cut from a 1⅛-inch "lucite" rod and was constructed in such a manner that a cap, 3, could be fitted over it, permitting it to be introduced at any point in a circulation system. A collar (i) was left at the base, and the shoulder (j) was threaded. The cap, 3, which screws onto the valve, 2, was cut from a similar rod. By polishing the surface of the collar (k) and the edge of the cap (l), it was possible to obtain a perfectly tight seal without the use of gaskets, if a little vaseline was applied to the threads before assembling.

Because of the elasticity of the rubber flap, the valve can be used in any position. Pressure differences as low as half a centimeter of water have been found to be sufficient for its operation. Constructed as it is so that only rubber and lucite are exposed, it can be used with most aqueous solutions, excepting concentrated acids and bases, and with those organic liquids which attack neither "lucite" nor rubber. Suitable materials could probably be found for making a similar valve for almost any special purpose.

The advantage of rocking circulating dialysis as here described over stationary dialysis for the equilibration of electrolyte concentrations was demonstrated by dialyzing 15 cc portions of distilled water against 2 liters of 0.2 M NaCl solution for various times using (a) rocking circulating dialysis and (b) stationary dialysis. The latter was accomplished by simply suspending the dialyzing bag near the bottom of the salt solution and allowing it to stand unagitated. Electrolyte concentrations after dialysis were estimated by measuring conductivities. As may be seen in Fig. 3,

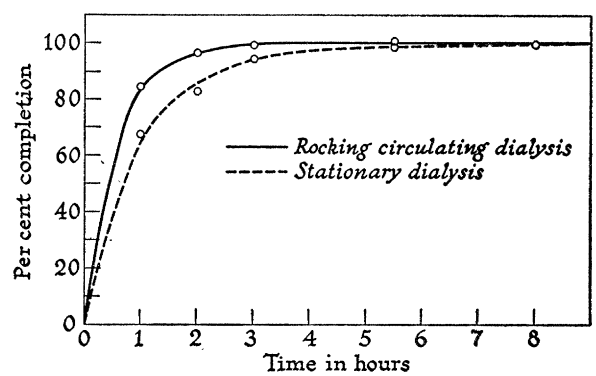

FIG. 3. Comparison of the rates of equilibration by rocking circulating dialysis and by stationary dialysis.

practical equilibrium is reached in about 3 hours by the rocking method but only in something more than 8 hours by the stationary method. In equilibrating viscous materials like protein solutions with electrolyte solutions, the advantages of the rocking method proved to be even more pronounced.

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