to zero field. It seems difficult to account for these large thermal changes in the opposite direction to what one would normally expect purely on the basis of Bozorth's flux-closure hypothesis. But some Bitter patterns recently recorded on the surface of a single crystal of some 3 percent silicon iron by D. H. Martin may throw some light on the problem. The crystal was exposed to a high field which was subsequently reduced to zero, and during the course of the experiment it was noted that closure domain daggers shot across the surface and that strange domain boundaries were formed in a perfectly regular sequence. Some of these boundaries separated domains whose vectors appeared to meet head-on, just as if the page before us was divided into two portions by a boundary running across it more or less parallel to the lower edge of the page. In the upper portion we may imagine the domain vectors to be parallel to the long edge of the page and directed downwards, and in the lower portion to be likewise parallel and directed upwards. But the boundary is not now the normal straight and clear-cut boundary as frequently recorded in Bitter figure work. It twists and wriggles in an extraordinary way as if it were trying to counteract the formation of free poles on its surfaces. If we have here the type of flux closure postulated by Bozorth and Kittel, then at the boundary the flux must turn either upwards or downwards into the surface of the page on both sides of the boundary. The latter is, however, so serrated and so narrow that considerable energy must be associated with it, and one feels that here is the most likely explanation of the observed cooling.

VII. ACKNOWLEDGMENTS

We are indebted to Mr. A. E. De Barr (now at Elliott Brothers), and Dr. R. J. Wakelin of Guest, Keen, and Nettlefolds Research Department for the provision and treatment of the silicon iron samples used in this work; one of us (G.M.) thanks the Department of Scientific and Industrial Research for a maintenance allowance which made the work possible.

DISCUSSION

G. Rathenau, *N. V. Philips Gloeilampen Fabrieken, The Netherlands:* The number of domain walls formed by thermal demagnetization may be much larger than the number formed by demagnetization in an alternating current field of decreasing amplitude at room temperature. These additional walls may be in metastable equilibrium at room temperature and give rise to nonequilibrium configurations.

L. F. Bates, *University of Nottingham, England:* The results of measurements of Bitter figures have shown very little change in magnetization patterns with the temperature ranges from solid CO_2 to about 150°C. We have found that "wriggly" boundaries appear on specimens which have been demagnetized by heating.

C. A. Fowler, Jr. (with **E. M. Fryer**), *Pomona College, Claremont, California:* By employing the longitudinal Kerr magneto-optic effect, photographs of domains in the (100) surface of a large crystal of silicon iron have been obtained. A series of such pictures clearly shows the characteristic movement of domain walls as the sample is carried through an initial magnetization curve to saturation. A second series of photographs, taken as the originally saturated sample has its magnetization gradually reversed to saturation in the opposite direction, reveals the sudden appearance of a single narrow antiparallel domain which proceeds to grow, with increasing reverse field, until it covers the entire crystal surface. Preliminary results have been described[1] and photographs of these effects are attached (see Figs. 1 and 2).

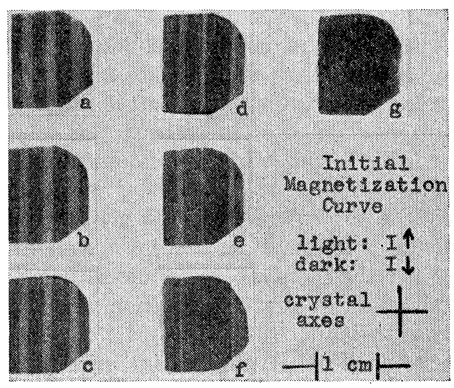

Fig. 1.

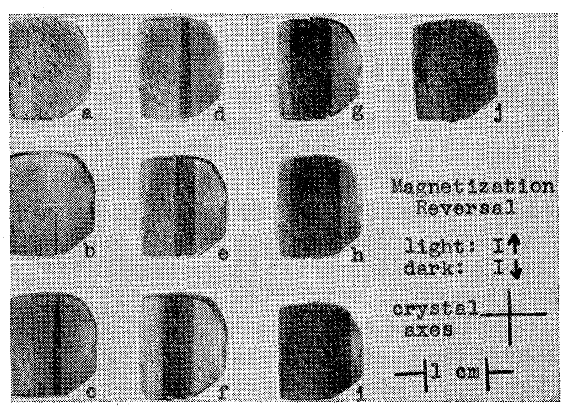

Fig. 2.

[1] C. A. Fowler, Jr., and E. M. Fryer, Phys. Rev. **86**, 426 (1952).

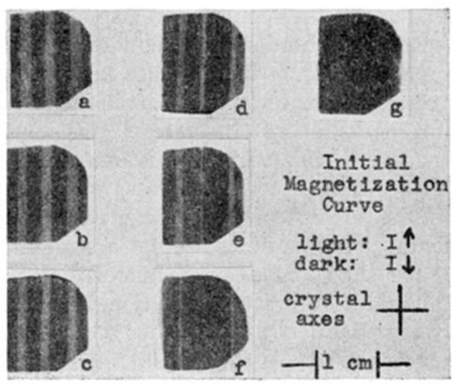
a
d
g
b
e
c
f
Initial
Magnetization
Curve
light: I↑
dark: I↓
crystal
axes
1 cm

Fig. 1.

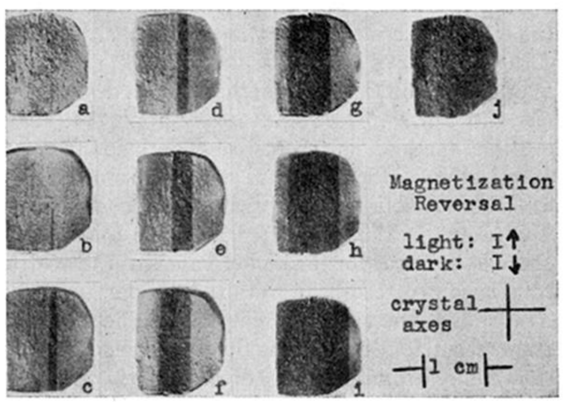
a
d
g
j
b
e
h
Magnetization
Reversal
light: I↑
dark: I↓
c
f
i
crystal
axes
1 cm

FIG. 2.