



SECTION I Nos. 1—16

Four principles of mechanics. Belt, chain, rope, foot treadle and miscellaneous drives.

MECHANICAL MODELS

A Description of More Than
One Hundred and Sixty Movements
Presented in 10 Sections of 16 Panels Each

Section I

1. Inclined Plane. The inclined plane is one of the basic principles of modern machinery. Its chief purpose is to enable a small force to overcome a large force. The act of rolling a barrel up a plank into a wagon is a simple example of the use of the inclined plane. Modifications of this principle are the wedge and screw.

2. Lever. The lever is another basic principle of mechanics. It consists of a rigid bar resting upon a point called the fulcrum. The points are arranged in model **1** as in pliers and shears, model **2** as in a shovel, model **3** as in the wheelbarrow. The wheel and axle, and pulley are modifications of a lever.

3. Wedge. The wedge is one of the oldest mechanisms and comes under the heading of the inclined plane. Some examples of wedges are the ax, chisel, nails, pins, carpenter's plane and cutting tools of nearly all kinds.

4. Screw. From the point of view of the mechanic, the screw is simply an inclined plane wrapped around a cylinder. The vise and letter-press are examples of the screw whose purpose is to obtain increased pressure. Another example, the jackscrew, is used by builders to lift heavy objects with the least effort. The propellers of boats and airplanes are further examples.

5. Belt Drives. Machines are of two kinds—the driving and the driven. Some driving machines are steam and oil engines, electric motors, and water wheels. Examples of driven machines are lathes, drills, planes, and saws. Some connecting link or means of transmission between the two is necessary. A common method is to use belts, chains or cogwheels. By twisting a flat belt half way the shafts may be driven at right angles if the belt rotates as indicated in this specific arrangement. In order to make belt track, center of upper pulley must be in line with right edge of lower pulley. In model **2** reversed motion is obtained by giving the round belt a half turn; and model **3** shows belt in straight line drive with pulleys rotating in same direction.

6. Belt Drives. Left hand model shows method of keeping loose belt taut at all times. Other model shows method of transmitting power by round belt in different planes producing the same rotation on the two lower vertical pulleys as indicated by arrows.

7. Chain drives. This panel shows early and modern forms of chain drive, the later type on the right being the universally used chain. It is called the silent chain and has small rollers at the contact points, making an almost frictionless performance. The speed of the sprocket wheels is inversely proportional to the number of teeth. Therefore model **1** shows a speed ratio of 1 to 1 and model **2** a ratio of 2 to 1.

8. Rope drive. Form of pulley used for transmitting power by rope drive, having grooves to

prevent slipping and to make it a positive drive. The two smaller pulleys below are guide pulleys. Such a drive is used for long distance transmission—example: obtaining power in various sections of an oil field.

9. Pulley types. Pulleys are of two kinds, fixed and movable. Both are combined for practical work. These are all fixed pulleys which consist of a wheel with grooved rim, called a sheave, free to rotate on an axle which is supported in a fixed block. A flexible rope or cable passes over the wheels and these types show variations in rim to keep the belt from slipping off. The fourth pulley from the left is essentially for a round belt or rope, and because pulley 5 kinks the rope or belt, it is possible to get the greatest pulling power without slipping.

10. Treadle drive. Treadle drive derived its name from the foot method of obtaining power. The force applied to the treadle is transmitted by the pitman or connecting rod into rotary motion by crank or disk.

Bell crank drive. This device makes use of an elbow shaped lever. It is a convenience for transmitting power in different planes as desired.

11. Slotted connecting rod. Rotating disk gives motion to rod with pause at both ends of stroke. This is used on brick making machinery. The pause allows mold to be loaded and unloaded at each end of stroke.

Treadle drive. This treadle drive dispenses with wrist pin used in No. 10 and uses a belt and eccentric or off center pulley.

12. Straight line drive. The straight line motion of A is converted into rotary motion by action of crank B working in an S shaped slot. This device does away with oscillating motion of rod as in No. 11 (upper).

13. Slotted bell crank drive. Circular motion of pin in disk, which works inside of the straight, slotted yoke, produces an irregular, vertical motion of rod. Downward motion of rod is slow but has a quick return. Examination of action of rotating pin in yoke explains this.

14. Slotted yoke drive. This is an example of rotary motion being converted into straight line motion. So it is opposite to that of No. 12.

15. Off-center-stop drive. This treadle motion has a spring attachment for bringing the crank A, when action ceases, back to a position off center where it will always start when pressure is applied to the foot lever.

16. Multiple travel movements. Multiple travel movements are very useful. The upper model has a mechanical advantage of 2 to 1 and the lower model of 8 to 1. The latter is that commonly used in expanding gates, doors, etc.