Now use the law of machines given above to calculate the force that would just balance the weight used in (2) below. Force × circumference of circle of which AB is radius = weight × pitch of screw.

2. Find this force experimentally.

Weight.—Unscrew the head of the jack-screw, and weigh it and the handle; replace it and have a boy whose weight is known stand on the screw. The total weight is equal to the sum of these two weights. For example, if the head of screw and the handle weigh 20 lbs. and the boy weighs 100 lbs. the total weight is 120 lbs.

Force.—Attach the spring balance at B and pull gently, so that the total weight is slowly raised. Record the reading on the balance.

Now pull in the opposite direction, so that the weight is slowly lowered. Record the reading on the spring balance.

$$\text{Reading I} = \text{Friction} + \text{force.}$$
$$\text{Reading II} = \text{Friction} - \text{force.}$$

Subtract the second from the first and we get:

$$2\ \text{Force} = \text{Reading I} - \text{Reading II.}$$

or

$$\text{Force} = \frac{\text{Reading I} - \text{Reading II}}{2}.$$

Compare this force with the value calculated in (1).

Friction. — You will notice that when we let go the handle of the screw, the weight does not go down. This is because the friction is holding it, and therefore the friction must be greater than the force that would balance the weight, if there were no friction. This is true of the jack-screw, no matter how great the weight is, because the friction increases with the weight.

Let us find the friction and compare it with the force. Take the readings given in (2) above and add them together.