Dynamometer

This interesting model can be used for comparing the power of different Electric or Clockwork Motors, and shows the principle of operation of dynamometers that are used in actual practice for ascertaining the horse power of an engine. This type of dynamometer is used to measure the power of an engine while it is driving other apparatus or machinery, and does not absorb any power except that lost in frictional resistance, so that the power exerted by the engine can be noted throughout its period of motion. This particular type of dynamometer is known as the "Tatham" Transmission Dynamometer, and the principle of operation will be understood from the model, by means of which some interesting experiments can be carried out.

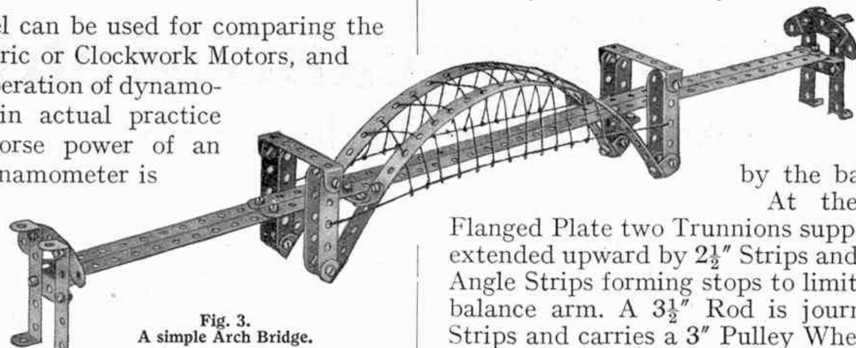
Fig. 3.
A simple Arch Bridge.

The base consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and at one end three $5\frac{1}{2}''$ Strips are bolted vertically to each side and extended at the top by Flat Trunnions. A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip connects the two sets of side Strips, and a $3\frac{1}{2}''$ Axle Rod is journalled in the upper holes of the Trunnions. The Rod carries a Bush Wheel to which a $12\frac{1}{2}''$ Strip is bolted, and it will be noticed that the Rod passes through one of the holes in the Strip. On each side of the Rod a $\frac{1}{2}''$ Reversed Angle Bracket is bolted to the Strip, and these form bearings for 2″ Rods carrying 1″ Pulleys. At the shorter end of the Strip a Hook is fixed and carries Strips that exactly balance the other end of the $12\frac{1}{2}''$ Strip, so that normally the long balance arm so formed is in a state of equilibrium.

The Crank Handle carries two 3″ Pulley Wheels, and a length of cord is passed round one of these and over each of the 1″ Pulleys on the balance arm, and then round a 1″ Pulley on a Rod journalled directly above the Crank Handle. A $5\frac{1}{2}''$ Strip is cranked as shown and pivoted to the base Plate. Its upper end carries a $\frac{1}{2}''$ loose Pulley mounted on a $\frac{3}{8}''$ Bolt, and a Rubber Band keeps the Pulley lightly pressed against the belt of cord.

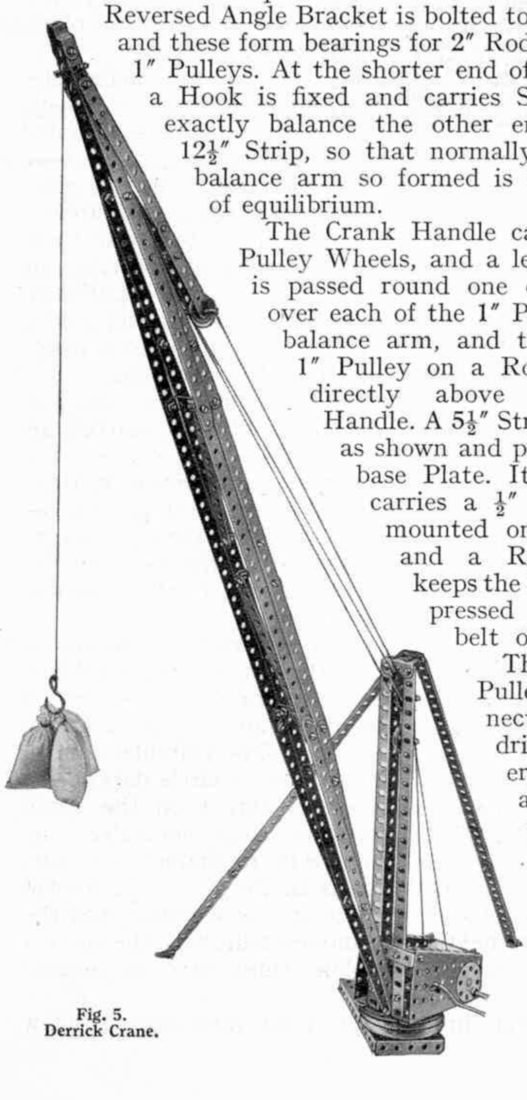
Fig. 5.
Derrick Crane.

The lower 1″ Pulley is connected to the driven machinery in the actual dynamometer, and in the model a band brake is fitted to absorb power that would actually be absorbed by the machines, and thus to demonstrate the operation of the model according to the amount of power required to overcome the friction generated by the band brake.

At the other end of the Flanged Plate two Trunnions support $5\frac{1}{2}''$ Strips that are extended upward by $2\frac{1}{2}''$ Strips and carry $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips forming stops to limit the movement of the balance arm. A $3\frac{1}{2}''$ Rod is journalled in the vertical Strips and carries a 3″ Pulley Wheel. A length of cord is tied to the Pulley and passed round its rim before being tied to a pivoted $12\frac{1}{2}''$ Strip serving as a brake lever. Cord is tied to the base Plate and passed round a 1″ Pulley on the Rod of the lower driven 1″ Pulley, and is then tied to the Axle Rod of the 3″ Pulley on the right of the illustration. When the brake is depressed the Pulley is rotated and the cord wound on to the Rod, thus tightening round the driven Pulley.

The 3″ Pulley on the outer end of the Crank Handle can be driven from a Motor, or the Crank Handle can be turned by hand to show the operation of the model. When the brake is applied to the driven Pulley there is a tendency for the driving cord to pull down the shorter end of the balance arm according to the resistance offered by the Pulley. As the shorter end of the arm is pulled down, a weight is added to the other end of the arm to maintain equilibrium, and in practice the power absorbed can be calculated from the figures showing the weight required to maintain equilibrium, its distance from the fulcrum of the balance arm, and the distances of the two free Pulleys from the fulcrum of the arm.

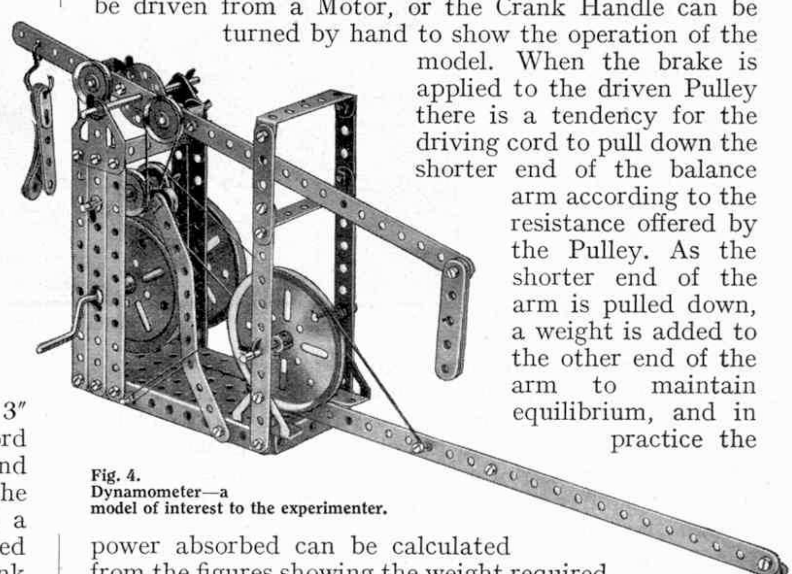
Fig. 4.
Dynamometer—a model of interest to the experimenter.

If a Motor is available some interesting experiments can be carried out with this model, and even with the hand operating gear its method of functioning will be found quite interesting and will demonstrate the principle of operation of the actual device.

Parts required for Dynamometer: 3 of No. 1; 8 of No. 2; 9 of No. 5; 2 of No. 10; 3 of No. 12; 3 of No. 16; 2 of No. 17; 1 of No. 19s; 3 of No. 19b; 4 of No. 22; 1 of No. 23; 1 of No. 24; 8 of No. 35; 33 of No. 37; 7 of No. 37a; 8 of No. 38; 1 of No. 40; 3 of No. 48a; 1 of No. 52; 1 of No. 57; 4 of No. 90a; 3 of No. 111c; 2 of No. 125; 2 of No. 126; 2 of No. 126a.

Derrick Crane

The model crane shown in Fig. 5 is fitted with hoisting and luffing movements, and the centre post is mounted on a swivel to allow for slewing of the jib. A 3″ Pulley is fixed with the boss downward to the Flanged Plate forming the base, by means of $\frac{3}{8}''$ Bolts. Another Pulley turns on the fixed Pulley, and carries two Sector Plates and two vertical $12\frac{1}{2}''$ Angle Girders. The Sector Plates are spaced apart by $2\frac{1}{2}''$ Strips and a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip and carry the winding and hoisting handles. The upper ends of the vertical Angle (Continued on page 316)