

Figure 1.4
Leonardo's human-powered drum. (From Reti 1974.)

leg muscles at good impedance matches (figure 1.5) had been developed, sometimes hundreds of years earlier, some designers and manufacturers persisted in requiring heavy hand cranking for everything from drill presses to pneumatic diving apparatus to church-organ blowers, even though in all these cases pedaling seems clearly advantageous.

The first clearly human-powered vehicles known to history (if we exclude classes like wheelbarrows and carts pulled or pushed by men) were carriages supposedly propelled by footmen, in France in the 1690s (Ritchie 1975, 16). (An alleged earlier effort by a pupil of Leonardo da Vinci has been convincingly shown by Lessing [1998a] to be a fake.)

The first bicycle

It seems likely that the most important discovery in the development of the bicycle was made by chance. Baron Karl von Drais, a resident of Mann-

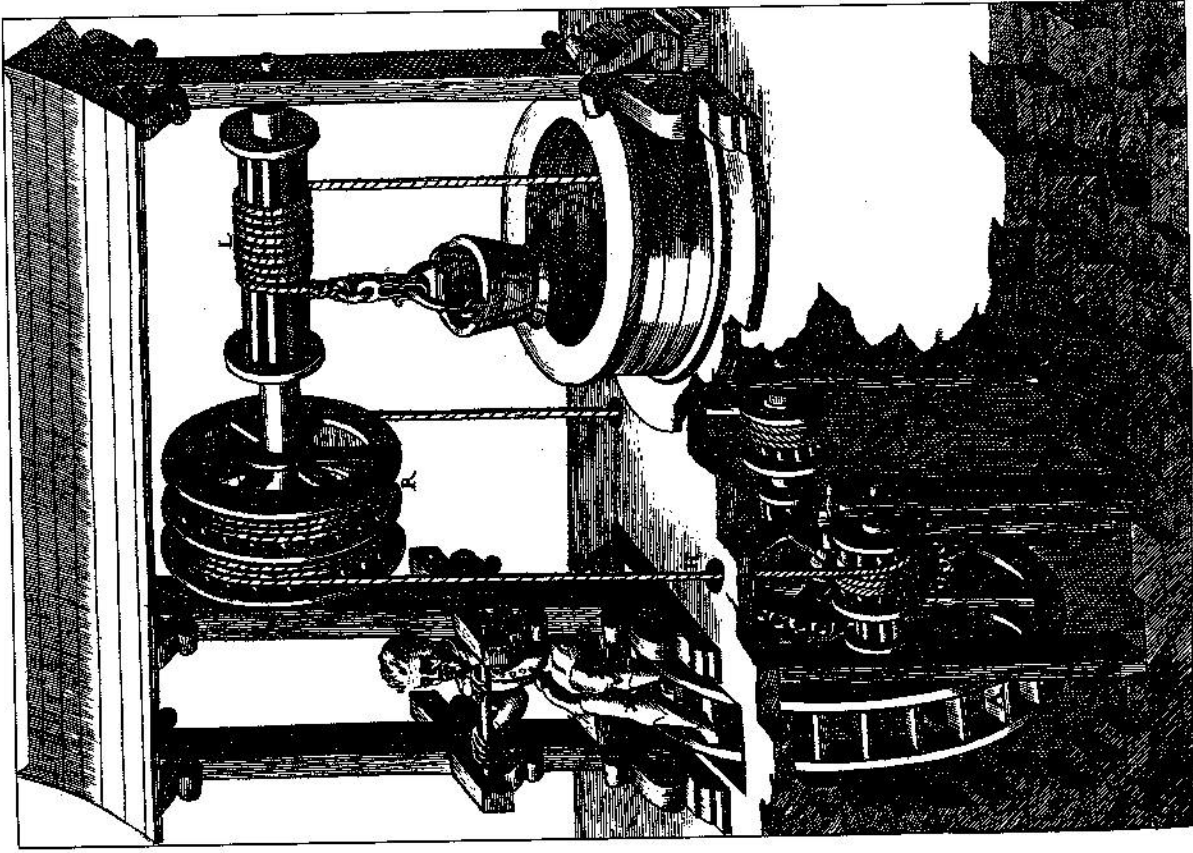


Figure 1.5
Treadmill geared winch (the first recumbent exerciser?). (From Gnudi and Ferguson 1987.)