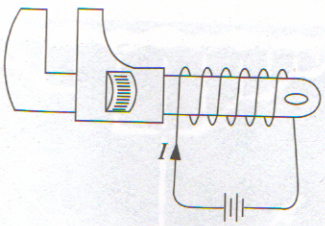

Figure 6.27

magnet. If you want to eliminate the remaining magnetization, you'll have to run backwards through the coil (a negative I). Now the external field points to the rig you increase I (negatively), M drops down to zero (point d). If you turn I still hi soon reach saturation in the other direction—all the dipoles now pointing to the *rig* this stage switching off the current will leave the wrench with a permanent magnet the right (point f). To complete the story, turn I on again in the positive sense: to zero (point g), and eventually to the forward saturation point (b).

The path we have traced out is called a **hysteresis loop**. Notice that the magn of the wrench depends not only on the applied field (that is, on I), but also on its magnetic "history."[8] For instance, at three different times in our experiment th was zero (a, c, and f), yet the magnetization was different for each of them. Actu customary to draw hysteresis loops as plots of B against H, rather than M against coil is approximated by a long solenoid, with n turns per unit length, then $H =$ and I are proportional. Meanwhile, $\mathbf{B} = \mu_0(\mathbf{H} + \mathbf{M})$, but in practice M is huge c to H, so to all intents and purposes $\mathbf{B}$ is proportional to $\mathbf{M}$.)

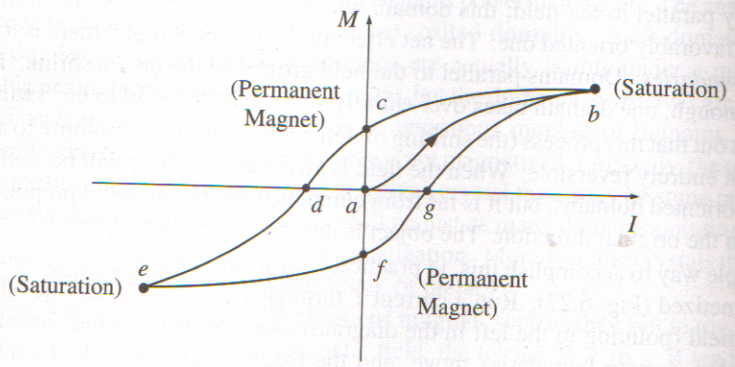

Figure 6.28

[8] Etymologically, the word *hysteresis* has nothing to do with the word *history*—nor with the word *hy* derives from a Greek verb meaning "to lag behind."