In the interest of conserving space or to avoid damage from fields of magnetized magnets during shipment, storage, or handling, they may be keepered with soft iron or paired in the proper polarity sense as shown in Figure 7-6(a) and (b). These measures will be successful provided of course that the proper precautions mentioned above are observed when removing the keeper or separating the paired magnets. Only insignificant fields will be detected around adequately keepered magnets, and they may be safely located much closer together without harmful effect. As shown in Figure 7-6(c) bar-type magnets may be arranged in long rows either before or after magnetization and stored with the polarity of adjacent rows reversed and with a row spacing approximately equal to the diameter of the magnet.

The relative ease of demagnetization through improper handling noted above has led many designers to enclose the magnet so that after assembly and magnetization it is inaccessible.

Magnetizing Equipment

Electromagnets. Electromagnets are convenient for magnetizing the more common shapes of permanent magnets such as rods, bars,

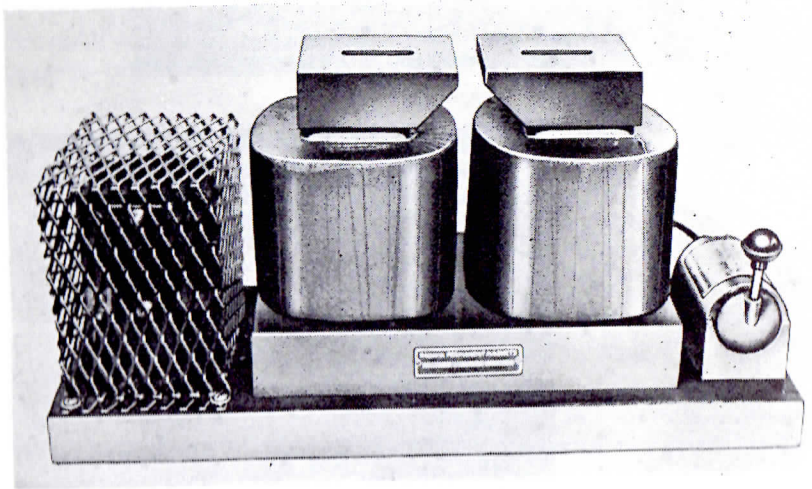

Figure 7-7. Conventional electromagnet magnetizer with variable air gap: operates from 125 volts direct current. Pole pieces can be changed to shape the field to suit common magnet shapes. (Courtesy of Indiana General Corp.)

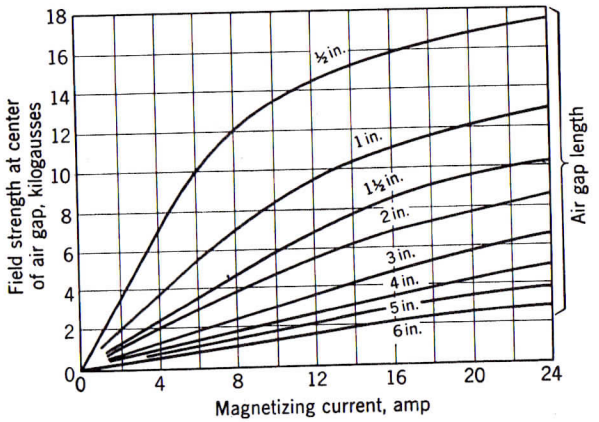

Figure 7-8. Air-gap field strength vs. magnetizing current curves for various gap lengths for conventional electromagnet.

rings, and some U-shaped magnets and assemblies. The conventional electromagnet magnetizer of Figure 7-7 has pole pieces which can be changed to shape the field. One pole is movable with respect to the other to provide the family of curves shown in Figure 7-8 for various air gaps. Magnetizers of this type are usually operated from a full-wave rectifier and are designed for intermittent operation.

Principal design considerations for an electromagnet to magnetize a particular magnet are:

1. Core section must be adequate to carry the saturation flux.
2. Ampere-turns must be sufficient to produce the total potential required by the magnet length, the magnetizer yoke, and any air gaps present.

Owing to leakage and losses, the core of the electromagnet should be about four times the area of the magnet to insure adequate flux level in the permanent magnet. Also, the flux should be directed according to the shape of the permanent magnet. Figure 7-9 shows good and bad practice for a variety of situations. When magnetizing very large magnets, enough potential should be used to allow a small air gap to be placed between magnet and magnetizer poles to facilitate removing the magnet. The basic electromagnet types are shown schematically in Figure 7-10. In multipole permanent magnet con-