MODEL OF THE MONTH

Tower Crane

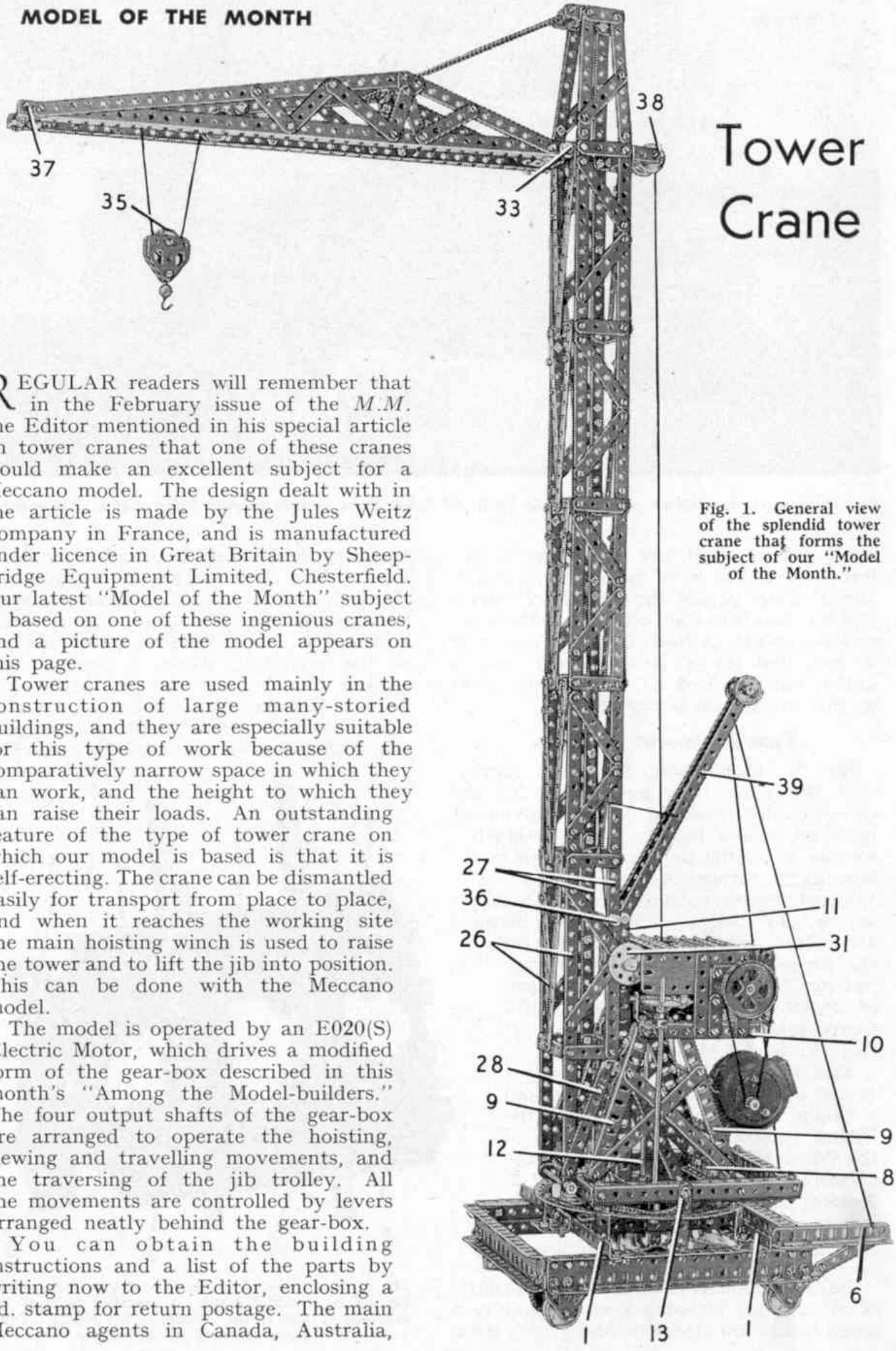

Fig. 1. General view of the splendid tower crane that forms the subject of our "Model of the Month."

REGULAR readers will remember that in the February issue of the *M.M.* the Editor mentioned in his special article on tower cranes that one of these cranes would make an excellent subject for a Meccano model. The design dealt with in the article is made by the Jules Weitz Company in France, and is manufactured under licence in Great Britain by Sheepbridge Equipment Limited, Chesterfield. Our latest "Model of the Month" subject is based on one of these ingenious cranes, and a picture of the model appears on this page.

Tower cranes are used mainly in the construction of large many-storied buildings, and they are especially suitable for this type of work because of the comparatively narrow space in which they can work, and the height to which they can raise their loads. An outstanding feature of the type of tower crane on which our model is based is that it is self-erecting. The crane can be dismantled easily for transport from place to place, and when it reaches the working site the main hoisting winch is used to raise the tower and to lift the jib into position. This can be done with the Meccano model.

The model is operated by an E020(S) Electric Motor, which drives a modified form of the gear-box described in this month's "Among the Model-builders." The four output shafts of the gear-box are arranged to operate the hoisting, slewing and travelling movements, and the traversing of the jib trolley. All the movements are controlled by levers arranged neatly behind the gear-box.

You can obtain the building instructions and a list of the parts by writing now to the Editor, enclosing a 2d. stamp for return postage. The main Meccano agents in Canada, Australia,

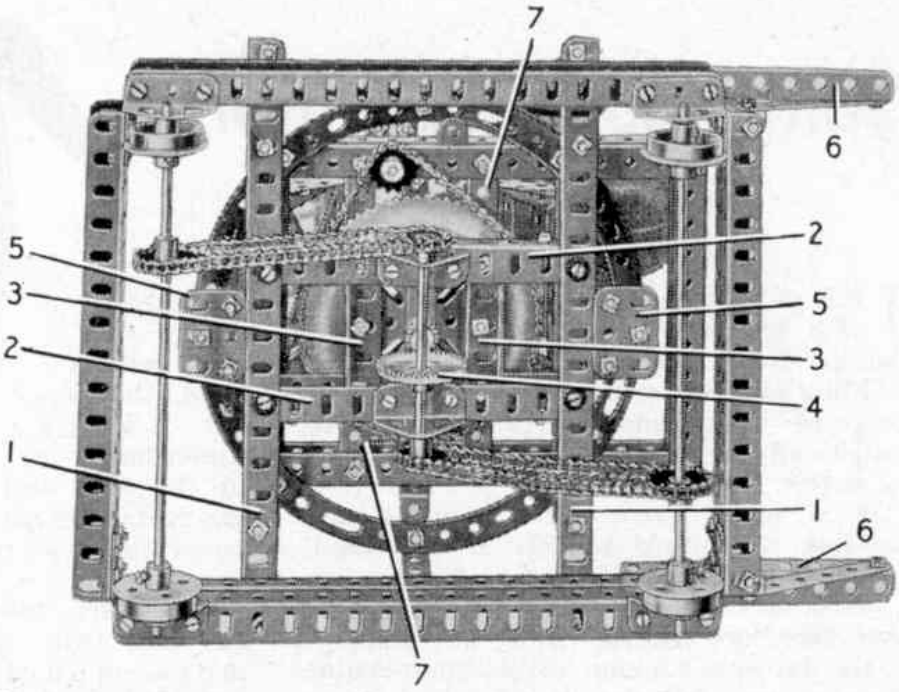

Fig. 2. This picture, showing the inside of the crane base, reveals clearly the arrangement of the drive to the travelling wheels.

New Zealand, South Africa, Ceylon, Italy and the U.S. of America are provided with copies of the current "Model of the Month" Instructions, and readers in those countries can obtain copies by writing to the appropriate agent, enclosing suitable stamps for postage.

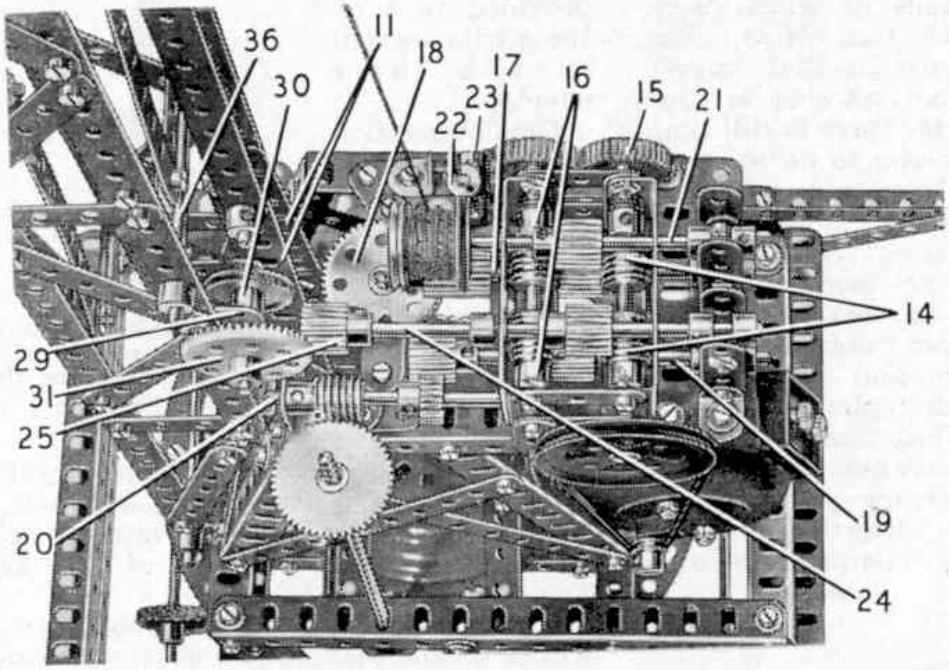

Fig. 3. A close-up view of the compact four-movement gear-box, which is used to control the crane.

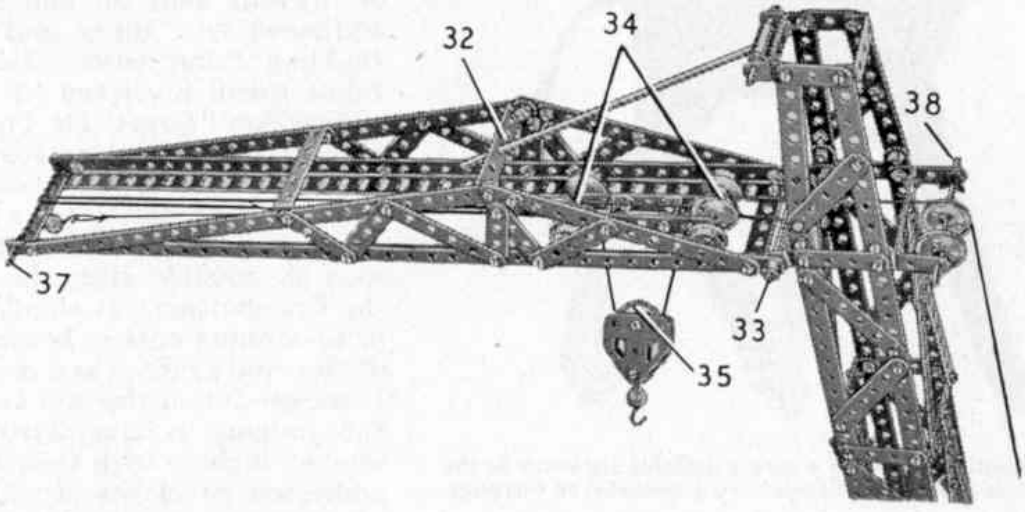

Fig. 4. This view shows the upper end of the tower, with the jib in position. The arrangement of the trolley can be seen clearly.

MODEL OF THE MONTH

TOWER CRANE

Illustrated in the July 1957 issue of the Meccano Magazine

Construction of the Wheeled Base

The main frame of the base consists of four channel girders, two of which are formed by 9½" Angle Girders and 9½" Flat Girders and the other two by 7½" Angle Girders and 7½" Flat Girders. The channel girders are connected by two 1" x 1" Angle Brackets at each corner to form a rectangular base structure, and two 9½" Angle Girders 1 are bolted across the structure, with the joins braced by 1" Corner Brackets.

Two channel girders 2, each made from two 5½" Angle Girders, are fixed between the Girders 1 and these support two 2½" Angle Girders 3. The 1⅝" Flanged Wheels of the base are fixed on 8" Rods mounted in Trunnions as shown, and each Rod carries a 1" Sprocket. The Sprockets are connected by lengths of Chain to ¾" Sprockets on a 3½" Rod carrying a 1½" Contrate 4. The 3½" Rod is supported in Trunnions bolted to the girders 2.

A 1½" Angle Girder is bolted to each of the Girders 1 and supports a 1½" Flat Girder 5. Two 1⅝" Bolts are fixed by nuts in a 7½" Circular Strip, and the Bolts are fixed by further nuts in the Flat Girders 5. The Circular Strip is connected to the 9½" channel girders and to the Girders 1 by four 1" Reversed Angle Brackets.

The base is extended at one end by two 4½" Angle Girders 6, which are braced by 3" Strips connected to the main frame by Angle Brackets.

Details of the Crane Superstructure

The base of the superstructure consists of four channel girders, two of which are 7½" Angle Girders bolted together while the other two are made from 5½" Angle Girders. The channel girders are connected at their ends to make a rectangular structure, and two 5½" Angle Girders 7 are bolted across it. A third 5½" Angle Girder 8 is bolted to Angle Brackets fixed to the 7½" channel girders.

Two 5½" Angle Girders 9 on each side are connected at their upper ends by a 4½" Angle Girder 10. The Girders 9 at the front are connected to the base frame by Angle Brackets, and those at the rear are attached to Fishplates bolted to the Girder 8. The structure is braced by 5½" Strips at the front and the sides.

Two 9½" Angle Girders 11 are bolted together at their upper ends, and they are fixed to the leading one of the Girders 7 so that one clear hole remains between them. Each of the Girders 11 is braced by a 5½" Strip connected to the rear one of the Girders 7 by an Angle Bracket.

A Flanged Disc from a Ball Thrust Race is bolted to the Girders 7, and a Toothed Disc is fixed to the Girders 2 and 3. The sections of the Ball Thrust Race are then assembled, with a 4½" Rod 12 passed through the centre. A Collar is used to hold the components together, and a ½" Pinion on the Rod is arranged to engage the Contrate 4.

Four 1" x ½" Angle Brackets, one of which is seen at 13, are bolted to the base of the superstructure, so that their lugs engage the lower face of the Circular Strip. These Angle Brackets serve to steady the superstructure and relieve the Rod 12 of stresses when the crane is working.

Arrangement of the Drive and the Gear-Box

Two 3½" Strips are bolted across the rear pair of the Girders 9 and an E020(S) Electric Motor is fixed to them. The gear-box housing consists of two 2½" x 1½" Flanged Plates connected at each end by two 1½" Strips, with further 1½" Strips covering the slotted holes in the flanges of the Plates. One end of the gear-box is supported by two 1½" Strips bolted to one of the Girders 10, and the other end is supported by two 1" x 1" Angle Brackets attached to the second one of the Girders 10 and to two 3½" Strips bolted between the Girders.

The Motor pulley is connected by a Driving Band to a 2" Pulley on a 3½" Rod, which carries also two Worm Gears 14 and a 1" Gear 15. The Rod is mounted in the centre holes in the flanges of one of the Flanged Plates, and Gear 15 drives another 1" Gear on a 3" Rod mounted similarly in the second Flanged Plate. The 3" Rod carries two Worm Gears 16. The drive to each of the output shafts is engaged by sliding the shaft so that a ½" diameter, ½" face Pinion on it engages one of the Worm Gears. When the Pinion engages one of the Worms 14 forward drive is obtained, and by moving the Pinion into mesh with one of the Worms 16 the direction of the drive is reversed. A neutral position is provided when the Pinion is located centrally between the Worms 14 and 16.

The sliding movement of each of the gear-box output shafts is controlled by a lever formed by a 2½" Strip. A bolt fixed in the Strip by a nut has its head located between two Collars on the corresponding output shaft. The two inner levers are lock-nutted to the lugs of a Double Bracket bolted to a 3½" Flat Girder fixed to the Girders 10, and each outer lever is lock-nutted to an Angle Bracket attached to the Flat Girder. The lock-nutting must be carried out tightly, to prevent the levers from moving too easily. It should be noted that the standard Grub Screws of the Pinions and the Collars used in the gear-box should be replaced by 7/64" Grub Screws.

The drive to the travelling movement is taken from the output shaft 17, which is a 4" Rod that carries a ½" diameter, ¾" face Pinion. The Pinion engages a 1½" Contrate 18 on a vertical 4" Rod mounted in a 2½" Strip attached to 1" Triangular Plates bolted to the Girders 10. The vertical Rod is connected to the upper end of Rod 12 by a Coupling.

The drive to the slewing motion is taken from 4" Rod 19, which carries a ½" diameter, ½" face Pinion that meshes with a ½" Pinion on a 3" Rod 20. Rod 20 is supported in the gear-box frame and in a 1" x 1" Angle Bracket bolted to one of the Girders 10. A Worm Gear on Rod 20 drives a 50-tooth Gear on a vertical 8" Rod fitted at its lower end with a ¾" Sprocket. The 8" Rod is mounted in one of the channel girders of the superstructure and in a 1" Triangular Plate attached to one of the Girders 10 by two Angle Brackets. The ¾" Sprocket is connected by Chain to the Toothed Disc of the Ball Thrust Race, and Collars are used to hold the 8" Rod in position.

The winding drum is formed by two 1" Pulleys on a 4" Rod 21. A 2½" Driving Band is placed round one of the Pulleys, and a Collar 22 presses against the Driving Band to form a brake when the Rod 21 is in its neutral position. Collar 22 is fixed on a 2" Rod held in a Coupling 23, which pivots on a 1⅛" Bolt supported in Angle Brackets bolted to one of the Girders 10, and held in one of the Angle Brackets by a nut. A Driving Band is passed round Coupling 23 and is stretched slightly and is attached to the superstructure. The Driving Band forces the Collar 22 against the Driving Band round the 1" Pulley, but movement of Rod 21 in either direction slides the Pulley clear of the Collar and releases the brake.

Traversing the trolley along the jib is operated by a 5" Rod 24, fitted with a ½" diameter, ½" face Pinion 25.

A cover over the gear-box is provided by two 3½" Angle Girders connected by six 3½" Strips, with two 1½" Strips arranged to leave a gap for the hoisting Cord. One side of the cover is a 3½" x 2½" Flexible

Plate edged by two vertical 3" Strips, and the other side consists of two 3" Strips and a 2½" x 1½" Flexible Plate. The lower ends of the 3" Strips are bolted to the Girders 10.

Construction of the Tower

The lower section of the tower consists of two 12½" Strips 26 and two 7½" Strips 27, connected by 2" Strips and 2½" x ½" Double Angle Strips. A made-up strip 28, formed by a 4½" Strip and a 2" Slotted Strip, is fixed in position. The tower is extended upward by two further sections, each of which is formed by four 12½" Strips connected by 2" Strips and 2½" x ½" Double Angle Strips. At the top, four 4½" Strips are bolted in place and their upper ends are connected by 1½" Strips and 1½" x ½" Double Angle Strips. The sides of the tower are braced by 3" Strips as shown, and the front and the back are braced by made-up strips bolted to the Double Angle Strips. Each of the made-up strips consists of a 5½" and a 2½" Strip overlapped three holes.

The tower pivots on a 3½" Rod held by Collars in a 2½" x ½" Double Angle Strip bolted to the front of the superstructure. In its vertical position, the tower is fixed by bolts passed through the strips 28 into Angle Brackets bolted to the front pair of Girders 9.

A Channel Bearing 29 is bolted to one of the Strips 27 of the tower, and a 1½" Rod is mounted in the Channel Bearing. The Rod carries a 1" Pulley 30, and a 1½" Contrate 31 that meshes with the Pinion 25 when the tower is fixed in its vertical position.

Details of the Jib and its Trolley

The lower members of the jib are two 18½" Angle Girders connected at their ends by 2½" Strips. A 12½" Strip and a 5½" Strip are bolted to each Girder, and are connected by a 1" Triangular Plate. The bolt joining the Triangular Plate to the 12½" Strip is lock-nutted, and supports also a 2½" x ½" Double Angle Strip 32. Bracing Strips are added as shown in Fig. 4.

The jib pivots on a 3½" Rod 33 held by Collars in a 2½" x ½" Double Angle Strip bolted to the tower. In its working position, the jib is supported horizontally by an 8" Rod fixed in a Coupling, which is carried by two 1" Rods mounted in the lugs of a 1½" x ½" Double Angle Strip bolted to the top of the tower. The 8" Rod is passed through Double Angle Strip 32 and is then fitted with a Collar.

The trolley consists of two 3½" Strips connected by two Double Brackets. The wheels are ¾" Flanged Wheels on 2" Rods, each of which carries also a 1" loose Pulley 34.

The pulley block is formed by two Flat Trunnions connected by nuts on ½" Bolts. A 1" loose Pulley 35 is mounted on one of the Bolts, and the other supports a small Loaded Hook.

Arrangement of the Cords

A length of Cord is tied to the inner end of the trolley, is taken over Rod 33 and is passed down inside the tower. The Cord passes under a 3½" Rod 36, is wrapped twice round Pulley 30, then is passed under Rod 36 again and is led up the tower. The Cord is taken over Rod 33, round a 3½" Rod 37 at the end of the jib, then is tied to a Driving Band looped round the leading axle of the trolley. The Driving Band is stretched slightly to tension the Cord.

The hoisting Cord is tied to its drum, is passed through the gear-box

cover and over a 1" loose Pulley on a 3½" Rod 38, mounted in a 2½" x 1" Double Angle Strip bolted to the tower. The Cord is passed over one of the Pulleys 34, round Pulley 35 and over the second one of the Pulleys 34, then is looped over a small Loaded Hook bolted to the outer end of the jib.

Erecting the Crane

In its dismantled position, the bolts fixing the tower to the Girders 9 are removed, and the tower and the jib are arranged almost horizontally along the ground. The 8" Rod slides through the Double Angle Strip 32 to allow the jib to pivot on its supporting Rod. To erect the crane, the erection mast 39 is first placed in position, as shown in Fig. 1. The mast consists of two 9½" Strips connected by a Single Bent Strip, and it pivots on a 1½" Rod held by Collars in the Girders 11. Two 1" loose Pulleys are held by Collars on a 1½" Rod passed through the top of the mast. Cord is passed through the mast and is fastened at each end to the Girders 6.

When the crane is dismantled the hoisting Cord is removed from its Pulleys and is fully wound on the drum. With the erection mast in place, the drum is allowed to unwind and the Cord is passed round the Pulleys of the mast and those on the Rod 38. Finally one end of the Cord is secured to the tower. By winding in the Cord, the tower is gradually pulled into its working position, and at the same time the jib resumes its normal angle. The tower is then bolted in place and the hoisting Cord can be rearranged to operate the pulley block in the normal way. When the crane is working, the erection mast is tied to the tower in a vertical position.

PARTS REQUIRED FOR TOWER CRANE

No. of Part	Qty.	No. of Part	Qty.	No. of Part	Qty.
1	12	16B	2	63	3
1A	2	17	1	77	5
2	28	18A	5	94	40"
2A	4	20	4	96	2
3	14	20B	4	96A	3
4	27	20A	1	102	1
5	30	22	3	103A	2
6	18	22A	7	103D	1
6A	14	26	2	103H	2
7A	2	26A	6	103K	2
8A	8	26B	1	111A	2
8B	8	27	1	111C	6
9	14	28	3	111D	3
9A	4	31	2	124	6
9B	2	32	5	126	6
9D	2	35	5	126A	2
9F	2	37A	420	133A	4
10	3	37B	408	145	1
11	3	38	76	160	1
12	14	40	1	168	1
12A	11	46	1		
12B	4	48	3	186	2
13A	5	48A	15	186B	1
15	1	51	2	188	1
15B	3	55A	2	190A	1
16	7	57C	2	1 E020(S) Electric Motor.	
16A	1	59	24		