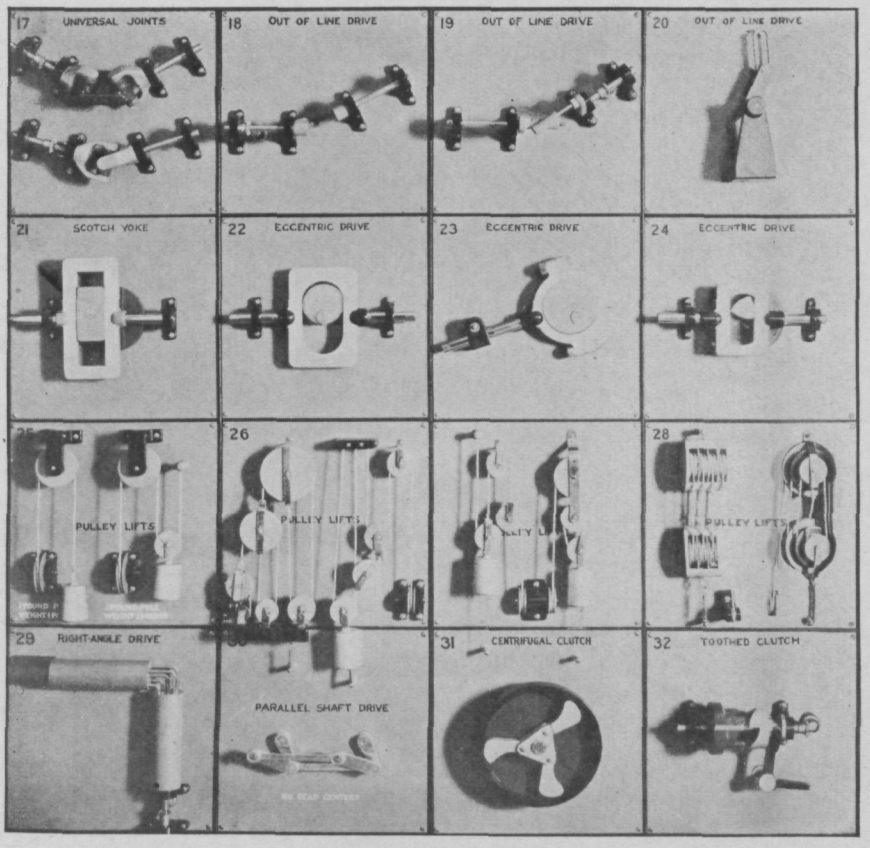

SECTION II NOS. 17—32

Universal joints, out of line drives, eccentrics, rope and pulley lifts, types of clutches.

Section II

17. Universal joints. A joint is a connecting link between two shafts which are out of line or change position. Its purpose is to transmit power, one end being the driver, the other end being driven, between two shafts which are at any desired angle. A good example of its use is in the automobile where the driven shaft is out of line with the engine or driving power.

18 and **19.** Out of line drives. The power in these two out of line drives is transmitted by joints. No. **18** is a universal joint but of unusual construction, not as practical as those in No. **17.** The joint in No. **19** will only operate when the shafts are placed at the same angle as the angles in the floating tube A, operating between the two driving arms. The placing of the shafts and construction of the tube require great precision.

20. Out of line drive. The advantage of this drive is to give a variable speed to the driven shaft to which a rod or other mechanism may be attached. The red slotted arm is the driver and the green crank is driven.

21. Scotch yoke. The green disk carries the driving pin to which is attached a guide, the red block. This guide, working inside of a rectangular yoke, gives a varying speed to the sliding rod, which is slower at the ends than at the center of stroke.

22. Eccentric drive. An eccentric is a revolving disk having the point, on which it revolves,

off the center of the disk. The eccentric is the driving force and works in an elongated yoke. This does away with the oscillating motion caused by disks which work in circular guides as in No. **23.**

23. Eccentric drive. This type of eccentric is the most commonly used. Application of it can be found in No. **155.**

24. Eccentric drive. Attached to the revolving disk in this drive is a triangular cam, which is a projection on a rotating wheel for giving or receiving motion against its edge. In this case, the disk and cam give the motion. The rod is at rest at the completion of each stroke. This form of eccentric is used on a steam-engine in the Paris Mint.

25. Pulley lifts. Pulleys were described in No. **9.** The model on the left is a simple fixed pulley for lifting weights. In this, the power must be equal to the weight to obtain a balance so a one pound pull is needed to lift a weight of one pound.

The second model has two pulleys, the upper fixed, the lower movable. Since there are two ropes, each exerting an upward pull equal to half the weight, the lifting power is doubled. Therefore a one pound pull will lift a two pound weight.

26. Pulley lifts. In this arrangement of pulleys, the mechanical advantage is very high. Note that each cord is attached at one end to a fixed point and to the center of the movable pulley on the other end. The lifting power in

the six pulley model (5 movable, 1 fixed) is 26 to 1, and in the four pulley model (3 movable, 1 fixed) it is 8 to 1.

27. Pulley lifts. The first model on this panel combines two movable and one fixed pulley. It has a lifting power of 4 to 1 and is generally known as a Spanish barton.

The second arrangement has two fixed and one movable pulley. Its lifting power is 3 to 1.

28. Pulley lifts. Two types of "block and tackle." The first has a lower pulley block with three grooved wheels or sheaves and the upper pulley block has four sheaves. Its lifting ratio is 7 to 1, therefore it will lift seven pounds when one pound pull is exerted on hand rope. Used most generally in construction work.

The second contrivance is known as White's pulleys, and has a ratio of 6 to 1.

29. Right-angle drive. Between the two revolving drive shafts placed at right angles to one another, are five metal bars bent at right angles. The ends of each are placed in holes in the revolving shafts and are free to be drawn in and out as the shafts rotate. The center is stationary and acts as a guide because it is centered in each shaft. The vertical shaft is the driver in this model. Such a mechanism was used before miter gears were invented.

30. Parallel shaft drive. This model represents method of driving parallel shafts 1 and 2, without gears and in the same direction. The front and back cranks or arms connected to shafts 1 and 2 are pinned together at a fixed

angle. This device has no dead center because while connecting rod A is in line with shafts 1 and 2 (or on dead center) B is in driving position (or off center).

31. Centrifugal clutch. The shaft carrying the red arms is the driver. When driver is at rest, arms are held back by the springs. When shaft is rotating, the weighted arms expand by centrifugal (from the center outward) force overcoming the pull of springs and engaging the drum so that it is made to move.

32. Toothed clutch. A clutch is a mechanical device used to connect a driving and a driven member on the same axis. It is operated by the lever and is designed so that the two members may be engaged or disengaged at will. This type is positive and is used where it is not objectionable to start the driven member suddenly, such as in mowing machines. Automobiles employ the other type called the friction clutch.