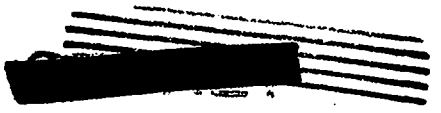

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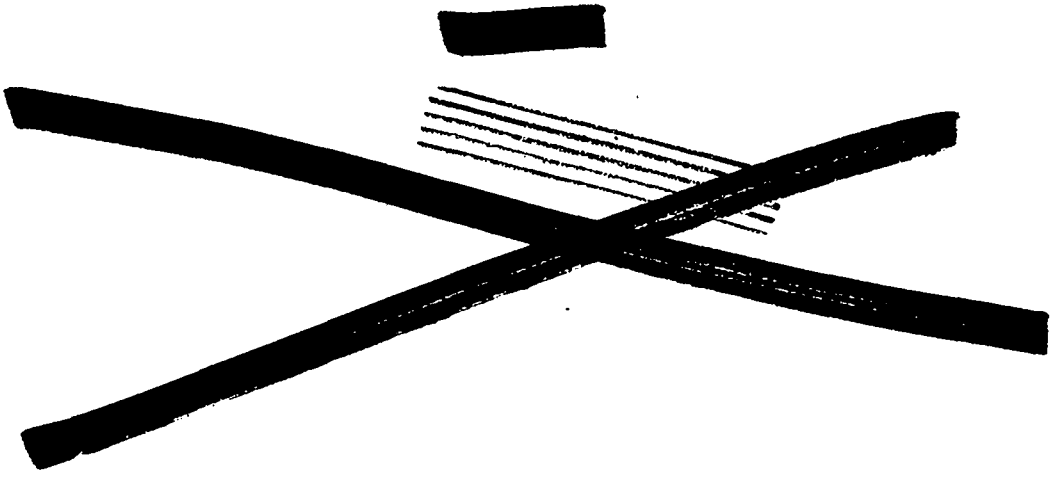

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NEUTRON DISTRIBUTIONS IN TAMPED 25 ASSEMBLIES II:

$4\frac{1}{2}$" Core of 25 Metal

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ABSTRACT

Neutron distribution measurements have been carried out on the 25 sphere of $4\frac{1}{2}$" diameter. Radial distribution curves are plotted for 25, 28 and 37 detectors in the sphere. Neutron multiplication values for the tamped sphere are calculated to be 4.19 for the WC tamper and 3.72 for the U tamper.

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NEUTRON DISTRIBUTIONS IN TAMPED 25 ASSEMBLIES II:

$4\frac{1}{2}$" Core of 25 Metal

Neutron distribution measurements paralleling those described in LA-307 have been made using the 25 sphere of $4\frac{1}{2}$" diameter. The average density of this sphere was 17.6 gm/cm^3 and it averaged 76% of 25 metal. The WC and U tampers were the same ones used in measurements on the $3\frac{1}{2}$" sphere. The source of neutrons was mock-fission source No. 3. Detectors were the spiral fission chambers (described in LA-420) used in previous measurements.

The small (3/8" diameter) detectors were used in the interior of the 25 sphere and as far into the tamper as counting rates would permit. When the counting rate of a small chamber became too slow, it was replaced by its larger (1" diameter) counterpart. The distributions measured by the two chambers were made to overlap by about 2 inches and the larger chamber was then carried to greater distances from the core. In order to plot the complete distribution curves, the small-chamber data were empirically normalized to those of the large chambers. With the aid of the 28-distribution data, the 25-chamber measurements were reduced to values which would have been measured by detectors employing pure 25.

Fig. 1 shows the distribution measurements for the two tampers as measured by the small 25 chambers. The neutron multiplication values of the 25 sphere were determined with the aid of these curves. Figs. 2, 3, 4 and 5 are complete distribution curves for the 25 and 28 detectors. Points measured by the small detectors are denoted by x's. The bad scattering of points in Fig. 3 was due to erratic behavior of the large 25 chamber. This condition was discovered too late to permit repetition of the measurements. In Fig. 6 are plotted the data obtained with the 37 detector. Because of the small amount (9 mg) of 37 available, this chamber was insensitive and could not be used at large distances from the neutron source.

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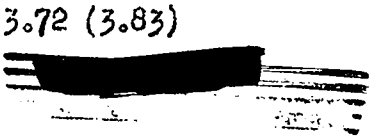
The vertical lines on the graphs indicate the boundaries of core and tamper. Horizontal lines represent the values, in air, of counting rate multiplied by r^2 for the neutron source and the chambers used in the measurements. All curves are arbitrarily begun at this ordinate value for zero distance between source and detector.

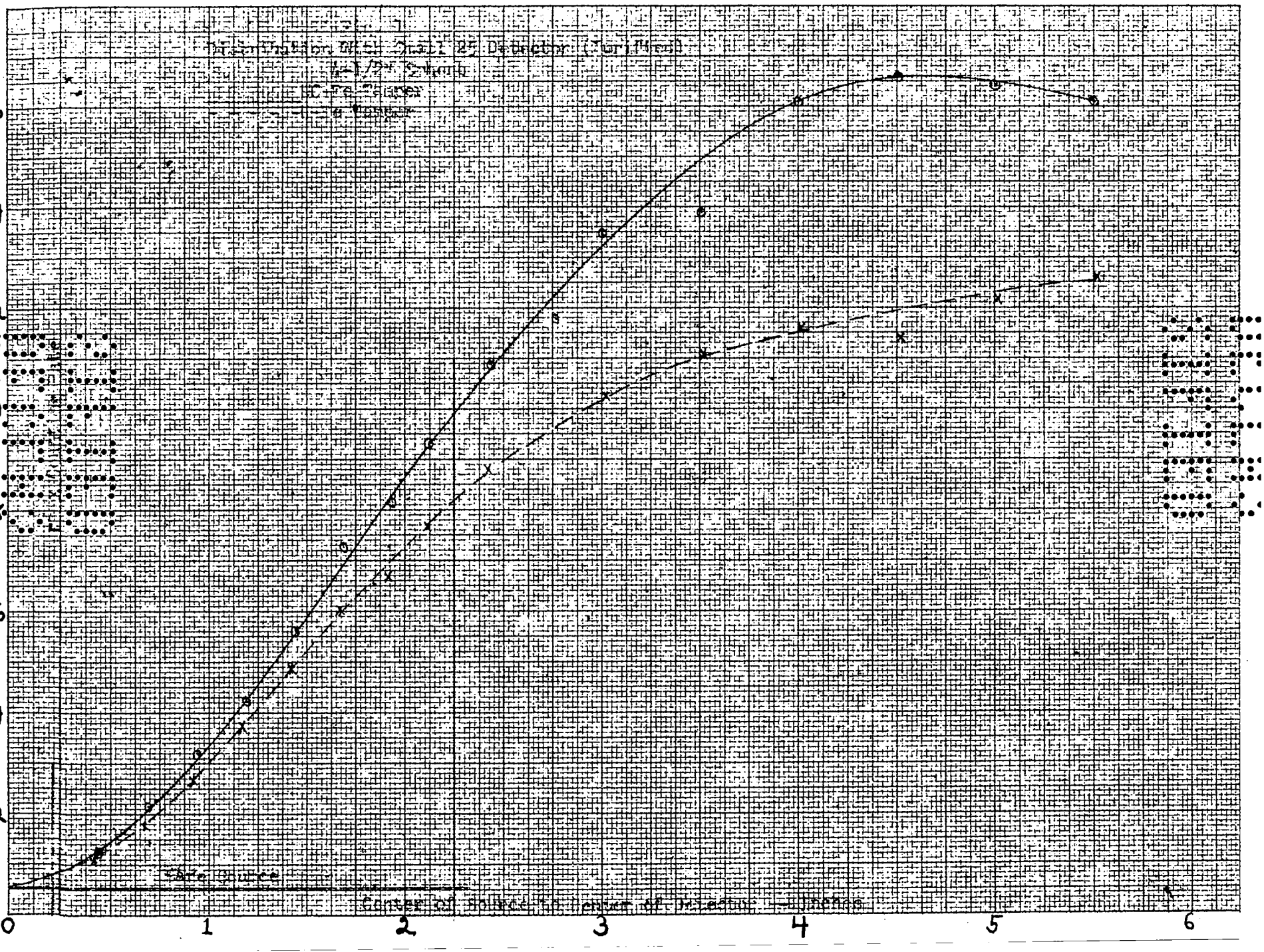
Neutron multiplication values for the tamped sphere were determined as in LA-307, from the relation: $M = 1 + F(\nu-1-\alpha)/Q$. F is the total number of fissions within the 25 sphere per second and Q is the number of neutrons per second from the source. F is determined from the 25 chamber and sphere constants and the area, within the core boundaries, under the curves in Fig. 1. Q is measured with the same chamber by a count on the bare mock-fission source. The strength of the mock-fission source was assumed to be, at any time, proportional to its polonium content. The cross section of the 25 in the detector for the neutron spectrum of this source was assumed to be 1.23 barns as given by Hanson, Serber and Williams in LA-227. Calibration procedures for the chambers are described in LA-307.

Multiplication values for the $3\frac{1}{2}$" sphere as determined from the distribution measurements were computed on the assumption that the net increase in neutrons per fission $(\nu-1-\alpha)$ was 1.36. The average value of $(\nu-1-\alpha)$ for pure 25 as given in LA-227 is 1.56. Table I summarizes the multiplication values of the $3\frac{1}{2}$" and $4\frac{1}{2}$" spheres for $(\nu-1-\alpha) = 1.56$. The values measured by Hanson and Williams with the cellophane-catcher and long-counter techniques are given in paranthesis for comparison.

TABLE I

Sphere	M_{WC}	M_U
$3\frac{1}{2}$"	2.12 (2.21)	1.99 (2.10)
$4\frac{1}{2}$"	4.19 (4.35)	3.72 (3.83)





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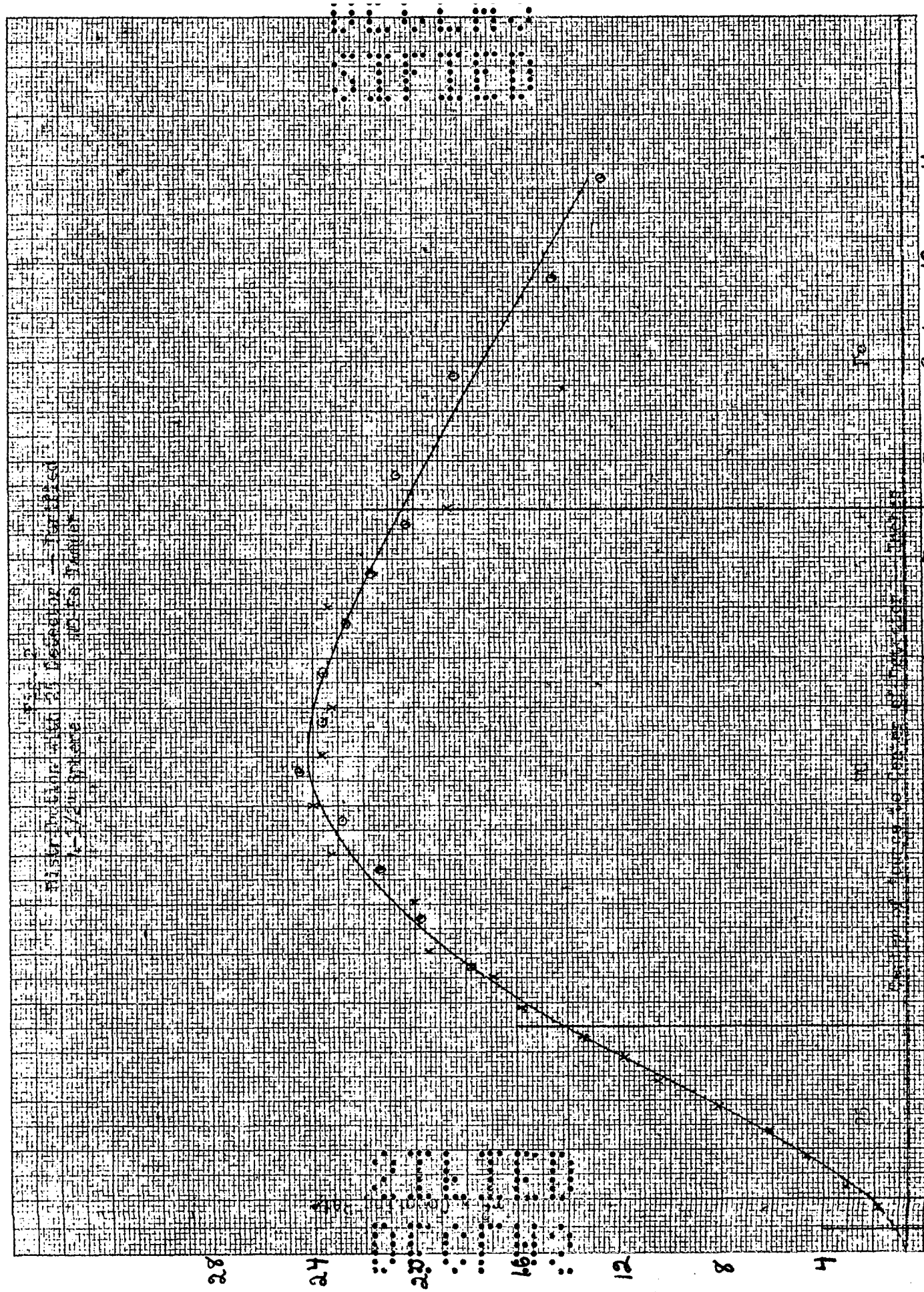

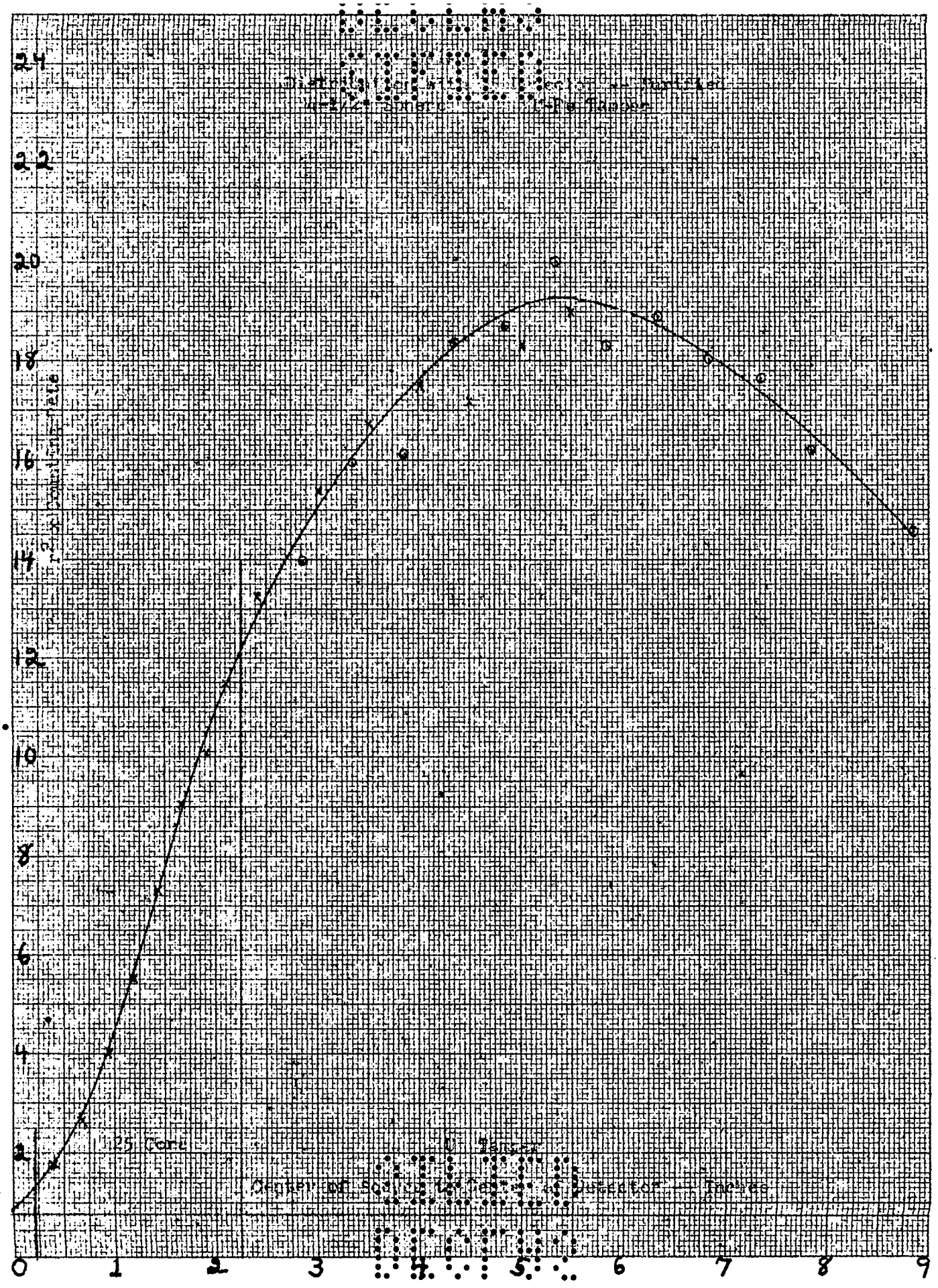

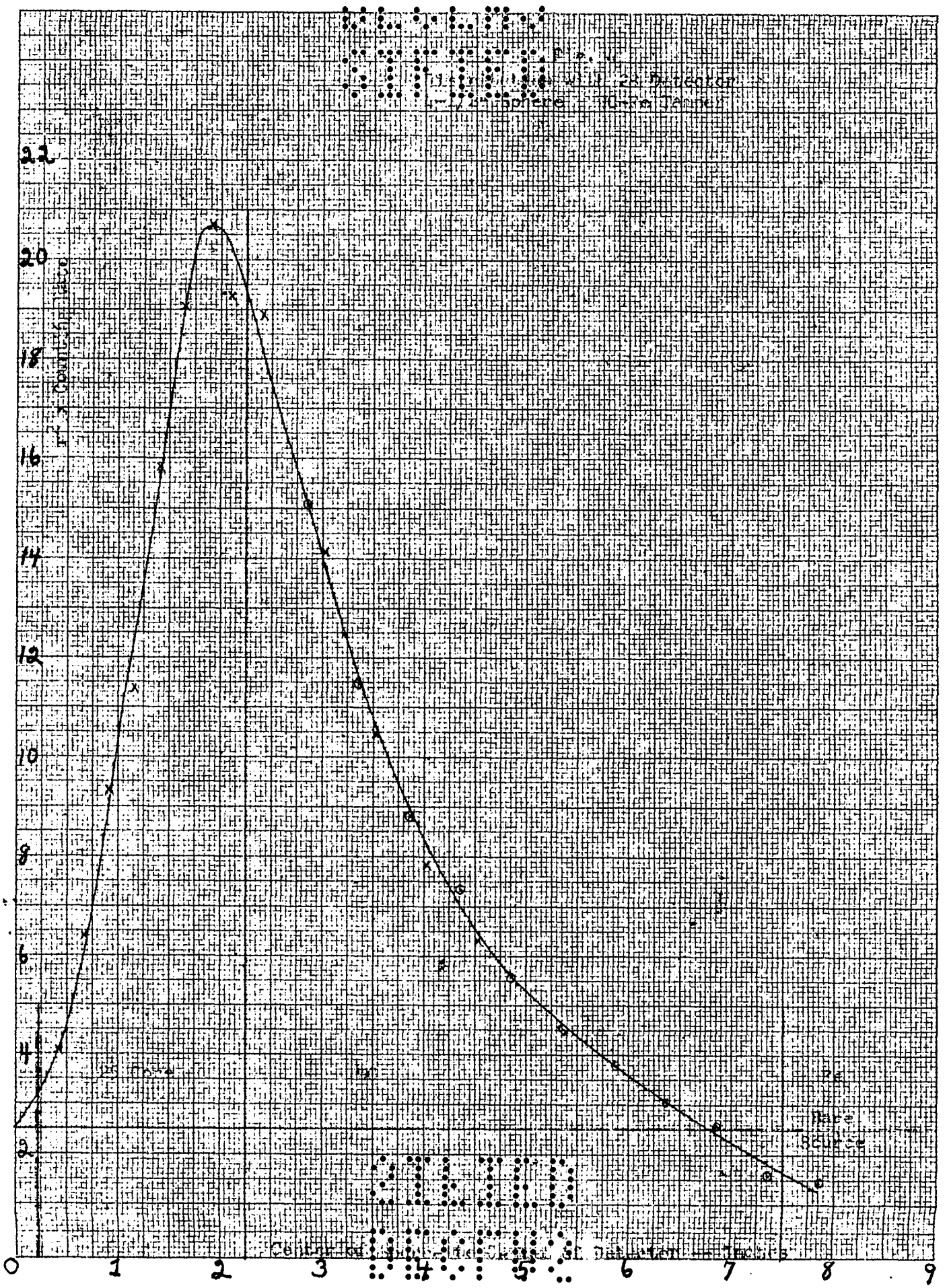

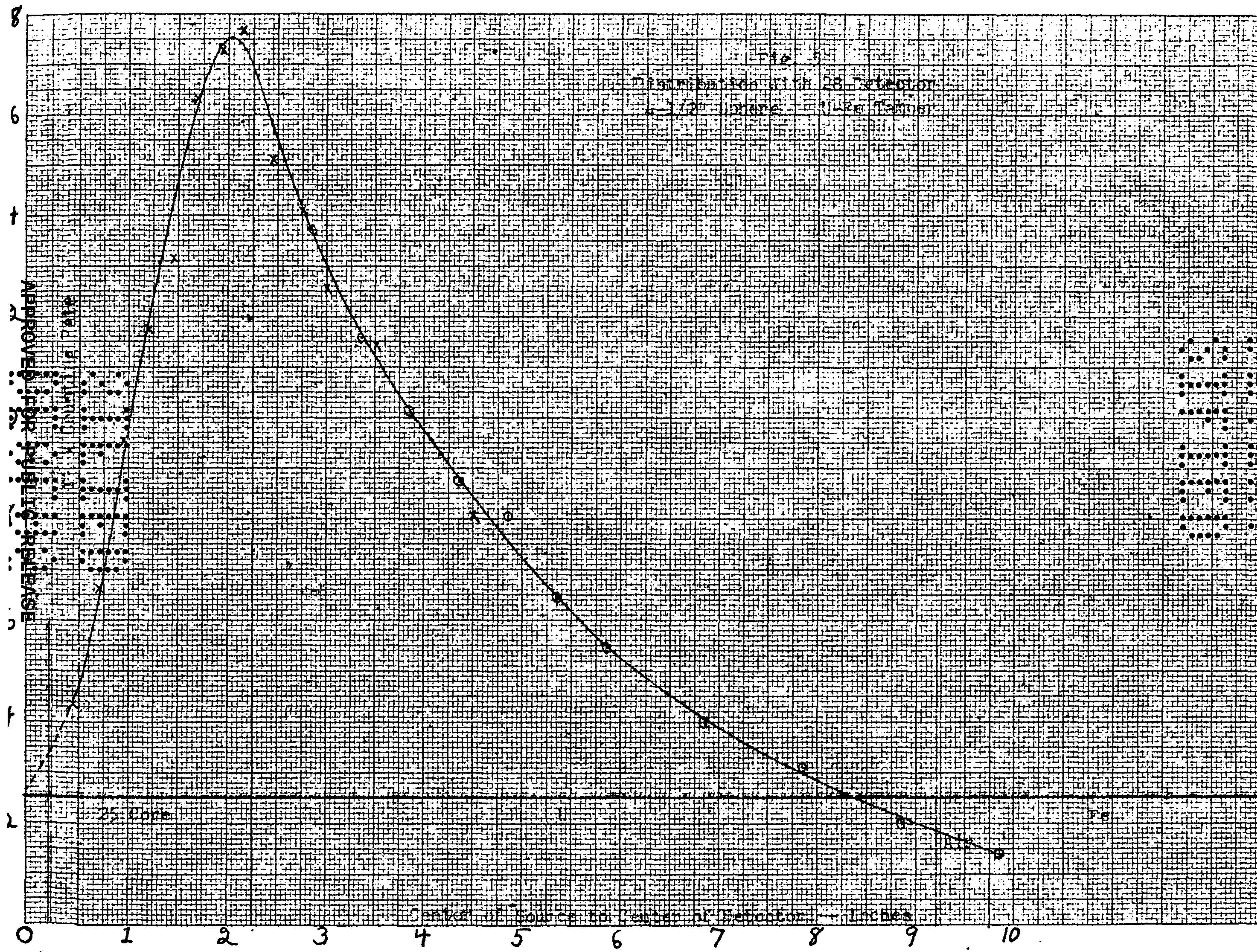

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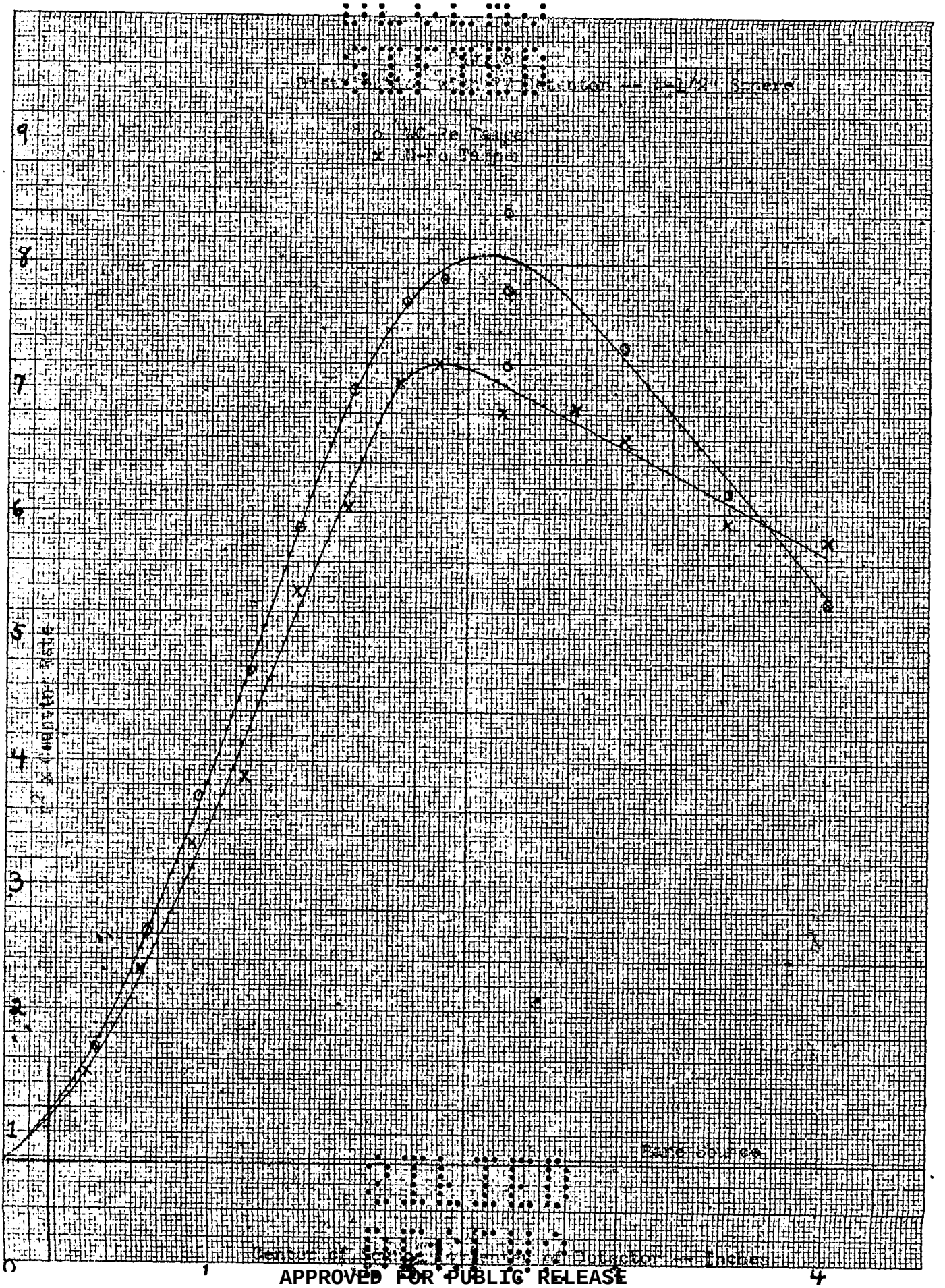

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