

Further, it is evident that the change in the momentum of a body will take place in the direction in which the force acts. A falling body continually increases its momentum since the force of gravity acts in the direction of the motion. If it is thrown upwards the momentum is continually decreased because the force is acting in a direction opposite to the motion.

We can state our conclusions in the following way:

Change of momentum, in a given time, is proportional to the impressed force and takes place in the direction in which the force acts.

This is called Newton's Second Law of Motion.

PROBLEM

1. A tug begins to tow a steamer of mass 2,000 tons and in 10 minutes gives it a velocity of 8 feet per second. If it had been a 6,000-ton vessel, what velocity would have been given in this time?

26. Motion of the Planets. The orbit of the earth about the sun is an ellipse, which, however, is almost a circle. Its speed is about $18\frac{1}{2}$ miles per second.

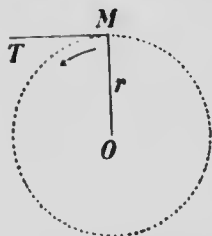


FIG. 11 — Orbit of earth about the sun. O is the sun; the earth is at M .

As we have seen, if the sun (and the other heavenly bodies) were absent, the earth would move along the straight line MT (Fig. 11) at a uniform rate. But the sun at O exerts an attractive force on it and produces a motion towards O , i.e., in the direction of the force.

The earth continually tends to move along the tangent, but the force towards the centre is just enough to cause it to bend into its elliptical orbit.

27. Action and Reaction. Let a cord be attached to each end of a spring balance and let two boys take hold and pull in opposite directions until the balance shows a tension of (say)