following: whether rickets is due to lack of Fat Soluble A, whether there is an antiscorbutic vitamine (Water Soluble C), and in what sense pellagra may be rated as a deficiency disease. All the material is handled in a cautious and modest way with the result that no encouragement is given to faddists of any kind.

PERCY G. STILES

## EXPERIMENTS ON THE RECORDING AND REPRODUCTION OF CARDIAC AND RESPIRATORY SOUNDS

WE have recently conducted experiments at the Bureau of Standards in which permanent records of cardiac and respiratory sounds have been made and reproduced by the use of a telegraphone. The records have also been made audible throughout the room with the aid of audion amplifiers and a loud-speaking telephone.

A carbon telephone transmitter of ordinary type with a rubber adapter substituted for the mouthpiece was used for the stethoscope. The currents from the telephone transmitter were amplified by means of a five-stage audion amplifier which was connected to the recording element of a steel wire telegraphone. The magnetic records of the cardiac and respiratory sounds thus obtained were made audible by connecting telephone receivers to the telegraphone in the usual manner. The telegraphone currents were also amplified by means of a three-stage audion amplifier which was connected to a loud speaking telephone. In this way the sounds were made audible throughout the room.

This method of obtaining permanent records of cardiac and respiratory sounds and of reproducing them offers interesting possibilities in the study of normal and pathological conditions of the heart and lungs and their demonstration to an audience for purpose of instruction.

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## SPECIAL ARTICLES

### THE SEPARATION OF THE ELEMENTS CHLORINE AND MERCURY INTO ISOTOPES

IN SCIENCE of March, 1920, Harkins and Broeker reported that they had obtained a separation of chlorine into isotopes by diffusing hydrogen choride gas. The separation at that time amounted to an increase of atomic weight equal to 0.055 unit, or a change of density amounting to 1,550 parts per million. This separation has been definitely confirmed by Dr. Anson Hayes and the writer, who have secured an increase of 0.04 unit of atomic weight in a larger quantity of material. Elaborate purifications have been resorted to, and definite evidence has been secured to show that the increase in density found is actual, and not due to impurities. The details of this work were supposed to have been printed in the August number of the *Journal* of the American Chemical Society. However, since the date of publication of this number is doubtful on account of the printers' strike, it seemed advisable to answer here the considerable number of inquiries as to whether we have secured definite evidence of the separation.

About six months after our notice of the separation of chlorine into isotopes had been published, Bronsted and von Hevesy published a notice in *Nature* indicating that they had separated mercury into isotopes. However, since the extent of the density change reported by them was only about *one thirtieth* of that previously obtained by us in the case of chlorine, it seemed to us that the evidence for this separation of mercury was inconclusive, since a change of 50 parts per million in density might be due to minute amounts of impurities. In order to see if they could confirm these results, Dr. R. S. Mulliken and the writer have vaporized mercury at low pressures. The mercury was carefully purified by five fractional distillations in air at low pressures, and one in a high vacuum, after initial purifications with nitric acid. The increase in density obtained amounts to 69 parts, and the decrease to 64 parts or a total