

MECCANO



(TRADE MARK 296321)

INSTRUCTIONS

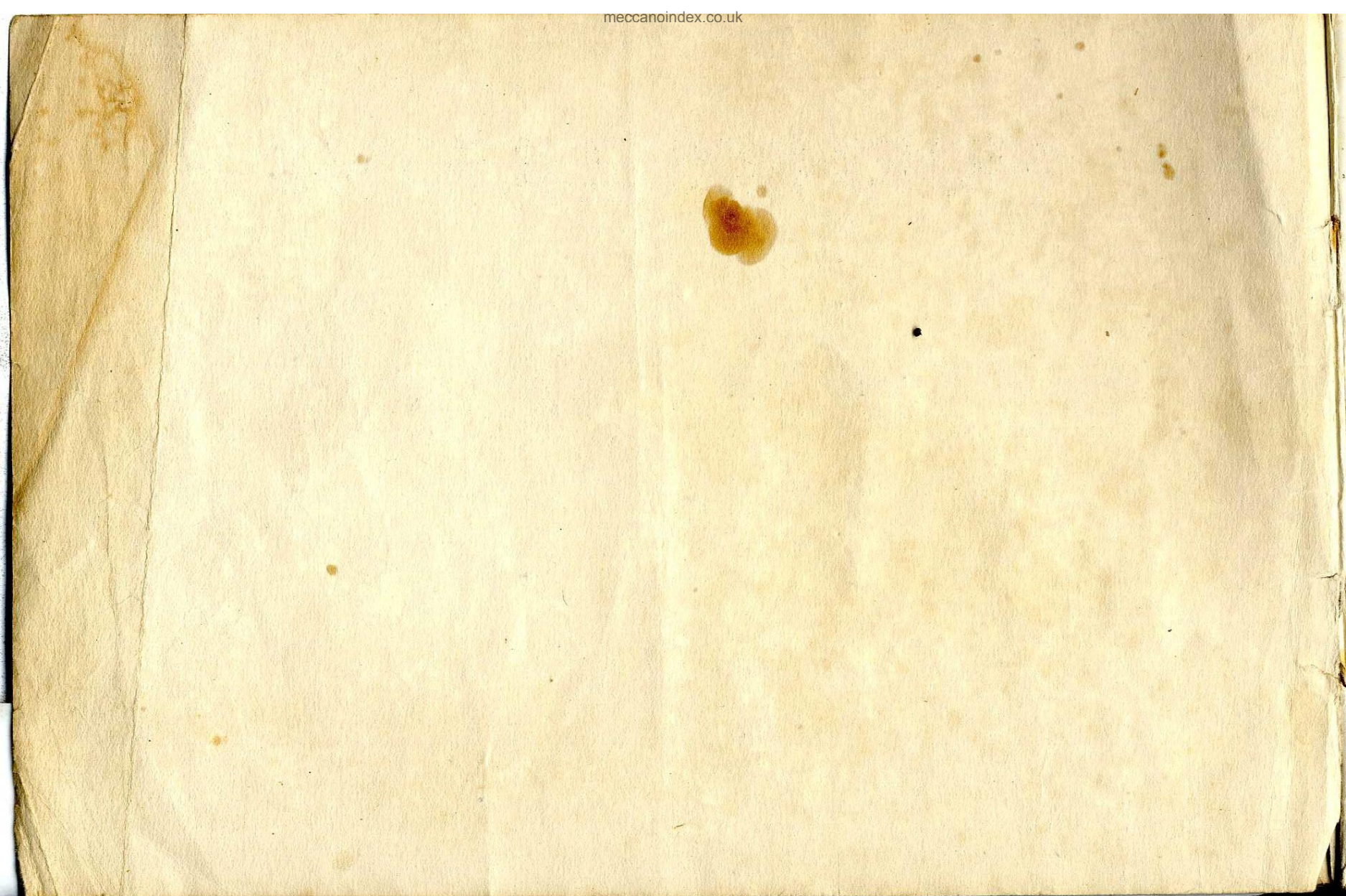
BOOK No. 3.

Price 1/3. *9/See 2/-*

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No. 21.

ENGLISH EDITION



HORNBY CLOCK WORK TRAINS

THE HORNBY TRAINS are manufactured by Meccano Ltd., and they are built on the Meccano principle. All the parts are standardised, and Engines, Tenders, Coaches and Wagons may be taken entirely to pieces and rebuilt. If one of the parts is lost or damaged you can fit a new one yourself. *A Hornby Train lasts for ever!* The Hornby Train is a beautiful piece of workmanship, with perfect clockwork mechanism ensuring smooth running. Each train is guaranteed by Meccano Ltd.

PERFECT MECHANISM BEAUTIFUL FINISH STANDARDISED PARTS



The Hornby Clockwork Train No. 2 Pullman

This includes an Engine and Tender of a larger type, measuring 17in. long. A superior mechanism has been adopted making this the most attractive and satisfactory clockwork train yet produced. The Coaches are beautiful both in colouring and finish. Each set includes Engine, Tender, one Pullman and one Dining Coach as illustrated, with set of rails making a 4ft. diameter circle (Gauge 0). In four colours to represent London and North-Western, Midland, Great Northern, and Caledonian Railway systems. The Engine is fitted with reversing gear, brakes and governor.

Complete set in gold-embossed box - - price 80/-

Engines - 40/- each Tenders - 5/- each Coaches - 16/- each (Rails, Points and Crossings see below.)

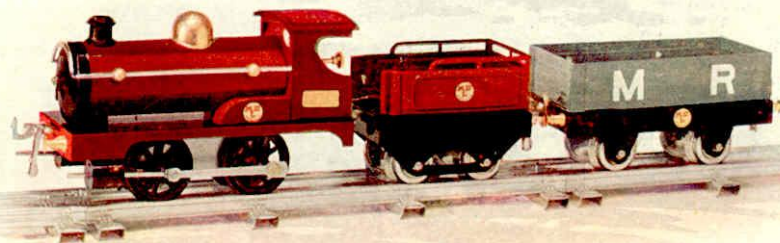
The Hornby Clockwork Train No. 2 Goods

This is similar to the passenger set No. 2, but two waggons in place of coaches.

Complete set in gold-embossed box - - 57/6

Crossings, right or acute angle - 2/6 each.	Points, right or left hand (for 2ft. and for 4ft. diam.) - 5/- each.	Loco. - 40/- each
Tender - 5/- each	Wagons - - 4/6 each	Rails - - 6/- per doz.

The Hornby Clockwork Train No. 1 Goods



Gauge 0. In four colours to represent the London and North-Western, Midland, Great Northern, and Caledonian Railway systems. Each set contains Engine, Tender and one Wagon, with set of rails including a 2ft. diameter circle and two straights. The Engine is fitted with reversing gear, brakes and governor.

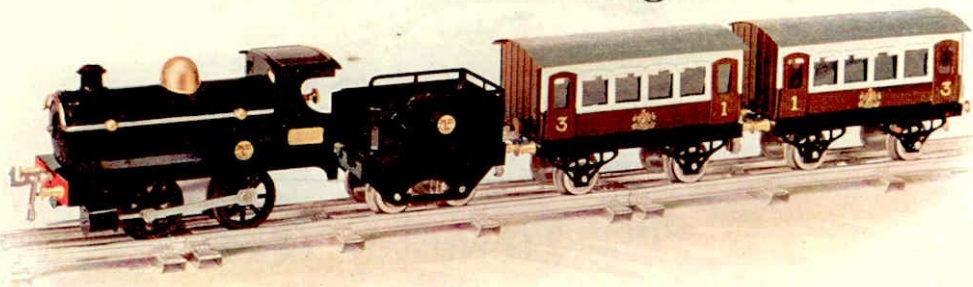
Complete Set in strong attractive box - - price 30/-

Engines - - - 18/6 each
Tenders - - - 4/6

Wagons - - - - 4/6 each
(Rails, Points, and Crossings see below.)

The Hornby Clockwork Train No. 1 Passenger

Gauge 0. In four colours to represent the London and North-Western, Midland, Great Northern, and Caledonian Railway systems. The Coaches are beautifully enamelled in colours. Each set contains Engine, Tender and two coaches with set of rails including a 2ft. diameter circle and two straights. The Engine is fitted with reversing gears, brakes and governor.



Complete set in gold-embossed box,
price - - - - - 38/6

Points, right or left hand (for 2ft. or 4ft. diam.) 5/- each

Engines - - - 18/6 each
Tenders - - - 4/6

Coaches - - - - 6/6 each

Rails, straight or curved - 6/- per doz.

Crossings (right or acute angle) 2/6 each.

MECCANO

Hornby's Original System, First Patented 1901

PATENTS & DESIGNS,
GREAT BRITAIN:

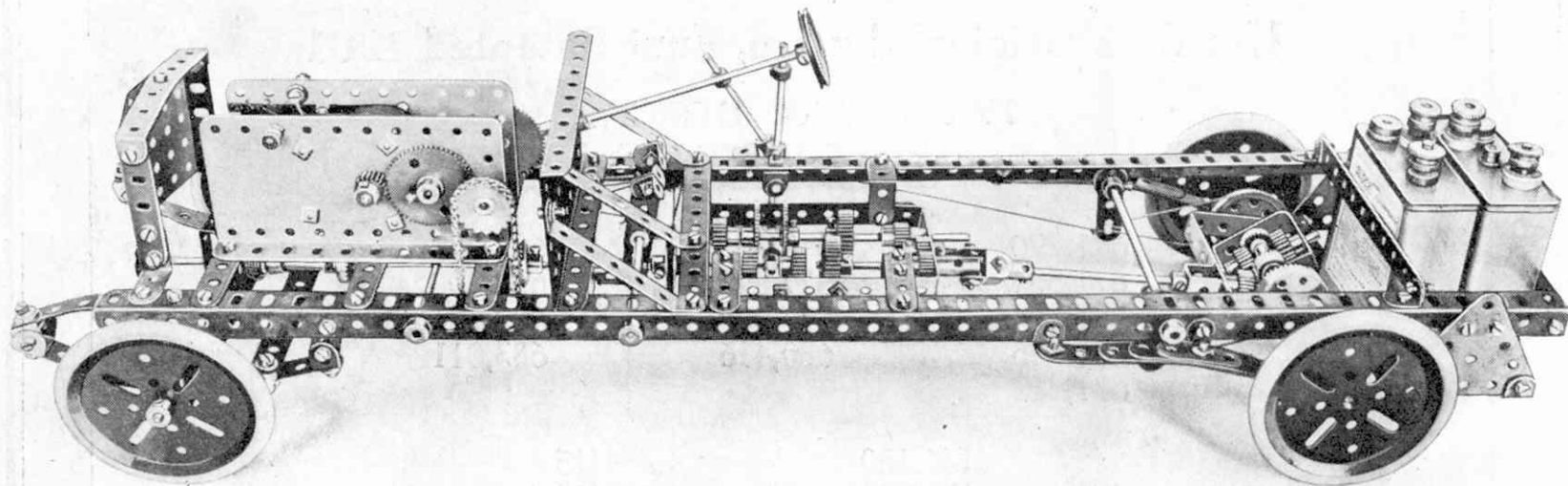
671,790	648,958	682,209
671,534	577,272	682,208
671,484	577,207	682,934
671,485	680,416	683,011
671,212		

154,130	4,564/15
153,234	4,183/14
145,357	3,869/14
139,125	22,962/13
116,370	20,535/13
	21,117/12

PATENTED THROUGHOUT THE WORLD

Meccano Motor Chassis

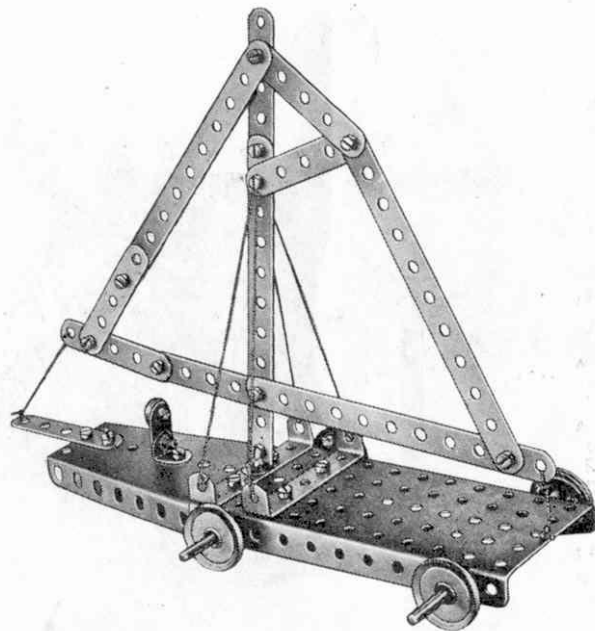
Special Meccano Model No. 429



The Meccano Motor Chassis is a model of exceptional interest as it provides a complete demonstration of a real Motor Chassis. It has a differential gear, steering gear, and perfect gear box, giving two forward speeds and a reverse. It also has an underslung system of springs. In order to make its construction quite clear a large number of sectional photographs and drawings are necessary, and it is impossible to find space for these, and the necessary instructions which go with them, in this Manual. We have, therefore, compiled a separate art sheet containing full instructions, with clear illustrations, and this may be purchased either from your dealer or from Meccano Limited, Liverpool. Price 3d., or 4d. post free.

Model No. 430 Sailing Boat

(Outfit No. 2)

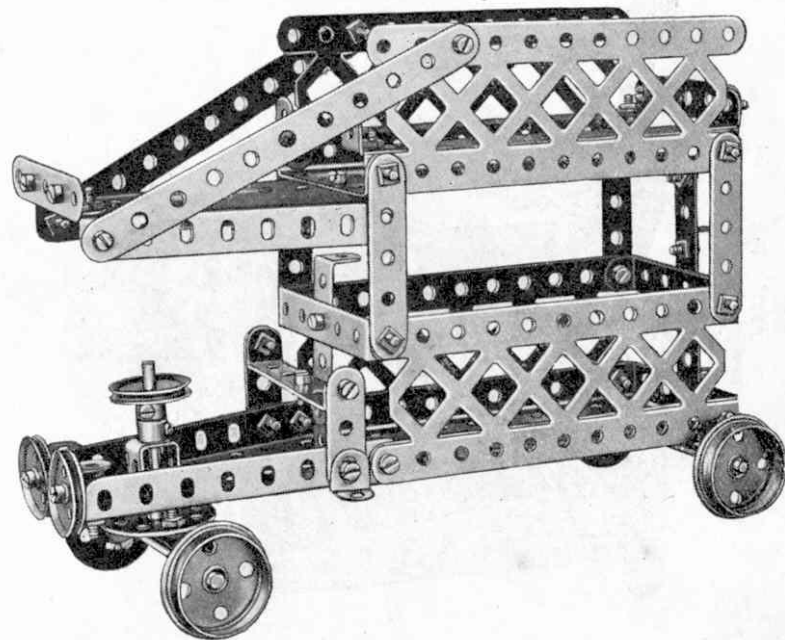


Parts Required:

4 of No. 2	1 of No. 22a
6 " " 5	20 " " 37
1 " " 10	1 " " 52
6 " " 12	1 " " 54
2 " " 16	2 " " 60
4 " " 22	

Model No. 431 Motor Bus

(Outfit No. 4)



Parts Required:

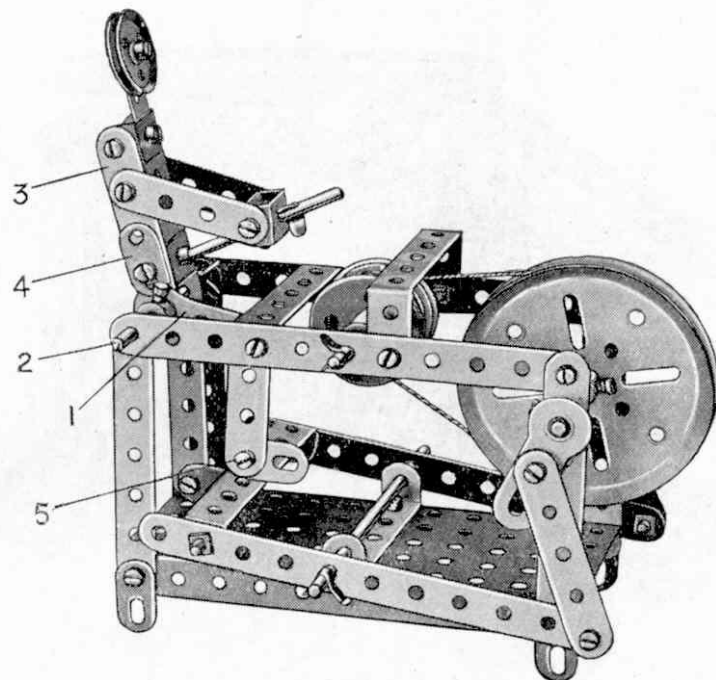
2 of No. 2	1 of No. 17	1 of No. 45
1 " " 3	4 " " 20	2 " " 52
6 " " 5	1 " " 22	1 " " 54
3 " " 11	2 " " 22A	1 " " 59
12 " " 12	1 " " 24	7 " " 60
2 " " 16	48 " " 37	

Special Parts: 2 of No. 6A

Model No. 432

Knife Grinder

(Outfit No. 5)



Parts Required:

4	of	No.	2
4	"	"	3
2	"	"	4
4	"	"	5
3	"	"	6
4	"	"	10
3	"	"	11
2	"	"	12
1	"	"	15
3	"	"	16
1	"	"	17
1	"	"	19A
2	"	"	20
1	"	"	22
1	"	"	22A
2	"	"	35
32	"	"	37
6	"	"	37A
1	"	"	46
1	"	"	52
2	"	"	60
3	"	"	62

Special Part:

1 of No. 60B

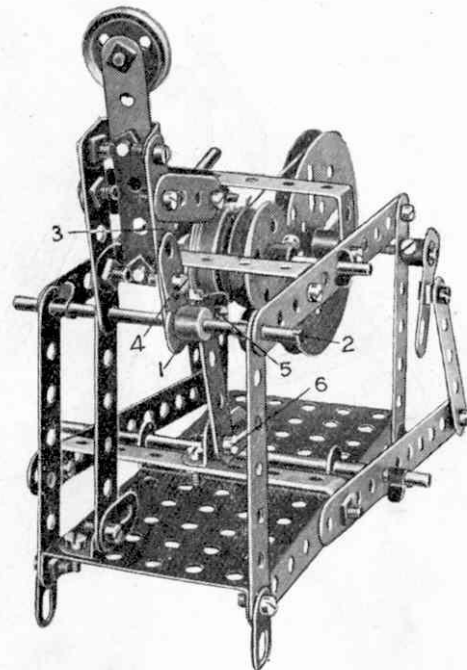
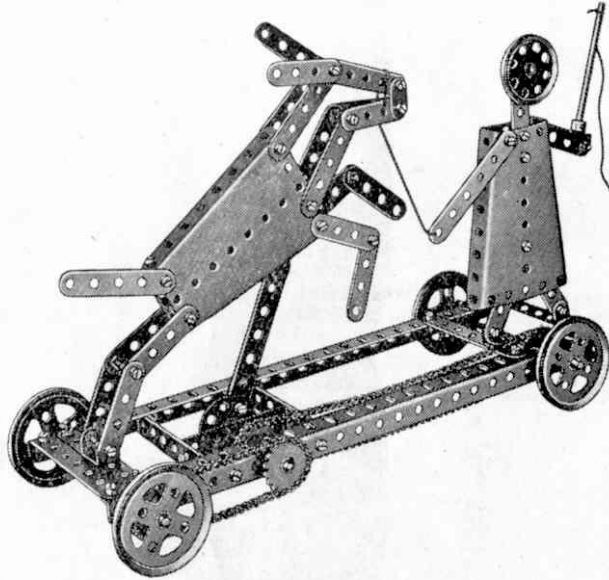


FIG. A.

The crank 1 is secured to the rod 2, and the $2\frac{1}{2}$ " side-strip 3 is clamped to the crank 1 by the flat bracket 4. The bolt at the end of the crank forming the knee and the bolt 5 are lock-nutted to allow free movement. When the treadle is operated the body works backwards and forwards.

Model No. 433
Galloping Donkey
 (Outfit No. 6)



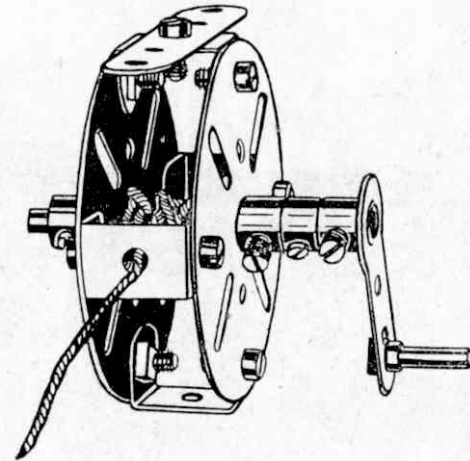
Parts Required:

5 of No. 3	1 of No. 16A
1 " " 4	1 " " 21
9 " " 5	1 " " 24
10 " " 6	1 " " 35
2 " " 8	52 " " 37
2 " " 10	5 " " 37A
1 " " 11	4 " " 54
2 " " 12	1 " " 59
2 " " 15	1 " " 60
1 " " 16	18 " " 94

Special Parts:

4 of No. 20A
1 " " 38
2 " " 60B
4 " " 96

Model No. 434
Fishing Reel
 (Outfit No. 3)



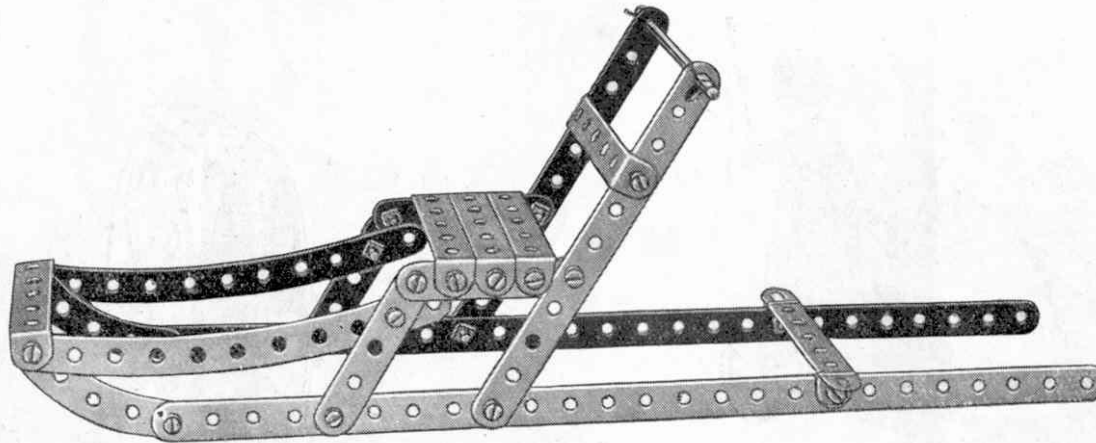
Parts Required:

1 of No. 5	Special Parts:
4 " " 11	2 of No. 109
1 " " 13	1 " " 115
1 " " 16A	
9 " " 37	
2 " " 59	
1 " " 62	

Model No. 435

Kicking Sleigh

(Outfit No. 2)

**Parts Required:**

2	of	No. 1
2	"	" 2
4	"	" 5
2	"	" 12
1	"	" 16
2	"	" 35
24	"	" 37
6	"	" 60

Special Parts:

2	of	No. 89
2	"	" 90

Model No. 436

Rowing Boat

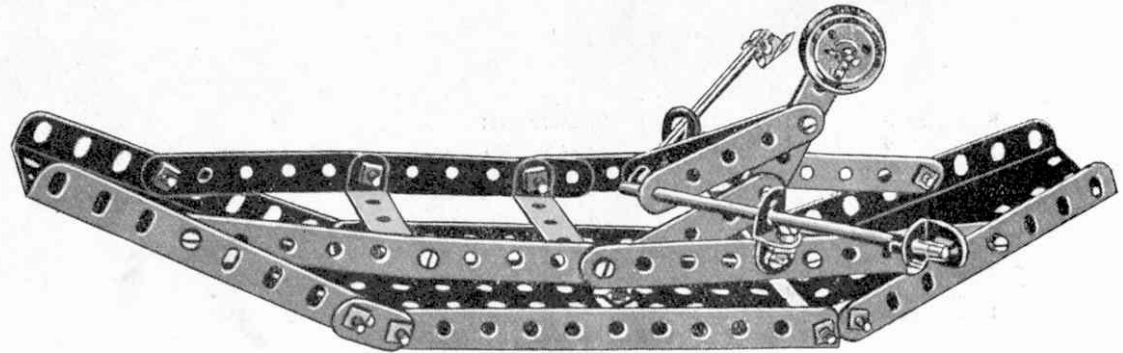
(Outfit No. 1)

Parts Required:

4	of	No. 2	4	of	No. 35
5	"	" 5	24	"	" 37
4	"	" 10	1	"	" 52
7	"	" 12	2	"	" 54
2	"	" 15A	3	"	" 60
1	"	" 18A			
2	"	" 22A			

Special Parts:

4 of No. 38



Model No. 437

Roundabout

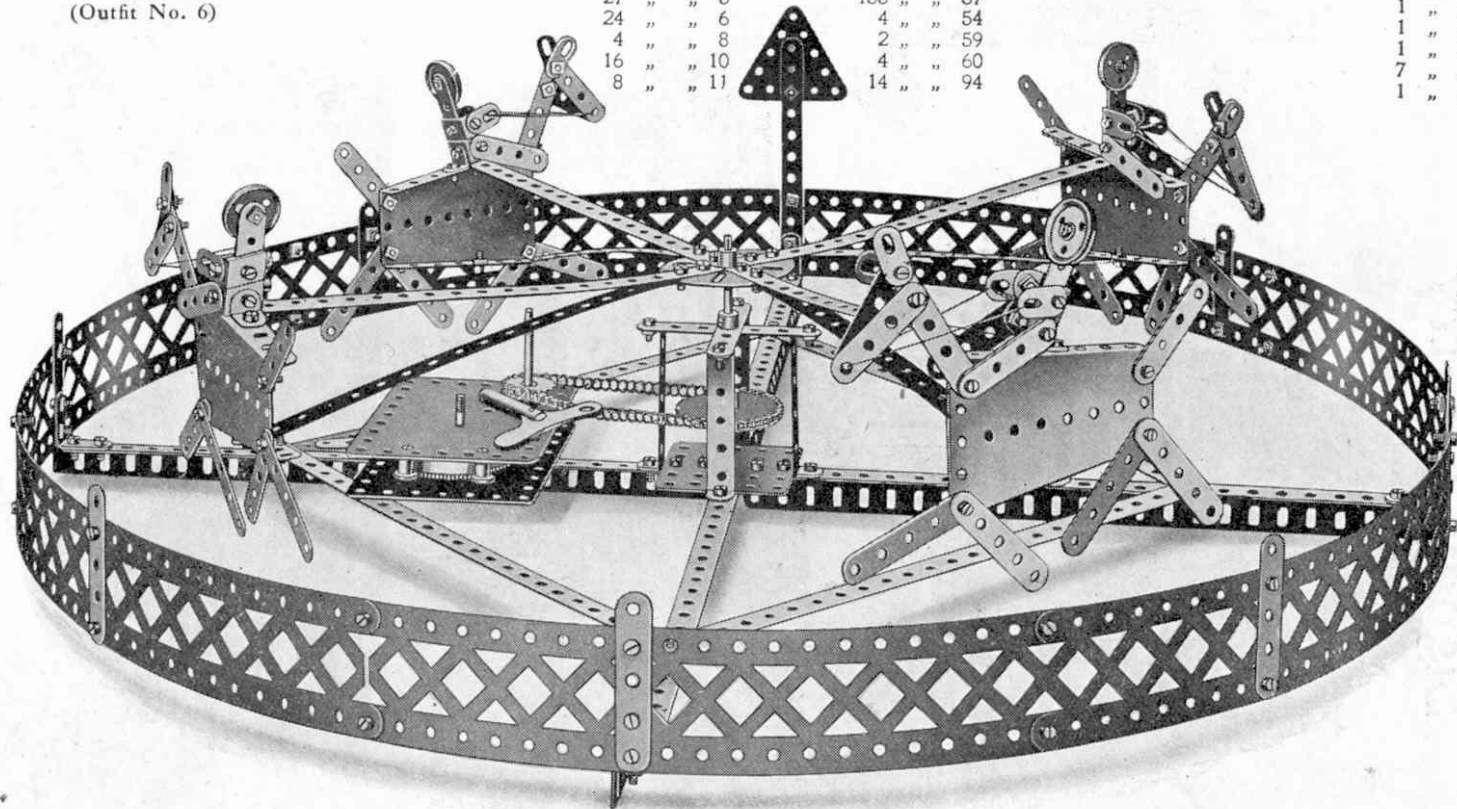
(Outfit No. 6)

Parts Required:

12 of No. 1	4 of No. 12
1 " " 2	1 " " 15
2 " " 3	4 " " 22A
27 " " 5	135 " " 37
24 " " 6	4 " " 54
4 " " 8	2 " " 59
16 " " 10	4 " " 60
8 " " 11	14 " " 94

Special Parts:

4 of No. 12A
1 " " 72
1 " " 76
1 " " 95
1 " " 96
7 " " 99
1 " " 109

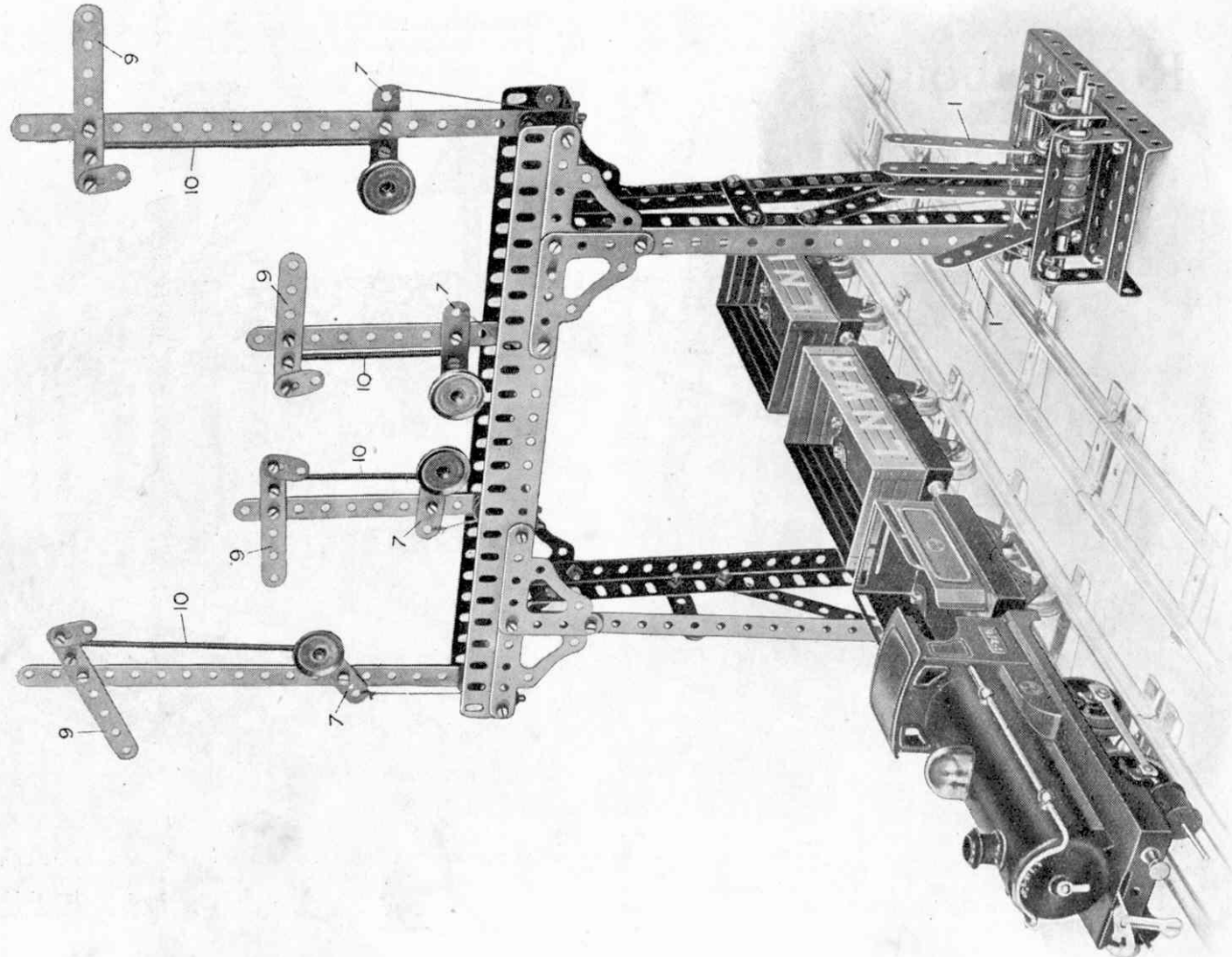


In this model the animals, built up from sector plates and short strips to represent the limbs, are carried from $9\frac{1}{2}$ strips bolted to a face plate, which is rotated from the centre rod by means of a chain and a 1" sprocket wheel connected to the spring motor.

The centre rod, by means of which the rotating figures are driven, is supported below the face plate by a light framing to give rigidity.

The model is surrounded by braced girder strips bolted together, and strengthened by $12\frac{1}{2}$ " cross angle girders, connected in the centre by a $2\frac{1}{2}$ " by $2\frac{1}{2}$ " flat plate. The centre hole of this plate carries the lower end of the vertical rod upon which the animals are mounted.

Model No. 438
Signal Gantry
(Outfit No. 5)



Model No. 438 Signal Gantry (continued)

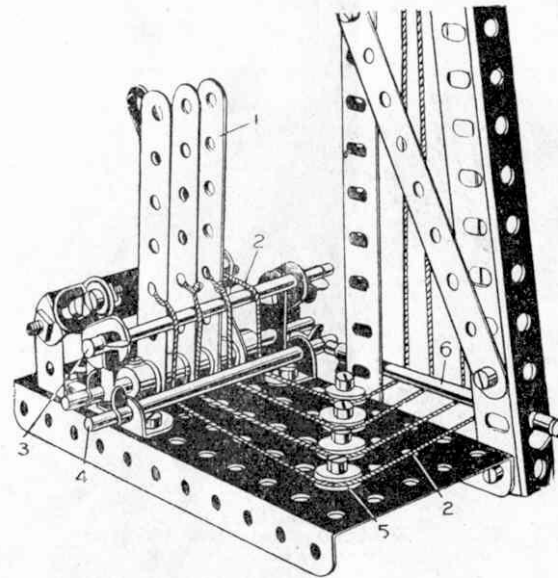


FIG. 438A

The detail views, Figs. 438A and 438B, bring out the construction of the various parts. In Fig. 438A the levers 1 which operate the cords 2 are passed round the upper and lower rods 3 and 4, and round the $\frac{1}{2}$ " pulleys 5, giving the cords 2 a quarter turn before they pass round the rods 6, thence to the various weighted levers 7, which are connected as shown in Fig. 438B, to threaded bosses 8 on the signal arms 9 by threaded rods 10.

Parts Required :

2	of	No.	2
6	"	"	3
2	"	"	4
1	"	"	5
6	"	"	6
6	"	"	10
4	"	"	16
1	"	"	17
4	"	"	22
8	"	"	23
10	"	"	35
77	"	"	37
4	"	"	37B
2	"	"	46
1	"	"	52
5	"	"	59
1	"	"	60

Special Parts :

2	of	No.	1A
2	"	"	2A
4	"	"	8A
4	"	"	12A
4	"	"	33A
10	"	"	38

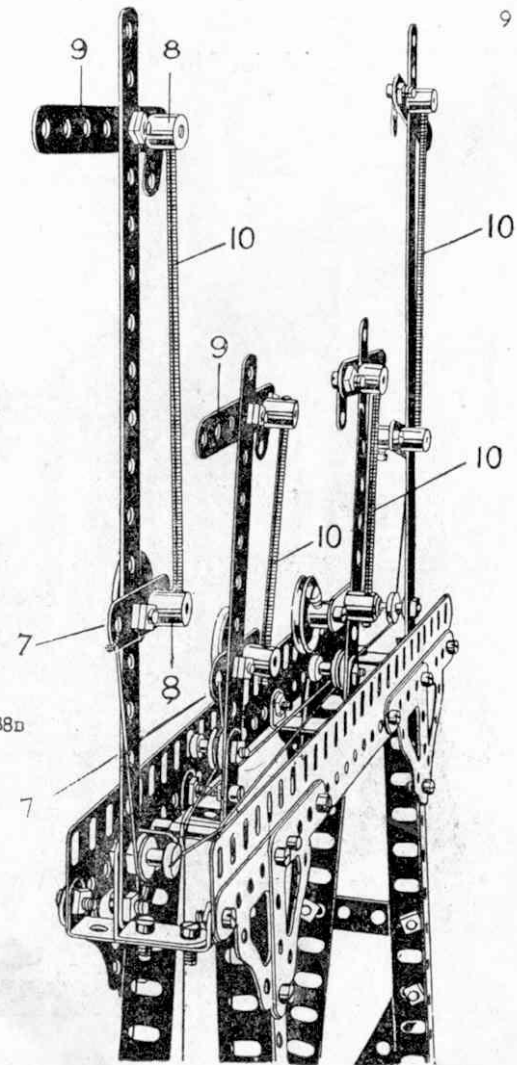
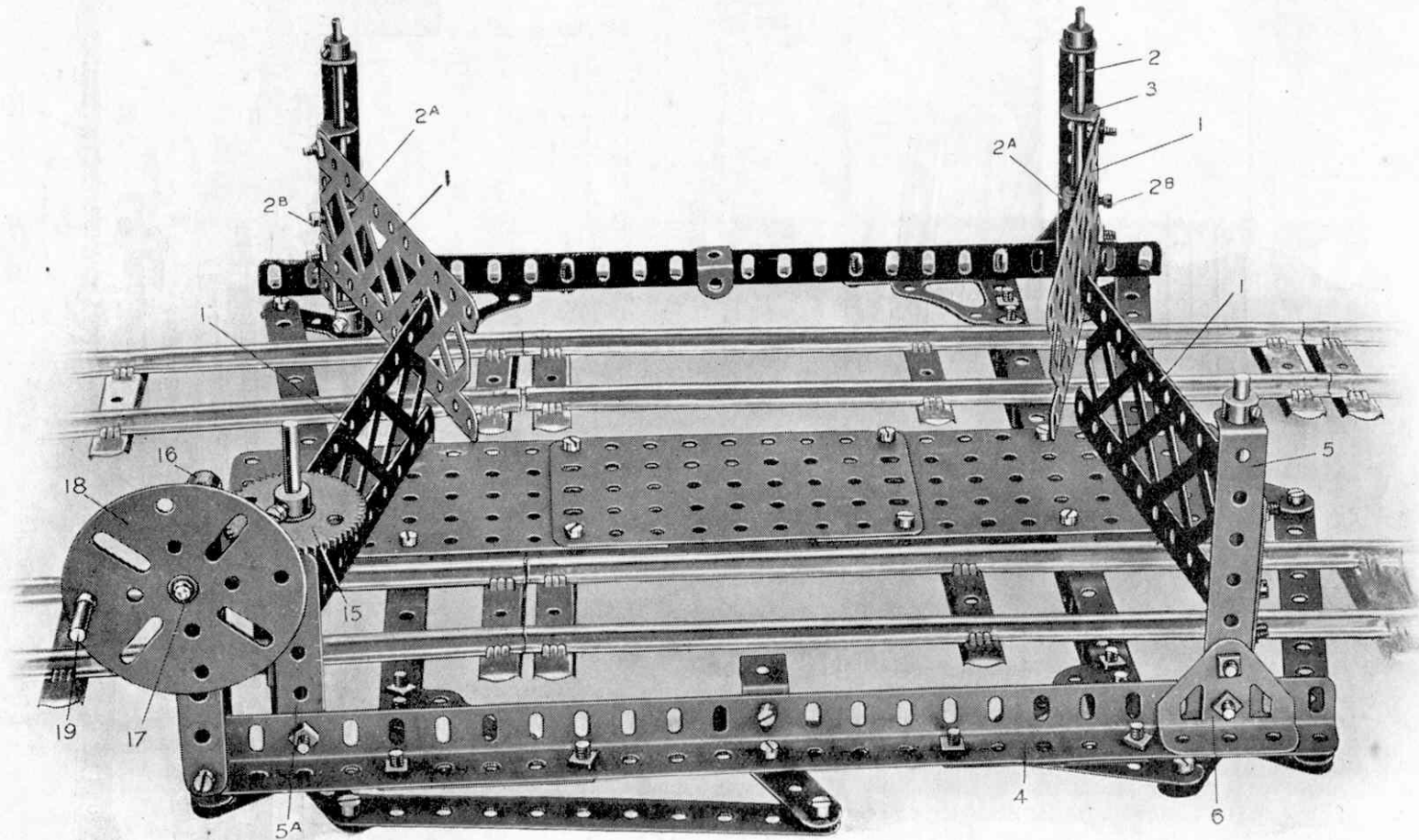


FIG. 438B

Model No. 439 Level Crossing Gates

(Outfit No. 6)



Model No. 439 Level Crossing Gates (continued)

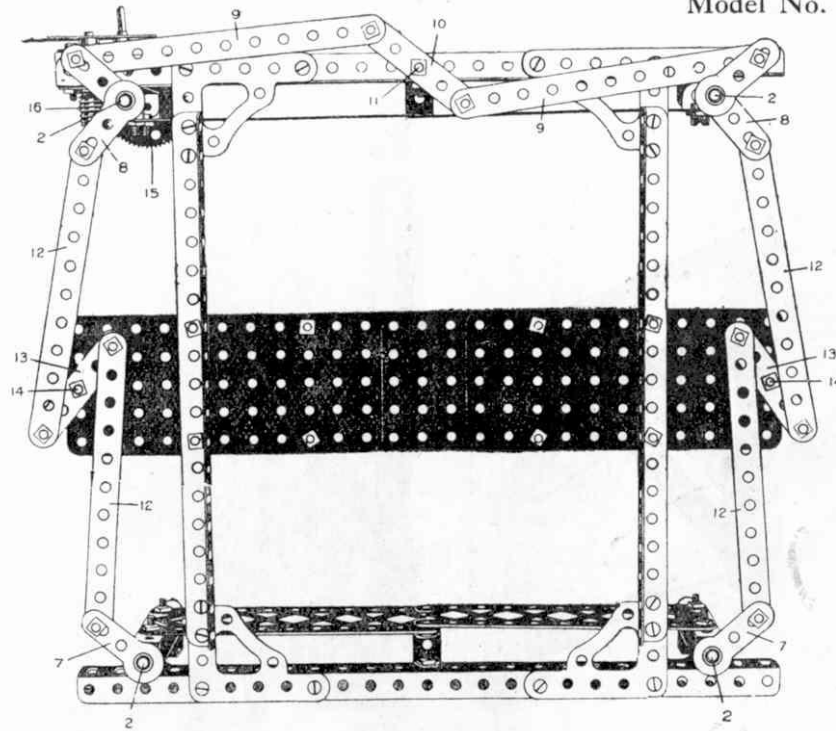


FIG. 439A

Parts Required:

6	of	No. 2
2	"	4
3	"	5
2	"	8
4	"	11
4	"	15A
1	"	17
1	"	27A
1	"	32
53	"	37
16	"	37A
7	"	59
4	"	60
2	"	62

Special Parts:

1	of	No. 6A
2	"	8A
1	"	53A
3	"	60B
3	"	70
4	"	100
4	"	108
1	"	109
1	"	115
3	"	126
2	"	128

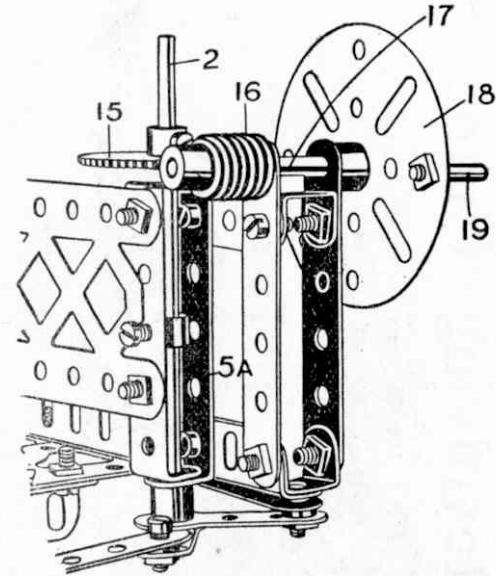


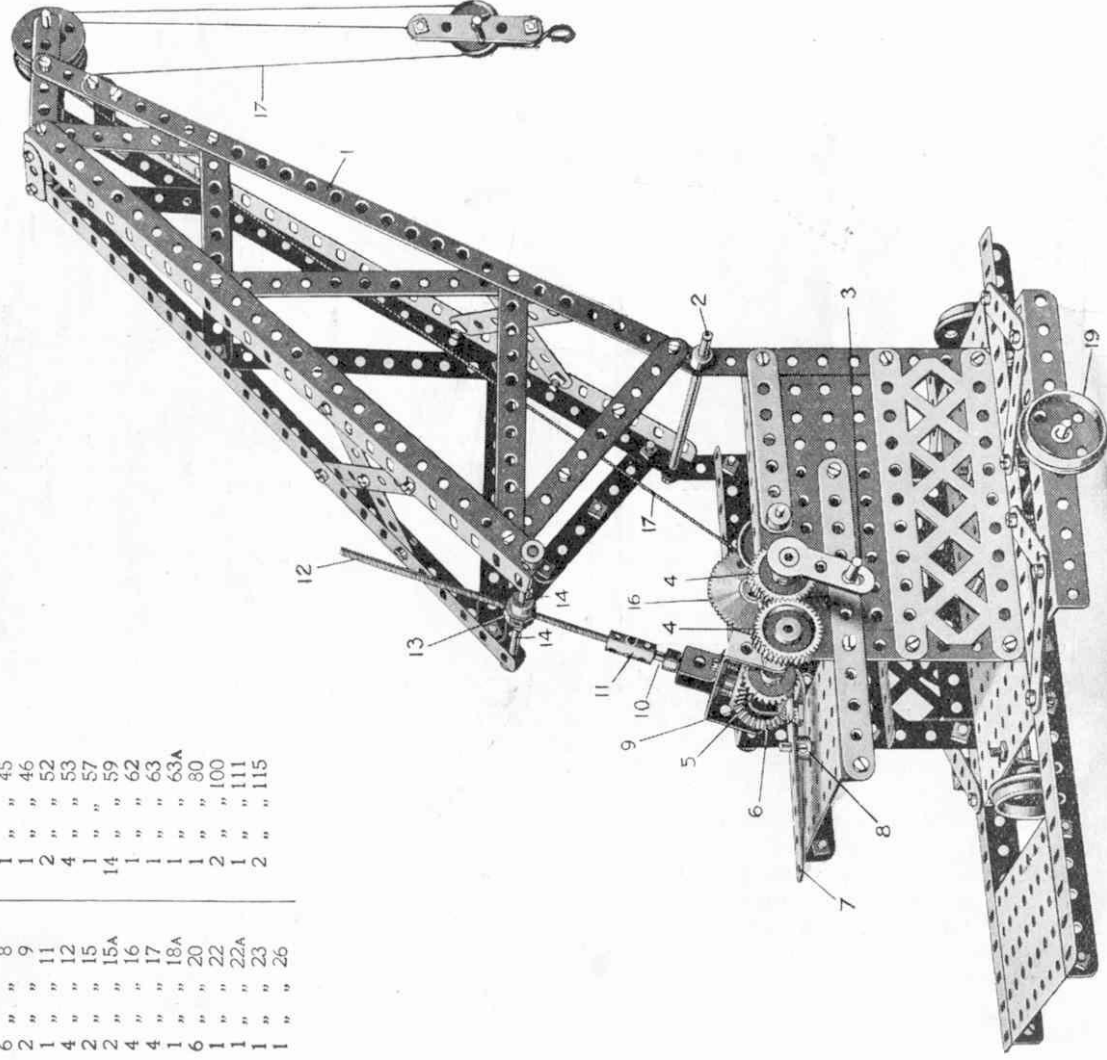
FIG. 439B

The gates consist of $5\frac{1}{2}$ " braced girders 1 and are pivotally carried on the rods 2 being bolted to $2\frac{1}{2}$ " by $\frac{1}{2}$ " double angle strips 3. On each rod 2 is threaded a collar 2A, Fig. 439, and a bolt 2B is passed through the centre hole of the double angle strips 3 and screwed into the thread hole of the collar 2A, nipping the collar to the rod 2, thus ensuring that the braced girders 1 shall turn with the rods 2. Three of the rods 2 are carried from the lower angle girders 4 in $3\frac{1}{2}$ " by $\frac{1}{2}$ " double angle strips 5, and one in a $2\frac{1}{2}$ " by $\frac{1}{2}$ " double angle strip 5A, the feet of the strips 5 being reinforced to the angle girders 4 by the trunnions 6. The rods 2 are coupled together by cranks 7 on the rear rods, and bell cranks 8 on the other rods, the ends of the two bell cranks being connected by strips 9 to $2\frac{1}{2}$ " strip 10 pivoted on the bolt 11, Fig. 439A, while the bell cranks 8 are connected to the cranks 7 by other strips 12, pivotally connected to $2\frac{1}{2}$ " strips 13, pivoted on the bolts 14. Consequently, all the rods 2 are inter-connected. As will be seen from the Figs. 439 and 439B, a 56-toothed gear wheel 15 is secured on one of the rods 2, and is engaged by a worm 16 on a rod 17 to which is secured a face plate 18, fitted with a threaded pin 19, as an operating handle. By turning the face plate 18 the spindles 2 are all rotated, and the gates caused to open or close.

Model No. 440 Revolving Crane (Special Model)

Parts Required:

9 of	No. 2	1 of No. 27A
17	3	30
2	4	31
10	5	35
2	6	37
2	6A	38
6	8	45
2	9	46
1	11	52
4	12	53
2	15	57
2	15A	59
4	16	62
4	17	63
1	18	63A
6	20	80
1	22	100
1	22A	111
1	23	115
1	26	



Model No. 440 Crane (continued)

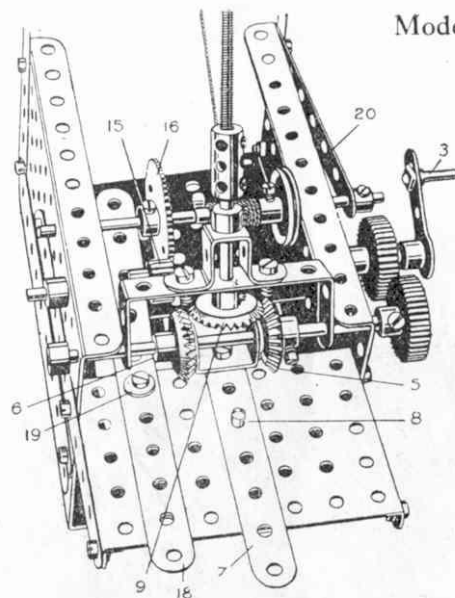


FIG. 440A

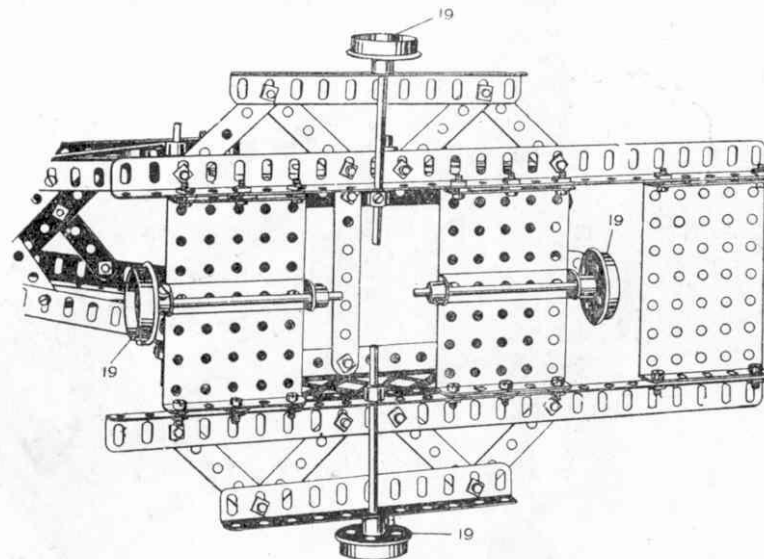
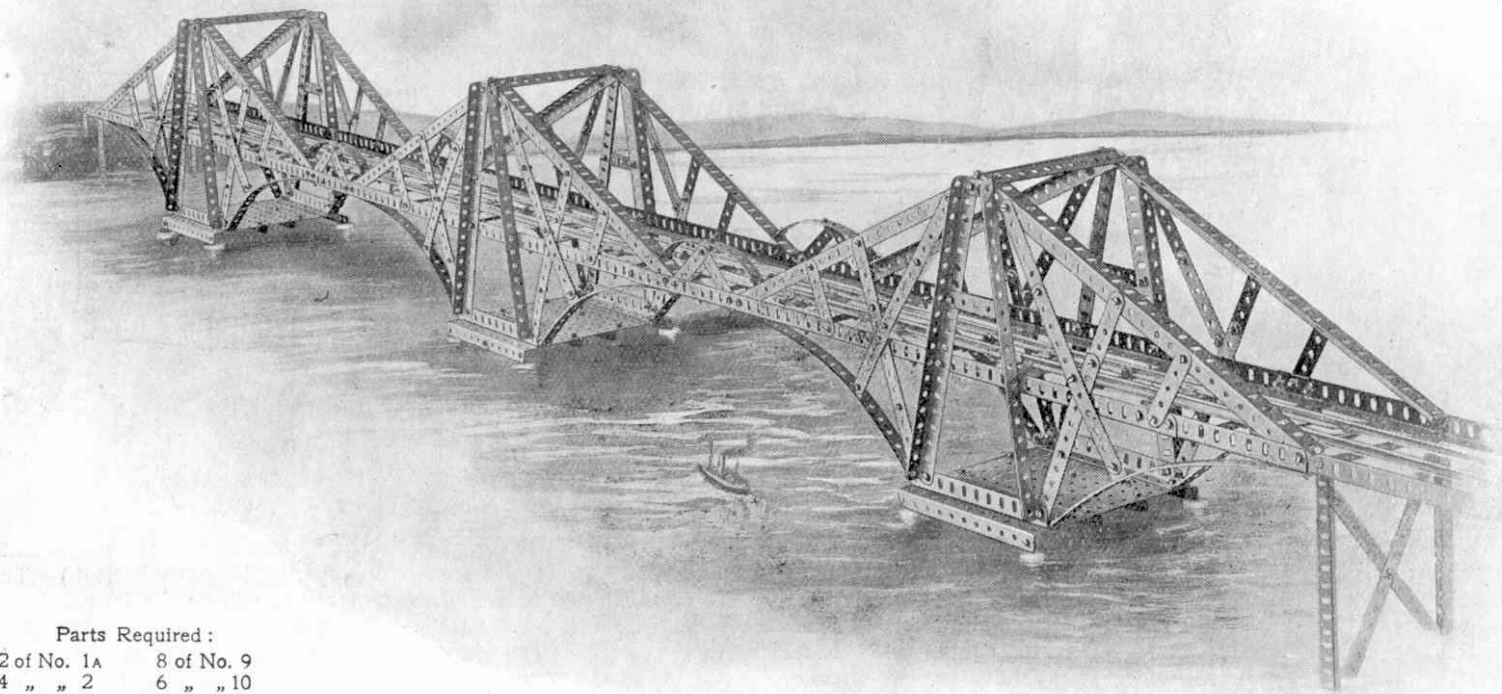


FIG. 440B

The jib 1, the construction of which is clear from the drawing, is pivoted at its lower end on a 5" axle rod 2, the movement of the jib about this pivot being obtained from the handle 3, which drives a rod carrying bevel wheels 5, 6 (from the 1" gear wheels 4.) The bevel wheel rod is arranged to slide in its bearings by the strip 7, at the end of which is a double bracket, pivoted at 8, on the frame of the crane, on a threaded pin under which is a collar, and thus bring either the bevel 5, or the bevel 6, into engagement with a third bevel 9, Fig. 440A, on the end of a 2" rod 10, connected by the coupling 11, to a 5" screwed rod 12. This screwed rod engages the transverse threaded hole in an octagonal coupling 13, which is pivotally carried on two 2" rods 14, so as to give a clear way for the screwed rod 12. According to the direction in which the clutch handle 7 is thrown over, and the handle 3 turned, the jib will be raised or lowered. The rod of the handle 3, also carries a $\frac{1}{2}$ " pinion 15, which is adapted to engage and drive a 57-toothed gear wheel 16, round the spindle of which is wound the cord 17, by means of which the load is raised or lowered. The spindle of the wheel 16, is caused to slide in its bearings to engage the pinion 15, by means of the 5" strip 18, Fig. 440A, pivoted at 19, by a bolt lock-nutted to the plate, the other end of which is bent up to engage between the boss of the gear wheel 16, and a collar (not shown).

A spring formed by slightly bending a $3\frac{1}{2}$ " strip 20, bolted to the side of the frame, automatically releases the winding spindle from engagement with the pinion 15 when the handle 18 is released.

The crane rotates on the wheels 19, which are carried on rods at right angles, as shown in Fig. 440B.



Parts Required :

12 of No. 1A	8 of No. 9
74 " " 2	6 " " 10
24 " " 5	36 " " 12
6 " " 7	350 " " 37
12 " " 8	26 " " 38
12 " " 8A	

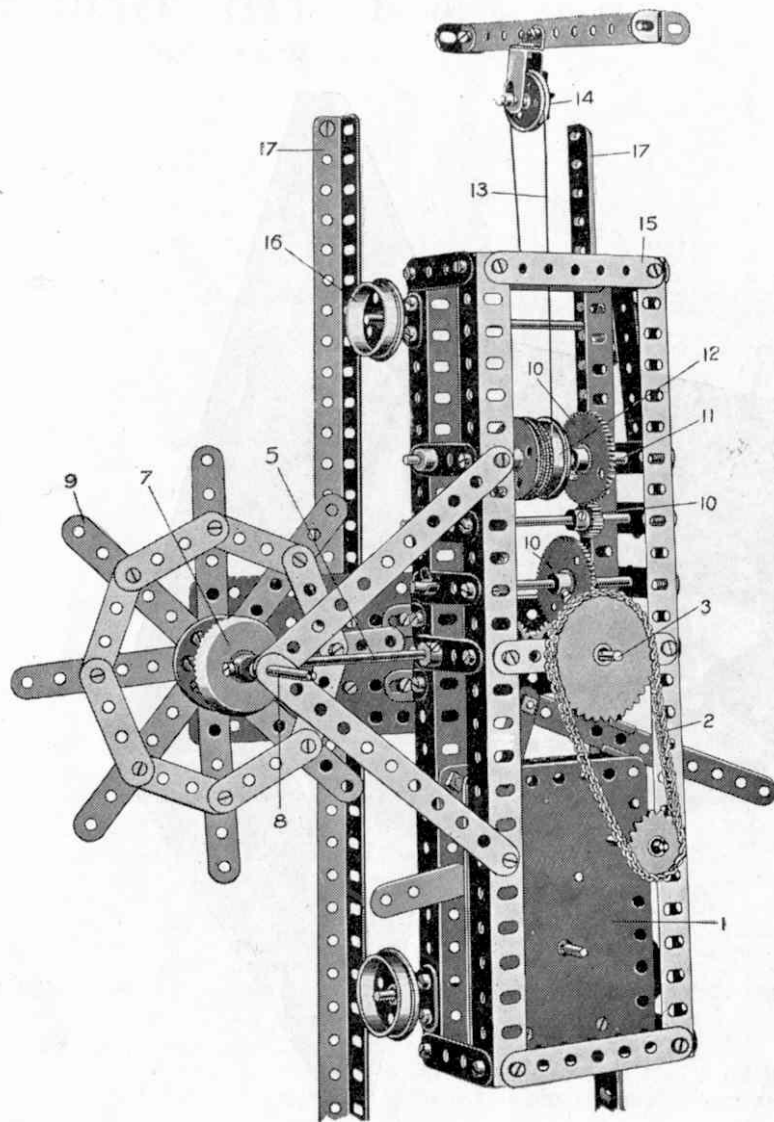
Each of the cantilever spans is made of $9\frac{1}{2}$ " angle girders, connected by their lower ends to a $5\frac{1}{2}$ " angle girder. The inclined $12\frac{1}{2}$ " angle girders are connected at the apex of the cantilever to the top holes of the inclined girders coupled by flat brackets and at their lower outer ends to horizontal angle girders. The horizontal girders are connected across by $5\frac{1}{2}$ " strips disposed at intervals of about 11 holes apart, and on these are secured "O" gauge track rails. The track rails are held to the cross strips by bolts, beneath the heads of which are washers engaging the lower flange of the track rails and binding them on to the cross strips.

The bases of the cantilevers are formed by two $5\frac{1}{2}$ " flanged plates coupled at the centre by a $5\frac{1}{2}$ " flat plate.

Model No. 442

Coal Cutting Machine

(Outfit No. 6)

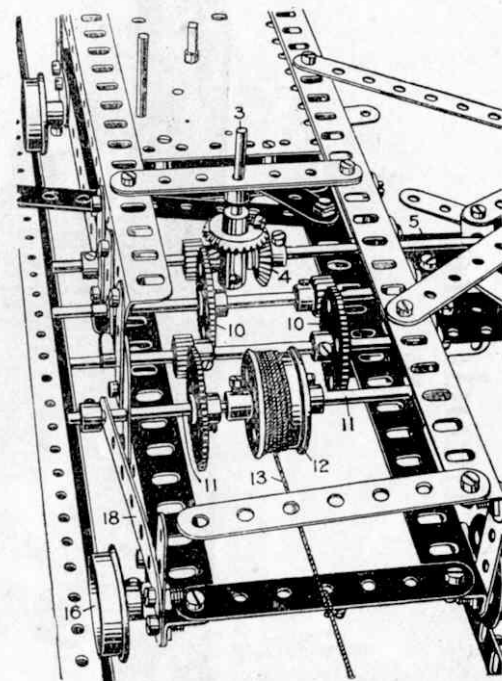


Parts Required :

4 of No. 2	6 of No. 20
6 " " 3	1 " " 22A
8 " " 4	1 " " 24
20 " " 6	4 " " 26
2 " " 7	3 " " 27A
4 " " 8	1 " " 28
2 " " 9	6 " " 35
9 " " 12	75 " " 37
1 " " 13A	1 " " 44
5 " " 15	1 " " 50
1 " " 16	6 " " 59
1 " " 17	1 " " 63
1 " " 18A	12 " " 94

Special Parts:

2 of No. 30
1 " " 52A
4 " " 77
1 " " 95
1 " " 96
1 C.W. Motor.



The clockwork motor 1 drives, by the chain and sprocket gear 2, the rod 3, which is connected by bevel wheels 4 to the horizontal rod 5, a $\frac{1}{4}$ " pinion on the end of which drives a contrate wheel 7 on the rod 8 of the cutting wheel 9. The rod 3 also drives through a gear train 10 a rod 11 on which is a drum composed of two flanged wheels 12. A cord 13 winding from the drum round a pulley 14, is connected to the trolley 15. The pulley 14 is fixed to the trolley 15 which runs on flanged wheels 16 on the rails 17. Consequently, as the cutting wheel 9 is rotated from the motor, the cord 13 is also slowly wound on the drum 12, and the whole carriage moving along, the cutting wheel also travels along the coal face.

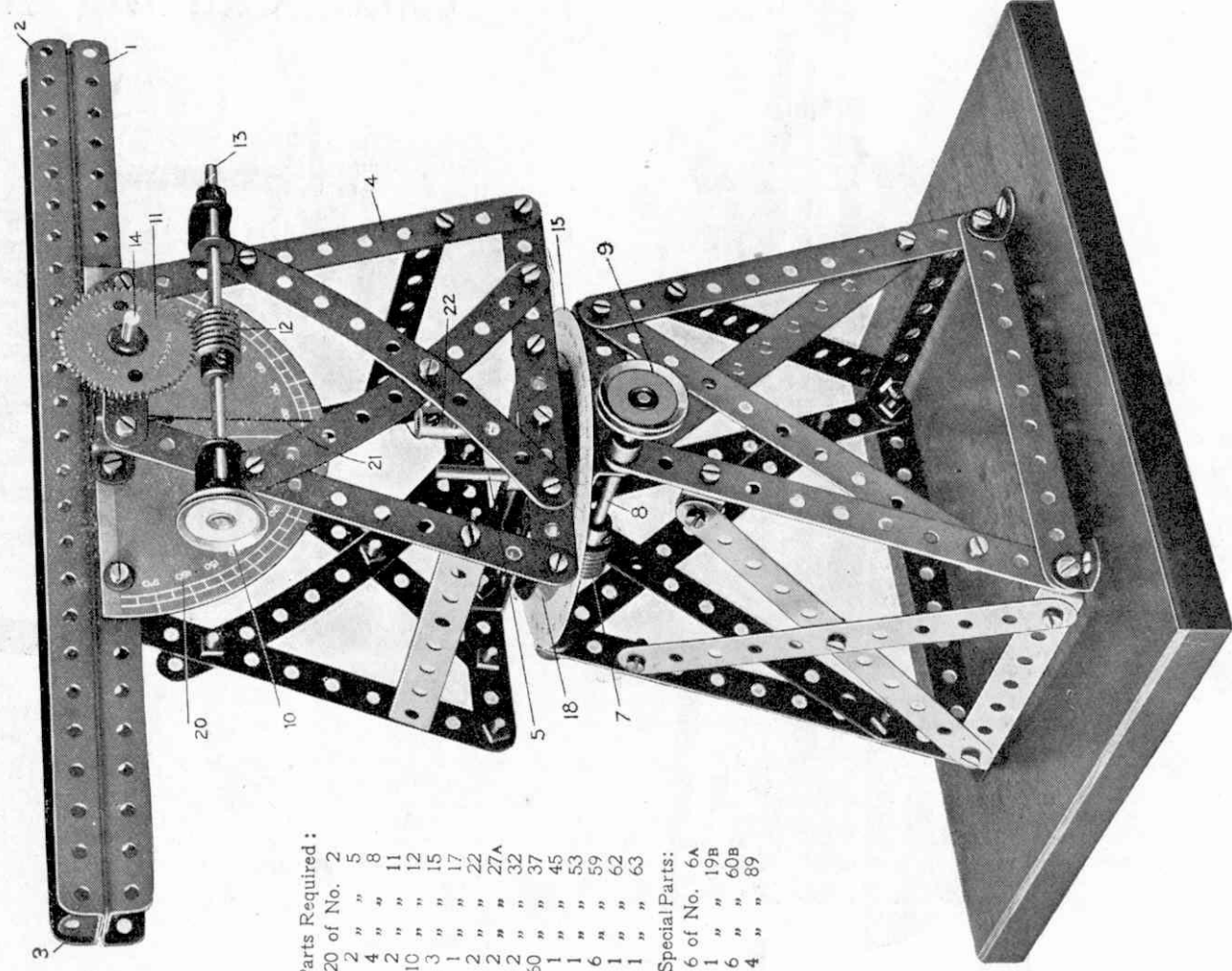
The mechanism may be thrown out of gear by pressing the rod 11 which slides in its bearings. The strip 18 forms a spring to hold it in gear.

Model No. 443

Theodolite

(Outfit No. 5)

16



Model No. 443 Theodolite (continued)

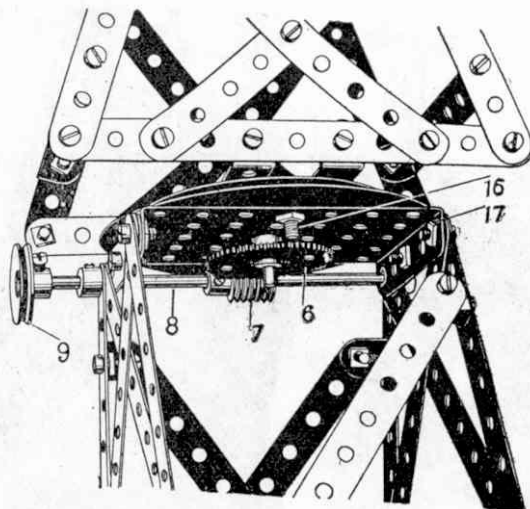


FIG. 443A

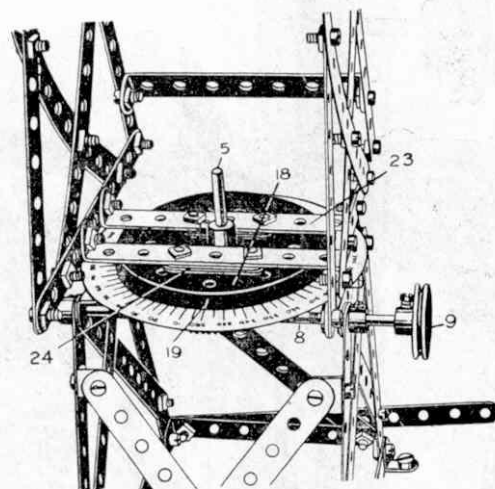


FIG. 443B

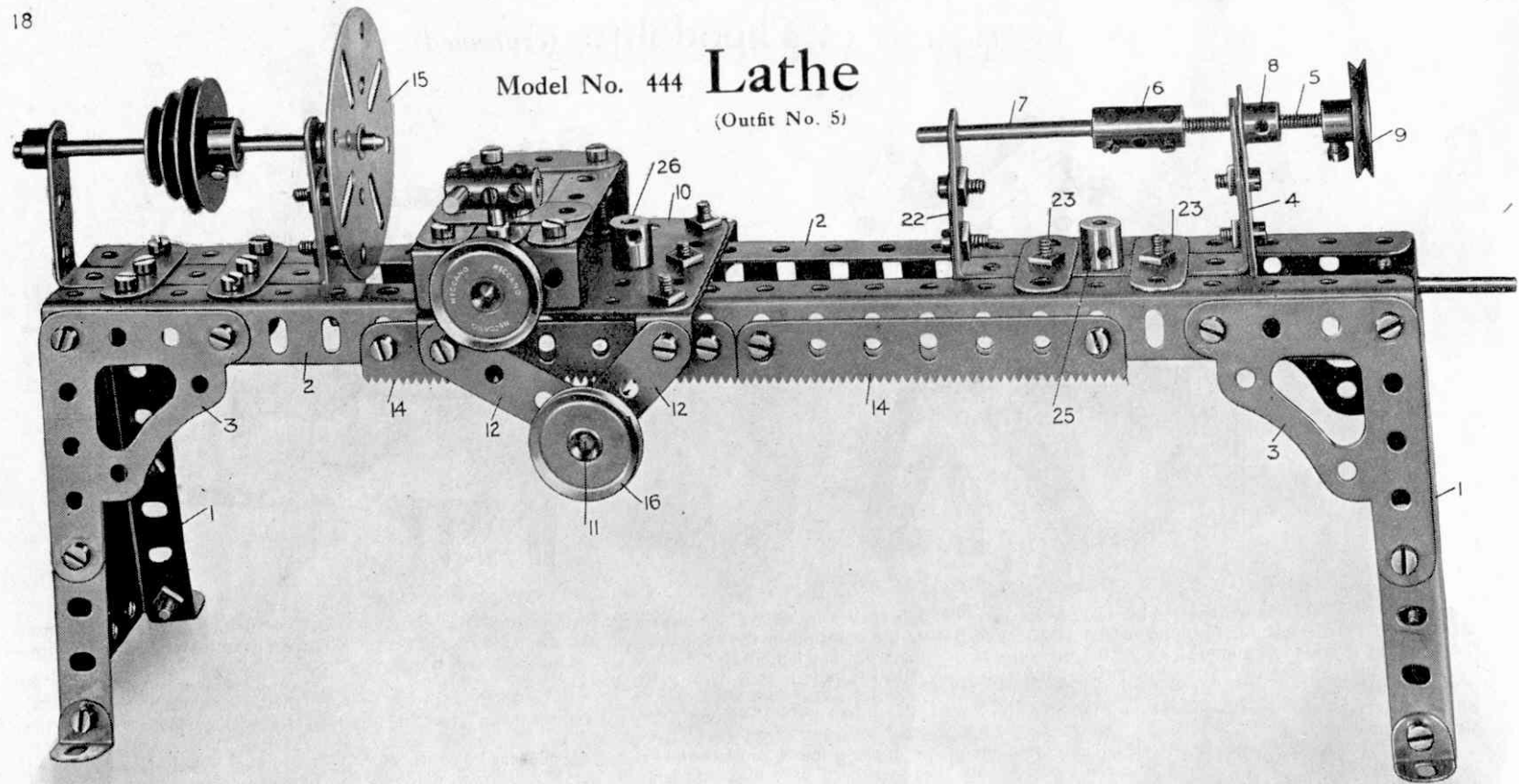
The Theodolite is represented by two reverse pairs of angle girders 1 and 2, which form a "sighting arm," an angle bracket 3 being bolted at one end to form an eye piece. A small piece of gummed paper is fastened over the aperture in the angle bracket, and a fine pin-hole made in the paper at the centre of the aperture. Two crossed threads are gummed across the aperture of the angle bracket bolted at the other end of the sighting arm.

The upper framework 4 swivels horizontally with the vertical spindle 5 as a pivot. On the lower end of this rod is a gear wheel 6, 443A, engaged by a worm 7 on a rod 8, operated by the 1" pulley 9. This gives the horizontal traverse of the upper frame 4, in which the sighting arm is pivotally mounted upon a rod 14, on which is a gear wheel 11 engaged by a worm 12 on a rod 13 operated by a 1" pulley 10. This mechanism gives the vertical traverse or inclination of the sighting arm.

A protractor for the horizontal angular movement of the upper frame 4 consists of a graduated cardboard disc 15, which is bolted by a bolt 16 to a perforated flanged plate $3\frac{1}{2}$ " by $2\frac{1}{2}$ " 17, the head of the bolt 16 being above the cardboard disc, and beneath the 3" pulley wheel 18. The cardboard disc is thus held against movement by the bolt 16, its centre hole engaging round the pivot rod 5. An index mark or pointer 19 is made on the pulley wheel 18. The movement of this pointer round the graduated scale on the disc shows the horizontal angular traverse.

Similarly, the vertical traverse of the sighting arm is indicated by means of a semi-circular protractor 20, bolted to the lower angle girder 1 of the sighting arm, a cord 21 carrying a weight 22, being hung from the rod 14, the position of the thread 21 over the protractor 20 indicating the vertical angular adjustment of the sighting arm. The thread 21 has a loop by which it is hung on the rod 14, so that its direction always points truly radially to the rod 14, and this gives the correct angular reading. In order to bring the double angle strips 23 flush with the outer rim of the pulley wheel 18, three $1\frac{1}{2}$ " packing strips 24 are bolted beneath the double angle strips, as shown in Fig. 443B.

The sighting arm is secured to the rod 14 by a crank bolted to the arm on the opposite side to the protractor and nipped by the set screw to the rod 14. The cardboard protractors for use with this model are supplied separately (see price list).



Model No. 444 **Lathe**
(Outfit No. 5)

Parts Required:

3 of No. 5	4 of No. 12	1 of No. 18	2 of No. 54
3 " " 6	1 " " 13	3 " " 22	3 " " 59
2 " " 8	2 " " 16	1 " " 26	4 " " 60
4 " " 11	1 " " 17	53 " " 37	2 " " 63

Special Parts:

14 of No. 6A	1 of No. 72	4 of No. 108	2 of No. 112
3 " " 38	1 " " 80A	1 " " 109	1 " " 115
1 " " 62A	1 " " 81	2 " " 110	1 " " 123
3 " " 64			

Model No. 444 Lathe (continued)

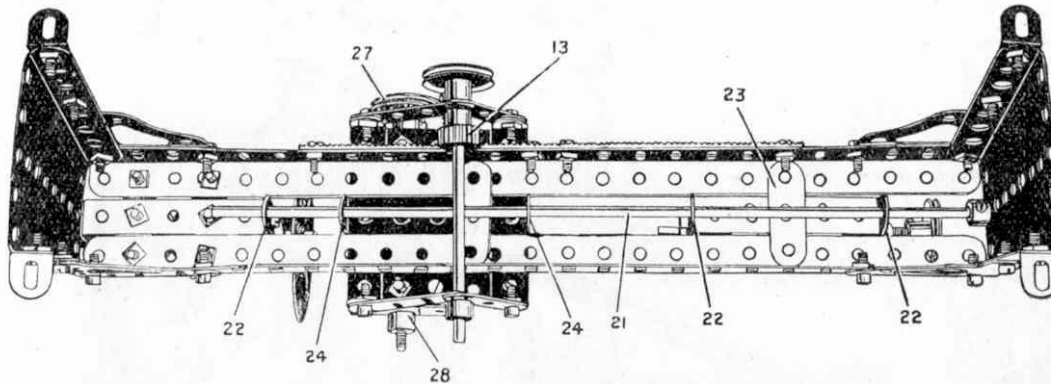


FIG. 444A

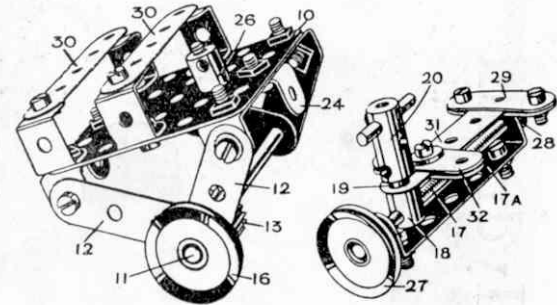


FIG. 444B

FIG. 444C

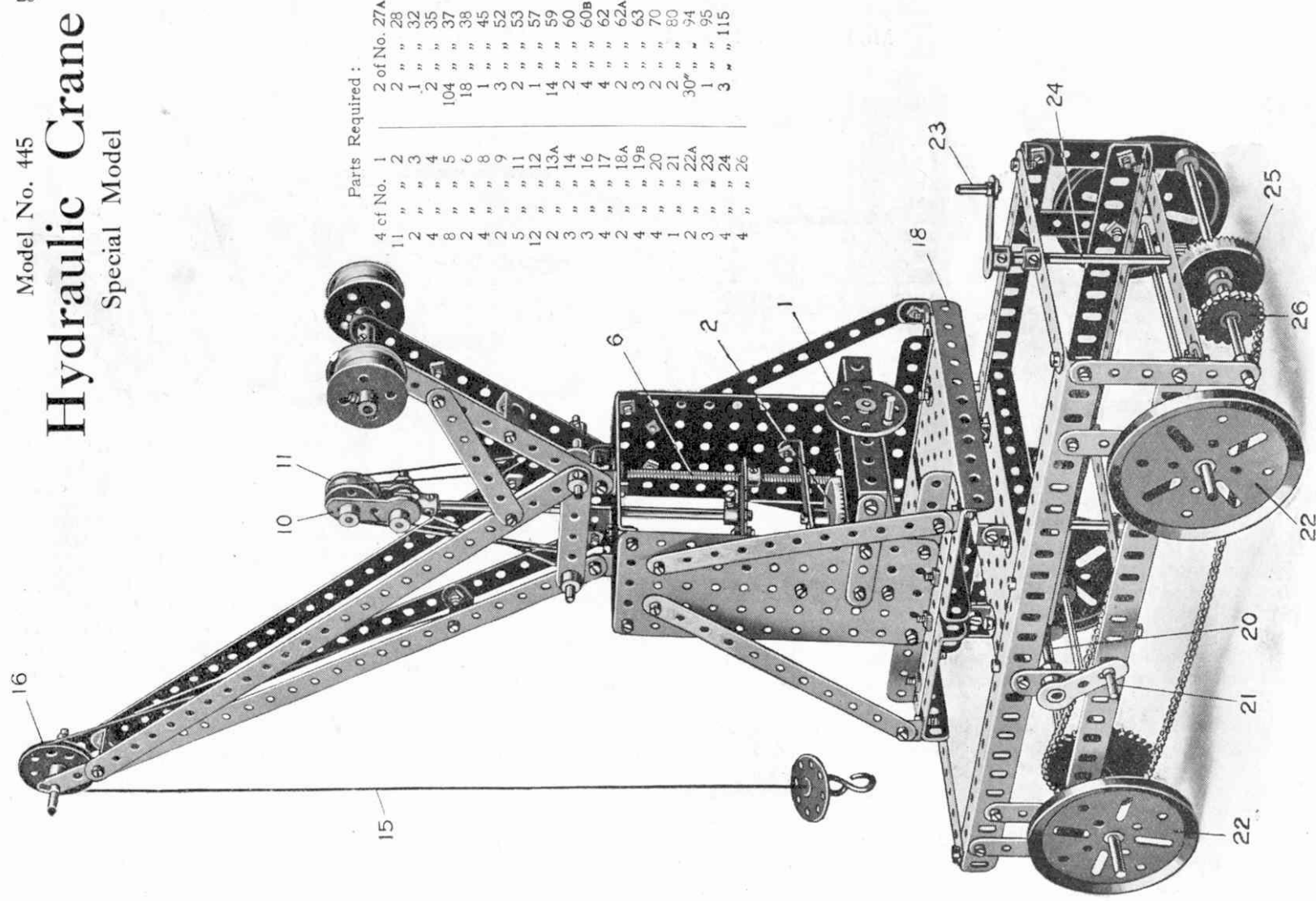
The lathe frame is built up from sector plates 1, at each end bolted to $12\frac{1}{2}$ " angle girders 2, forming the bed, by means of architraves 3. The tail stock 4, slides between the angle girders 1, and has a screw adjustment 5, the screw of which is connected by the threaded coupling 6 to the rod 7; the screw 5 is threaded into a threaded crank 8, and is operated by the 1" pulley wheel 9. The tail stock is locked by turning the threaded boss 25, which engages the bolt holding the underneath cross strip 23, thus gripping it beneath the lathe bed. The saddle 10, consisting of a $2\frac{1}{2}$ " by $2\frac{1}{2}$ " flat plate, carries the rod 11, journalled in the strips 12, and carries a pinion 13, Fig. 444B, which engages the racks 14, so that the saddle may be moved to or from the face plate 15, by turning the pulley wheel 16. The traversing movement is obtained by means of the screw 17, which engages a threaded boss 18, into the end of which is screwed a threaded pin 19, carrying the coupling 20, which forms the tool post. The saddle is locked by the threaded boss 26, similar to the tail stock. The screwed rod 17, is held against end movement in the $2\frac{1}{2}$ " by $\frac{1}{2}$ " bent strip 17A, by the pulley wheel 27 at one side and the collar 28 on the other.

The construction of the saddle is shown in Figs. 444B and 444C, where the $1\frac{1}{2}$ " strips 29, of Fig. 444C are shown removed from Fig. 444B; these strips 29, are bolted at the end of the guide strips 30, Fig. 444C, and form guides for the $2\frac{1}{2}$ " strip 31, carrying the tool post. They are spaced apart by the thickness of the strips 30, and the $1\frac{1}{2}$ " strips 32, bolted to the strip 31, slide on the strips 30. As will be seen from the underneath view, Fig. 444A, a guide rod 21, is fixed beneath the bed plates, and is engaged by the end holes of the $1\frac{1}{2}$ " strips 22, secured to the sides of the head and tail stocks; $1\frac{1}{2}$ " strips 23, being bolted above and below to retain the tail stock in position. The saddle engages the rod 21, by means of a $2\frac{1}{2}$ " by $\frac{1}{2}$ " double angle strip 24.

Model No. 445

Hydraulic Crane

Special Model



Parts Required :

4 of No.	1	2 of No. 27A
11	2	2
2	3	2
4	4	1
8	5	2
2	6	104
4	8	18
2	9	1
5	11	3
12	12	2
3	13A	2
3	14	14
3	16	2
4	17	4
2	18A	4
4	19B	2
4	20	2
1	21	2
2	22A	30"
3	23	1
4	24	3
4	26	115

Model No. 445 Hydraulic Crane (continued)

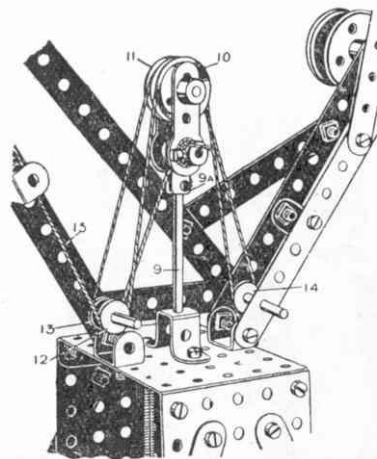


FIG. 445B

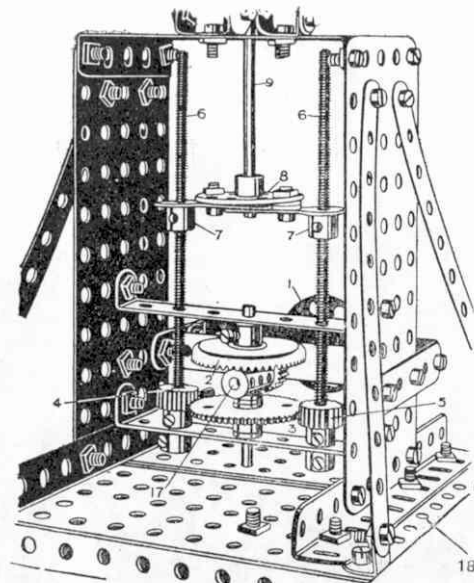


FIG. 445C

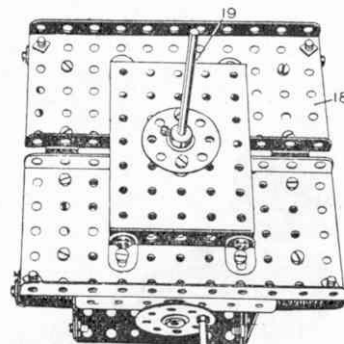


FIG. 445D

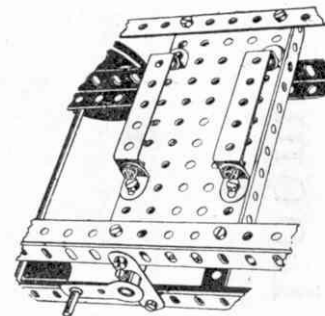


FIG. 445E

This model is designed to illustrate the operation of a Hydraulic Crane, in which great power is utilised to force two or more sets of pulley wheels apart, chains passing round the pulley wheels so that by a small movement of the operating power a great movement of the load is effected. In the model, instead of water-power, screws are used to move the chain or cord pulleys.

The weight is raised or lowered by operating the hand-wheel 1. The rod of this wheel carries a pinion which gears with a $1\frac{1}{2}$ " contrate wheel 2. On the rod of the contrate wheel is a lower 57-toothed gear wheel 3, which engages two $\frac{1}{2}$ " pinions 4 and 5, secured on vertical screwed rods 6, so that these rods are rotated in the same direction on the turning of the handle 1. The rods engage the bosses of threaded cranks 7, secured on a bush wheel 8, in the boss of which is fixed a 6" rod 9. This rod at the top is secured in a coupling 9A, to which are connected on a 1" transverse rod two cranks which support another 1" rod, forming a bearing for two $1\frac{1}{2}$ " loose pulleys 10 and 11. Two $\frac{1}{2}$ " pulleys 12 and 13 are loosely mounted on a 2" rod at the base of the jib on one side, and a single $\frac{1}{2}$ " pulley 14 on another 2" rod at the other side.

The cord 15 passes over the pulley 16 at the top of the jib, round the pulley 12, up round the pulley 10, round the lower pulley 14, back round the other pulley 11, round the small pulley 13, and is made fast to the coupling 9A.

By turning the handle 1 the contrate wheel 2 is rotated, thus driving the pinions 4 and 5 and rotating the screwed rods, which causes the threaded cranks round all the pulleys, and, due to the number of loops of the cord, the small movement of the top pulleys 10 and 11 results in a larger movement of the crane hook.

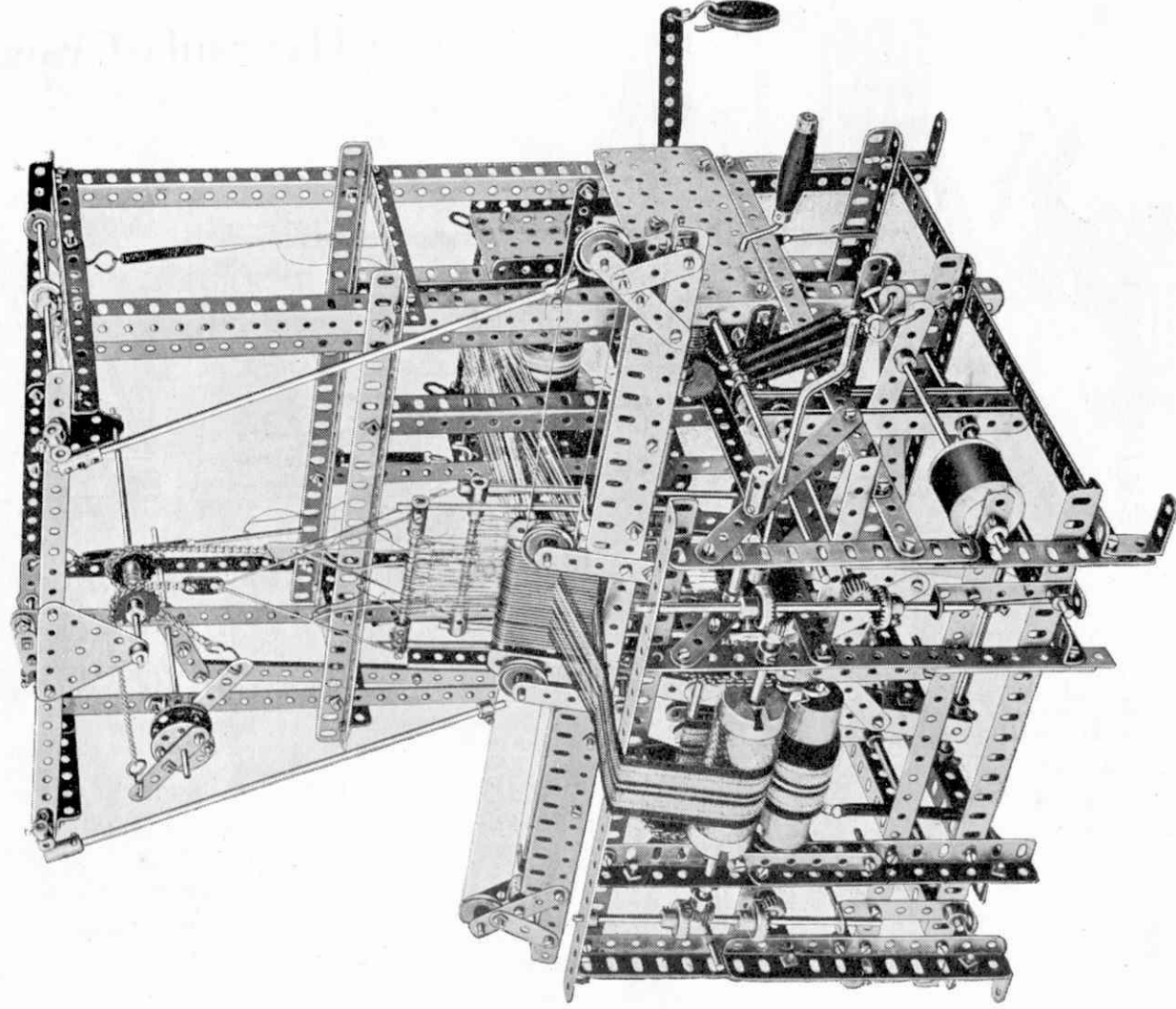
The rod of the bush wheel 1, which carries a $\frac{1}{2}$ " pinion, is journaled in a coupling 17, above and beneath which are placed two washers. The rod is held in position by the wheel 1 on one side of the cross strip, and by a collar on the other side.

The crane is carried on a platform 18, pivoting about a vertical rod 19, on which is a 57-toothed gear wheel engaged and driven by a worm on a rod 20, on the end of which is the operating handle 21.

The crane is caused to travel on the wheels 22 by the handle 23, a $\frac{1}{2}$ " pinion at the foot of its rod 24 driving a $1\frac{1}{2}$ " contrate wheel 25 on the rod 26, coupled by chain and sprocket wheels to the front wheels 22.

Loom

Model No. 446
Special Model

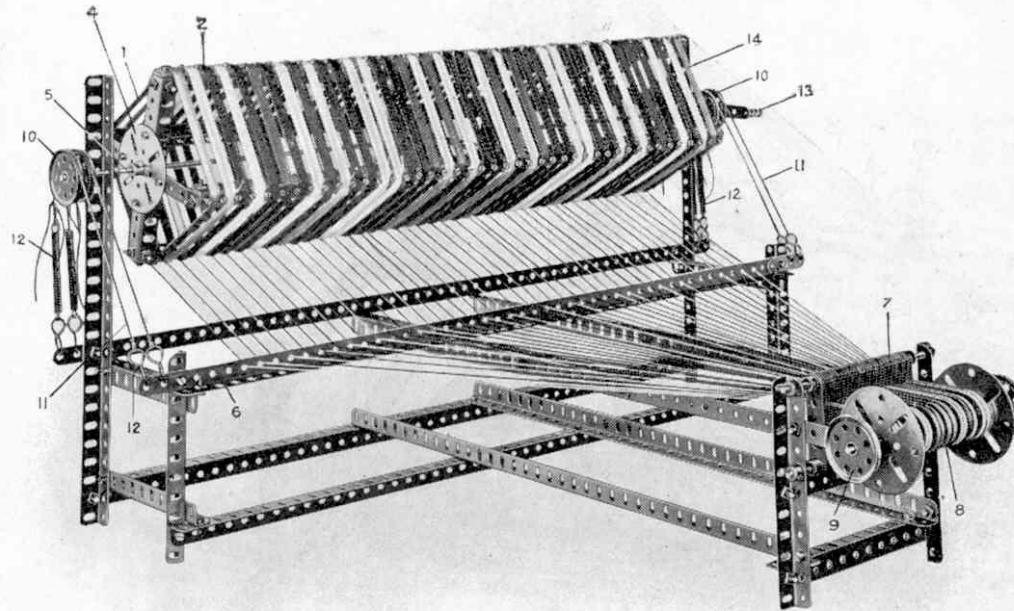


The Meccano Loom is one of the most remarkable and interesting models which Meccano makes. It is absolutely automatic, beautiful material being woven by simply turning the handle. It is a somewhat complicated model, requiring careful construction and accurate adjustment. It is impossible to do justice to it in this book, and we have, therefore, compiled a special sheet of instructions in which it is illustrated and described in detail. This may be purchased either from your local Meccano dealer or from Meccano Limited, Liverpool. Price 3d., or post free, 4d.

Model No. 447

Beaming Frame

Special Model



Parts Required :

2 of No. 1	6 of No. 21
4 " " 2	1 " " 26
44 " " 5	1 " " 33
4 " " 6	253 " " 37
4 " " 7	88 " " 38
2 " " 7A	4 " " 43
12 " " 8	8 " " 57
10 " " 9	10 " " 59
8 " " 12	1 " " 63
2 " " 13	1 " " 103
3 " " 14	4 " " 109

The frame upon which the warp threads are wound is built up of $12\frac{1}{2}$ " angle girders, 2, overlapped seven holes and bolted to a $5\frac{1}{2}$ " girder 1 and $5\frac{1}{2}$ " strip crossed and connected to face plates 4 on the $11\frac{1}{2}$ " rod 5.

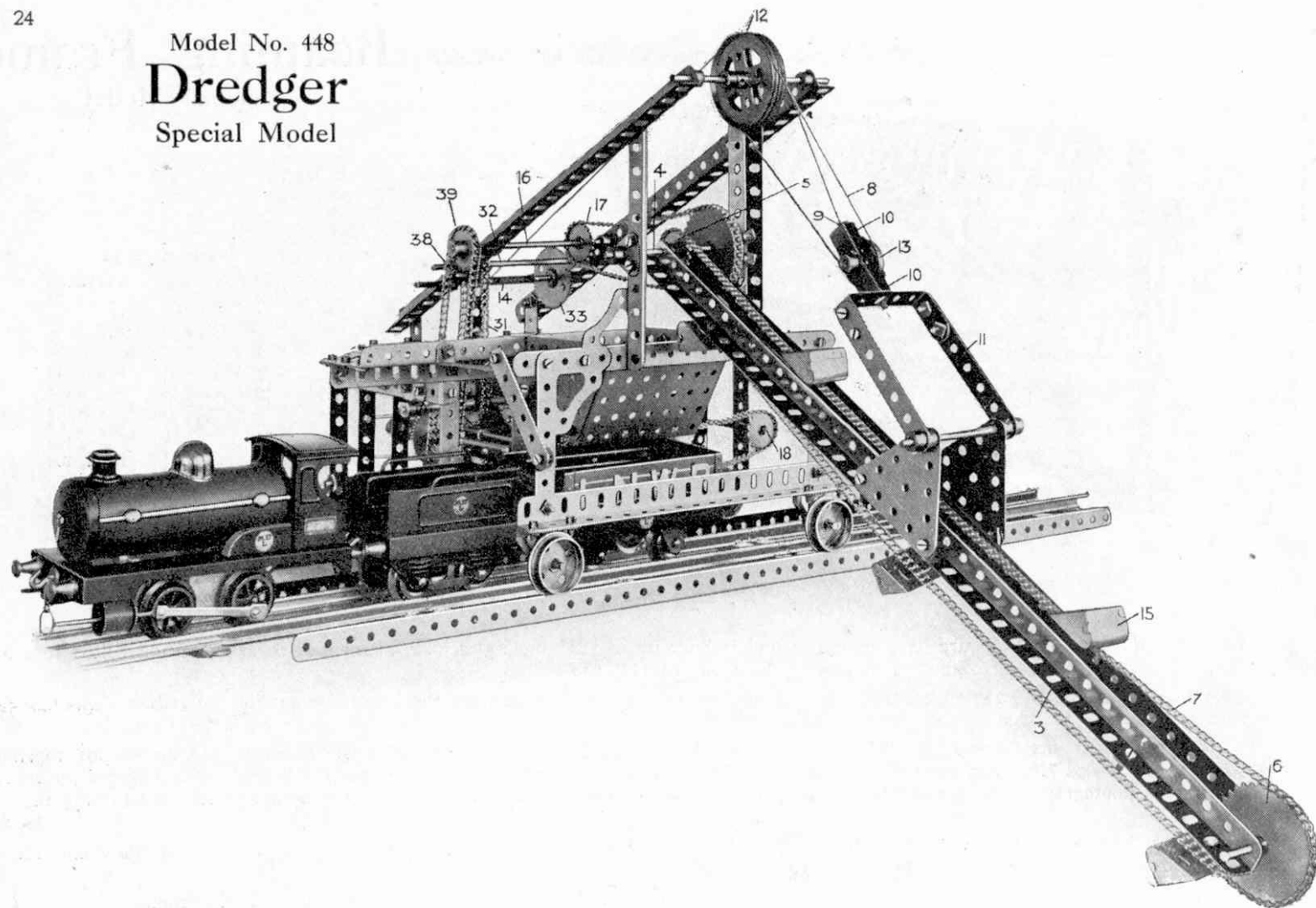
Inside the frame, two $5\frac{1}{2}$ " angle girders are bolted nine holes from each end to form the inner bearings for the rods 5. Another $5\frac{1}{2}$ " girder is bolted crosswise to these in the centre to form a stay.

The warp threads are first wound upon the warp-frame, and pass through the holes in a $24\frac{1}{2}$ " angle girder 6, and, converging together, pass between the $2\frac{1}{2}$ " strips 7 forming the reed, and so on to the beam 8. On the far side of the beam rod is a $\frac{1}{2}$ " pinion engaged by a pawl (not shown on the photograph) which prevents backward rotation of the beam as the warp threads are wound thereon by turning the $1\frac{1}{2}$ " pulley wheels 9.

A brake mechanism for tensioning the frame 2 is provided by securing two 1" pulley wheels 10 at each end of the frame rod 5, cords 11, secured by hooks passing over the pulleys 10 and being kept taut by the springs 12.

A handle 13 is provided on the rod 5 by means of which the warp threads 14 are originally wound on the frame.

Model No. 448
Dredger
Special Model



Model No. 448 Dredger (continued)

Begin by building up the framework, as shown in Fig. 448A, the hopper being made of two inclined $3\frac{1}{2}$ " flanged plates 1, connected at the ends by $2\frac{1}{2}$ " triangular plates 2. This leaves a chute space at the bottom of the hopper.

The bucket arm, Fig. 448 is built up of two $18\frac{1}{2}$ " angle girders 3, braced by 2" strips, and at the centre by two diagonally disposed 3" strips. The bucket arm is pivoted on a rod 4 round a 1" sprocket wheel 5 on which, and another 2" sprocket 6 at the outer end of the arm, the bucket chain 7 is passed. The arm is raised by means of a cord 8, which is secured at 9 to two reversed cranked bent strips 10 bolted to the yoke 11, formed of $3\frac{1}{2}$ " strips, connected at the top by a $2\frac{1}{2}$ " by 1" double angle strip. The cord 8 passes round one of the two 2" pulleys 12 and then round the 1" pulley 13, over the other 2" pulley 12 on to the winding rod 14. The buckets 15 are caused to move round the arm by rotation of the rod 4, which is effected from the rod 16 by chain and sprocket gear 17.

The motor spindle 18, Fig. 448, drives on to the sprocket wheel 19 on a rod 20 on which is a $\frac{1}{2}$ " pinion 21. The upper and lower rods 22, 23, Fig. 448B, are controlled by their clutch handles 24, 25, and carry 57-toothed gear wheels 26, 27, either of which by sliding their rods may be brought into engagement with the driven pinion 21.

The rod 22, Fig. 448B and 448C, carries a $\frac{1}{2}$ " pinion 28 which engages a contrate wheel 29, on the rod carrying which is a sprocket 30, which drives by a chain 31 a sprocket on the rod 32 a $\frac{1}{2}$ " pinion 33A on which engages and drives the gear wheel 33 on the winding rod 14 controlling the cord 8, which raises and lowers the arm. Consequently, by operating the clutch-handle 24 the bucket arm may be raised or lowered.

The rod 23, Fig. 448B, similarly may be moved by its clutch arm 25 and the gear wheel 26 brought into engagement with the pinion 21. On the rod 23 is a bevel 34 engaging another bevel wheel 35, on a rod 36, Fig. 448C, on which is a sprocket wheel 37. This sprocket drives by a chain 38, Fig. 448D, a sprocket wheel 39, on the rod 16, which, as previously described, operates the movement of the buckets, which are thus under the control of the clutch handle 25.

The travelling of the apparatus on the wheels 40 is controlled by a middle clutch handle 41, which moves the rod 42, Fig. 448C, this rod carrying a $\frac{1}{2}$ " pinion 43 and a 57-toothed gear wheel 44, which are operated by the sliding movement of the rod 42 to engage or disengage respectively with a gear wheel 45 and a $\frac{1}{2}$ " pinion 46, the latter being on the same rod as the pinion 21, whilst the gear wheel 45 is on a short rod, carrying a sprocket 45A, Fig. 448D, which drives through a chain 46A another sprocket 47, Fig. 448B, on the rod of the travelling wheels 40. Consequently, the drive from the motor is taken from the sprocket 19 Fig. 448B, through the pinion 46 and rod 42 to the chain 46A, and so to the sprocket 47 driving the travelling wheels 40. In order to reverse any of the movements, the switch handle of the motor is connected to the bell crank 48 pivoted on the rod 49, Fig. 448D, and provided with a handle strip 50.

Parts Required:

1 of No. 1	13 of No. 14	2 of No. 30	4 of No. 76
4 " " 2	4 " " 15	20 " " 37	4 " " 77
10 " " 3	6 " " 15A	8 " " 37A	8' 10" " " 94
5 " " 4 ✓	3 " " 16	18 " " 38	2 " " 95
4 " " 6 ✓	3 " " 17	2 " " 44	10 " " 96
2 " " 7A ✓	3 " " 18A	1 " " 46	1 " " 103B
6 " " 8	6 " " 20	3 " " 53	4 " " 108
1 " " 8A ✓	2 " " 20A	30 " " 59	3 " " 115
2 " " 9	1 " " 22A	1 " " 60	2 " " 126
3 " " 11	7 " " 26	2 " " 60A	1 " " 128
13 " " 12	7 " " 27A	11 " " 60B	5 " " 131
5 " " 12A ✓	1 " " 28	1 " " 72	E. Motor

Model No. 448 Dredger (continued)

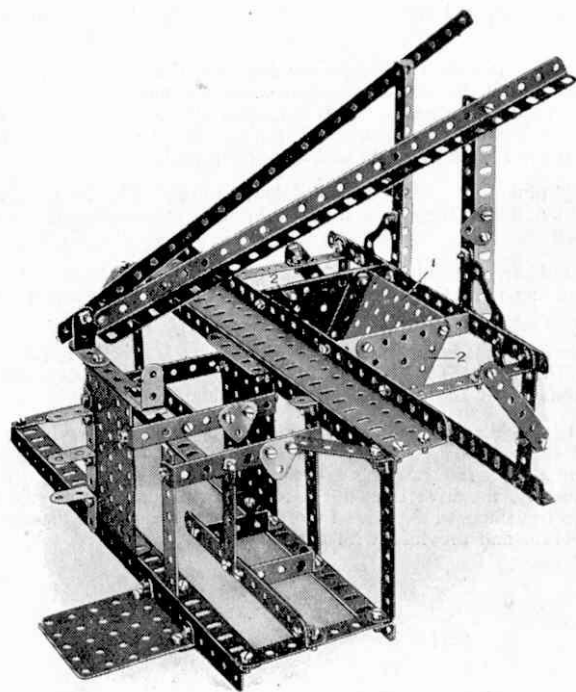


FIG. 448A

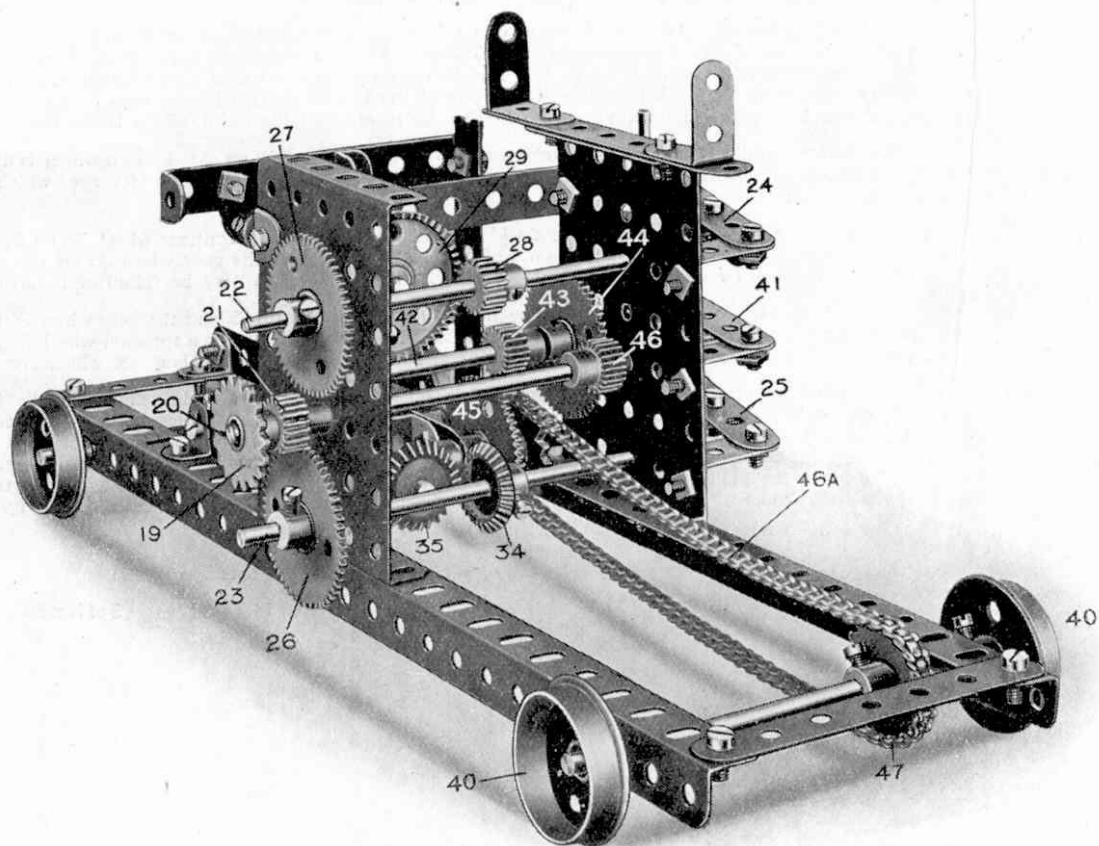


FIG. 448B

Model No. 448 Dredger (continued)

27

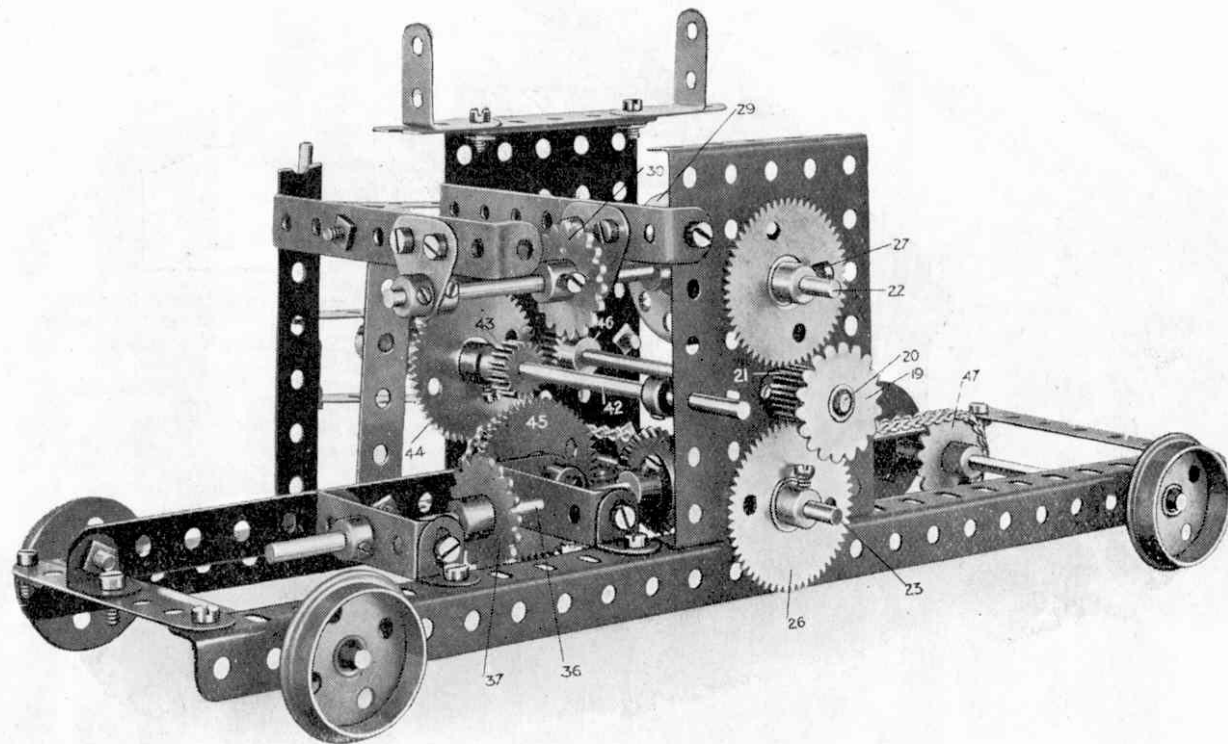


FIG. 448c

Model No. 448
Dredger (*continued*)

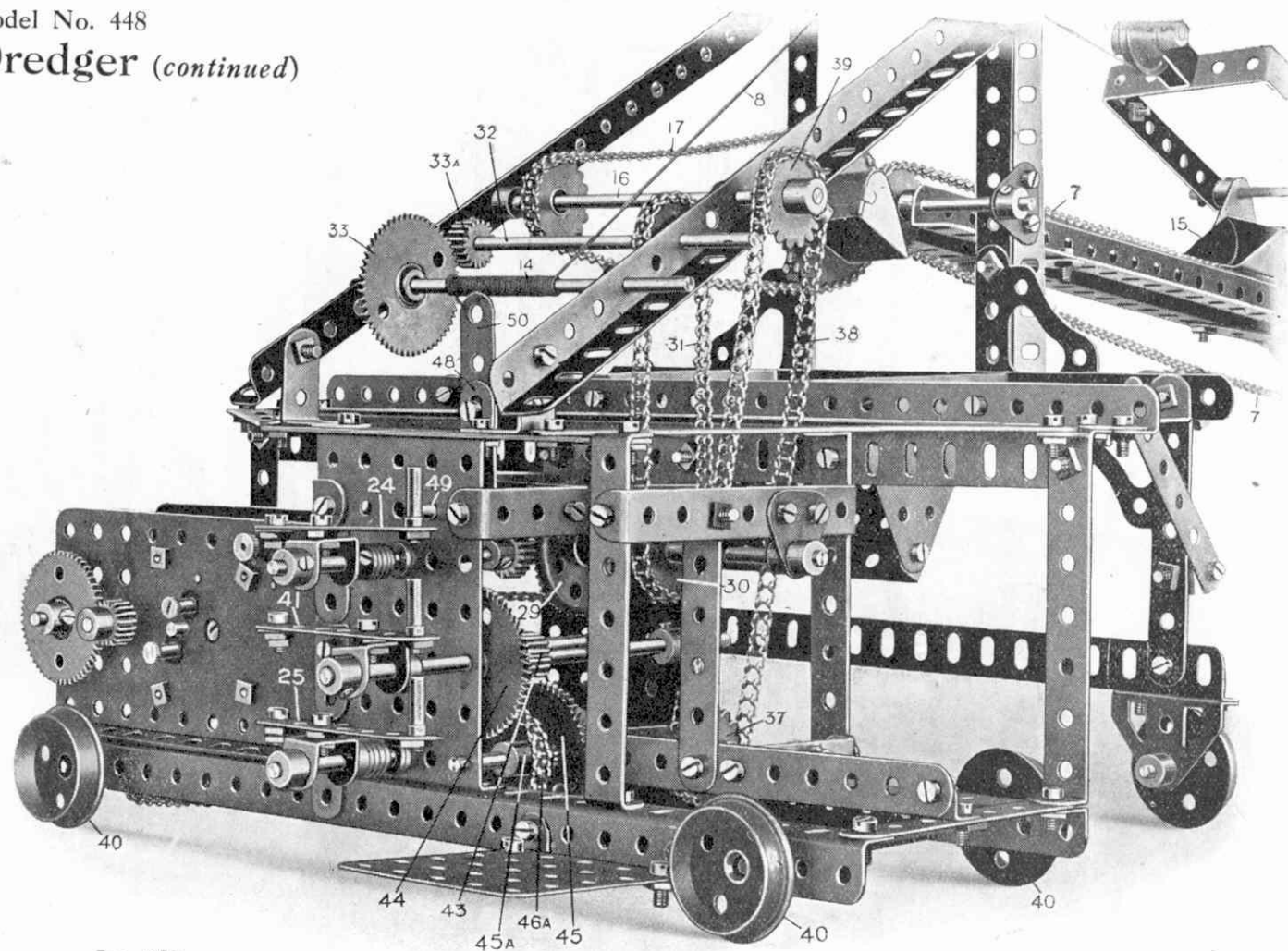
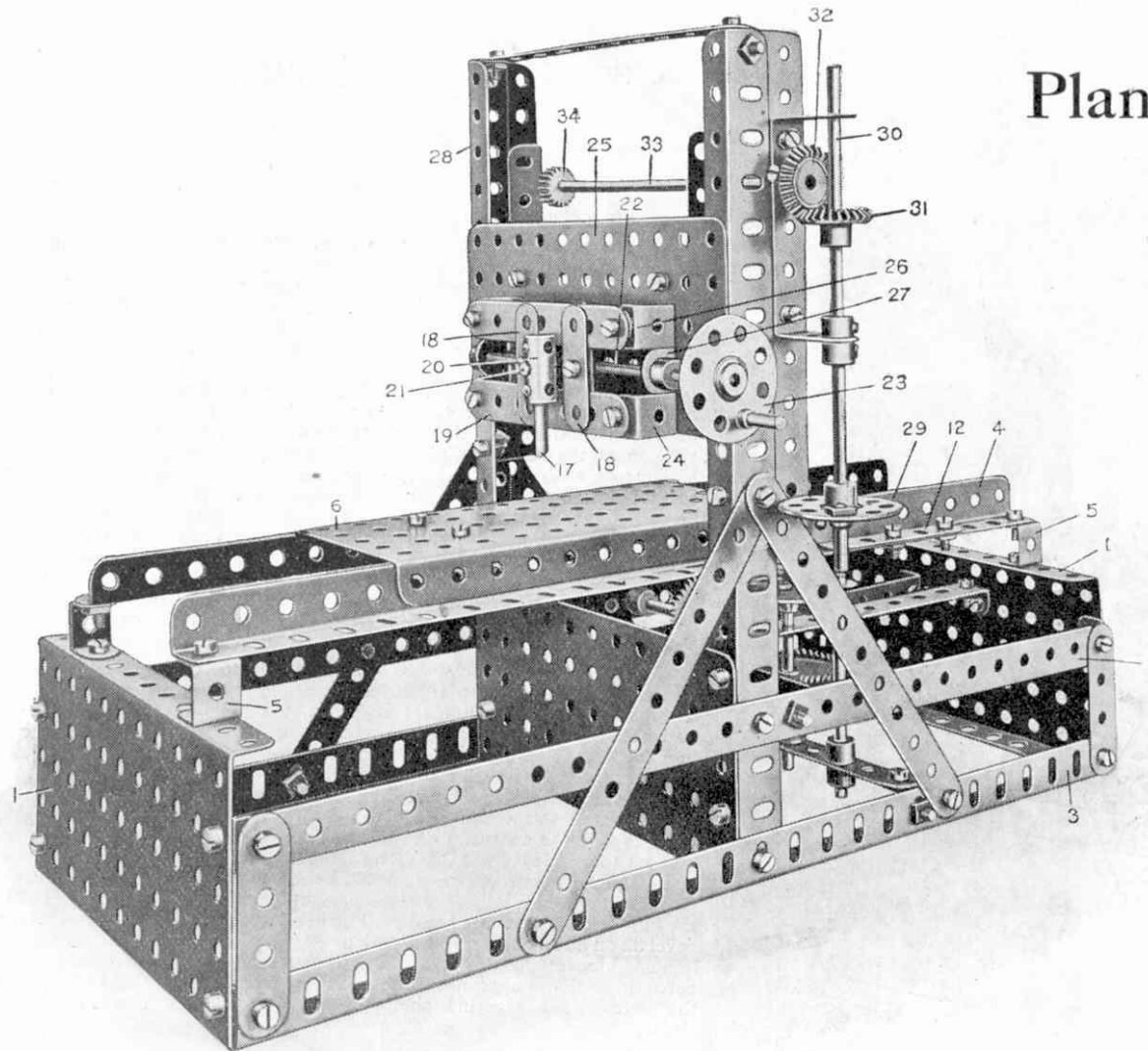


FIG 448D

Model No. 449

Planing Machine

(Outfit No. 6)



Parts Required :

2 of No.	1	3 of No.	24
7 "	2	5 "	26
3 "	3	2 "	27A
1 "	5	1 "	28
4 "	6	74 "	37
4 "	8	3 "	37A
8 "	11	9 "	38
12 "	12	1 "	46
1 "	14	1 "	50
1 "	15	2 "	52
5 "	16	12 "	59
1 "	18A	1 "	63
2 "	20		

Special Parts :

3 of No.	6A
2 "	8A
2 "	30
1 "	46
1 "	60B
5 "	60C
1 "	64
2 "	70
1 "	80
2 "	103
2 "	110
2 "	115

FIG. 449A

Model No. 449 Planing Machine (continued)

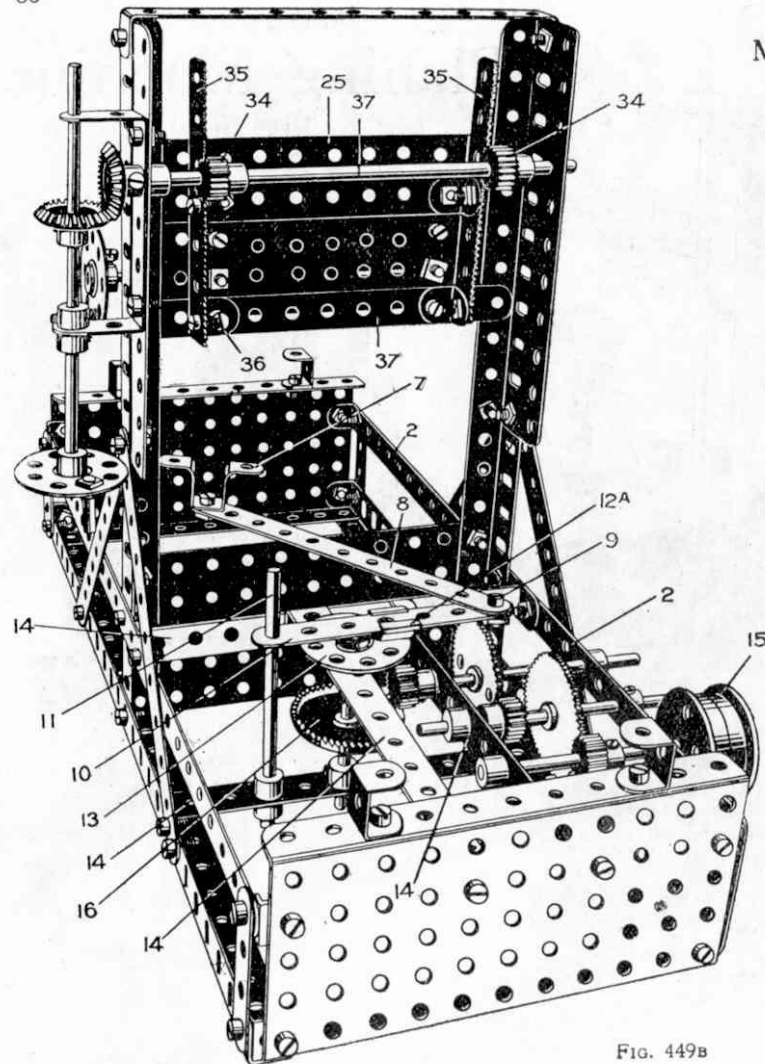


FIG. 449B

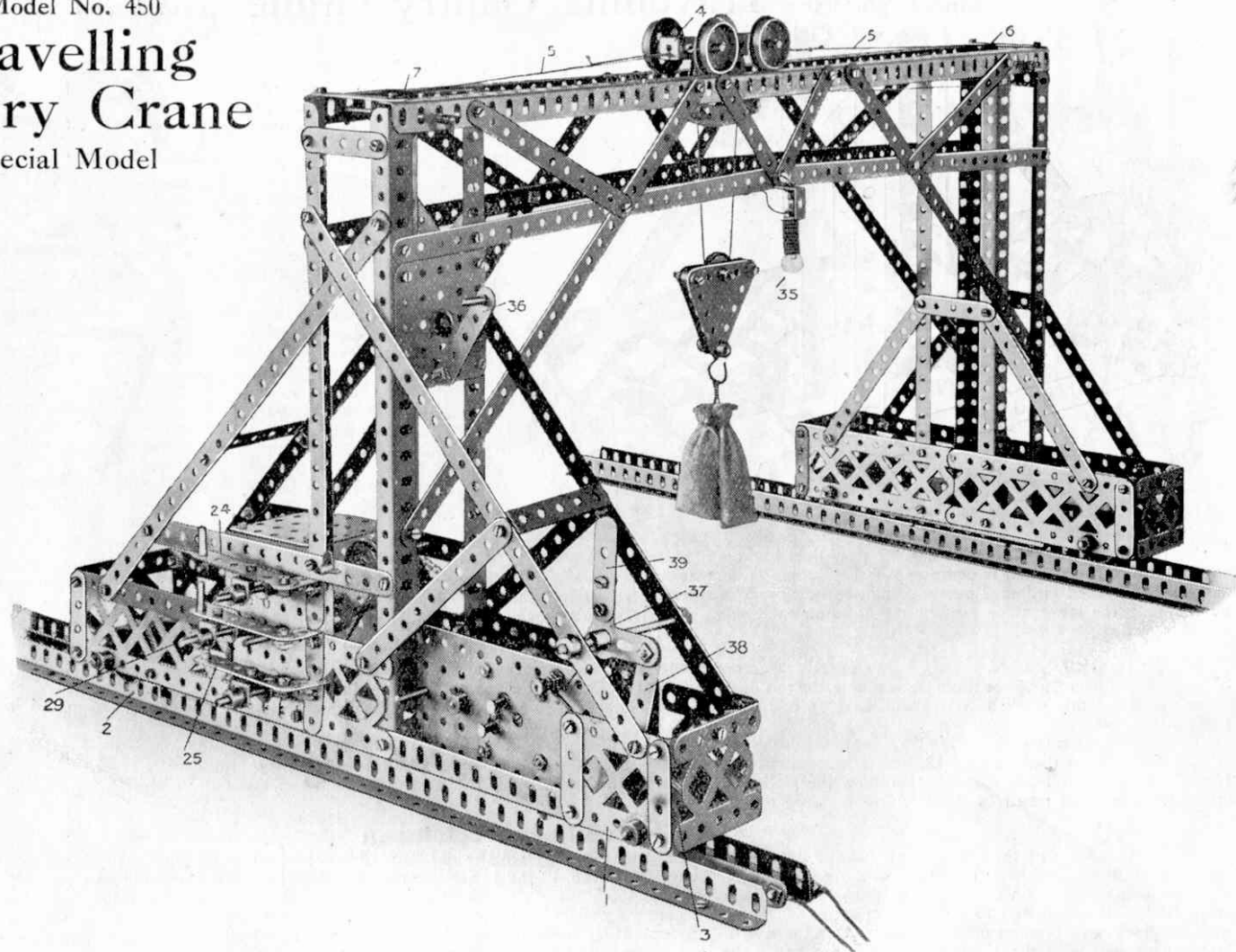
Fig. 449A is a perspective view from the front.

Fig. 449B is a rear view.

The main frame is built up from $5\frac{1}{2}$ " flanged plates 1, connected by angle brackets to $12\frac{1}{2}$ " strips 2 and lower angle girders 3. Angle girders 4 are bolted to the flanged plate 1 by double brackets 5. These angle girders 4 form the rails upon which the table 6 of the planer slides. The table consists of a $5\frac{1}{2}$ " flanged plate. The table is moved to and fro, being bolted by the double bent strip 7, Fig. 449B, to a $5\frac{1}{2}$ " strip 8 the end of which is attached at 9 to a $3\frac{1}{2}$ " strip 10, pivoted on a rod 11. The strips should be lock-nutted to allow free movement. The rod 11 passes through one of the elongated holes in the angle girder 4, and to prevent play of the rod a $2\frac{1}{2}$ " strip 12 is bolted on the flange of the angle girder 4, and in the end hole of this strip the top of the rod 11 is pivoted. The strip 10 engages an eye piece 12A bolted to a bush wheel 13. The eye piece is lock-nutted on the bush wheel, so that while held to the bush wheel it may rotate freely about the bolt as a pivot. Consequently, as the wheel 13 rotates, the table 6 will be moved in one direction, while cutting, more slowly than on the return movement when the work is being brought back. A gear framing by which the bush wheel 13 is driven is made by $5\frac{1}{2}$ " by $\frac{1}{2}$ " double angle strips 14, Fig. 449B. The gear is driven from the belt pulley 15, formed of two flanged wheels reversed. The gear train may be clearly followed from the illustration, terminating in a pinion driving the contrate wheel 16, secured on the bush wheel rod.

The traversing movement of the cutting tool 17 is effected by means of a guide, formed of two $1\frac{1}{2}$ " strips 18, bolted to two corresponding strips at the rear of the horizontal $3\frac{1}{2}$ " strips 19, a middle spacing $1\frac{1}{2}$ " strip being horizontally arranged between the strips 18. The cutting tool 17 is carried in a coupling 20, which is connected by a threaded pin 21, to a threaded boss on a feed screw 22, which is operated from the bush wheel 23, Fig. 449A. The horizontal strips 19 are supported by double angle brackets 24 from the face plate 25, and washers 26 are placed beneath the nuts on the strips 19, in order to give the necessary distance at the rear for clearance for the threaded boss on the threaded rod 22. The threaded rod 22 is journaled in the ends of a $3\frac{1}{2}$ " by $\frac{1}{2}$ " double angle strip 27, bolted to the plate 25. The vertical movement of the plate 25 on the upright angle girders 28 is effected from the bush wheel 29 mounted on a rod 30, a bevel wheel 31 engaging a corresponding bevel 32 on a rod 33, carrying 2 pinions 34, which engage the racks 35, secured by angle brackets 36 to $5\frac{1}{2}$ " strips 37, bolted to the plate 25, with spacing washers between, so that a clearance is provided between the ends of the strips 37 and the plate 25, to engage in a sliding movement round the flanges of the angle girders 28.

Model No. 450
**Travelling
Gantry Crane**
Special Model



Model No. 450 Travelling Gantry Crane (continued)

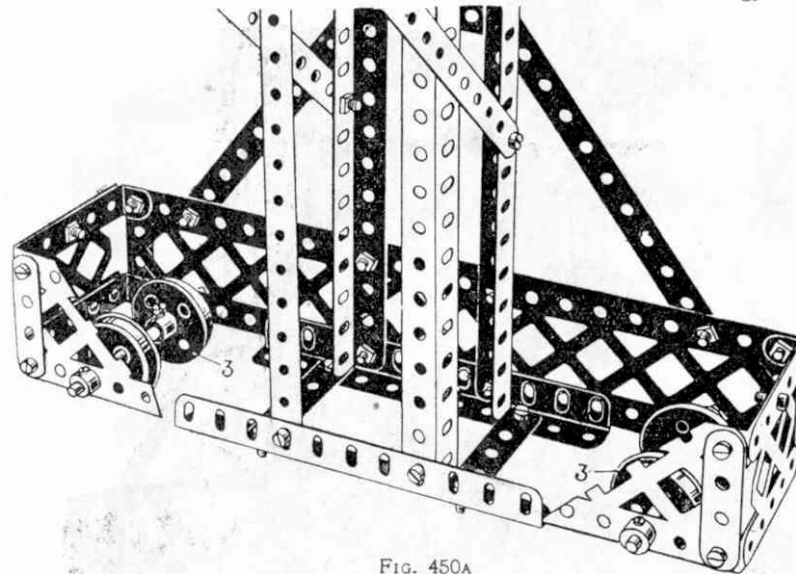


FIG. 450A

Parts Required :	
12 of No. 1	3 of No. 27
12 " " 2	3 " " 27A
6 " " 3	11 " " 35
3 " " 4	149 " " 37
17 " " 5	10 " " 37A
14 " " 6	38 " " 38
1 " " 6A	3 " " 44
6 " " 7	2 " " 53
10 " " 8	1 " " 57
2 " " 9	30 " " 59
6 " " 11	9 " " 60
4 " " 12A	1 " " 72
2 " " 15	2 " " 76
2 " " 15A	2 " " 90
11 " " 16	26 " " 94
1 " " 16A	1 " " 95
2 " " 17	3 " " 96
4 " " 18A	8 " " 98
12 " " 20	6 " " 100
8 " " 22A	2 " " 111
2 " " 23	1 " " 128
2 " " 25	Electric Motor.
3 " " 26	

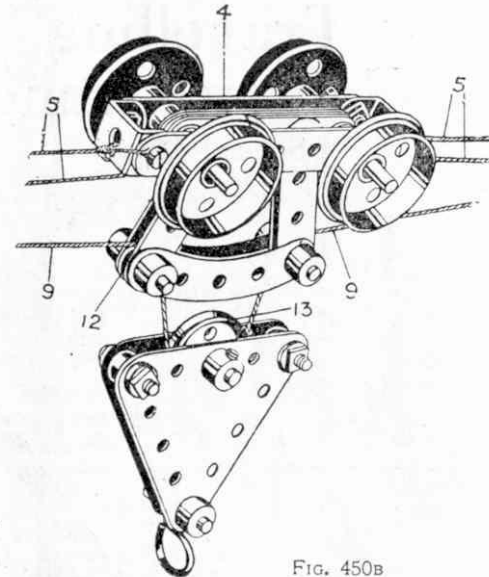


FIG. 450B

The upper part of the framework is well brought out in the illustration. It is to be noted that as regards the feet carrying the motor and the travelling wheels, the centre portion is composed of $12\frac{1}{2}$ " angle girders at the lower edge, extended on one side by $2\frac{1}{2}$ " braced girders 1, overhanging 4 holes, and on the other side by $5\frac{1}{2}$ " braced girders 2 overhanging five holes. The other shorter foot on the gantry is shown in Fig. 450A, and is built up of $5\frac{1}{2}$ " braced girders, overlapped and overhanging the lower angle girders five holes on each side. The travelling wheels 3 are carried in the lower holes of the braced girders.

Traversing Mechanism

The traversing of the trolley 4, is effected by a cord 5 which passes from the far end of trolley 4, round a pulley 6, and is returned and passed over one of the 3" pulleys 7, down to, and has three turns round the rod 8, then passing up and round another of the pulleys 7, and is connected to the near end of the trolley, Fig. 450B. Consequently, rotation of the rod 8 will wind up one end of the traversing cord 5 and pay out the other end, thus causing the trolley 4 to travel to or fro along the gantry rails.

The load is raised or lowered by another cord 9 which is wound round the upper rod 10, thence round the guide pulley 11, round the third of the pulleys 7, Fig. 450, and over the $\frac{1}{2}$ " pulley 12, Fig. 450B, beneath the 1" pulley 13, on the load block round another $\frac{1}{2}$ " pulley, and is made fast on the far end of the gantry frame. If the rod 10 is not being rotated, therefore, the trolley 4 travels to and fro without the load being raised or lowered. Rotation of the rod 10, however, in one or other direction, will result in the load being raised or lowered.

Travelling Mechanism

The travelling of the whole gantry crane upon the wheels 3 is effected from the rod 14 a sprocket wheel 15 on which is connected by a chain 16 to another sprocket wheel 17 on the rod 18 of the travelling wheels, Fig. 450C. The rods 8, 10 and 14 are operated as follows:—The motor spindle 19, Fig. 450B, drives by the chain 20 a 2" sprocket wheel 21 on a rod 22, on which is a $\frac{1}{2}$ " pinion 23, Fig. 450C. The rods 10 and 8 are slideably controlled by the clutch operating handles 24, 25, which are bolted and lock-nutted to double bent strips 26, engaging between collars 27 nipped on the rods. On the outer end of the rod 10 is a 56-toothed wheel 28, a similar wheel being secured on the outer end of the rod 8. By operating the clutch handles 24, 25, either or both of the gear wheels 28 or 28A may be brought into engagement with the $\frac{1}{2}$ " pinion 23 and thus cause the load to be raised or lowered, or the trolley 4 to be traversed.

Model No. 450 Travelling Gantry Crane (continued)

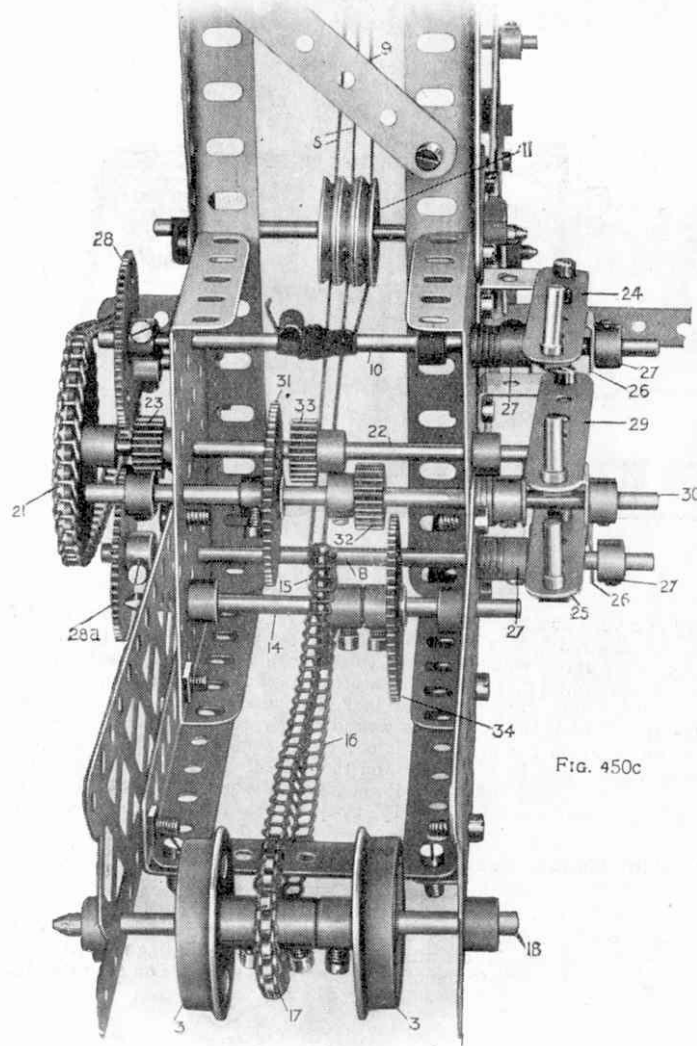


FIG. 450c

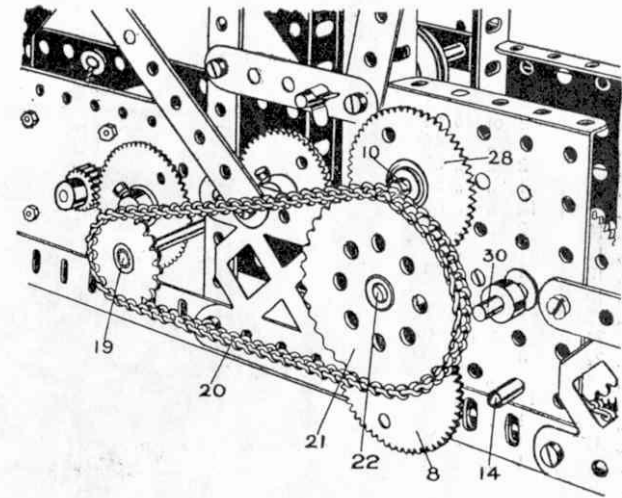


FIG. 450b

The third clutch handle 29 similarly controls the sliding movement of a rod 30, on which is secured a 56-toothed gear wheel 31 and $\frac{1}{2}$ " pinion 32, and on the rod 22 is secured another $\frac{1}{2}$ " pinion 33, while on the rod 14 is a further 56-toothed gear wheel 34. By moving the handle 29, therefore, the gear wheel 31 and the pinion 32 may be brought into engagement respectively with the pinion 33 and the gear wheel 34, thus providing a reduced gear train from the driven rod 22 to the rod 14, and as the latter is coupled by the chain 16 to the rod 18 of the travelling wheels 3 the whole gantry is caused to move to and fro.

The reversal of the motor is controlled by a bell crank 37, coupled by a $2\frac{1}{2}$ " strip 38 to the reversing lever of the motor, a strip 39 being bolted to the bell crank as an extension handle.

A small electric globe 35 may be mounted on the crane, and controlled by switch 36, Fig. 450.

Model No. 451

Wire Covering Machine

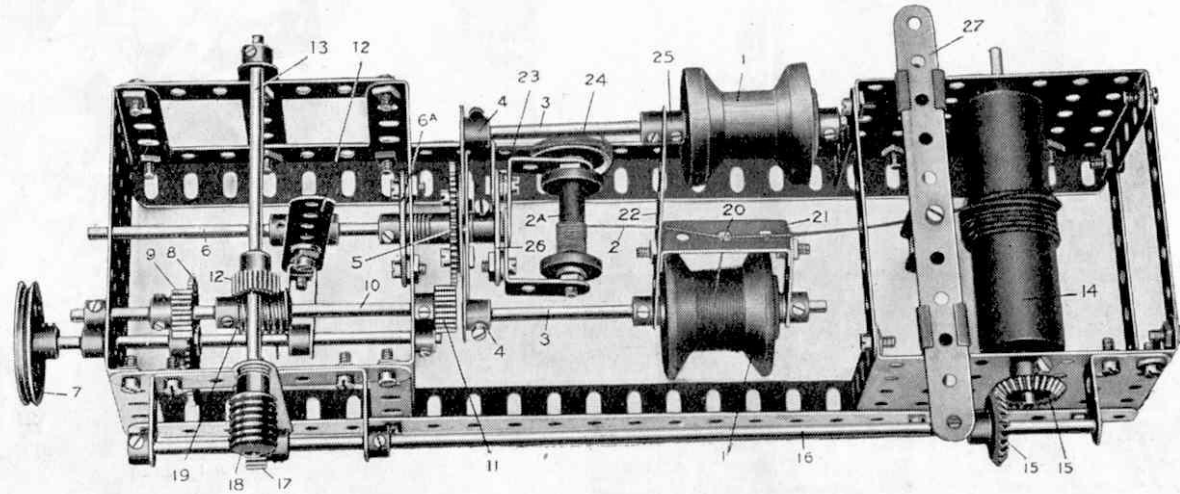
(Outfit No. 6)

Parts Required:

1 of No. 2	2 of No. 44
7 " " 3	1 " " 46
2 " " 4	2 " " 50
1 " " 5	4 " " 53
2 " " 8	12 " " 59
1 " " 10	2 " " 62
2 " " 12	1 " " 63
1 " " 13	1 " " 81
3 " " 15	
4 " " 15A	
1 " " 21	2 of No. 6A
1 " " 22	3 " " 12A
2 " " 24	2 " " 30
4 " " 26	17 " " 38
2 " " 27A	1 " " 60A
2 " " 32	1 " " 106
41 " " 37	1 " " 301

Special Parts:

2 of No. 6A
3 " " 12A
2 " " 30
17 " " 38
1 " " 60A
1 " " 106
1 " " 301

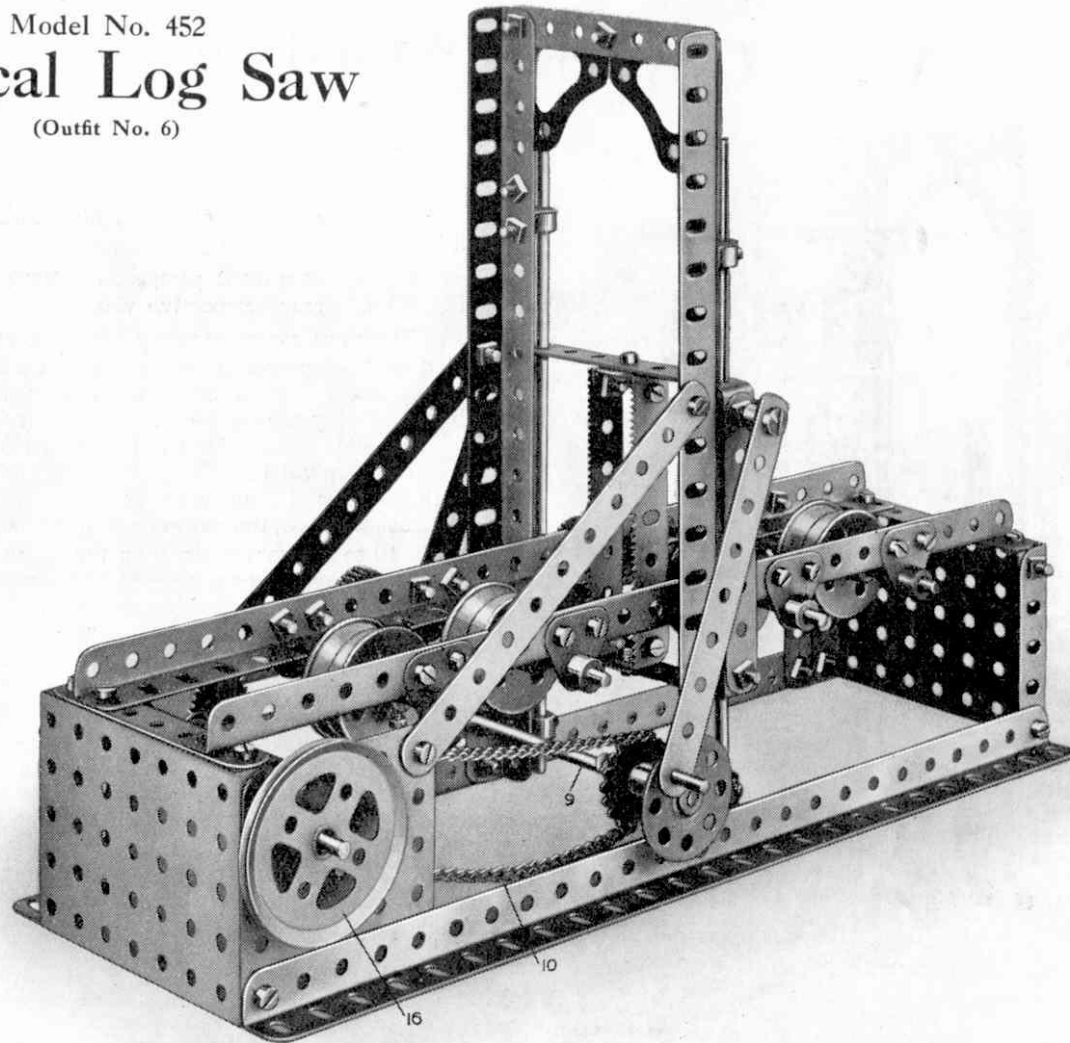


The bobbins 1, carrying the thread by means of which the wire 2 is covered, are carried in a yoke consisting of two rods 3, secured in cranks 4, between a $2\frac{1}{2}$ " and $1\frac{1}{2}$ " strip, and bolted to a 57-toothed gear wheel 5, rotatable loosely on a fixed 5" rod 6. On the rod 6, is a bush wheel 6A, bolted thereto and to the frame. This holds the rod against rotation. The bobbin 2A is carried in the two 1" angle brackets, forming a frame which is bolted to the bush wheel 26, the latter being held by its screw fixedly on the rod 6. The yoke is rotated from the pulley wheel 7, a 57-toothed gear wheel 8, on the spindle of which drives a $\frac{1}{2}$ " pinion 9, on an upper 4" rod 10, another $\frac{1}{2}$ " pinion 11, on the end of which engages and drives the gear wheel 5; this rotates the yoke. The gear 8 is caused to engage or disengage with the pinion 9 by a clutch mechanism operated by the handle 12. As the yoke rotates, the thread from the bobbins is wound closely round the wire 2, and in order to ensure an even wrapping of the thread on the wire, the take-up roller 14, is provided, on to which the wire as it is covered is wound. The take up roller is driven with a very slow movement by bevel pinions 15, from a side rod 16, a $\frac{1}{2}$ " pinion 17 on which is driven by a worm 18, on the rod 13. Consequently, the same rotary movement of the rod 10, to drive the bobbin yoke, also operates the worm 19, engaging the pinion 12 and worm 18, engaging the pinion 17, which slowly drives the take-up roller 14, bringing the uncovered wire 2 slowly past a perforation 20, in the guide strip 21, formed of $1\frac{1}{2}$ " by $\frac{1}{2}$ " double angle strip and carried from the yoke arm 22.

In order to prevent the wire 2 unwinding too freely from its bobbin 2A, a brake is provided, consisting of a cord 23, passing round a pulley 24, on the spindle of the bobbin 2A, and connected to a flat bracket bolted on the bush wheel 26.

It will be noticed that a collar 25 is placed on one side of the yoke strip 22, which has the effect of setting one of the bobbins slightly to the rear of the other, and the effect of this is to give two windings round the wire, one over the other. The thread on the bobbins may be of different colours, which would give a variegated effect to the covering. In order to cause the covered wire to be wound evenly on the take-up roller 14, a distributor is provided, consisting of a strip 27, beneath which is bolted a double bracket through which the covered wire passes. By moving the strip 27 from one side to the other, the wire winds evenly on the roller 14.

Model No. 452
Vertical Log Saw
 (Outfit No. 6)



Parts Required :

2 of No.	2
5 "	3
1 "	6
4 "	8
12 "	12
1 "	13
2 "	13A
1 "	15
4 "	15A
2 "	16
8 "	20
2 "	24
2 "	25
1 "	26
1 "	27A
2 "	32
59 "	37
2 "	53
17 "	59
12 "	94

Special Parts:

2 of No.	2A
2 "	8A
2 "	12A
1 "	20A
2 "	30
2 "	33A
6 "	37A
2 "	60B
2 "	72
10 "	77
2 "	96
2 "	108
2 "	110
2 "	115

FIG. 452

Model No. 452 Vertical Log Saw (continued)

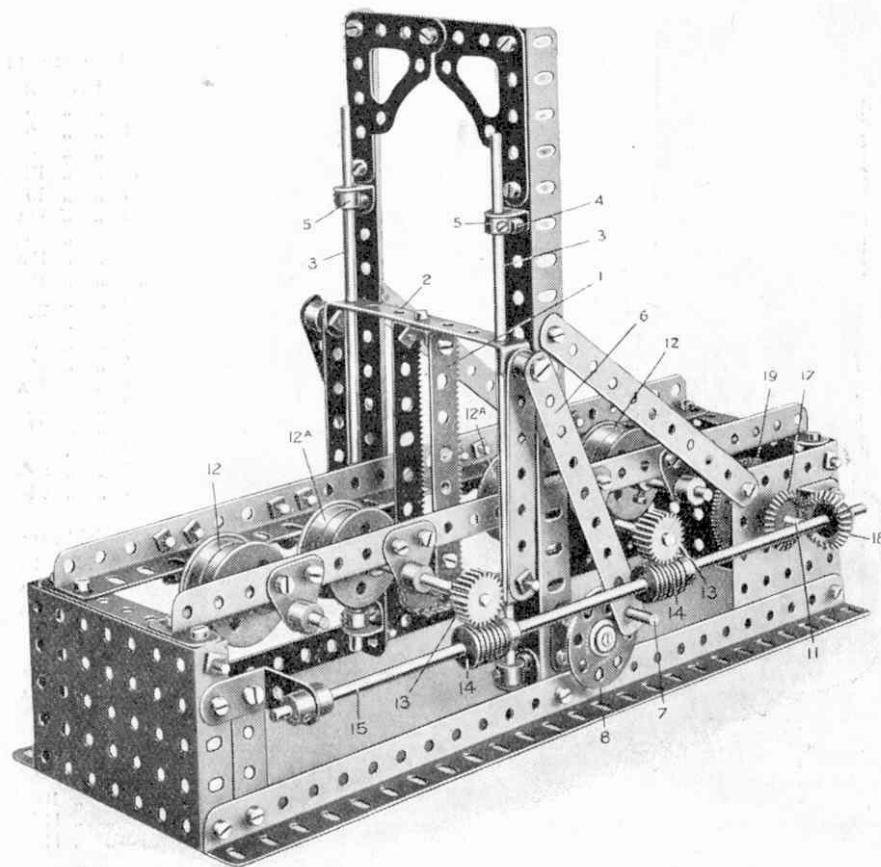


Fig. 452A

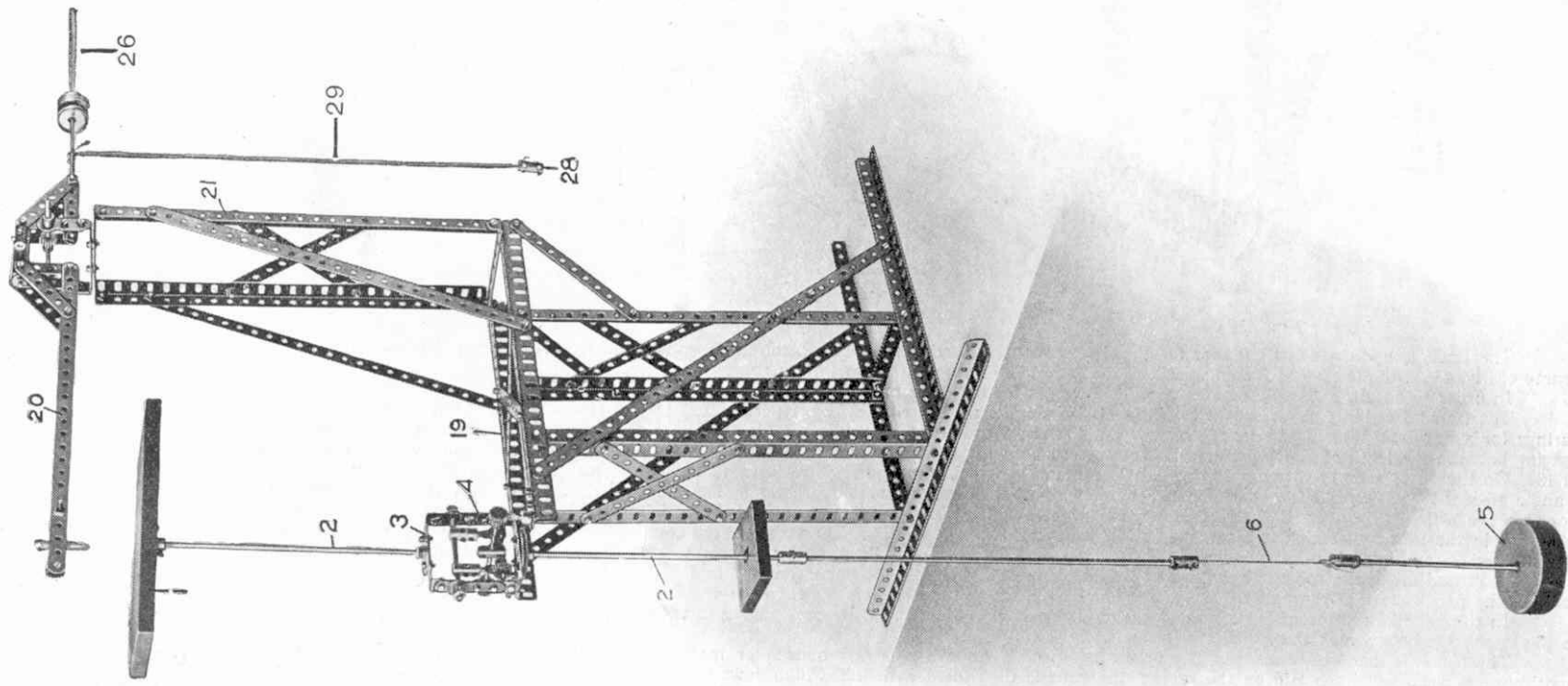
This is a model of a machine used for sawing logs into planks.

Fig. 452 is a front perspective view of the log saw, and Fig. 452A a rear perspective view.

The saws represented by the rack strips 1 are carried in a vertical moveable frame 2 which slides on the rods 3 as guides. These rods 3 are rigidly held in the angle brackets 4 by the collars 5. The saw frame is reciprocated on the guide rods 3 by the link strips 6, connected to the frame 2 by pivot bolts lock-nutted to the frame and spaced with collars and the lower holes engage the threaded pins 7 on the bush wheels 8, the rod 9 of which is connected by a sprocket chain 10 to a sprocket wheel on the spindle 11. The log is caused to move past the saws by being supported on the pairs of reversed flanged wheels 12 and 12A, the centre pairs of which are positively driven from the $\frac{3}{4}$ " pinions 13, which are engaged by the worm 14 on the rod 15. The movement of the flanged pulleys 12A and of the saws 1 are both effected from the 2" pulley wheel 16, the rod of which carries a $\frac{1}{2}$ " pinion engaging a 56-toothed wheel 19 on the rod 11. At the outer end of this rod 11 is a bevel wheel 17 engaging a corresponding bevel 18 on the rod 15. Consequently, if the pulley wheel 16 be driven, the saw frame is reciprocated vertically, and the centre pairs of the flange wheels rotated, causing the log to be fed towards the saws. The opposite end of the rod carrying the pulley wheel 16 passes through one of the holes of the 1" angle bracket forming the bearing for the rod 15.

Model No. 453

Twin Elliptic Harmono- graph Special Model



Parts Required:

8 of No.	1
10 "	2
3 "	3
4 "	4
6 "	5
4 "	6
11 "	7
5 "	11
2 "	12
2 "	13
2 "	13A
1 "	14
3 "	16
2 "	16A
1 "	17
3 "	21
2 "	22
2 "	22A
2 "	24
6 "	26
96 "	37
2 "	37A
2 "	38
3 "	46
4 "	59
1 "	60B
6 "	62
9 "	63
6 "	65
1 "	107
2 "	111

Model No. 453 Twin-Elliptic Harmonograph (continued)

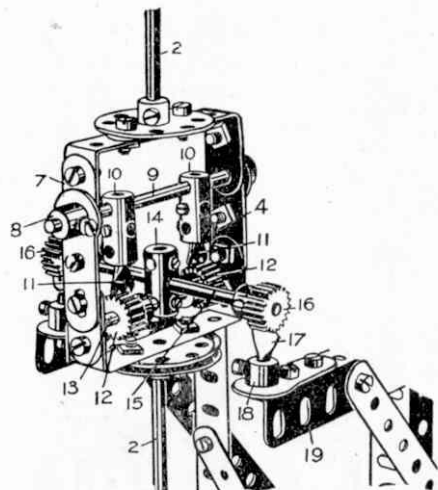


FIG. 453A

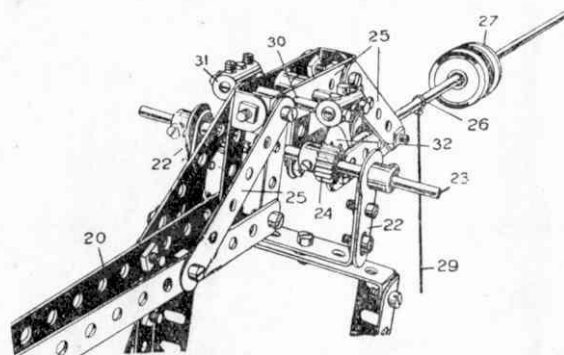


FIG. 453B

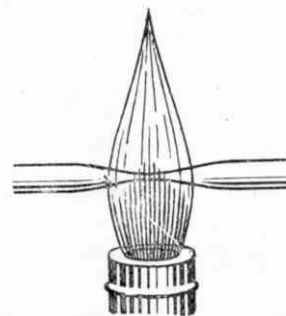


FIG. 453C

The table 1, upon which the paper for the design rests, is carried on a rod 2, the lower end of which is bolted to a bush wheel 3, which in turn is bolted to a frame 4, Fig. 453A, the lower rod 2 being similarly bolted to the frame 4 and carrying a somewhat heavy weight 5.

In order to obtain a flexible movement of the weight 5, the lower parts of the rod are coupled by a short length of string 6.

The frame 4 is built up as shown in Fig. 453A, of double angle strips $2\frac{1}{2}$ " by 1", connected by $2\frac{1}{2}$ " side strips 7, outside which are bolted cranks 8 to provide bearings for a rod 9 secured in the crank bosses. On the rod 9 are secured couplings 10 in the lower ends of which are mounted centre forks 11 forming knife edges engaging between the teeth of two $\frac{1}{2}$ " pinions 12 fixed on a 2" rod 13, which is secured in a centre coupling 14 across which, in the centre hole of each, is bolted a $3\frac{1}{4}$ " rod 15. On the outer ends of this rod 15 are two $\frac{1}{2}$ " pinions 16 which rest upon centre forks 17 forming lower knife edges, secured in the bosses of cranks 18 carried on angle girders 19. Consequently, the frame 4 is balanced so as to swivel in two directions about the knife edges 17 and the knife edges 11. The ink pencil is gripped between the ends of two $12\frac{1}{4}$ " strips 20, forming an arm which is pivotally supported as shown in Fig. 453B. At the top of the arm 21, Fig. 453B, are bolted two cranks 22, in the bosses of which is secured a rod 23 carrying two pinions 24. The strips 20 are coupled by 3" and 2" strips 25 to form a yoke, in the rear of which is fixed a rod 26 on which is a balance weight 27, formed by a number of pulleys, and a further weight 28 is suspended from the rod 26 by cord 29. The balance is adjusted along the rod so that the pencil will just rest lightly on the paper on the table 1, and the extra weight 28, when hanging free, as in Fig. 453, just lifts the pencil clear of the paper. By lifting the weight 28 and resting it somewhere on the frame, the pencil is brought into light contact with the table 1.

In the yoke 25 are inserted two rods 30, each carrying couplings 31 in the centre holes of which are secured centre forks 32 forming knife edges, which engage the $\frac{1}{2}$ " pinions 24 about which the pencil arm swivels.

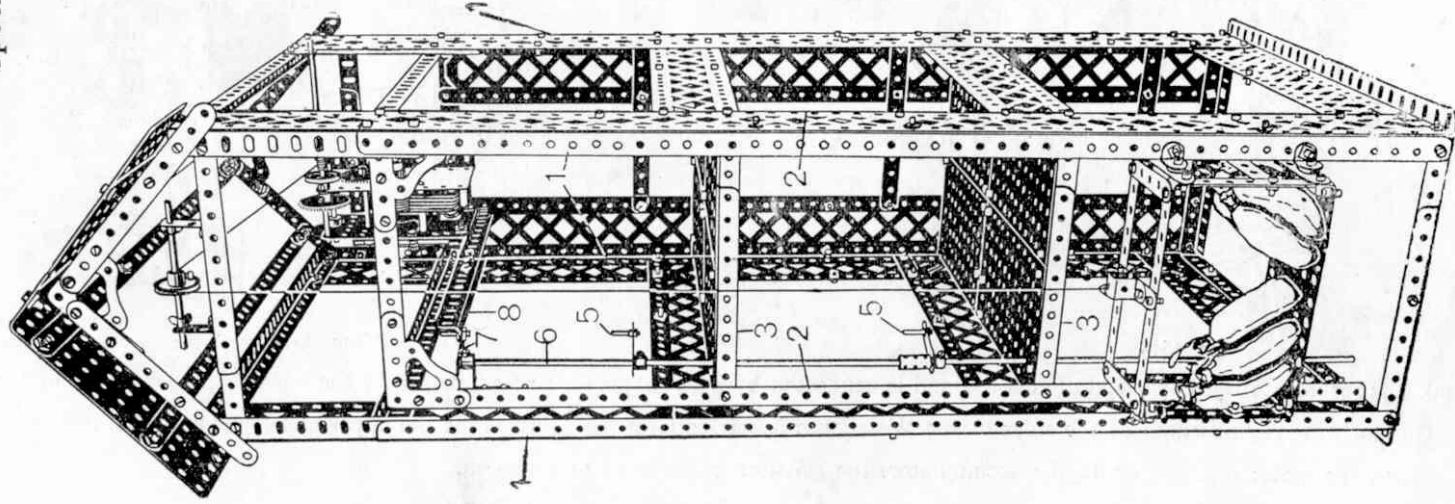
The pencil is made by drawing out a short length of $\frac{1}{8}$ " glass tubing in a bunsen or methylated spirit lamp, about $\frac{1}{2}$ " taper, Fig. 453C, and the end ground smoothly on a clean wet hone laid on the table; the tube is then filled with ink, which flows freely through the fine perforation in the point.

To operate the apparatus, if the weight 5 be given a swinging movement, the table 1 is oscillated, and the stationary pencil describes a diagram on the paper, which is varied according to the direction in which the weight swings.

Warehouse

Special Model

Model No. 454



Commence this model by building the framework. $24\frac{1}{2}$ " angle girders are used to form the corner uprights 1 with $5\frac{1}{2}$ " angle girders overlapped three holes at the top. Two $24\frac{1}{2}$ " angle girders 2 are also used to carry the front portion of the warehouse floors, the latter being bolted to two $5\frac{1}{2}$ " angle girders 3 overlapped eight holes and connected across to the two inner angle girders 2. Two similar $5\frac{1}{2}$ " angle girders are bolted to the back of the framework, to carry the other end of each of the floors. The floor is formed of four $5\frac{1}{2} \times 3\frac{1}{4}$ flat plates butted together and bolted in the centre to a $5\frac{1}{2}$ " double flat strip on the under side—the two outer ends being bolted to the angle girders 3.

The horizontal side-strips are formed of $12\frac{1}{2}$ " strips to which are bolted the braced girder strips.

Fig 454A shows the construction of the Cage. This is guided by bolt heads,

Parts Required:

No.	1	2	No.	35
18	1	240	"	37
21	"	30	"	38
9	5	1	"	45
1	"	6A	"	46
4	"	7	"	52A
6	"	8	"	59
6	"	9	"	62
23	"	12	"	63
1c	"	12A	"	70
2	"	13	"	99
2	"	14	"	100
1	"	16	"	103
3	"	22	"	108
			"	115

Model No. 454 Warehouse (continued)

4 at each side riding along the inwardly turned flanges of the angle girders 2. The bolts are attached to angle brackets which are secured to a $1\frac{1}{2}$ " strip, this latter being secure to the side-strips of the cage, spaced with three washers to take up the play between the cage and the upright girders 2.

Fig. 454B shows the position of the motor, and this may be started and stopped from the control crank handles 5, one on each floor of the warehouse. These crank handles are fixed on a vertical rod 6 composed of two $11\frac{1}{2}$ " rods connected by a coupling.

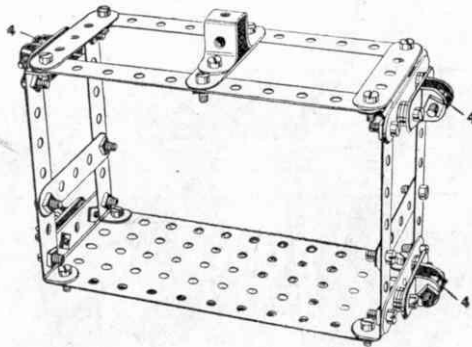


FIG. 454A

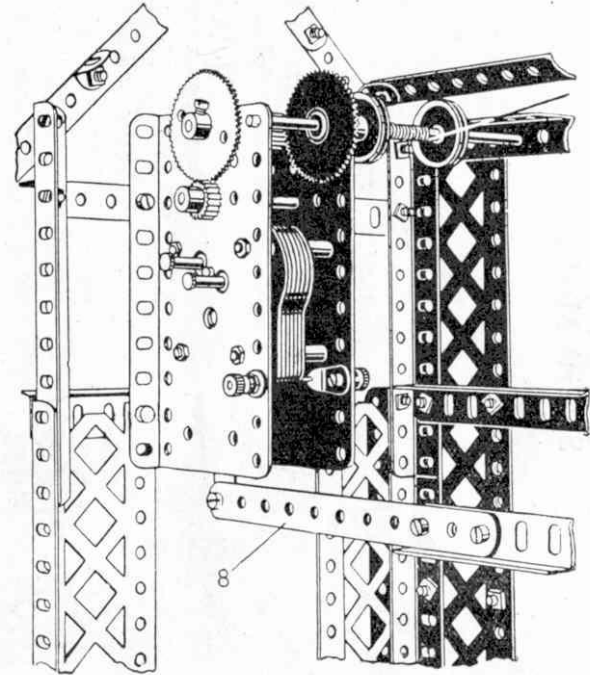
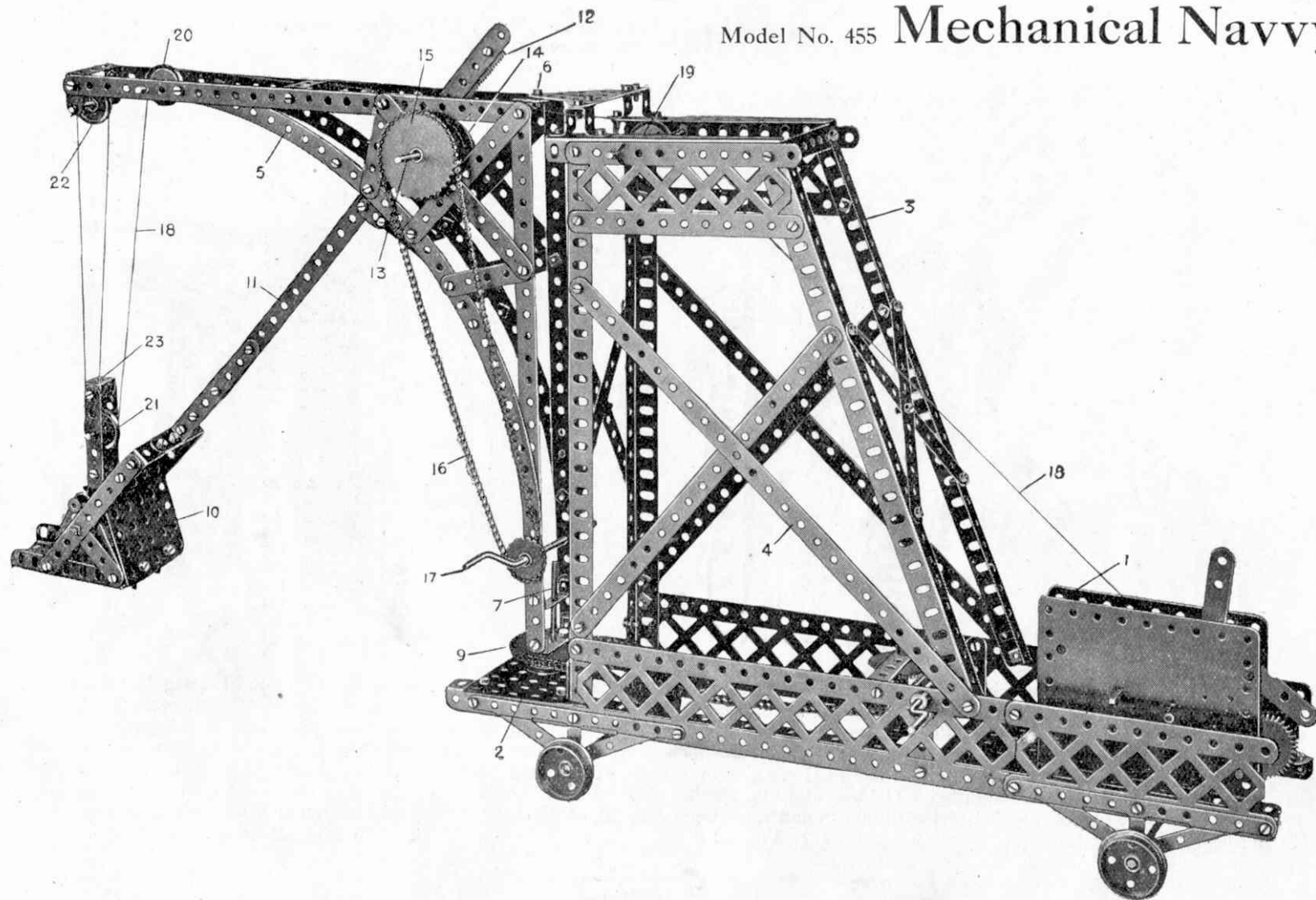


FIG. 454B

A crank 7 is secured to the upper end of this rod and is connected by a $5\frac{1}{2}$ " angle girder and strip 8 to the operating lever of the motor.

One inch brackets secured to the sides of the Warehouse by strips form the bearings for the upper and lower ends of the vertical rod.

When the motor is wired up to the accumulator, the elevator is ready to be operated.

Model No. 455 **Mechanical Navyy**

Model No. 455 Mechanical Navy (continued)

(Outfit No. 6)

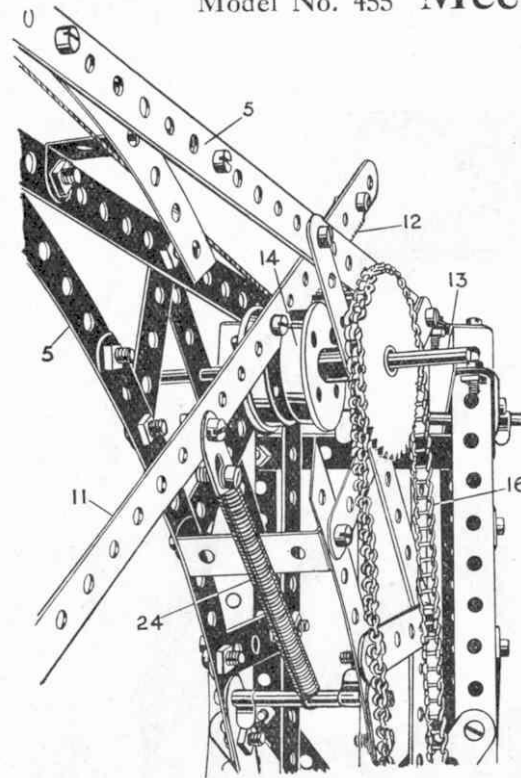


Fig. 455A

Parts Required:

7 of No. 1	6 of No. 20
6 " " 2	2 " " 22
4 " " 3	4 " " 22A
2 " " 4	1 " " 26
4 " " 5	2 " " 27A
4 " " 6	1 " " 32
4 " " 8	17 " " 35
2 " " 9	129 " " 37
3 " " 10	1 " " 37A
2 " " 11	1 " " 43
3 " " 12	2 " " 45
2 " " 15	1 " " 46
1 " " 15A	7 " " 59
4 " " 16	5 " " 60A
4 " " 17	1 " " 60B
1 " " 18A	48 " " 94
2 " " 19	

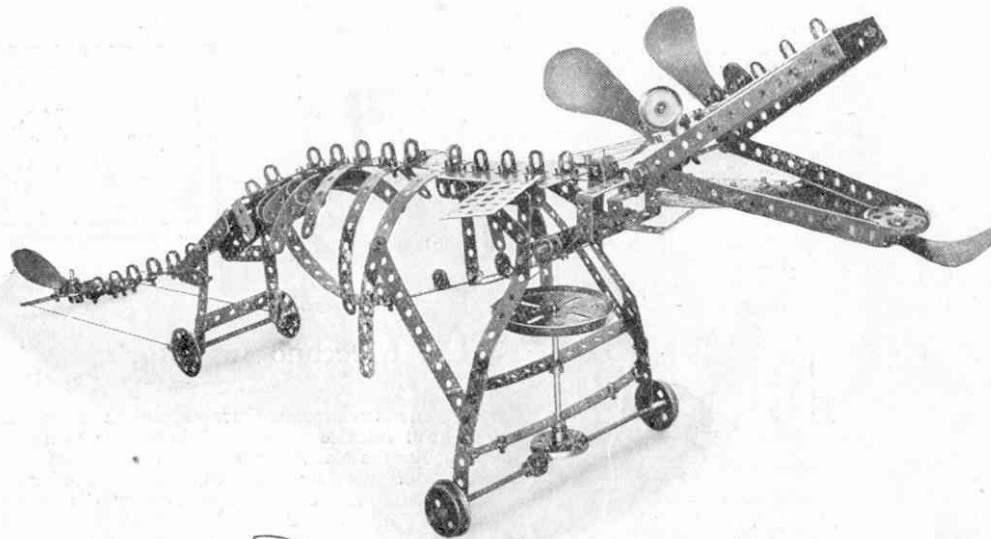
Special Parts:

2 of No. 1A	6 of No. 89
4 " " 2A	2 " " 95
2 " " 7A	2 " " 96
3 " " 12A	2 " " 99
3 " " 38	4 " " 100
1 " " 52A	1 " " 110
1 " " 53A	4 " " 113
1 " " 72	2 " " 114

In this model the framework can be readily built up from the information given in the illustration, the motor 1 being bolted on the lower platform 2 and the superstructure 3 being made up of angle girders at the corners and braced at 4. The jib 5 is pivotally carried by the bolt 6 at the top in a triangular plate and on a short rod 7 on the foot, a chain and sprocket gear 9 being provided to swing the jib. The bucket or grab 10 is mounted on the ram 11 to the upper part of which a rack 12 is bolted engaged by a pinion on the rod 13 mounted between two flanged wheels 14. A sprocket 15 on the rod 13 is engaged by a chain 16 operated from the cranked handle 17 so that by turning the handle 17 the bucket 10 may be adjusted. The bucket 10 is raised or lowered by the cord 18 which passes from the motor 1 over a pulley 19 and another pulley 20 at the end of the jib and round the lower pulley 21 on the bucket returning up round a second pulley 22 on the jib and being made fast to the bucket at 23. Springs 24, Fig. 455A are provided to keep the rack 12 in engagement with the pinion.

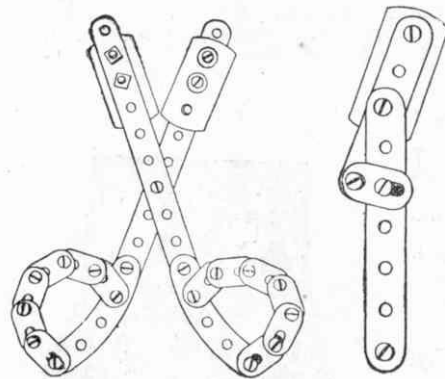
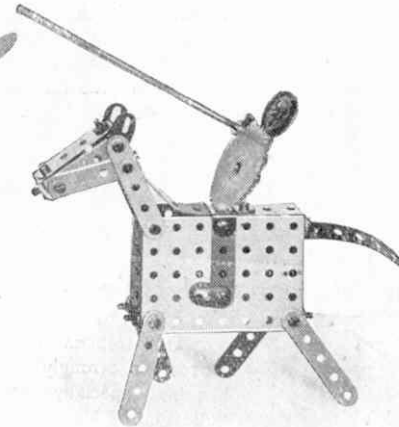
Special Model 456 St. George and Dragon

43



Parts Required, St. George:

1 of No. 3	1 of No. 22A
7 " " 5	31 " " 37
7 " " 6	1 " " 37B
7 " " 10C	2 " " 53
3 " " 11	2 " " 60
2 " " 12	1 " " 62
1 " " 14	1 " " 95



Scissors 457

Knife 458

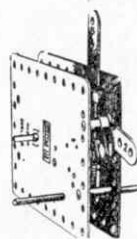
Suggestions for using old safety razor blades to make a pair of scissors, and photographer's trimming knife.

Parts Required, Dragon:

2 of No. 1	2 of No. 20	3 of No. 46
17 " " 2	2 " " 22	4 " " 54
7 " " 3	3 " " 24	6 " " 59
5 " " 5	1 " " 26	9 " " 60
3 " " 6	2 " " 28	2 " " 61
3 " " 11	2 " " 35	1 " " 69
34 " " 12	125 " " 37	2 " " 72
1 " " 13A	7 " " 38	6 " " 90
4 " " 16	4 " " 41	2 " " 110
1 " " 18A	1 " " 43	2 " " 114
1 " " 19B		

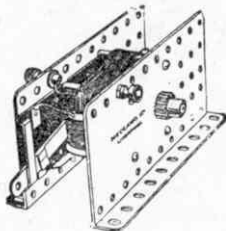
This model requires little description. The jaws of the dragon work by means of a cord fastened to a $3\frac{1}{2}$ " strip which is attached to the $2\frac{1}{2}$ " by $2\frac{1}{2}$ " flat plate forming the head. The cord is passed through a hole in the $12\frac{1}{2}$ " strip, which forms the back-bone. It is attached at its other end to the periphery of a 3" pulley wheel, which is caused to rotate as the dragon moves along the ground. To make the tail wag, cords are fastened to each end of the pivoted $3\frac{1}{2}$ " strip which carries the bush wheel and propeller blade forming the tail, and attached at their other ends to angle brackets bolted to the back wheels. As the animal moves along the ground the tail wags in quite a realistic way.

The Meccano Clockwork Motor



THE MECCANO CLOCKWORK MOTOR is a splendid piece of mechanism, simple, powerful, and reliable. It has been specially designed for use with Meccano models into which it may be built, thus becoming part of the model itself. It is simple in construction, and powerful and reliable in use. It is fitted with stopping and starting levers, and has a reversing movement. With extra gearing made from Meccano parts, a greater lifting power may be obtained. The Meccano Clockwork Motor is easy to understand and all its movements are fully explained in the instructions which accompany it. Price 12/6

The Meccano Electric Motor



THE MECCANO ELECTRIC MOTOR is strongly built, and has been specially designed to build into Meccano models. Elevators, Cranes, Sawmills, and Tool-shops are set in motion and rendered even more realistic. This greatly adds to the fun and fascination of building Meccano models. It is the most reliable and powerful toy electric motor made, and when properly geared will lift over 30 lbs. dead weight. It may be run by a 4-volt accumulator or, by employing a suitable transformer, direct from the main. The drive is taken up, either direct by shaft, or by transmission, and thus a positive and powerful drive is obtained. The Meccano Electric Motor is fitted with a reversing motion, provided with stopping and starting controls, and the gearing is interchangeable. Price 17/6

The Meccano Electrical Outfit

The application of Electricity to the Meccano system adds a further and wonderful charm. The joys of model building are now increased by the fascinating pastime of carrying out delightful electrical experiments.

THE MECCANO ELECTRICAL OUTFITS contain a number of specially designed electrical accessory parts, and, used in conjunction with any of the regular outfits, enable the user to construct models for making interesting and instructive experiments. These include the Electric Railway, Morse Key, Tapper Key, Buzzer, Electric Lamps, Electric Crane, Induction Coil, Electric Iron, Motor-Starter, etc.

Prices:

- | | |
|--|------|
| X1 (containing electrical parts, without motor or accumulator) | 12/6 |
| X2 (containing a Meccano Electric Motor, 4-volt accumulator, and electrical parts) | 50/- |



The Meccano Inventor's Accessory Outfit "A"

THE INVENTOR'S OUTFITS contain a selected assortment of valuable parts, which from time to time have been added to the Meccano system. By the aid of an Inventor's Outfit many Meccano Models in the Manual of Instructions can be much improved. ACCESSORY OUTFIT "A" contains four large 3 inch Pulley Wheels, new Gear Wheels, a supply of Washers, Sprocket Wheels and Sprocket Chain (for giving a positive drive) and a supply of the popular Meccano Braced Girders, which give a fine finish to Meccano Models. Price 10/-

The Meccano Inventor's Accessory Outfit "B"

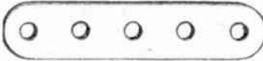





By adding either or both of the Inventor's Accessory Outfits, the possessor of one of the main Meccano Outfits, from No. 0 to No. 6 is enabled to construct a very large number of further models thereby deriving a great deal of extra enjoyment. They make a splendid addition to any Meccano Outfit.






ACCESSORY OUTFIT "B" contains a magnificent assortment of new parts, including Bevel Gears, 1 inch Gear Wheels, Flat Plates, Octagonal and Strip Couplings, Triangular Plates, Screwed Rods, Curved Strips, Rack Strips, Hinges, Buffers and Couplings for constructing trains. Every boy who is interested in engineering subjects will find this outfit of the greatest service to him, not only providing him with new movements, but also considerably extending the scope of his experiments. Price 25/-






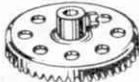



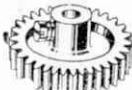




MECCANO PRICE LIST

Particulars and Prices of Meccano Parts






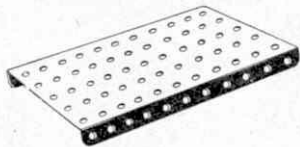
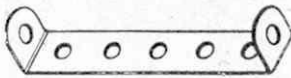
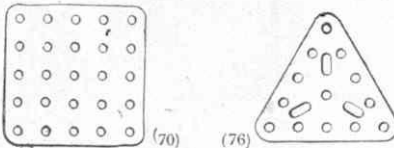

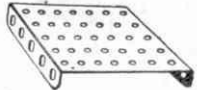



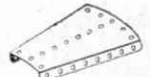


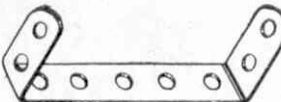


	
No.	s. d.
1. Perforated Strips, 12 $\frac{1}{2}$ " long ... $\frac{1}{2}$ doz.	1 6
1A. " " 9 $\frac{1}{2}$ " " ... " 1	3 0
1B. " " 7 $\frac{1}{2}$ " " ... " 1	0 0
2. " " 5 $\frac{1}{2}$ " " ... " 0	8 0
2A. " " 4 $\frac{1}{2}$ " " ... " 0	6 0
3. " " 3 $\frac{1}{2}$ " " ... " 0	5 0
4. " " 3" " ... " 0	5 0
5. " " 2 $\frac{1}{2}$ " " ... " 0	5 0
6. " " 2" " ... " 0	5 0
6A. " " 1 $\frac{1}{2}$ " " ... " 0	5 0
	
7. Angle Girders, 24 $\frac{1}{2}$ " long ... each	1 0
7A. " " 18 $\frac{1}{2}$ " " ... " 0	9 0
8. " " 12 $\frac{1}{2}$ " " ... $\frac{1}{2}$ doz.	2 9
8A. " " 9 $\frac{1}{2}$ " " ... " 2	0 0
8B. " " 7 $\frac{1}{2}$ " " ... " 1	9 0
9. " " 5 $\frac{1}{2}$ " " ... " 1	6 0
9A. " " 4 $\frac{1}{2}$ " " ... " 1	3 0
9B. " " 3 $\frac{1}{2}$ " " ... " 1	0 0
9C. " " 3" " ... " 1	0 0
9D. " " 2 $\frac{1}{2}$ " " ... " 1	0 0
9E. " " 2" " ... " 0	9 0
9F. " " 1 $\frac{1}{2}$ " " ... " 0	9 0
	
10. Flat Brackets ... $\frac{1}{2}$ doz.	0 3
	
11. Double Brackets ... each	0 1 $\frac{1}{2}$
	
(12)	
12. Angle Brackets $\frac{1}{2}$ " x $\frac{1}{2}$ " ... doz.	0 9
12A. " " 1" x 1" ... each	0 1 $\frac{1}{2}$
12B. " " 1" x $\frac{1}{2}$ " ... " 0	1 8
	
(12A)	

	
No.	s. d.
13. Axle Rods, 11 $\frac{1}{2}$ " long ... each	0 5
13A. " " 8" " ... " 0	5 0
14. " " 6" " ... " 0	3 0
15. " " 5" " ... " 0	3 0
15A. " " 4 $\frac{1}{2}$ " " ... " 0	2 0
16. " " 3 $\frac{1}{2}$ " " ... " 0	2 0
16A. " " 2 $\frac{1}{2}$ " " ... " 0	2 0
17. " " 2" " ... " 0	2 0
18A. " " 1 $\frac{1}{2}$ " " ... " 0	2 0
18B. " " 1" " ... " 0	1 1 $\frac{1}{2}$
	
19. Crank Handles ... each	0 5
	
19A. Wheels 3" diam. with set screws each	1 0
	
20. Flanged Wheels ... each	0 9
	
Pulley Wheels.	
19B. 3" dia. with centre boss and set screw each	1 0
20A. 2" " " " " " " " " " 0	9 0

	
(22)	
	
(22A)	
No.	s. d.
21. 1 $\frac{1}{2}$ " dia. with centre boss and set screw, each	0 9
22. 1" " " " " " " " " " 0	6 0
22A. 1" " without " " " " " 0	3 0
23. 1" " with " " " " " " 0	3 0
23A. 1" " with " " " " " " 0	6 0
	
24. Bush Wheels ... each	0 9
	
25. Pinion Wheels $\frac{1}{2}$ " diam. ... each	0 9
26. " " $\frac{1}{4}$ " " " " " " 0	6 0
	
GEAR WHEELS.	
27. 50 teeth to gear with $\frac{1}{2}$ " pinion each	1 3
27A. 57 " " " " " " " " " 1	3 0
	
28. Contrate Wheels, 1 $\frac{1}{2}$ " diam. ... each	1 3
29. " " " " " " " " " " 0	9 0

	
No.	s. d.
30. Bevel Gears ... (31) ... each	1 3
	
31. Gear Wheels, 1", 38 teeth ... each	1 6
	
32. Worm Wheels ... each	0 9
	
33. Pawls (complete) ... each	0 6
33A. Pivot Bolts with Nuts ... " 0	3 0
	
34. Spanners ... each	0 3
	
35. Spring Clips ... per box (doz.)	0 5
36. Screw Drivers ... each	0 5
36A. " " Extra Long ... " 0	9 0

Particulars and Prices of Meccano Parts (continued)

 <p>No. 37. Nuts and Bolts ... per box (doz.) 0 9 37A. Nuts ... " " 0 5 37B. Bolts ... " " 0 5 38. Washers ... " " 0 2 40. Hanks of Cord ... each 0 3</p>	 <p>No. 50. Eye Pieces ... each 0 3</p>	 <p>No. 59. Collars with Set Screws ... each 0 3</p>	 <p>No. (63c) (64) s. d. 63c. Threaded Couplings ... each 0 9 64. Threaded Bases ... " 0 3 65. Centre Forks ... " 0 3 66. Weights, 50 gramme ... " 1 6 67. " 25 ... " 1 6 68. Woodscrews, 1" ... doz. 0 5 69. Set Screws ... " 0 6 69A. Grub Screws ... " 0 6 69B. " " ... " 0 9</p>
 <p>41. Propeller Blades ... per pair 0 6</p>	 <p>52. Perforated Flanged Plates, 5 1/4" x 2 1/4" each 0 8 52A. Flat Plates ... 5 1/4" x 3 1/4" " 0 8</p>	 <p>60. Double Angle Strips, 2 1/4" x 1/2" ... 1/2 doz. 0 8 60A. " " " 1 1/4" x 1/2" ... " 0 6 60B. " " " 3 1/4" x 1/2" ... " 0 9 60C. " " " 5 1/4" x 1/2" ... " 1 3 60D. " " " 4 1/4" x 1/2" ... " 1 3 61. Windmill Sails ... each 0 3</p>	 <p>70. Flat Plates, 5 1/4" x 2 1/4" ... each 0 5 72. " 2 1/4" x 2 1/4" ... " 0 3 76. Triangular Plates, 2 1/4" ... " 0 3 77. " " 1" ... " 0 2</p>
 <p>43. Springs ... each 0 3</p>	 <p>53. Perforated Flanged Plates, 3 1/4" x 2 1/4" each 0 5 53A. Flat Plates ... 4 1/4" x 2 1/4" " 0 5</p>	 <p>44. Cranked Bent Strips ... each 0 2 62. Cranks ... each 0 5 62A. Threaded Cranks ... " 0 6</p>	 <p>78. Screwed Rods, 1 1/4" ... each 0 9 79. " " 8" ... " 0 8 79A. " " 6" ... " 0 6 80. " " 5" ... " 0 5 80A. " " 3 1/4" ... " 0 5 80B. " " 4 1/4" ... " 0 5 81. " " 2" ... " 0 3 82. " " 1" ... " 0 2</p>
 <p>45. Double Bent Strips ... each 0 2</p>	 <p>54. Perforated Flanged Sector Plates, each 0 5</p>	 <p>53. Couplings ... each 0 9</p>	 <p>89. Curved Strips, 5 1/4" ... each 0 3 90. " " 2 1/4" ... " 0 2</p>
 <p>46. Double Angle Strips, 2 1/4" x 1" ... 1/2 doz. 0 9</p>	 <p>57. Hooks ... each 0 2 57A. " (scientific) ... " 0 2 57B. " Loaded ... " 0 8 58. Spring Cord ... per length 1 3</p>	 <p>63A. Octagonal Couplings ... each 1 0 63B. Strip Couplings ... " 1 0</p>	

Particulars and Prices of Meccano Parts (continued)



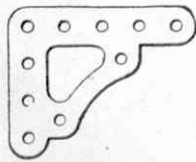
No.	s.	d.
94. Sprocket Chain	per yard	0 9



No.	s.	d.
95. Sprocket Wheels, 2" diam. ...	each	0 8
95A. " " 1 1/2" " " " " "	"	0 6
95B. " " 3" " " " " "	"	0 9
96. " " 1" " " " " "	"	0 5
96A. " " 1/2" " " " " "	"	0 5



No.	s.	d.
97. Braced Girders, 3 1/2" long	1/2 doz.	1 3
98. " " 2 1/2" " " " " "	"	0 9
99. " " 12 1/2" " " " " "	"	2 9
99A. " " 9 1/2" " " " " "	"	2 6
100. " " 5 1/2" " " " " "	"	1 6
101. Healds	for looms doz.	1 3
102. Single Bent Strips	each	0 2
103. Flat Girders, 5 1/2" long	1/2 doz.	1 6
103A. " " 9 1/2" " " " " "	"	2 3
103B. " " 12 1/2" " " " " "	"	3 0
103C. " " 4 1/2" " " " " "	"	1 3
103D. " " 3 1/2" " " " " "	"	1 0
103E. " " 3" " " " " "	"	0 9
103F. " " 2 1/2" " " " " "	"	0 8
103G. " " 2" " " " " "	"	0 6
103H. " " 1 1/2" " " " " "	"	0 5
104. Shuttles	for looms	each 6 0
105. Reed Hooks	"	0 6
106. Cloth Rollers	"	2 0
106A. Sand	"	2 3
107. Tables for Designing Machines	"	1 6

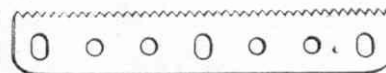


(108)



(109)

No.	s.	d.
108. Architraves	each	0 3
109. Face Plates 2 1/2" diam.	"	0 6



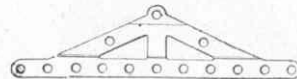
No.	s.	d.
110. Rack Strips, 3 1/2"	each	0 3



No.	s.	d.
111. Bolts, 1/2"	each	0 1 1/2
111A. " 1"	2 for	0 1 1/2
111B. " 1 1/2"	doz.	0 6



No.	s.	d.
112. Double Angle Strips, 2 1/2" x 1 1/2"	1/2 doz.	1 3
112A. " " 3" x 1 1/2"	"	1 6



No.	s.	d.
113. Girder Frames	each	0 3



(114)



(115)

No.	s.	d.
114. Hinges	per pair	0 6
115. Threaded Pins	each	0 3



(120)

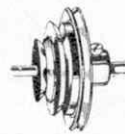


(121)

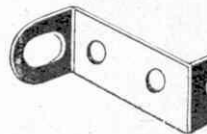


(122)

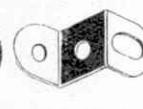
No.	s.	d.
120. Buffers	each	0 3
120A. Spring Buffer	pair	1 0
121. Train Couplings	each	0 6
122. Miniature Loaded Sacks	"	0 3



No.	s.	d.
123. Cone Pulleys	each	2 0

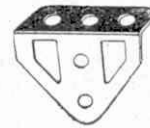


(124)

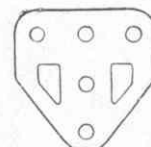


(125)

No.	s.	d.
124. Reversed Angle Brackets, 1"	1/2 doz.	1 3
125. " " 1 1/2"	"	0 9



(126)

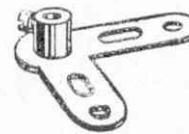


(126A)

No.	s.	d.
126. Trunnions	each	0 4
126A. Flat Trunnions	"	0 3



(127)

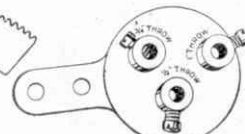


(128)

No.	s.	d.
127. Simple Bell Cranks	each	0 4
128. Boss Bell Cranks	"	0 6



(129)



(130)

No.	s.	d.
129. Rack Segments, 3" diam.	each	0 9
130. Triple Throw Eccentrics	"	2 0

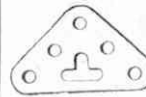


(131)



(132)

No.	s.	d.
131. Dredger Buckets	each	0 3
132. Flywheels, 2 1/2" diam.	"	3 6

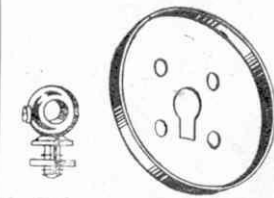


(133)



(134)

No.	s.	d.
133. Corner Brackets	each	0 5
134. Crank Shafts, 1" stroke	"	0 5
135. Theodolite Protractors	"	0 4



(136)



(137)

No.	s.	d.
136. Handrail Supports	each	0 5
137. Wheel Flanges	"	0 6
138. Ships' Funnels	"	0 6

MECCANO PRICE LIST

MECCANO OUTFITS

No. 0 Meccano Outfit	...	...	...	...	7/6
" 1	"	"	...	...	12/6
" 2	"	"	...	...	23/-
" 3	"	"	...	...	35/-
" 4	"	"	...	...	60/-
" 5 *	"	"	(Carton)	...	80/-
" 5 *	"	"	Presentation Outfit	...	125/-
" 6	"	"	Presentation Outfit	...	210/-
" 7	"	"	"	...	540/-
Meccano Clockwork Motor	...	...	...	...	13/6
" Electric Motor	...	...	...	...	18/6

ACCESSORY OUTFITS

No. 0A Meccano Outfit	...	...	...	...	6/-
" 1A	"	"	...	...	11/6
" 2A	"	"	...	...	13/-
" 3A	"	"	...	...	26/-
" 4A	"	"	...	...	20/-
" 5A *	"	"	(Carton)	...	75/-
" 5A *	"	"	(Wood)	...	120/-
" 6A	"	"	"	...	300/-
Inventor's Accessory Outfit A	...	...	...	...	12/6
" " " " B	...	...	...	...	22/6
No. X1 Meccano Electrical Outfit	...	...	...	...	18/6
" X2	"	"	"	...	65/-

* Outfits Nos. 5 and 5A are supplied in neat and well-made cardboard boxes (cartons) or in superior oak cabinets, with lock and key

Clockwork Train Price List.

HORNBY.

No. 1 Passenger Set complete	...	...	...	...	52/6
" 2 Passenger	"	"	...	...	105/-
" 1 Goods	"	"	...	...	37/6
" 2 Goods	"	"	...	...	67/6
No. 1 Locos	...	...	...	each	24/-
" Tenders	...	...	"	5/3	
" Passenger Coaches	"	9/6			
" Wagons	...	...	"	5/6	
No. 2 Locos	...	...	...	each	45/-
" Tenders	...	...	"	6/-	
" Pullman or Dining Cars	"	24/-			
" Wagons	...	...	"	5/6	

ZULU.

Passenger Set complete,	37/6
Goods	" " 27/6
Locos	... .. each 15/6
Tenders	... .. " 3/9
Passenger Coaches	" 7/6
Wagons	... .. " 4/6
Zulu Tank Locos...	" 18/-

MECCANO IS MORE THAN A TOY

IT is important to remember that when a boy is playing with Meccano he is using engineering parts in miniature, and that these parts act in precisely the same way as the corresponding engineering elements would do in actual practice. No other system of model construction could, therefore, be correct. Other toys which attempt the same object by other methods must avail themselves of other constructive elements which are not correct engineering elements. Consequently, though a boy may succeed in building playthings with them, they are merely toys, and nothing else, and his mind, as regards proper mechanical construction and methods, is distorted instead of instructed. He thus learns wrong principles, and when his ambition tempts him to invent or construct more elaborate models he will be stopped by the deficiencies of his non-mechanical system.

No Outfit is genuine unless it bears the
trade mark MECCANO