allowed no such growth. Finally, the cost of the entire process is well within the capacity of the ordinary laboratory, if not cheaper than present methods.

A solution containing 20 per cent. by weight of grade RH-393 PVA is prepared by suspending the powder in cold water (about 20° C.), breaking up the lumps, then stirring well while heating in a steam-bath to a temperature of 75–85° C. To the cooling solution is added 20 per cent. of glycerine by weight. Washed formalin-fixed tissue, without further preparation, is placed in this material in covered shallow dishes. Infiltration of ordinary tissues, as heart, lung, liver, spleen, etc., using pieces of average size, is as good when they are put directly into 20 per cent. PVA as when they are run through 5 per cent. and 10 per cent. first. The dishes are kept at room temperature but for a daily exposure of two hours to a temperature of 56° C. in the oven. Solidification takes place in 8 to 9 days. The total time may be shortened by cautiously uncovering the dish toward the end. The trimmed block of hardened PVA is attached to the fibre carrier-block with paraffin or with cement. The cut sections unroll in lukewarm water and are mounted immediately for staining. The medium is not washed away, but stains no more than does celloidin. The remaining procedures are as usual.

This is a preliminary report. Further experimentation in progress is aimed at eliminating heat and at shortening the procedure. The protean qualities of this plastic make such improvements highly probable.

We should like to thank E. I. du Pont de Nemours and Company for supplies of PVA and for considerable advice.

VIRGINIA LUBKIN
MARY CARSTEN

OPHTHALMOLOGICAL LABORATORY,
MONTEFIORE HOSPITAL,
NEW YORK

X-RAYS FROM RADIO TUBES

IN 1937 Simons, Clark and Klein[1] described a simple apparatus for the generation of x-rays from an old 01-A radio tube, the total cost of the equipment being something like $25. The purpose of the present note is to describe a simplified form of the apparatus, which can be assembled at an expense of six or seven dollars and which is remarkably effective for making radiographs of various specimens.

The materials required are:

Two Ford model T ignition coils (KW brand).
A step-down transformer, from 110 to 12 volts (if unavailable, two 110–6.3 volt transformers commonly used in radio circuits can be substituted with the 110-volt sides connected in parallel and the 6-volt sides in series).
An old 01-A radio tube.
A small wedge of sponge rubber.
Some No. 22 wire for hook-up connections.
A small portion of a metal foil.

[1] *Radiology*, 29: 721, 1937.

The two spark coils are connected in series by connecting the two terminals nearest the vibrators together. The 12-volt source is connected to the two terminals on the ends opposite the vibrators. The 110-volt end of the transformer is connected with a 110-volt line source. One of the vibrators is turned down tight so that it does not operate. A wedge of sponge rubber is slipped under the other vibrator to produce the maximum frequency possible. This adjustment takes about five minutes. One high tension lead is connected with the four prongs of the base wired together and the other with the foil wrapped around the upper part of the radio tube. The foil should not cover the portion of the tube facing the flat side of the plate element inside where the x-rays originate. The radio tube should be mounted on an insulated support, for the voltage is about 16 KV to ground with about 32 KV between the two high-tension terminals. A small glass tumbler, with a strip of adhesive tape, makes a good support. Radio tubes displaying a green fluorescence produce an x-ray beam of greater intensity than tubes showing a blue fluorescence.

For making radiographs at a distance from the radio tube to the object of four to six inches and with Agfa non-screen x-ray film held in double black paper envelopes, the time of exposure is from two minutes for thin objects to five minutes for thicker ones.

Excellent radiographs of objects such as seeds, fountain pens and other fabricated objects, gems, flowers, bones, etc., are easily obtained. The apparatus is also particularly well adapted for microradiographs, in which the radiograph of small specimens is registered on a fine-grained photographic emulsion and enlarged as described by Clark and Shafer.[2]

HOWARD C. BRINKER

ST. PAUL, MINN.

[2] Transactions of the American Society of Metals, p. 732. 1941.

BOOKS RECEIVED

BENT, ARTHUR CLEVELAND. *Life Histories of North American Flycatchers, Larks, Swallows, and their Allies.* Pp. xi + 555. 70 plates. U. S. Government Printing Office. Paper, $1.00.

Contributions to the Calculus of Variations, 1938–1941. Pp. vii + 527. University of Chicago Press. $3.00.

HAYNES, WILLIAMS and ERNST A. HAUSER. *Rationed Rubber.* Pp. vii + 181. Alfred A. Knopf, Inc. $1.75.

HOLLINGWORTH, LETA S. *Children Above 180 IQ.* Pp. xvii + 332. World Book Company.

Physics of the Earth. IX—Hydrology. Edited by OSCAR E. MEINZER. Pp. xi + 712. Illustrated. McGraw-Hill. $7.50.

TSCHAN, FRANCIS J., HAROLD J. GRIMM and J. DUANE SQUIRES. *Western Civilization. The Decline of Rome to 1660.* Pp. 783 + xciii. Illustrated. J. B. Lippincott. $3.25.