Variation in the Longitudinal Incremental Permeability due to a Superimposed Circular Field

Retyped from NATURE Page 795, October 29, 1938

During the course of an investigation of the variation of the longitudinal incremental permeability by a superimposed circular magnetic field, some rather interesting results were obtained with certain iron-nickel alloys. The ferromagnetic materials under investigation were of wire form and served as the core of long slender solenoid. Direct current was passed through the core to produce the circular field, and the longitudinal permeability was calculated from inductance measurements on the solenoid.

Using well-annealed alloys, it was found that rather large increases in longitudinal incremental permeability could be obtained as a function of relatively small superimposed circular field, while upon twisting the conducting core a gradual change from an increase to a decrease in the incremental longitudinal permeability as a function of a superimposed circular field was obtained.

These effects are shown in Fig. 1 where curve (a) gives the variation of the inductance of the solenoid as a function of the direct current through the conducting core of an unstrained sample. Curve (b) is that obtained after the core has been twisted the 120 degrees. Here the inductance of the solenoid without any core is 1.3 millihenries. In all measurements, the effect of the earth's field was reduced to a minimum and the sample were completely demagnetized before each run.

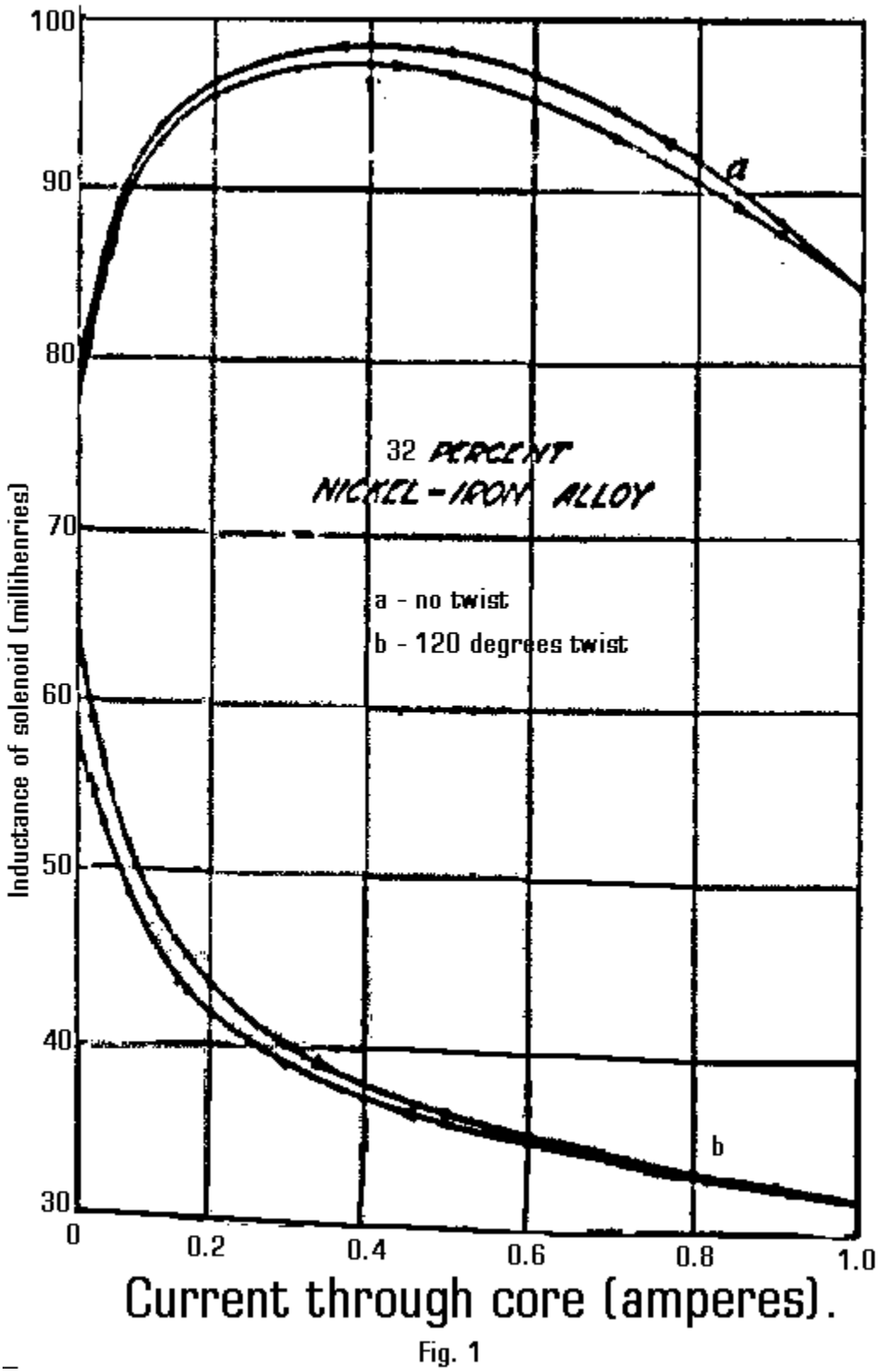

Fig. 1

Fig. 2 shows the variation in longitudinal incremental permeability of the core as a function of the degree of twist when a current of 0.5 amperes passes through the core. Variations in permeability thus obtained on the samples were much greater than those obtained by twisting when no current passes through the core.

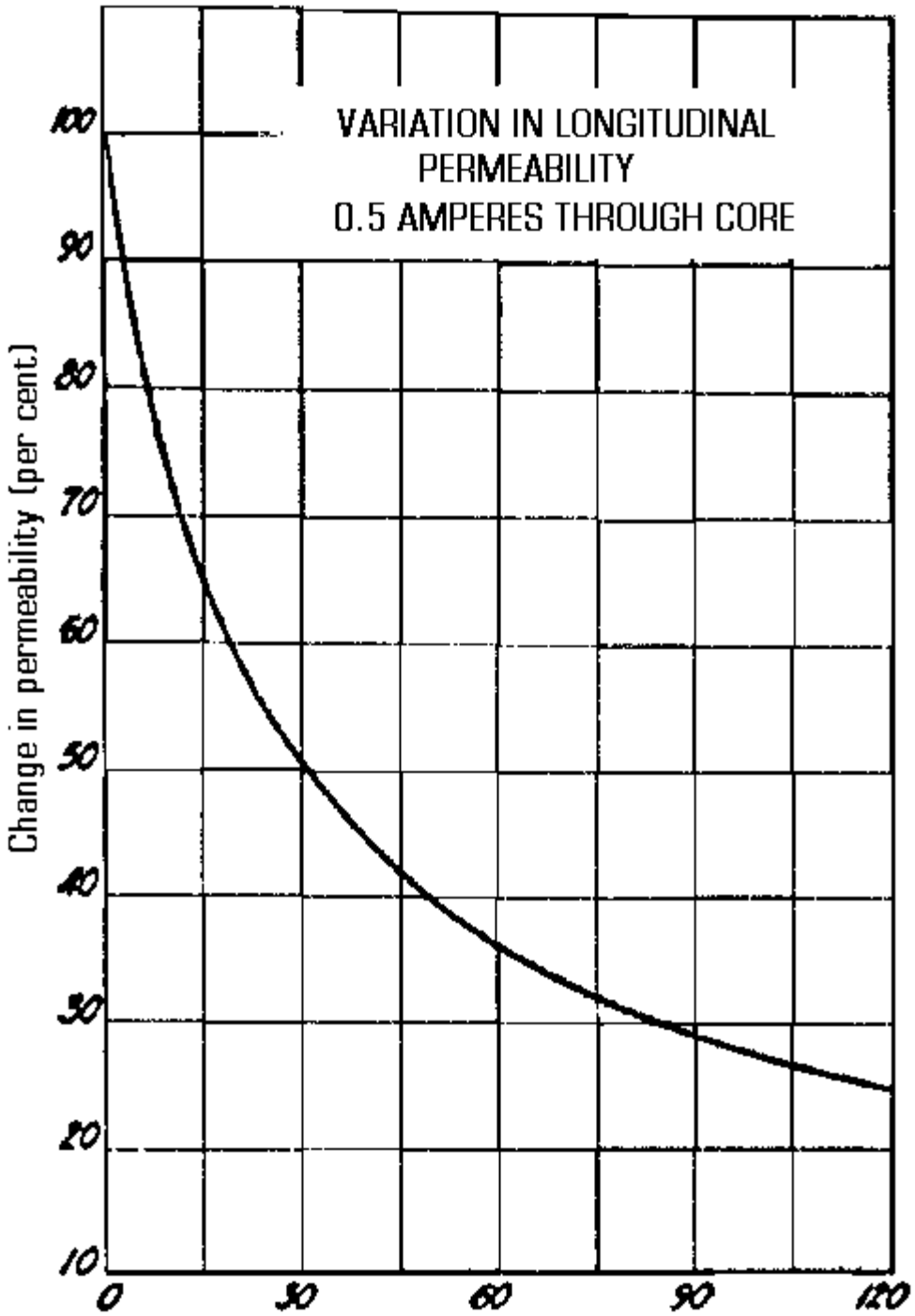

Fig. 2

These large variations in inductance, obtained as a function of the current through the core or as a function of the degree of twisting of the core while carrying a definite current appear to have many possible applications.

A complete account of this work covering all of the common ferromagnetic material will be given elsewhere. (no further references given)

J. S. Webb Institute of Technology, University of Minnesota, Minneapolis, Minnesota, Aug. 31.
