UNITED STATES ATOMIC ENERGY COMMISSION

184-INCH CYCLOTRON VERTICAL BEAM OSCILLATIONS IN THE REGION OF 82-INCH RADIUS

by

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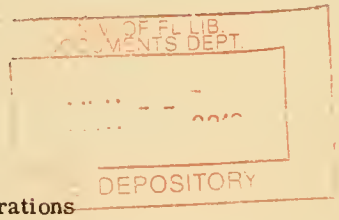

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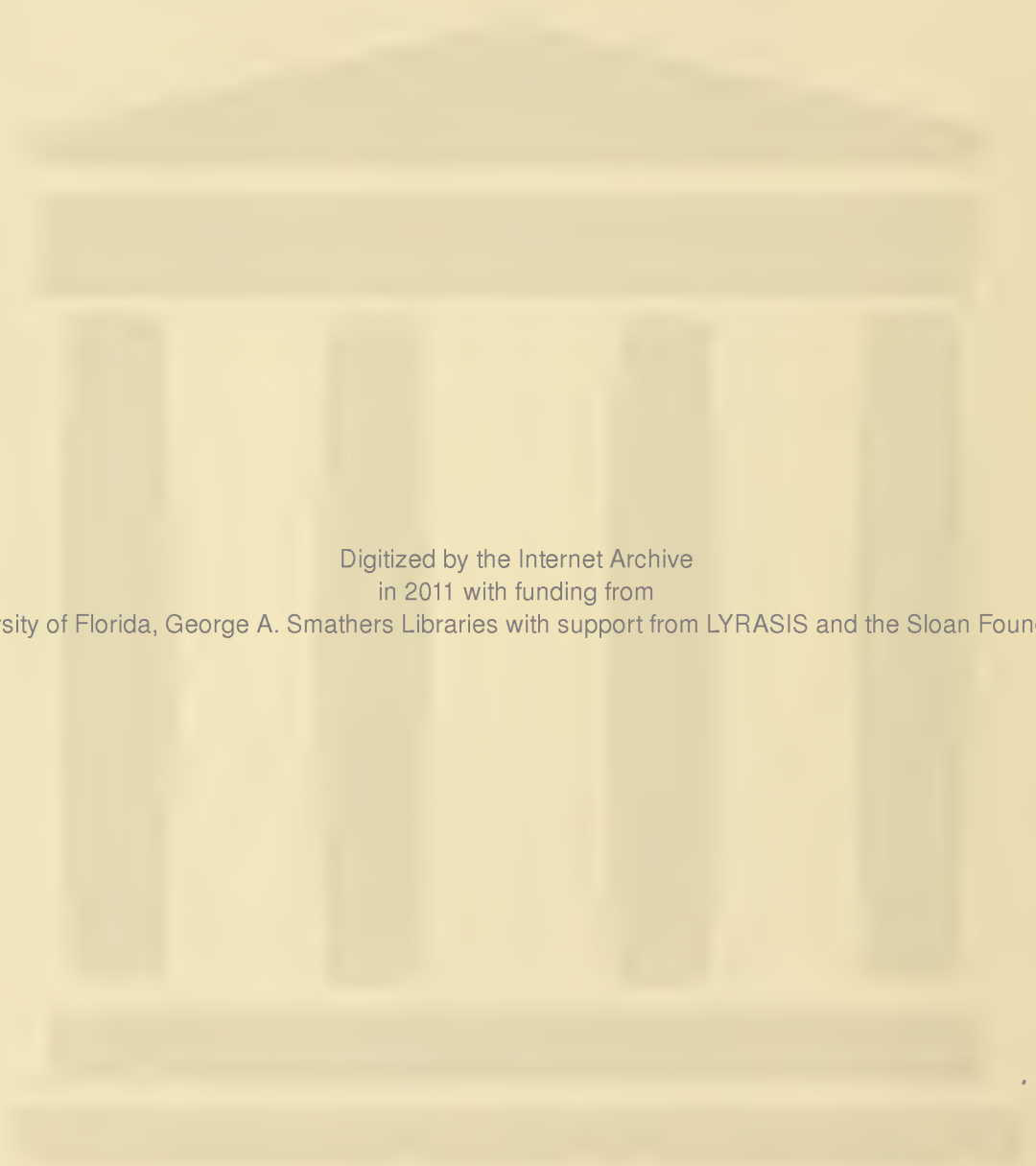

184-INCH CYCLOTRON VERTICAL BEAM OSCILLATIONS IN THE REGION OF 82-INCH RADIUS

By James Vale

Experiment done by: L. Houser, R. Watt, and J. Vale

INTRODUCTION

It was discovered early in the operation of the 184-inch cyclotron, that the beam did not go out to the expected 85-inch radius.

The Theoretical Group suggested that the beam did not go beyond a radius of 82 inches because of vertical oscillations building up in the vicinity of this point. According to their calculations, the vertical oscillations built up a large enough amplitude at the point where $n = 0.2$ ($n = -R/H\ dH/dR$) so that the beam hit the dee and was lost. An attempt had been made to find this vertical spreading, previously, but it was unsuccessful. Consequently, the following experiment was performed.

EXPERIMENTAL SETUP

Several targets were made of 1/16-inch copper sheet. These were U-shaped and were placed in the tank and bombarded. The plane of the sheet was vertical, and the arms of the U were roughly parallel to the dee face. See sketch of target appended hereto.

Thus, the beam had to traverse the slot in the U to reach the back of the target. Hence, any vertical spreading in the beam would result in its hitting the U arms.

These targets were run into the tank, one at a time, on the regular probe mechanism, were bombarded with a large deuteron beam for about 1 to 3 minutes, removed from the tank and radioautographs were taken to determine where the beam was hitting. The targets differed only in the width of the slot. These slot widths varied from 2 1/2 to 4 1/2 inches.

RESULTS

The autographs indicate a rapid spreading vertically of the beam at about 81 1/2 inches. This agrees quite closely with the point at which $n = 0.2$ from magnetic measurements. The autographs indicate that the vertical spreading is large enough so that most of the beam gets caught by the dee at this point. (Prints of autographs appear on following pages.)

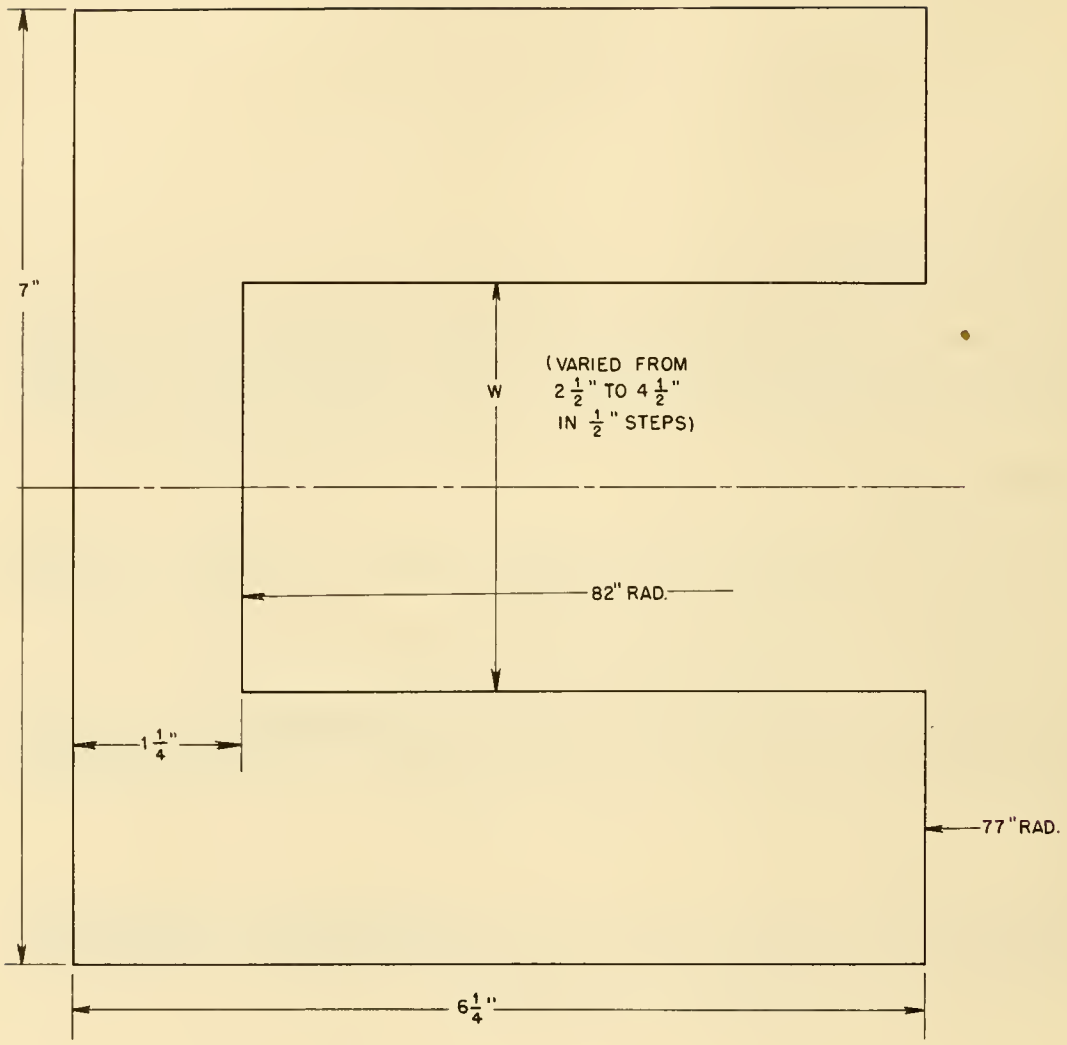

Figure 1. Sketch of target.

Figure 2.

Figure 3.

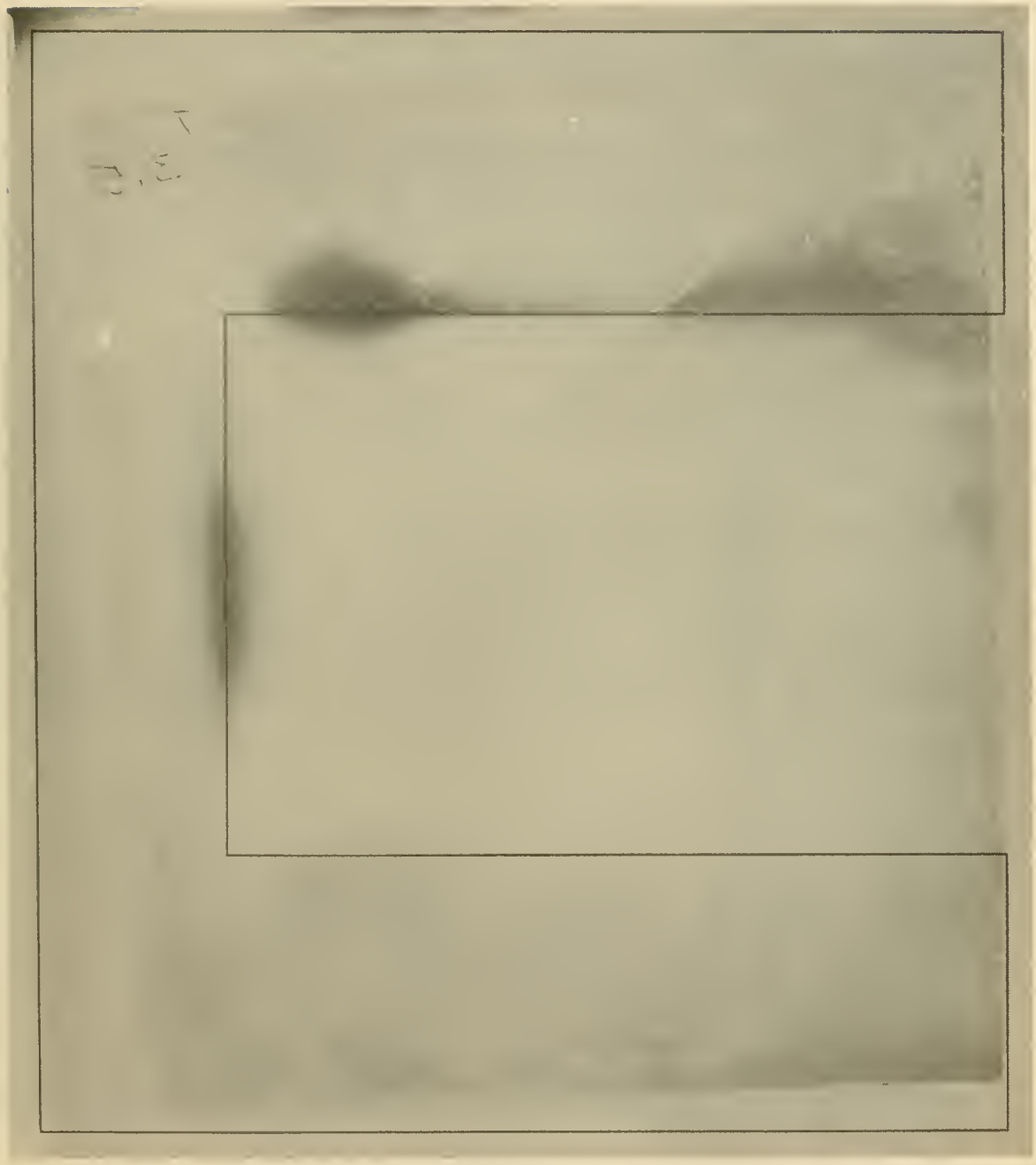

Figure 4.

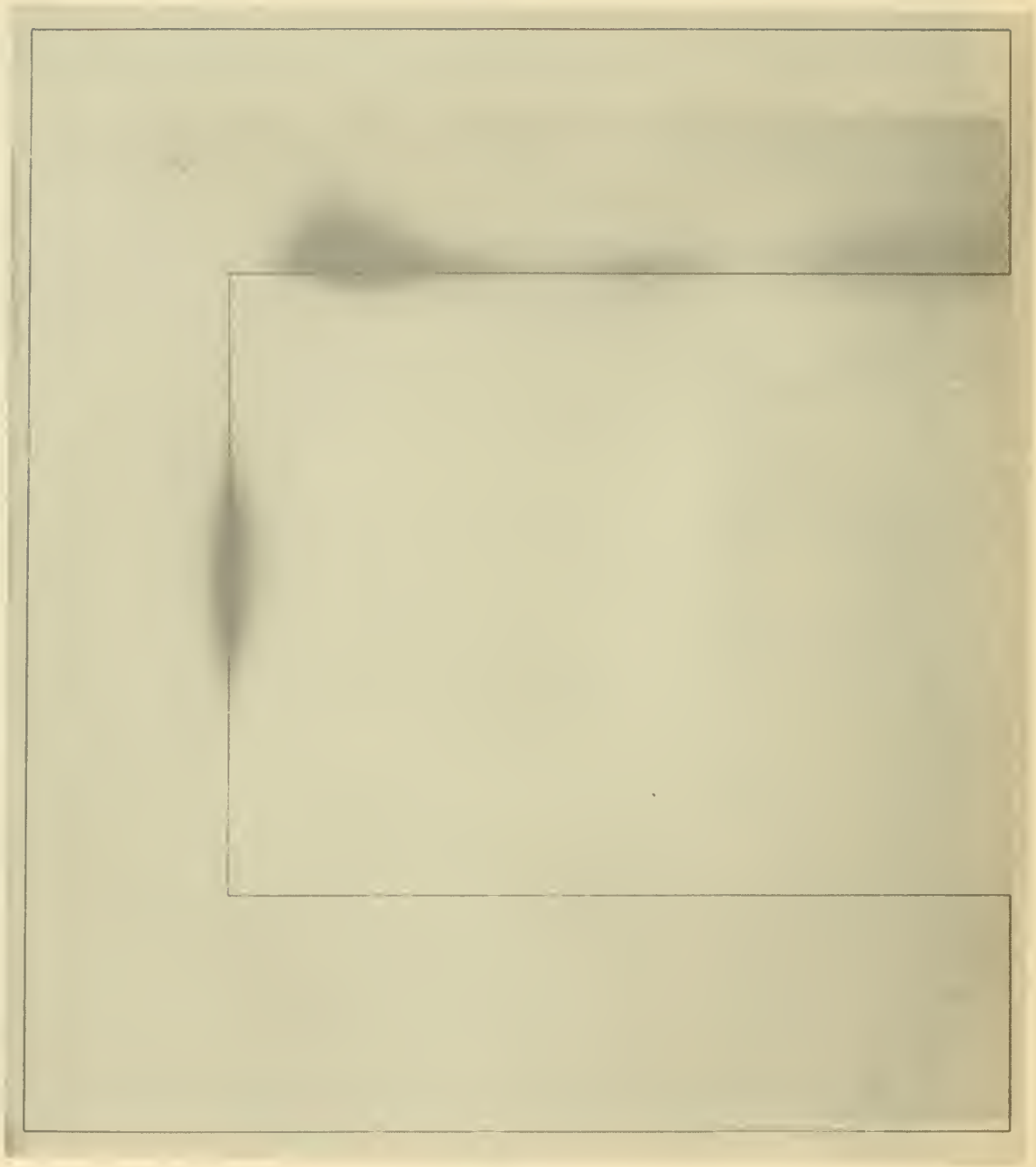

Figure 5.

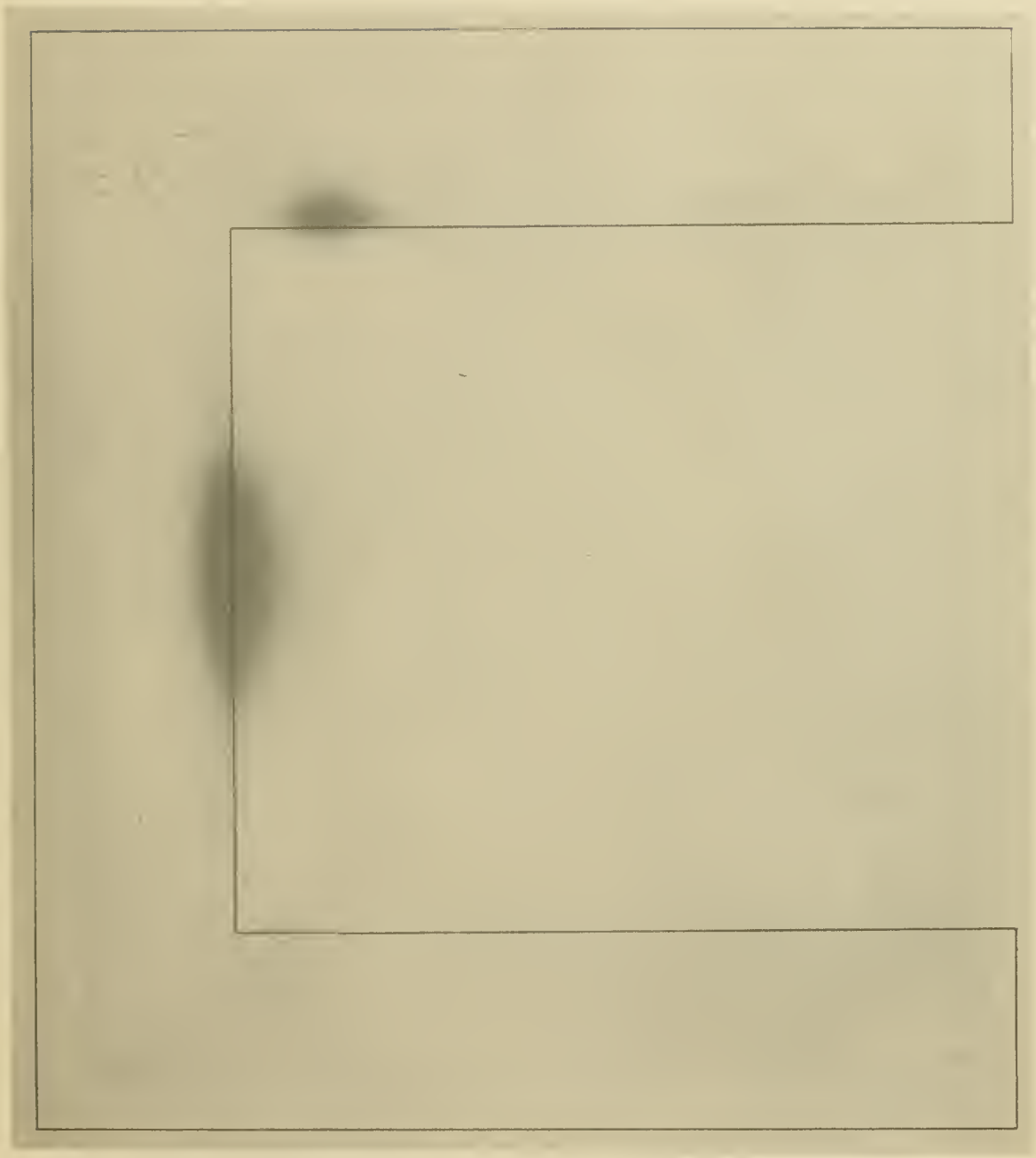

Figure 6.