

phake<sup>1, 2</sup> first demonstrated this type of depth effect of the high frequency field, and has presented experimental evidence which indicates that high frequency treatment plates which are allowed to make contact with the surface of tissue produce a tissue heating which is closely comparable with that of diathermy, in which the production of heat is predominantly in the superficial layers of tissue.

The experimental evidence presented clearly demonstrates that it is possible to produce abnormally high temperature in a chosen region (*i. e.*, knee joint of a dog) by means of local applications of short wave electric energy of sufficient intensity. Furthermore, these relatively high temperatures may be produced in the deep (intra-articular) tissue of the region without the simultaneous production of high temperatures in the superficial (subcutaneous) tissues of the region (*i. e.*, portion of leg of dog) exposed to the high frequency electric field of the type used in these investigations.

#### 7854 P

#### Precipitation of Apparent Creatinine from Serum Ultrafiltrates.

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In earlier isolation experiments<sup>1, 2</sup> on blood creatinine, the use of protein precipitants, of adsorbents, and evaporation in acid solution all made the interpretation of results difficult. In the case of sera showing various degrees of nitrogen retention a simpler path which avoids these difficulties is open. In the following experiments cellophane No. 300 was used as the membrane in an ultrafilter operated by a nitrogen pressure of 400 lb. per square inch. A few drops of toluene were added to the serum and the receiving vessel.

To 10 cc. of ultrafiltrate are added 250 mg. of pure picric acid. This is dissolved by shaking the tube under the hot water tap, and the solution is cooled to about 25° in cold water. One-tenth cc. of 10% potassium chloride solution is added, and the solution is mixed at once. An excess of picric acid may precipitate at this point, but unless

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<sup>1</sup> Schliephake, Erwin, *Klin. Wchnschr.*, 1928, **7**, 1600.

<sup>2</sup> Schliephake, Erwin, *Strahlentherapie*, 1930, **38**, 655.

<sup>1</sup> Gaebler, O. H., and Keltch, A. K., *J. Biol. Chem.*, 1928, **76**, 337.

<sup>2</sup> Gaebler, O. H., *J. Biol. Chem.*, 1930, **89**, 451.

the amount of apparent creatinine is very large, one can centrifugize and decant without any loss of chromogenic substance. A small crop of crystals then forms on the bottom or wall of the tube containing the decanted liquid. These crystals contain the apparent creatinine, but free picric acid and a small amount of potassium picrate are still present. If the concentration of apparent creatinine is very high, crystallization may go to completion in a few hours, but as a rule 24 hours are required, and with amounts below 4 mg. per 100 cc. the time required may be still longer.

TABLE I.

Source of Serum	Apparent creatinine in mg. per 100 cc. of ultrafiltrate	
	Before Precipitation	After Precipitation
Human, nephritis	13.6	2.7
"    "	9.0	2.3
"    renal calculi	2.8	1.6*
Dog 10, uranium nephritis	13.3	2.8
Dog 11, "    "	4.2	1.8
Same animal, 2 days later	4.1	2.0
"    "    recovering	2.7	2.0*
Creatinine added:		
Normal serum + 3 mg./100 cc.	3.9	1.5*
"    "    + 3 mg./100 cc.	4.6	1.5*
"    "    + 11.8 mg./100 cc.	12.2	0.9

\* 5 to 6 days required for complete precipitation.

The apparent creatinine values in the ultrafiltrate before and after carrying out the above precipitation are shown in Table I. Unless otherwise stated, 24 hours were allowed for precipitation. Values below 5 mg. per 100 cc. were determined at 1:5 dilution, others at higher dilutions, the concentration of picric acid being kept at 1.2%, and the technique being the same as in Folin's original method for determination of creatinine in picric acid blood filtrates. Analyses of the precipitate in three or four instances confirmed the results obtained before and after precipitation, but most of the precipitates are being used for the more important matter of qualitative examination. The cause of the slow precipitation in the case of ultrafiltrates from sera to which small amounts of creatinine had been added is not clear. The filtrates which were used gave no turbidity with picric or tungstic acid, but on shaking a slight froth appeared which broke almost instantly. Use of a heavier or denser membrane<sup>3</sup> may be indicated.

It must not be assumed from the writer's earlier studies dealing with fractions of ordinary filtrates, that all of the chromogenic

<sup>3</sup> McBain, J. W., and Kistler, S. S., *J. Gen. Physiol.*, 1928, **12**, 187.

substance precipitated in the present experiments is creatinine potassium picrate. A direct study of the precipitate will be reported later.

## 7855 P

**Amplified Heart Sounds. Use of the Crystal Microphone.\***

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The object of this paper is to describe a practical method of amplifying heart sounds that may be used to teach students abnormalities of these sounds, to distinguish murmurs and to elucidate cardiac arrhythmias. This procedure is particularly useful in teaching auscultation to students.

Many amplifiers† have been described both in the United States and abroad. These usually have been bulky and not portable and many require the use of batteries. We have designed a high-gain 3-stage amplifier that is portable, inexpensive, operates on alternating current and does not require the use of batteries. The essential features consist of a type 57 tube of high amplification value, which is resistance coupled to another 57 tube in the second stage; and this in turn is resistance coupled in a 2A5 tube in the third stage. The power supply is the customary circuit and is heavily filtered using 30 henry chokes and 28 microfarads of condenser. A 2-ampere fuse was installed to prevent burning out the transformer in the event the amplifier is plugged into direct current by mistake. A 12-inch permanent magnet speaker was selected because of a better tone response than the magnetic speaker, and because it is lighter in weight than the dynamic speaker. An output transformer, while not required, was found to improve the tone response. It is possible with certain modifications to use this amplifier with direct current.

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† The crystal type of microphone has been used by Dr. H. B. Weiss at the Cincinnati General Hospital and a crystal microphone was used in the apparatus developed and demonstrated by Mr. M. L. Lockhart at the meetings of the American Heart Association and the American Medical Association. The advantage of the arrangement described in this report is its inexpensiveness.