BUILD A BEAM ENGINE

ONE of the first steam engines ever built for industrial use was the Beam Engine and although it is a rather ancient-looking machine, I found it enormously fascinating to build as it illustrates, perfectly, the basic workings of this type of engine. Power for the movements is supplied by the small battery-operated Emebo Electric Motor.

Engine Bed

Each side of the bed is built-up from two 17½ in. compound girders 1, made from two 12½ in. Angle Girders, which are joined by two 5½ in. Strips 2. The structure is strengthened by a compound 17½ in. strip 3 and the intervening space is filled by a 12½ in. Strip Plate 4 and a 5½ in. Flexible Plate 5. Two 2½ in. Strips 6 and 7 are bolted to girder 1 and a 12½ in. Braced Girder is connected to these. Note that the lower bolt holding Strip 7 also holds a Fishplate. Two 12½ in. Strips 8 and 9 are bolted to Strip 3, Strip 8 passing behind the above-mentioned Fishplate, and Strip 9 passing behind another Fishplate bolted further along girder 1.

Both sides are joined together, at the base by two 5½ in. by 2½ in. Flanged Plates, and at the top by three 5½ in. Strips 10, 11 and 12. The space between Strips 11 and 12 is filled in by three 5½ in. by 2½ in. and a 5½ in. by 1½ in. Flexible Plate, the latter being nearest to Strip 12.

A further two 12½ in. Strips 13 are bolted between Strips 10 and 11, and a Double Bracket 14 is fixed to each through the hole mid-way between Strips 10 and 11. The fly-wheel will be journalled through these Double Brackets. Two 2 in. by 1½ in. Flexible Plates are fixed to each Strip 13,

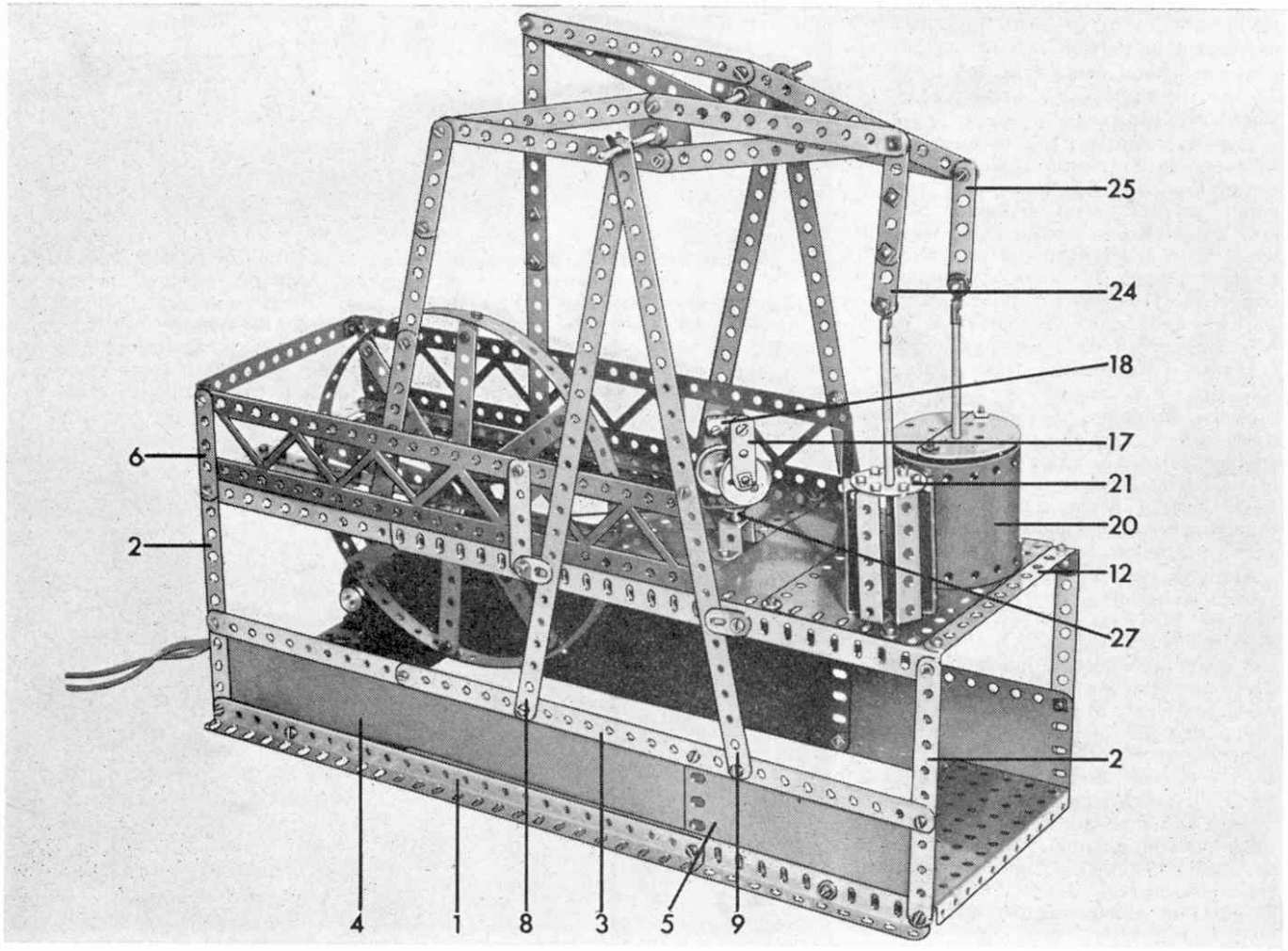
Two 12½ in. Strips, bent to form a circle, serve as the fly-wheel circumference and the spokes are mainly 3½ in. Strips connected between Angle Brackets on the circumference and the hub, which is an eight-hole Bush Wheel. There are eight spokes, but two of them are built-up from two 2½ in. Strips. These are placed opposite each other on the fly-wheel.

The completed fly-wheel, a 1 in. Pulley 15 and a 2 in. Pulley 16, both with bosses, are fixed tightly on a 3½ in. Rod journalled in Double Brackets 14, all three being situated between Strips 13. The Rod is held in position by Cranks on each end making use of two Washers between the Cranks and the Double Brackets.

A governor is formed from two 1 in. Pulleys without boss bolted to 1½ in. Strips 17. These are loosely connected to a Coupling 18 by ½ in. Bolts held by Grub Screws. The Coupling, in turn, is fixed to a 3½ in. Rod which carries a ½ in. Pulley with boss, and which is journalled in a Double Bent Strip 19 and a hole of the 5½ in. Flexible Plate. A collar beneath the Plate holds the Rod in place.

The main cylinder is built-up from

Full building instructions for this model Beam Engine are given above.



two 4½ in. by 2½ in. Flexible Plates 20, attached to two 2½ in. by ½ in. Double Angle Strips. The lower lugs of these Double Angle Strips are used to connect the cylinder to the Plates forming the top of the bed, while two Semi-circular Plates are bolted to the upper lugs. This is done by first fixing a ⅜ in. Bolt through each lug, so that it is held in place, while bolting the Semi-circular Plate in position.

As can be seen from the illustrations, a smaller cylinder is comprised of six 2½ in. by ½ in. Double Angle Strips fixed to a six-hole Wheel Disc 21 at the top. The completed structure is bolted to the Plates, forming the top of the bed, through the holes in the spare lugs of two of the Double Angle Strips.

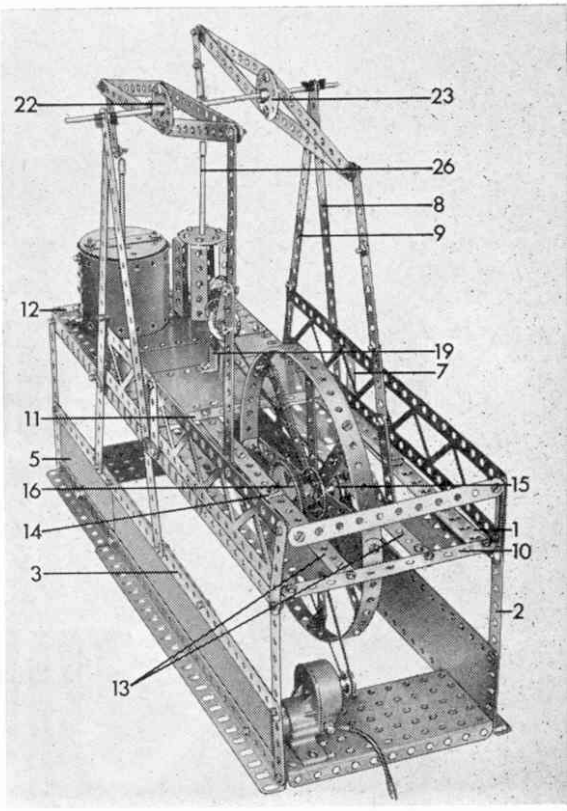
Each engine beam is built up from four 5½ in. Strips arranged in two sharp 'V's with the open ends together and bolted, in one case, to an eight-hole Bush Wheel 22 and, in the other case, to a six-hole Wheel Disc 23, held by Collars. At the fly-wheel end of each beam, the point of the 'V' is lock-nutted to a compound 9½ in. strip. One of these strips is made up from two 2½ in. and two 3 in. Strips, while the other comprises two 5½ in. Strips. At its other end, each compound strip is lock-nutted through the end hole of the Cranks holding the fly-wheel Rod in place. The Rod on which the beams are pivoted is a 7½ in. compound, made up of a 4 in. and a 3½ in. Rod joined by a Rod Connector. The rod is journalled in the end holes of Strips 8 and 9, and is held in place by Spring Clips.

At the cylinder ends of the beams, the 'V' over the smaller cylinder is lock-nutted to a compound 3½ in. strip 24, made from two 2½ in. Strips 25. A 6½ in. Rod 26, free to slide in the centre hole of the Wheel Disc 21 and the corresponding hole in the Plates to which the cylinders are attached, is connected to Strip 24 by a Rod and Strip Connector. A similar thing happens in the case of the large cylinder except that the rod is a 7 in. compound, made from a 5 in. and a 2 in. Rod joined by a Rod Connector.

The Motor is bolted to the Flanged Plate nearest the fly-wheel, as shown and the drive is taken from it to Pulley 16. A further drive is taken from Pulley 15 to the ½ in. Pulley 27 on the governor.

Parts required

12 of No. 1	1 of No. 20a	2 of No. 62
18 of No. 2	1 of No. 22	1 of No. 63
6 of No. 3	2 of No. 22a	2 of No. 99
2 of No. 4	1 of No. 23a	2 of No. 111a
13 of Bo. 5	2 of No. 24	6 of No. 111c
2 of No. 6a	1 of No. 24a	2 of No. 186b
8 of No. 8	1 of No. 24c	4 of No. 188
4 of No. 10	4 of No. 35	1 of No. 189
2 of No. 11	144 of No. 37a	2 of No. 191
10 of No. 12	127 of No. 37b	4 of No. 192
1 of No. 14	22 of No. 38	2 of No. 197
1 of No. 15	1 of No. 45	2 of No. 212
1 of No. 15b	8 of No. 48a	2 of No. 213
3 of No. 16	2 of No. 52	2 of No. 214
1 of No. 17	3 of No. 59	1 Emebo Motor



The Beam Engine, showing the drive from the Emebo Motor to the fly-wheel.