

MECCANO



AMERICAN TRADE MARK 83171
CANADIAN TRADE MARK 55 Fol. 13476

MANUAL *of* INSTRUCTIONS

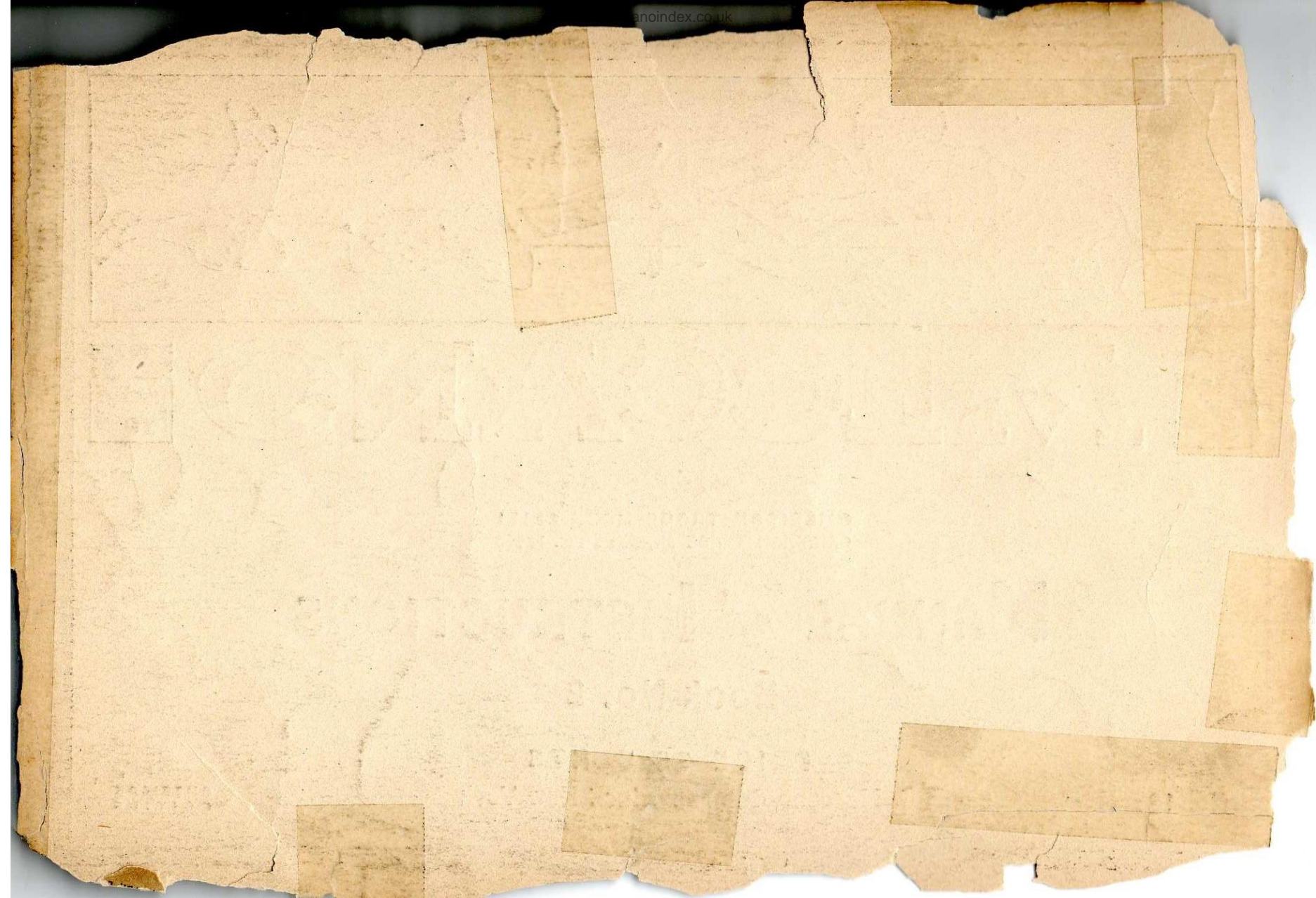
Book No. 2

PRICE 35 CENTS

Meccano Company, Inc., New York

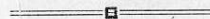
No. 18

AMERICAN
EDITION



MECCANO

HORNBY'S ORIGINAL SYSTEM, FIRST PATENTED 1901



Patents and Designs

United States of America

810,148 JANUARY 16, 1906
1,079,245 NOVEMBER 18, 1913
1,161,131 NOVEMBER 23, 1915
1,166,688 JANUARY 4, 1916

Design Patent

49,308 JULY 4, 1916
FURTHER PATENTS PENDING

Canada

151,243 OCTOBER 21, 1913
156,296 JUNE 16, 1914
158,101 SEPTEMBER 29, 1914

FURTHER PATENTS PENDING

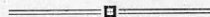


Great Britain

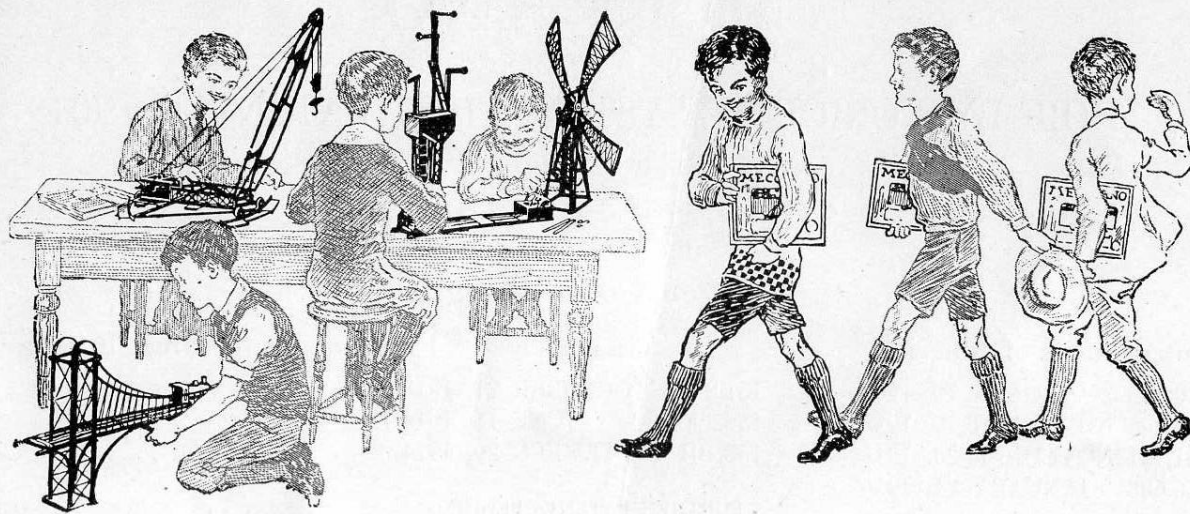
577,272
577,207
648,958

22,962--13
20,535--13
21,117--12
4564--15

2085--11
4183--14
3869--14
103,537--17



PATENTED THROUGHOUT THE WORLD



100 New Meccano Models

THIS book contains an entirely new series of Meccano Models, and it forms a splendid addition to the regular 140 page Meccano Manual, with its 326 models. Many of the new models have been designed by our own staff of skilled model builders, who are experimenting with new parts and models all the time; others have been suggested by men whose profession is engineering, and whose hobby is Meccano model building; many of them are the pick of the models which have been sent in to compete for the big prizes in the Grand

100 New Meccano Models—*Continued*

Meccano Competitions. We have hundreds more new models which are being perfected, and all Meccano boys should look out for these in future editions of the Meccano Manual.

MECCANO FOR SCIENTIFIC BOYS

The scientific and educational side of Meccano is going ahead at a great pace. Boys everywhere are using Meccano to make experiments in mechanical problems, and teachers are finding in it an easy and effective means of imparting engineering knowledge to students. We are illustrating in this manual a few choice scientific examples which any boy will find pleasure in constructing, whether he is interested in mechanics or not.



THE MECCANO MAGAZINE

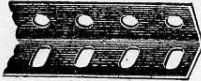
If you are not a regular reader of the **Meccano Magazine**, you are missing a lot of the fun of the Meccano hobby. It contains all kinds of useful "hints" to Meccano boys on model-building, essays and letters from Meccano boys, useful articles written specially for boys, announcements of new competitions and lists of prize-winners. It is a live magazine for live boys. Write to the Editor, **Meccano Magazine**, for a specimen copy, which will be sent to you free. The next three issues will be sent to you gratis on receipt of 6 cents in stamps to cover postage.

IMPORTANT NOTICE.—In some of the models throughout this manual we have made use of the Meccano Braced Girder, large wheels, sprocket wheels and chain, etc., which are only supplied in the Inventor's Accessory Outfit, or as separate parts. We have employed these parts, as they improve the appearance and working of models, and they also form a suggestion for the use of the Inventor's Accessory Outfit; but in every case the same models may be effectively built with the parts contained in the regular Meccano outfits.

MECCANO COMPANY, Inc.
Building 10, Bush Terminal, Brooklyn, N. Y.

Prices of Meccano Accessory Parts

No.			Cents
1.	Perforated Strips, 12½" long	½ doz.	45
2.	" " 5½" "	"	25
3.	" " 3½" "	"	20
4.	" " 3" "	"	20
5.	" " 2½" "	"	15
6.	" " 2" "	"	15
6A.	" " 1½" "	"	15



7.	Angle Girders	24½" long	each	25
7A.	"	18½" "	"	20
8.	"	12½" "	½ doz.	60
9.	"	5½" "	"	45



10.	Flat Brackets	½ doz.	05
-----	---------------	----	----	--------	----



11.	Double Brackets	each	03
-----	-----------------	----	----	------	----



12.	Angle Brackets	doz.	10
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12A.	Angle Brackets, 1"	each	
------	--------------------	----	----	------	--



13.	Silver Steel Axle Rods, 11½" long,	each	10
13A.	Axle Rods, 8" long	..	10
14.	" 6" "	..	05
15.	" 5" "	..	05
15A.	" 4½" "	..	05
16.	" 3½" "	..	05
17.	" 2" "	..	02
18A.	" 1" "	..	02

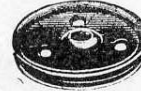
No.			
19.	Crank Handles	..	each 10



19A.	Wheels,	3 in. diam.	..	each	20
19B.	Pulley Wheels	" with set screw	"	"	25



20.	Flanged and Grooved Wheels,	each	25
-----	-----------------------------	------	----



Pulley Wheels.				
20A.	2" dia., with set screw	..	each	20
21.	1½" " " "	..	"	20
22.	1" " " "	..	"	10
22A.	1" " without " "	..	"	05
23.	½" " " "	..	"	03
23A.	½" " with " "	..	"	10



24.	Bush Wheels	each	15
-----	-------------	----	----	------	----



25.	Pinion Wheels, ¾" diam.	..	each	25
26.	" ½" "	..	"	15



Gear Wheels.				
27.	50 teeth to gear with ¾" pinion	each	30	
27A.	56 teeth to gear with ½" pinion	each	35	



No.			
28.	Contrate Wheels, 1½" diam.	each	50
29.	" " ¾" "	"	30



32.	Worm Wheels	each	25
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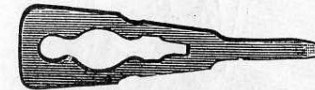
33.	Pawls	each	05
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34.	Spanners	each	10
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35.	Spring Clips	..	per box (doz.)	15	
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36.	Screw Drivers	each	10
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37.	Nuts and Bolts	per box (doz.)	12	
37A.	Nuts	..	"	05
38.	Washers	..	doz.	05
40.	Hanks of Cord	..	each	03

Prices of Meccano Accessory Parts---Continued



- No. 41. Propeller Blades .. per pair 15 Cents



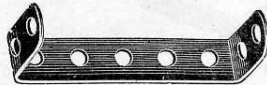
43. Springs each 05



44. Cranked Bent Strips each 05



45. Double Bent Strips each 05



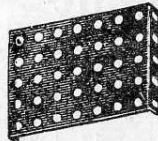
46. Large Bent Strips each 05



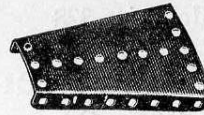
- 47A. Dynameters (tension) each 1.50



50. Eye pieces each 05



52. Perforated Flanged Plates, $5\frac{1}{2}$ " x $2\frac{1}{2}$ " .. each 25
53. " " " $3\frac{1}{2}$ " x $2\frac{1}{2}$ " .. each 20



- No. 54. Perforated Sector Plates .. each 20
56. Instruction Manuals .. " 35
56A. Instruction Manuals, No. 2 " 35



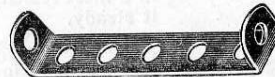
57. Hooks each 01
57A. Hooks (Scientific) each 01



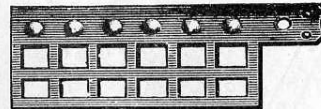
58. Spring Cords per length 30



59. Collars with Set Screws .. each 05



60. Bent Strips, $2\frac{1}{2}$ " long .. per $\frac{1}{2}$ doz. 20



61. Windmill Sails each 10



62. Cranks each 15

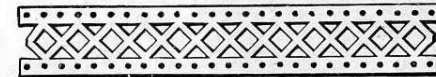
- No. 63. Couplings each 15
65. Centre Forks " 10
66. Weights, 50 gramme " 20
67. " 25 " 15
68. Wood Screws, $\frac{1}{2}$ " doz. 10
69. Set Screws " 10
69A. Grub Screws " 10
70. Flat Plates, $5\frac{1}{2}$ " x $2\frac{1}{2}$ " .. each 15
72. " " $2\frac{1}{2}$ " x $2\frac{1}{2}$ " .. " 10
80. Screwed Rods, 5" " 15
81. " 2" " 10
82. " 1" " 05



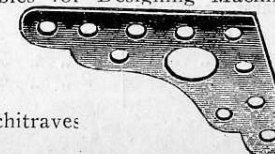
90. Curved Strips, $2\frac{1}{2}$ " .. $\frac{1}{2}$ doz. 25
94. Sprocket Chain per yard 25



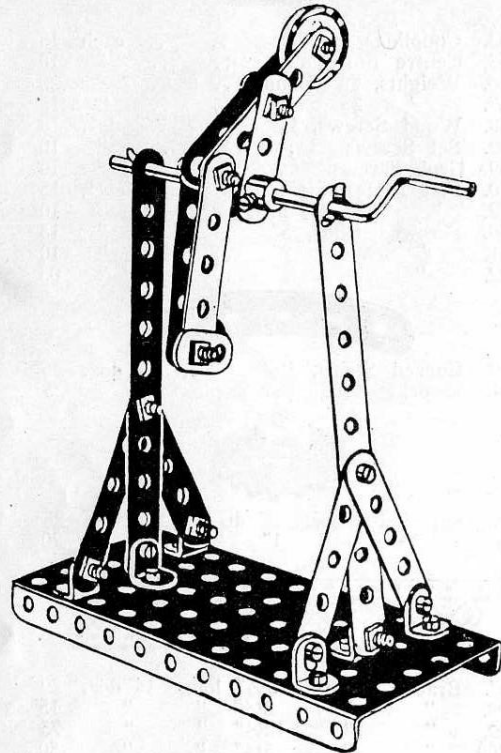
95. Sprocket Wheels, 2" diam. .. each 25
96. " 1" " .. " 20



97. Braced Girders, $3\frac{1}{2}$ " long $\frac{1}{2}$ doz. 20
98. " " $2\frac{1}{2}$ " " " 15
99. " " $12\frac{1}{2}$ " " " 75
100. " " $5\frac{1}{2}$ " " " 50
101. Healds .. for Looms doz. 45
102. Single Bent Strips .. each 05
103. Flat Girders, $5\frac{1}{2}$ " .. " 10
104. Shuttles .. " 50
105. Reed Hooks .. " 05
106. Rollers .. " 10
107. Tables for Designing Machines " 25



108. Architraves .. each 05



Model No. 327

The Acrobat

(Outfit No. 3)

Parts Required :

2 of No. 2	1 of No. 19	21 of No. 37
8 " " 5	1 " " 22A	1 " " 52
2 " " 10	2 " " 35	2 " " 62
6 " " 12		

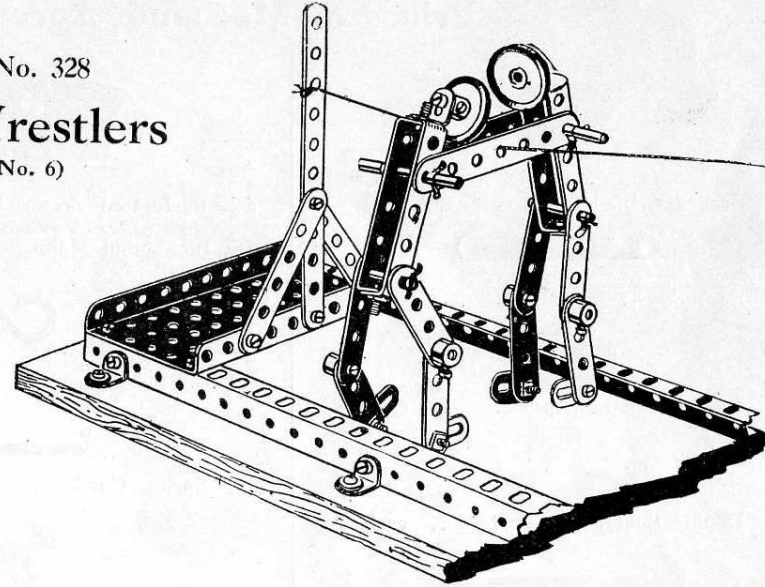
Model No. 328

The Wrestlers

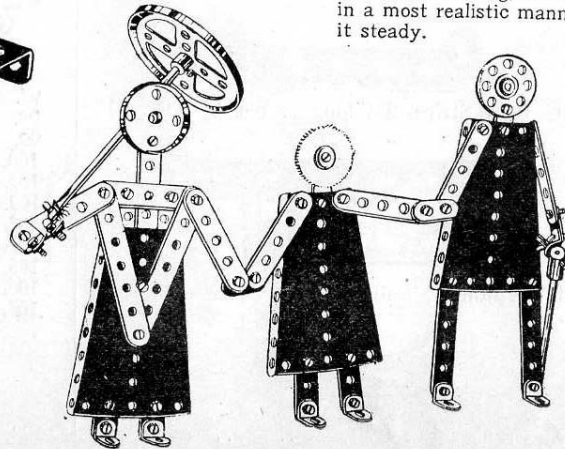
(Outfit No. 6)

Parts Required :

1 of No. 2	2 of No. 18A
2 " " 3	2 " " 22
2 " " 4	8 " " 35
8 " " 6	18 " " 37
2 " " 8	1 " " 52
4 " " 10	4 " " 59
8 " " 12	4 " " 60
2 " " 17	



Boys will at once recognise this familiar toy. When the cord, which should be about 4ft. long, is held fairly tight, and manipulated, the figures will wrestle in a most realistic manner. The model should be mounted on a board, to keep it steady.

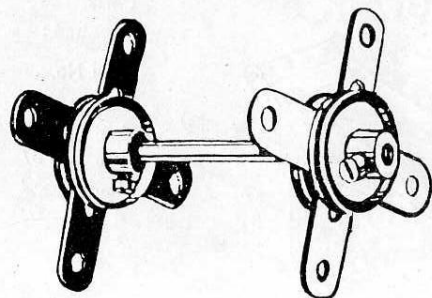


Model No. 329

The Meccano Family

Parts Required :

1 of No. 2	1 of No. 15	1 of No. 27A
2 " " 3	1 " " 15A	4 " " 35
2 " " 4	1 " " 17	34 " " 37
12 " " 5	1 " " 19A	3 " " 54
7 " " 10	1 " " 21	1 " " 63
9 " " 12	1 " " 24	

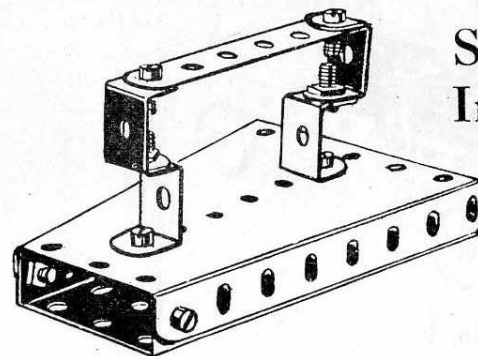


Model No. 330

Cutlery Rest

(Outfit No. 0)

Parts 4 of No. 5
 Required: 1 " " 15A
 4 " " 22

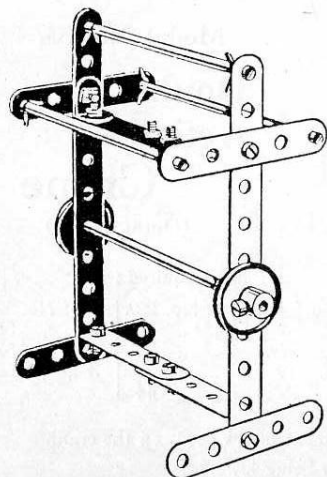


Model No. 332

Smoothing Iron

(Outfit No 2)

Parts 1 of No. 4
 Required: 4 " " 11
 8 " " 37
 2 " " 54



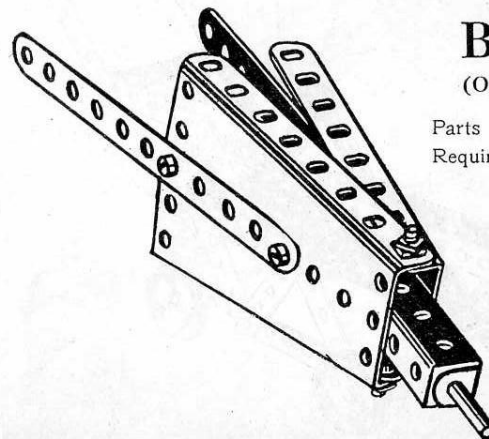
Model No. 331

Towel Rail

(Outfit No. 2)

Parts Required:

2 of No. 2	3 of No. 15A
8 " " 5	2 " " 22
4 " " 12	6 " " 35
1 " " 15	12 " " 37



Model No. 333

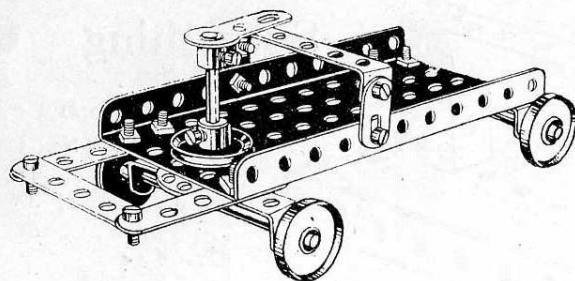
Bellows

(Outfit No. 1)

Parts 2 of No. 2
 Required: 2 " " 17
 11 " " 37
 2 " " 54
 4 " " 60

Model No. 334

Motor Van (Outfit No. 2)



Parts
Required :

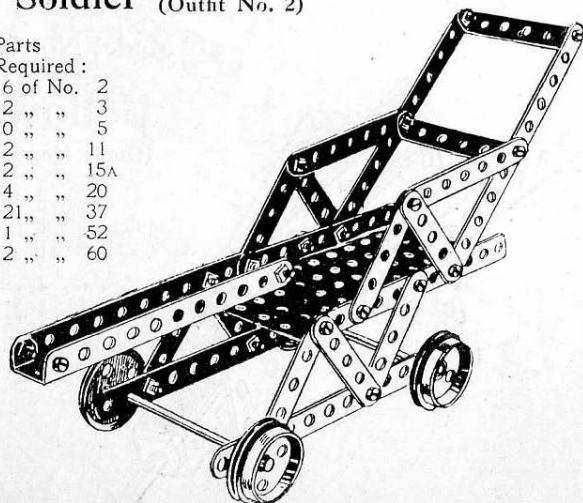
3 of No. 5
2 " " 10
2 " " 15A
3 " " 22
2 " " 22A
1 " " 24
2 " " 35
14 " " 37
1 " " 52
2 " " 60
1 " " 62

Model No. 335

Chair for Wounded Soldier (Outfit No. 2)

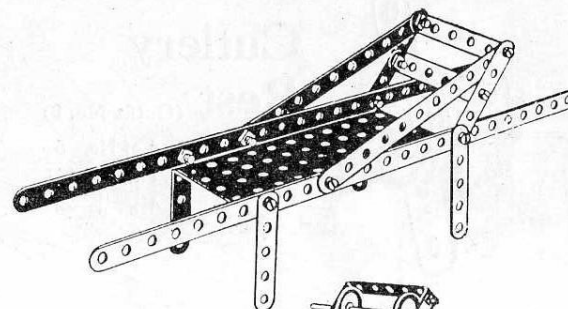
Parts
Required :

6 of No. 2
2 " " 3
10 " " 5
2 " " 11
2 " " 15A
4 " " 20
21 " " 37
1 " " 52
2 " " 60



Model No. 336

Stretcher

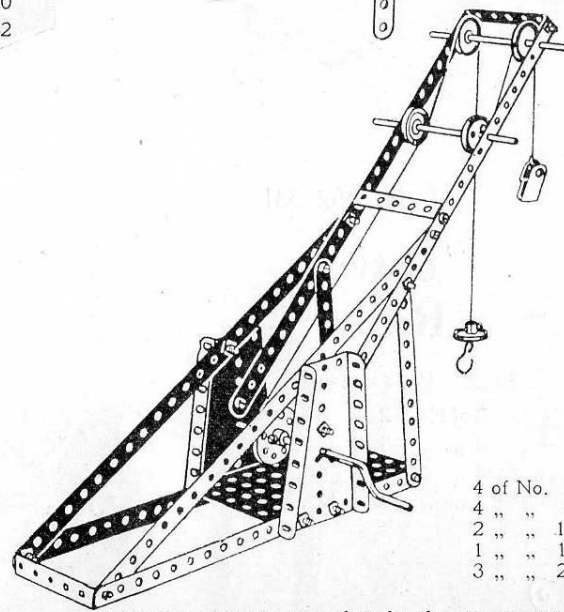


Parts
Required :

2 of No. 1
2 " " 2
6 " " 5
10 " " 37
1 " " 52
2 " " 60

Model No. 337

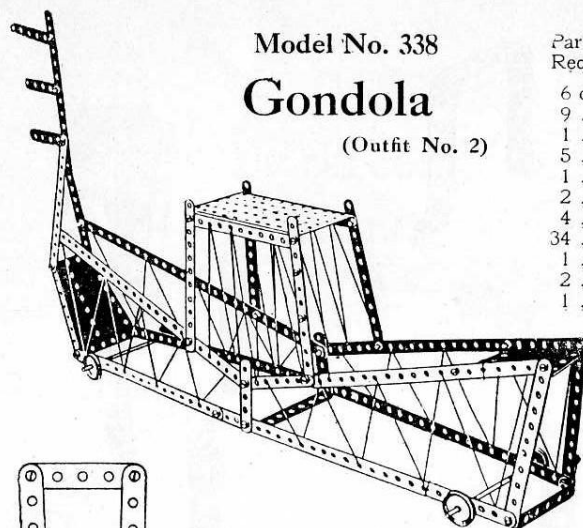
Double Action Crane (Outfit No. 1)



Parts Required :

4 of No. 1	2 of No. 22A	1 of No. 52
4 " " 2	1 " " 24	2 " " 54
2 " " 15A	4 " " 35	1 " " 57
1 " " 19	22 " " 37	3 " " 60
3 " " 22	1 " " 44	

A feature of this crane is that, by the arrangement of the cords on the crank handle, one load may be raised whilst the other is being lowered.



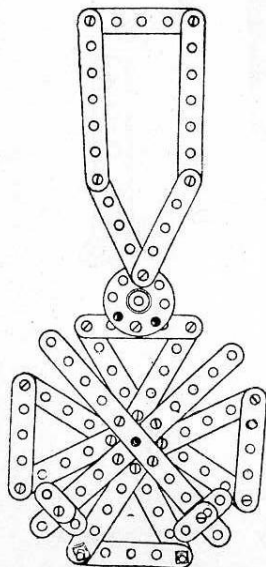
Model No. 338

Gondola

(Outfit No. 2)

Parts
Required:

6 of No.	1
9 " "	2
1 " "	3
5 " "	5
1 " "	10
2 " "	16
4 " "	22
34 " "	37
1 " "	52
2 " "	54
1 " "	60



Model No. 339

**Croix
de
Guerre**

(Outfit No. 4)

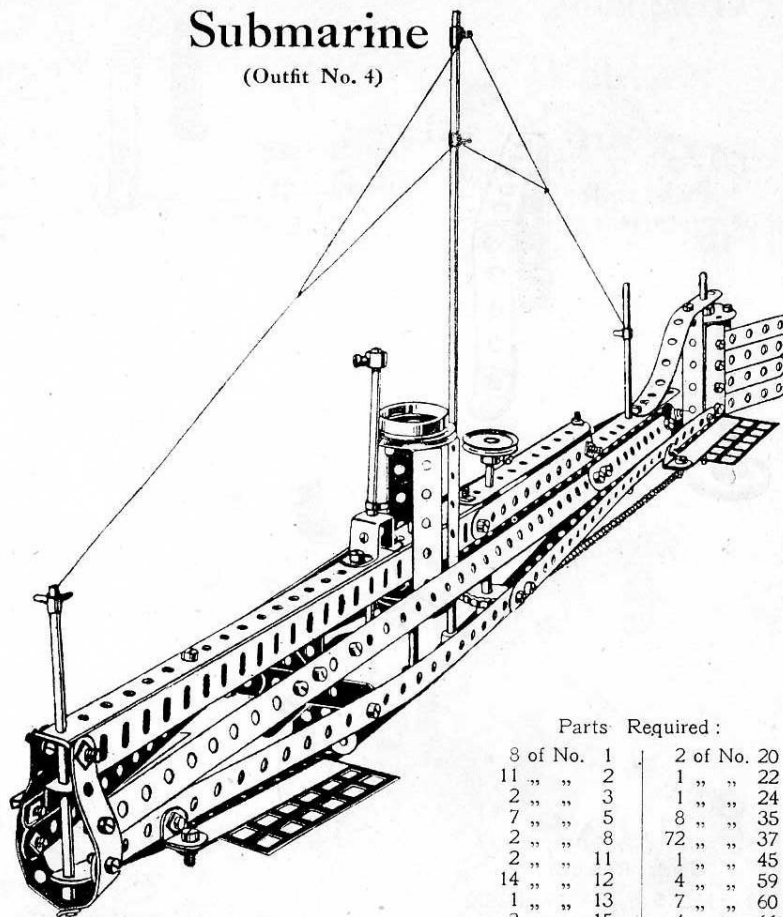
Parts
Required:

2 of No.	2
2 " "	3
15 " "	5
4 " "	10
1 " "	24
24 " "	37

Model No. 340

Submarine

(Outfit No. 4)



Parts Required:

3 of No.	1	2 of No.	20
11 " "	2	1 " "	22
2 " "	3	1 " "	24
7 " "	5	8 " "	35
2 " "	8	72 " "	37
2 " "	11	1 " "	45
14 " "	12	4 " "	59
1 " "	13	7 " "	60
3 " "	15	4 " "	61
2 " "	15A	2 " "	94
1 " "	16	2 " "	96

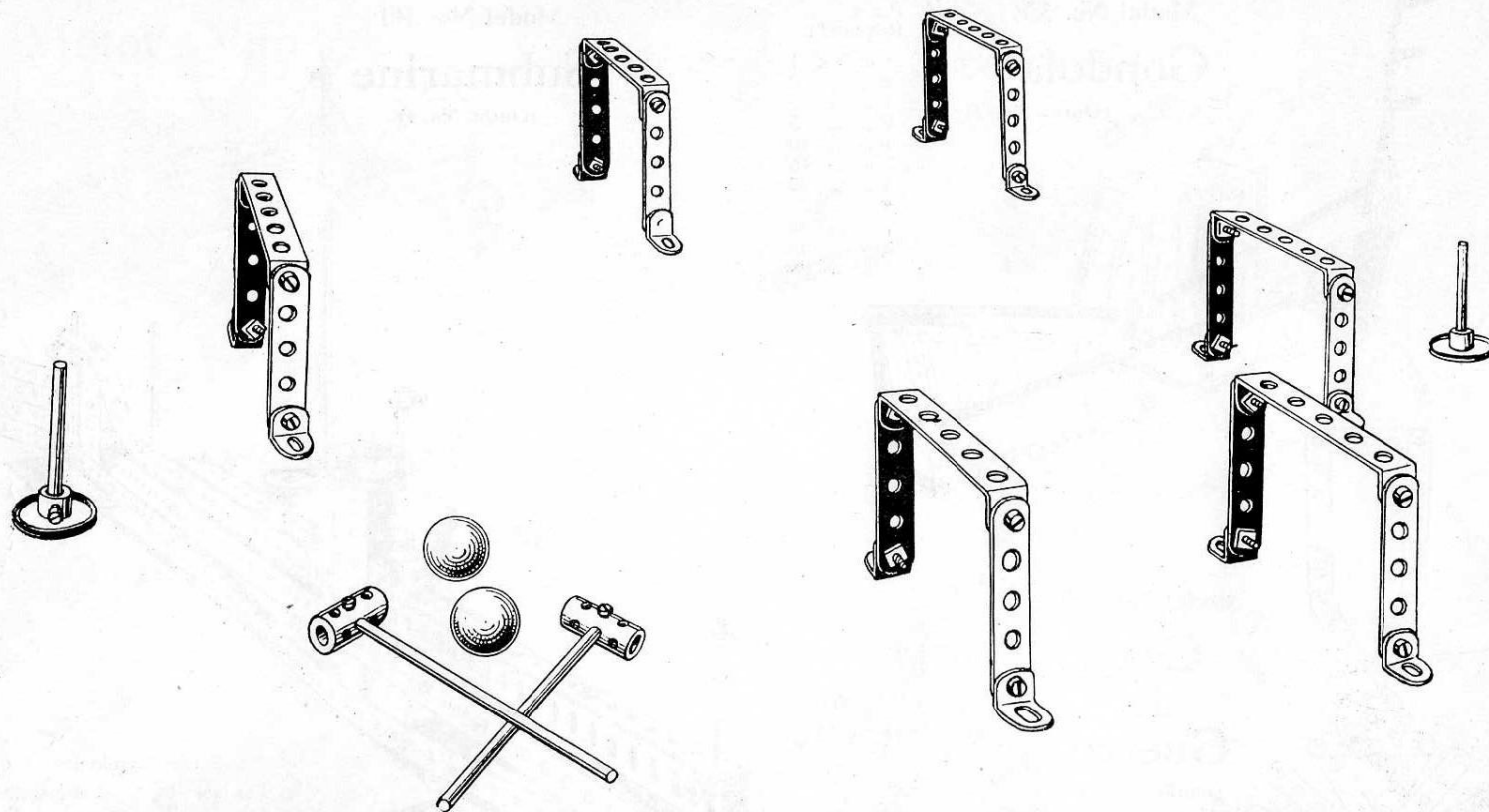


Table Croquet

12 of No. 5	2 of No. 22
12 " " 12	24 " " 37
2 " " 16	2 " " 63
2 " " 17	

A most diverting table game. Coloured marbles should be used for the balls. Full instructions for playing croquet may be obtained from any sports or games dealer.

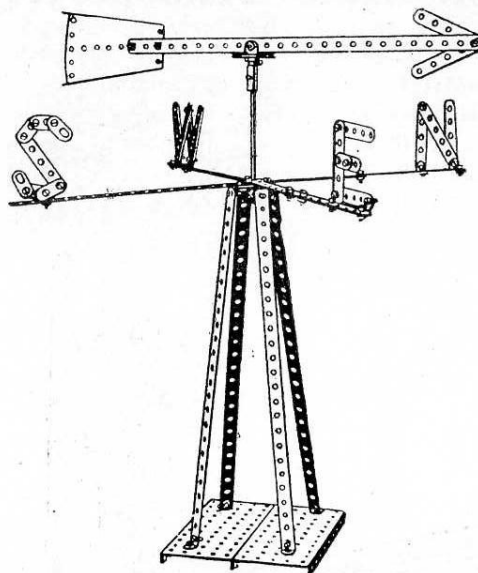
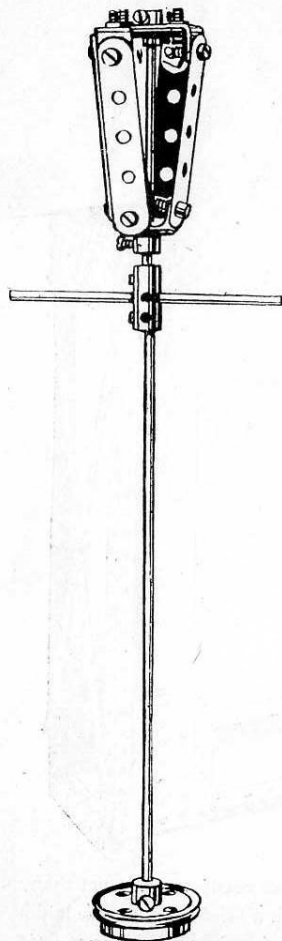
Model No. 342

Street Lamp

(Outfit No. 3)

Parts Required :

4 of No. 5	1 of No. 20
2 " " 11	1 " " 24
4 " " 12	12 " " 37
1 " " 13	1 " " 59
2 " " 16	1 " " 63



Model No. 343

Weather Vane

(Outfit No. 3)

Parts Required :

7 of No. 1	17 of No. 12	50 of No. 37
2 " " 2	1 " " 15	2 " " 52
13 " " 5	1 " " 21	1 " " 54
7 " " 10	1 " " 24	1 " " 63

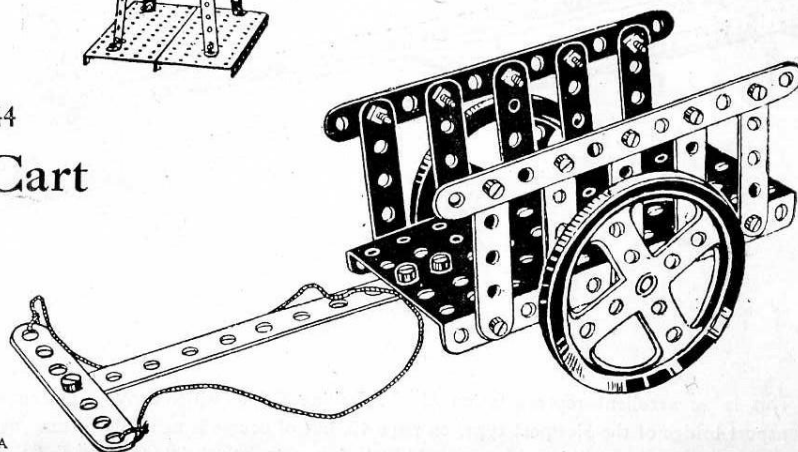
Model No. 344

Bullock Cart

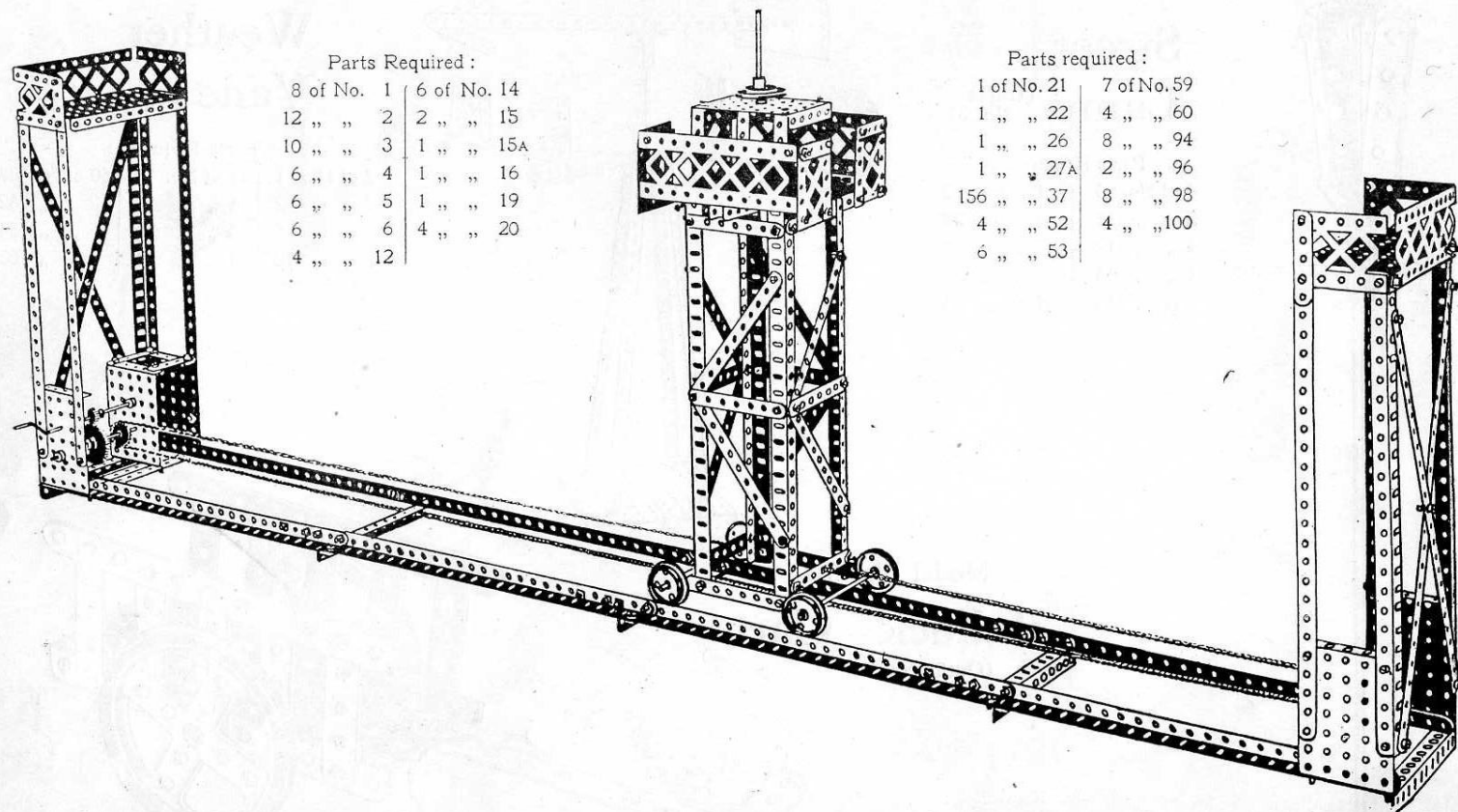
(Outfit No. 2)

Parts Required :

3 of No. 1	1 of No. 16
1 " " 3	2 " " 19A
10 " " 5	21 " " 37



Model No. 345 St. Malo Transporter Bridge (Outfit No. 6)



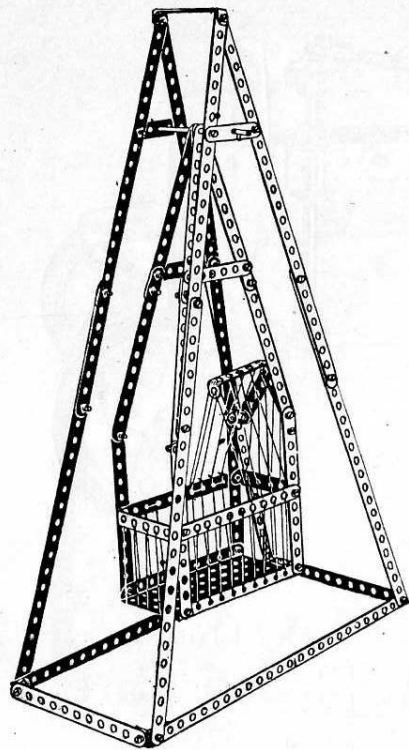
Parts Required :

8 of No. 1	6 of No. 14
12 " " 2	2 " " 15
10 " " 3	1 " " 15A
6 " " 4	1 " " 16
6 " " 5	1 " " 19
6 " " 6	4 " " 20
4 " " 12	

Parts required :

1 of No. 21	7 of No. 59
1 " " 22	4 " " 60
1 " " 26	8 " " 94
1 " " 27A	2 " " 96
156 " " 37	8 " " 98
4 " " 52	4 " " 100
6 " " 53	

This is an excellent representation of the Rolling Bridge which conveys passengers from St. Malo to St. Servan. It is much less costly to construct than a transport bridge of the Newport type, on page 42, but of course it can only be used over marshy land with shallow water, over which a solid track can be laid. The clever Meccano boy will know how to add little decorations to the transporter and the landing platforms, in the way of flags, &c., and make a first-class toy of this fine model.



Model No. 346
Swinging Cot

(Outfit No. 2)

Parts Required :

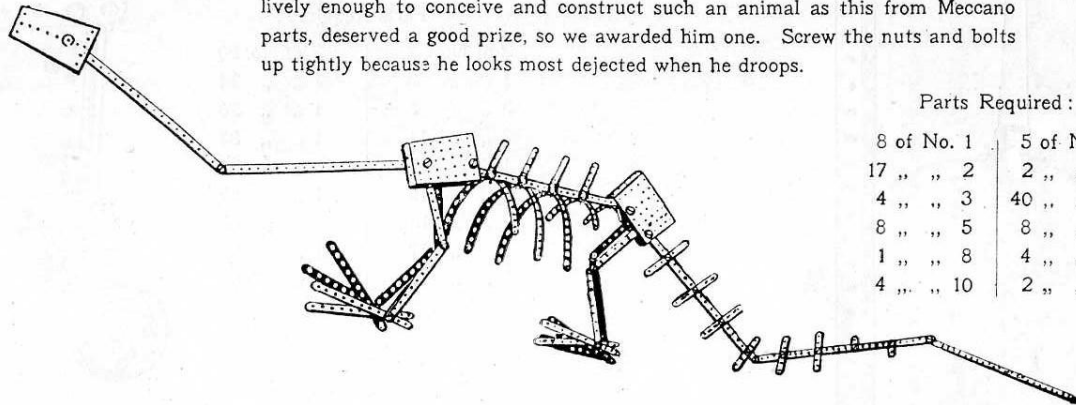
10 of No. 1	6 of No. 12	46 of No. 37
16 " " 2	1 " " 15A	1 " " 52
2 " " 4	2 " " 35	4 " " 60
4 " " 5		

Model No. 347

Diplodocus

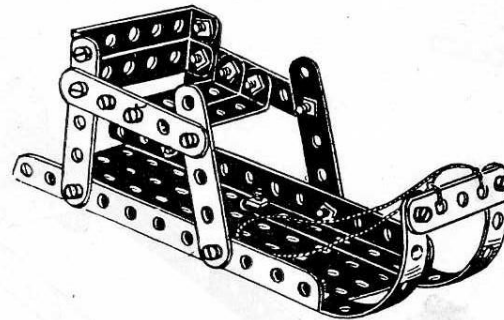
(Outfit No. 4)

This is a most extraordinary effort sent in by a young French boy to compete for one of the big prizes in our Meccano Contest. We could scarcely class it as an engineering model, but any boy with a brain clever enough and an imagination lively enough to conceive and construct such an animal as this from Meccano parts, deserved a good prize, so we awarded him one. Screw the nuts and bolts up tightly because he looks most dejected when he droops.



Parts Required :

8 of No. 1	5 of No. 17
17 " " 2	2 " " 22
4 " " 3	40 " " 37
8 " " 5	8 " " 59
1 " " 8	4 " " 53
4 " " 10	2 " " 54



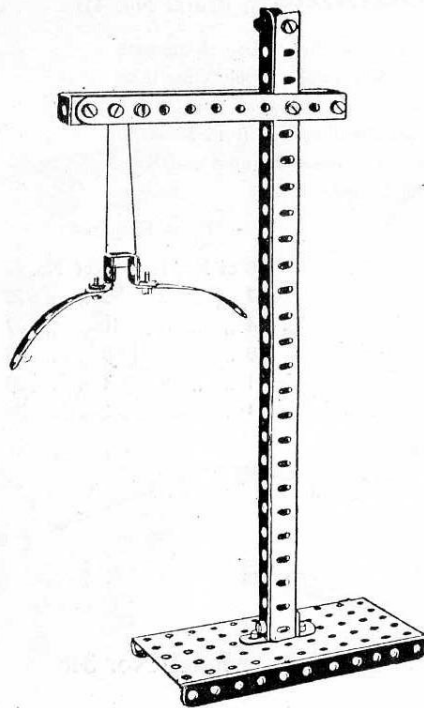
Model No. 348

Toboggan

(Outfit No. 1)

Parts Required :

2 of No. 2	1 of No. 52
7 " " 5	4 " " 60
20 " " 37	



Model No. 349

Railway Gauge

(Outfit No. 2)

Parts Required:

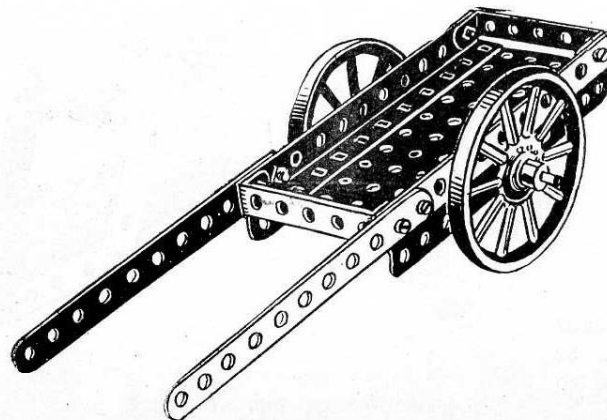
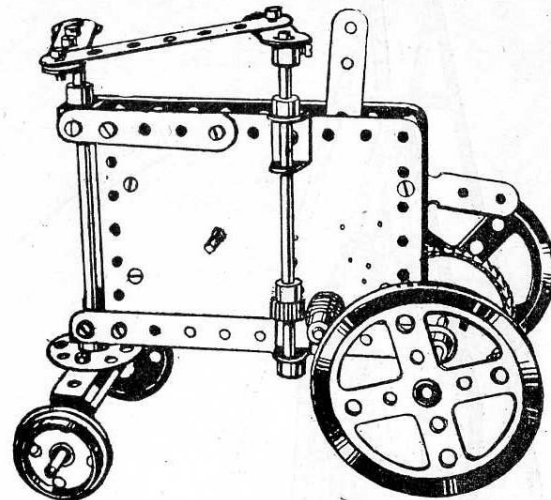
2 of No. 2	2 of No. 12
2 " " 5	18 " " 37
2 " " 8	1 " " 45
4 " " 11	1 " " 52

Model No. 350 Auto Steering Car

(Outfit No. 3)

Parts Required:

2 of No. 2	2 of No. 20
1 " " 3	1 " " 24
3 " " 5	1 " " 26
3 " " 11	1 " " 32
1 " " 12	16 " " 37
2 " " 15	1 " " 59 ₄
2 " " 15A	2 " " 62
1 " " 17	1 " " 95
2 " " 19A	1 " " 96



Model No. 351 Station Cart

(Outfit No. 0)

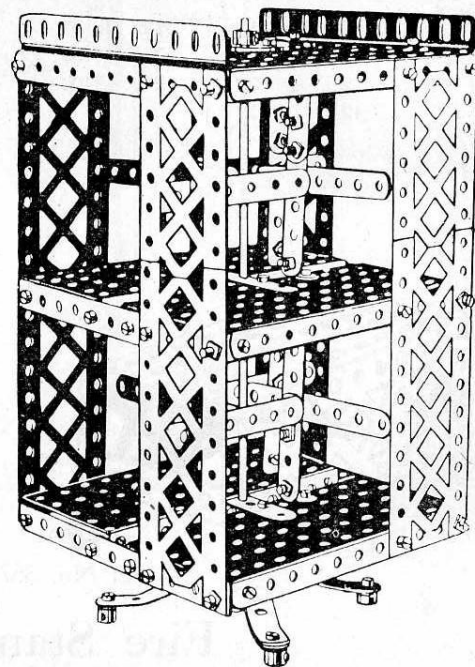
Parts Required:

4 of No. 2	10 of No. 37
4 " " 12	1 " " 52
1 " " 15A	2 " " 60
3 " " 19B	

Model No. 352

Revolving Book Case

(Outfit No. 6)



Parts Required:

10 of No. 2	2 of No. 24
8 " " 3	108 " " 37
18 " " 5	6 " " 52
2 " " 9	4 " " 59
36 " " 12	1 " " 63
1 " " 13	

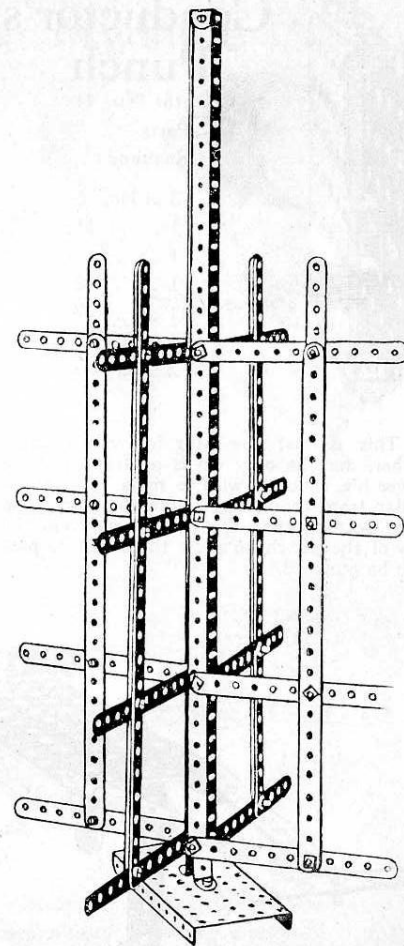
Model No. 353

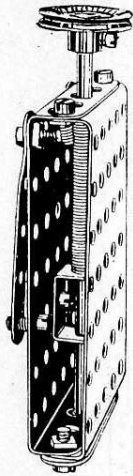
Post Card Stand

(Outfit No. 3)

Parts
Required:

8 of No. 1
16 " " 2
4 " " 8
2 " " 11
1 " " 15
36 " " 37
1 " " 45
1 " " 52
1 " " 59





Model No. 354

Conductor's Punch

(Outfit No. 4)

Parts

Required :

3 of No. 5—

1 " " 11

1 " " 15A

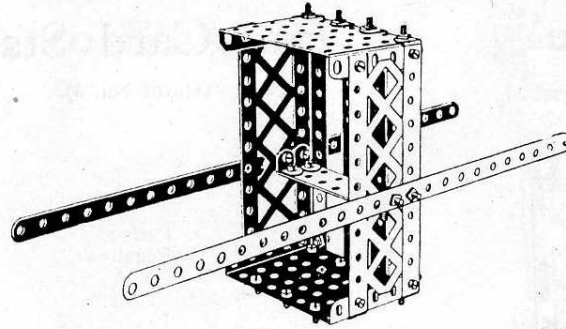
1 " " 22

11 " " 37

1 " " 43

2 " " 53

This is just the thing for your younger brother, and he only needs a strap to hang it over his shoulder with to make him into a regular tram conductor. Note the 2½ in. strip at the bottom, spaced a little away from the body of the punch, to allow the ticket to pass in to be punched.



Model No. 355

Ship Yard Bogey

(Outfit No. 0)

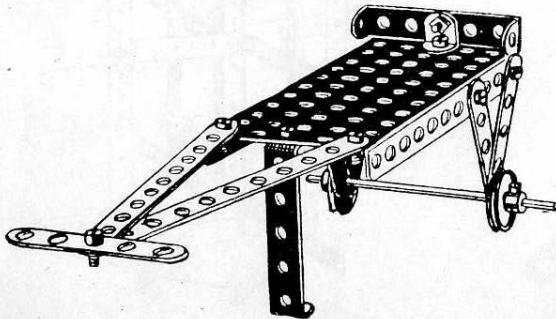
Parts Required :

2 of No. 2 | 2 of No. 22

5 " " 5 | 9 " " 37

1 " " 12 | 1 " " 52

1 " " 15A | 1 " " 60



Model No. 356

Chinese Palanquin

(Outfit No. 3)

Parts Required :

2 of No. 1

31 of No. 37

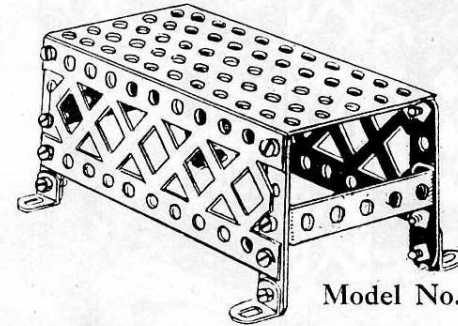
4 " " 2

2 " " 53

2 " " 3

2 " " 100

12 " " 12



Model No. 357

Fire Stand

(Outfit No. 0)

Parts Required :

4 of No. 5

1 of No. 52

4 " " 12

2 " " 60

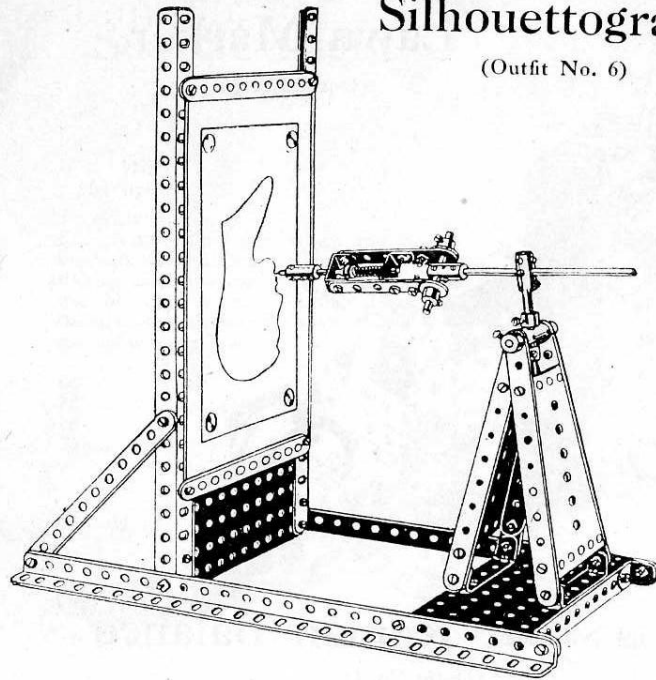
16 " " 37

2 " " 100

Model No. 358

Silhouettograph

(Outfit No. 6)



Parts Required:

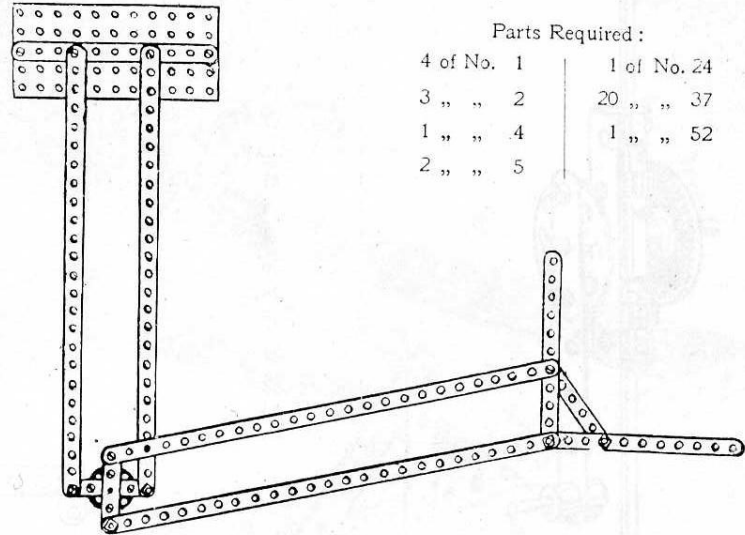
8 of No. 2	4 of No. 12	2 of No. 18A	2 of No. 54
2 „ „ 4	3 „ „ 13	42 „ „ 37	5 „ „ 59
4 „ „ 8	1 „ „ 16	1 „ „ 43	2 „ „ 62
2 „ „ 11	2 „ „ 17	2 „ „ 52	6 „ „ 63

The writing arm should be about 3ft. long. The person to be silhouetted should sit with his profile exactly opposite the centre of the writing board, upon which a sheet of plain paper has been fixed. The writing arm is then passed smoothly round the profile.

Model No. 359

Drafting Machine

(Outfit No. 3)



Parts Required:

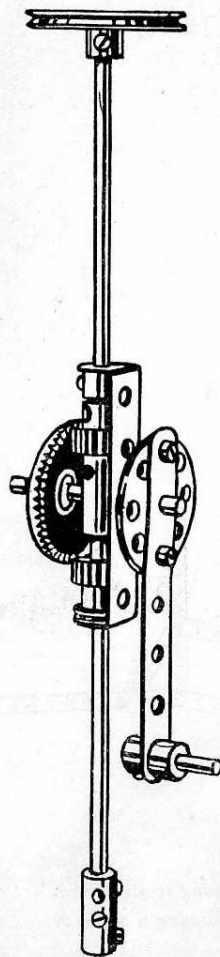
4 of No. 1	1 of No. 24
3 „ „ 2	20 „ „ 37
1 „ „ 4	1 „ „ 52
2 „ „ 5	

This is an instrument used by draughtsmen for drawing straight lines at any angle and in any part of the board, also for producing a series of horizontal and vertical parallel lines.

Model No. 360

Breast Drill

(Outfit No. 4)

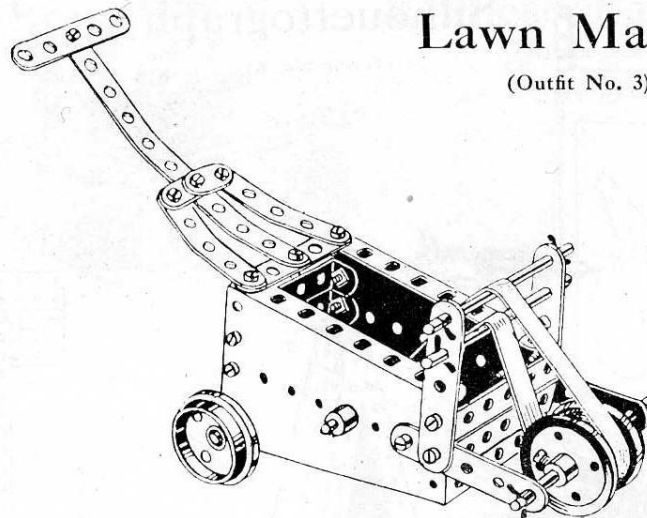
Parts
Required :

1 of No. 3
2 " " 15
1 " " 17
1 " " 18A
1 " " 21
1 " " 23
1 " " 24
2 " " 26
1 " " 28
2 " " 37
3 " " 59
1 " " 60
2 " " 63

Model No. 361

Lawn Marker

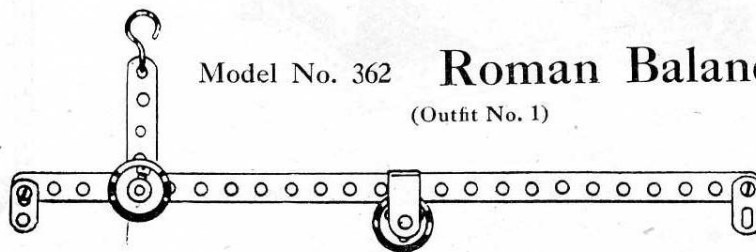
(Outfit No. 3)

Parts
Required :

1 of No. 2
8 " " 5
2 " " 10
3 " " 15A
2 " " 16
4 " " 20
6 " " 35
25 " " 37
1 " " 53
2 " " 54
2 " " 59
5 " " 60

Model No. 362 **Roman Balance**

(Outfit No. 1)

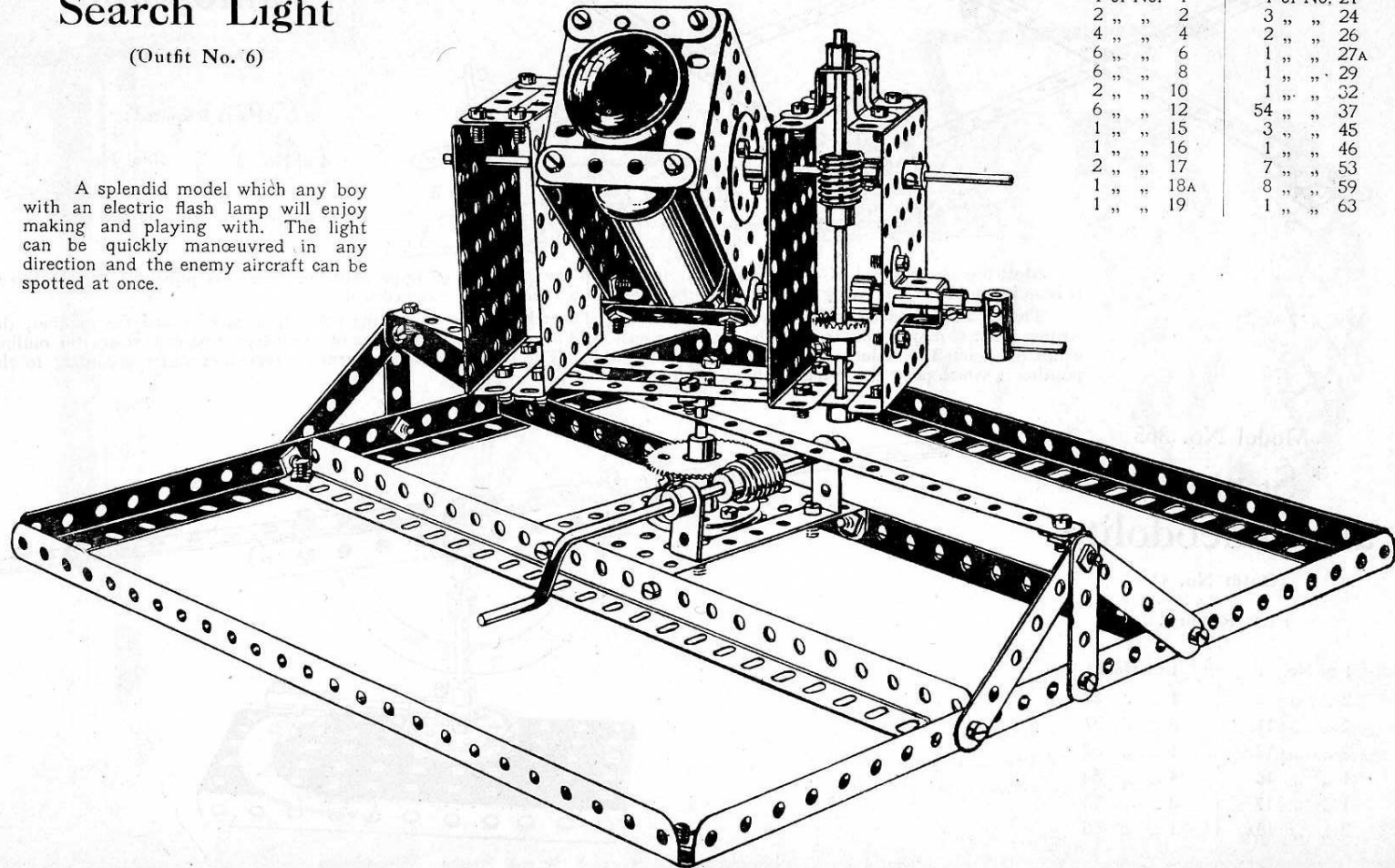


Parts Required :

1 of No. 1	2 of No. 22	1 of No. 44
2 " " 5	1 " " 22A	1 " " 57
2 " " 10	4 " " 37	

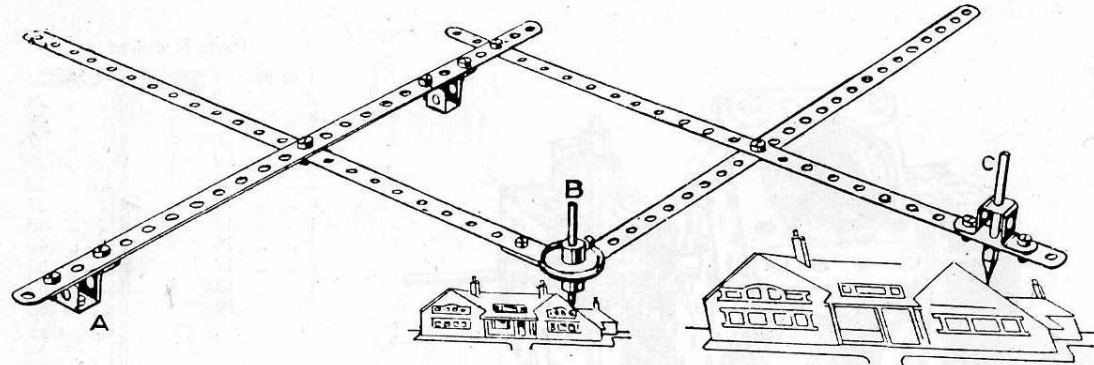
Model No. 363
Search Light
 (Outfit No. 6)

A splendid model which any boy with an electric flash lamp will enjoy making and playing with. The light can be quickly manoeuvred in any direction and the enemy aircraft can be spotted at once.



Parts Required :

1 of No. 1	1 of No. 21
2 " " 2	3 " " 24
4 " " 4	2 " " 26
6 " " 6	1 " " 27A
6 " " 8	1 " " 29
2 " " 10	1 " " 32
6 " " 12	54 " " 37
1 " " 15	3 " " 45
1 " " 16	1 " " 46
2 " " 17	7 " " 53
1 " " 18A	8 " " 59
1 " " 19	1 " " 63



Model No. 364

Pantograph

(Outfit No. 6)

Parts Required :

4 of No. 1	10 of No. 37
1 " " 17	3 " " 45
1 " " 22	1 " " 62

Most boys have heard of the Pantograph, but not many have had an opportunity of seeing its principles demonstrated. It is an instrument for copying plans, &c., on the same or on a reduced or enlarged scale.

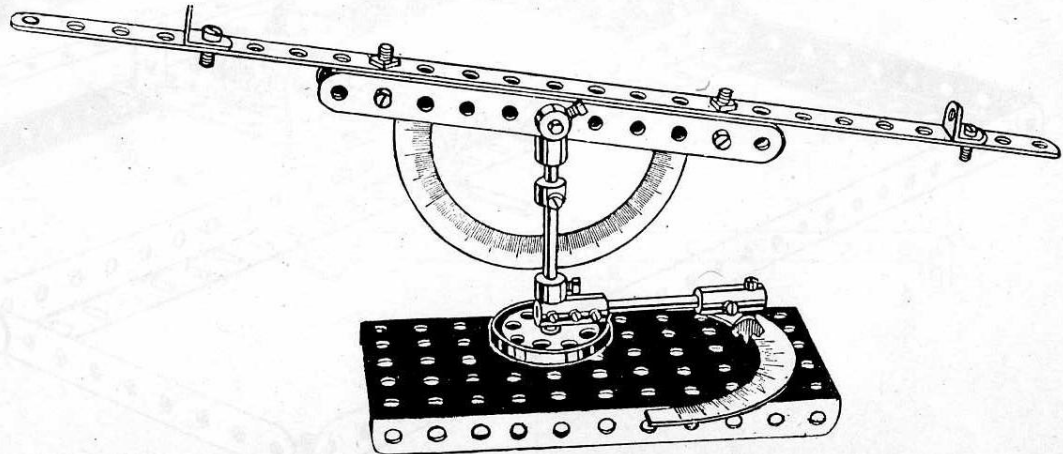
The apparatus is fixed at the point A. If an enlarged sketch is to be made, the point B is traced round the outlines, the writing point C reproducing the sketch on a larger scale. When a reduced drawing is to be made, the point C traces the outline, whilst the point B reproduces the sketch on a smaller scale. The degree of enlargement or reduction varies according to the position in which point C is fixed on the perforated arm.

Model No. 365 Sextant and Theodolite

(Outfit No. 4)

Parts Required :

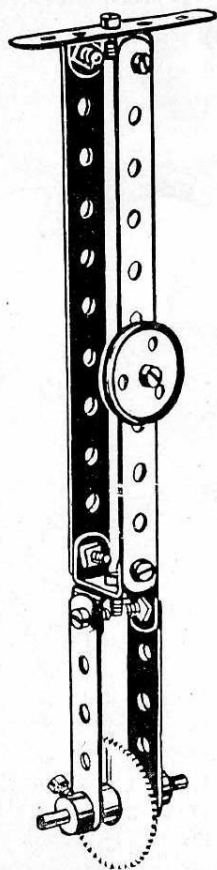
1 of No. 1	1 of No. 21
2 " " 2	1 " " 22
2 " " 11	8 " " 37
2 " " 12	1 " " 52
1 " " 16	4 " " 59
1 " " 17	3 " " 63
2 " " 18A	1 " " 65



Model No. 366

Pastry Designer

(Outfit No. 4)



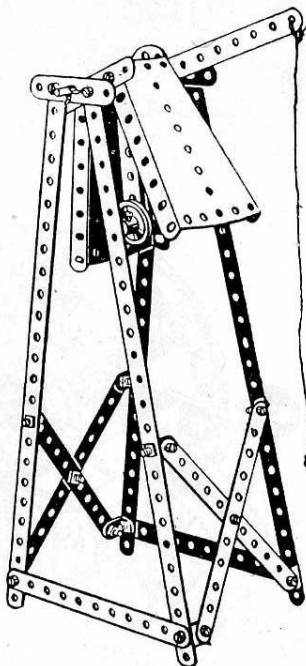
Parts
Required :

2 of No. 2
3 " " 5
3 " " 11
1 " " 17
1 " " 22A
1 " " 27
7 " " 37
2 " " 59

Model No. 367

Fire Alarm

(Outfit No. 1)

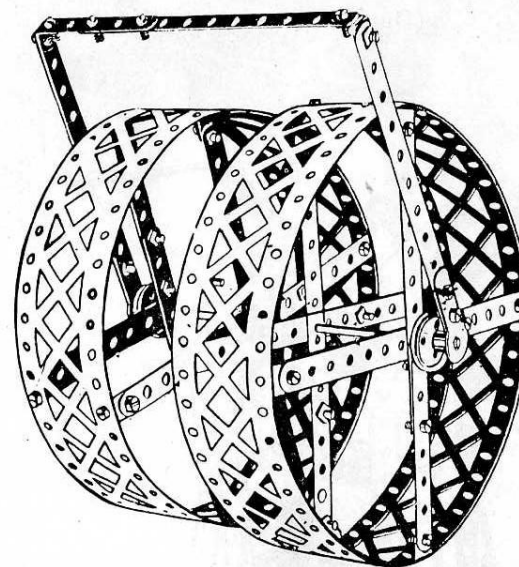


Parts Required :

4 of No. 1	1 of No. 22
7 " " 2	1 " " 24
1 " " 3	4 " " 35
3 " " 5	26 " " 37
8 " " 12	2 " " 54
1 " " 15A	

Model No. 368

Child's Joy Wheel

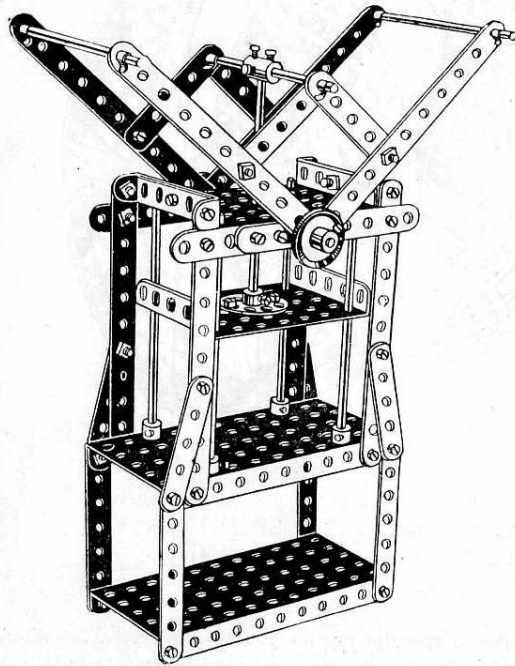


Parts Required :

11 of No. 2	2 of No. 16	2 of No. 62
4 " " 3	2 " " 22	1 " " 63
5 " " 5	2 " " 22A	4 " " 99
18 " " 12	54 " " 37	

This makes a splendid toy for your young brother or sister.
It can be decorated by threading coloured ribbons through the
holes, or with coloured streamers.

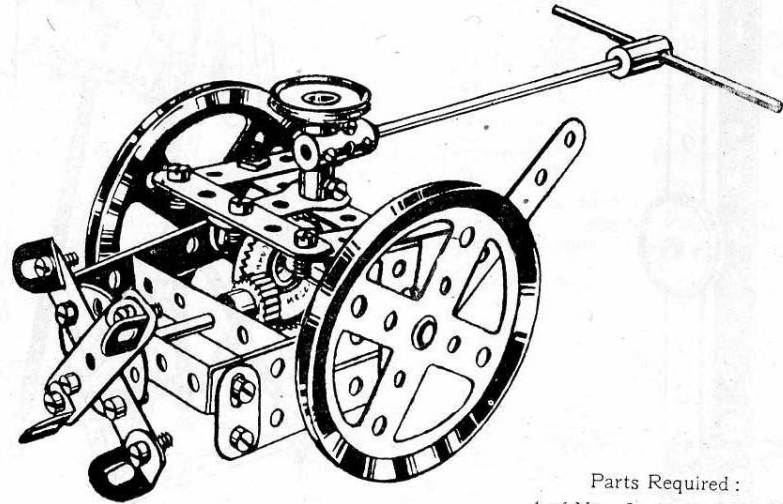
Model No. 369
Bale Press
 (Outfit No. 3)



Parts
 Required :

10 of No.	2
4 " "	3
8 " "	5
4 " "	15
3 " "	15A
2 " "	17
2 " "	22
1 " "	24
14 " "	35
36 " "	37
2 " "	52
2 " "	53
4 " "	59
2 " "	60
2 " "	62
1 " "	63

Model No. 370
Potato Reaper
 (Outfit No. 4)



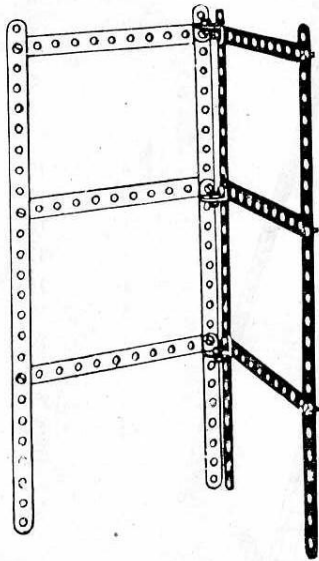
Parts Required :

1 of No. 3	1 of No. 24
8 " " 5	1 " " 26
2 " " 10	1 " " 23
4 " " 12	19 " " 37
1 " " 15	1 " " 46.
2 " " 16	1 " " 59
1 " " 17	2 " " 60
1 " " 18A	1 " " 62
2 " " 19A	2 " " 63
1 " " 22	

Model No. 371

Clothes Horse

(Outfit No. 1)



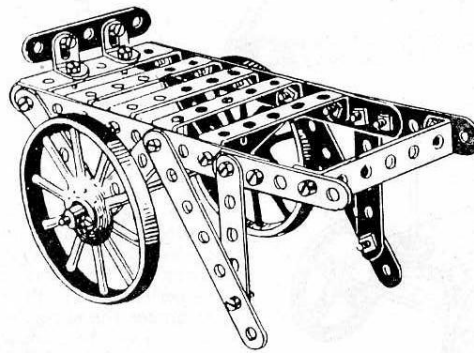
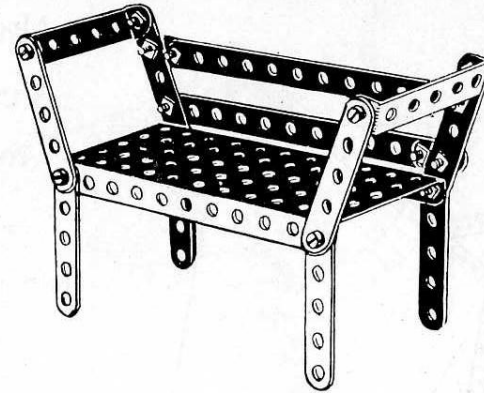
Model No. 372

Settee

(Outfit No. 0)

Parts Required :

2 of No. 2	13 of No. 37
8 " " 5	1 " " 52
3 " " 10	2 " " 60



Model No. 373

Market Gardener's Truck

(Outfit No. 2)

Parts Required :

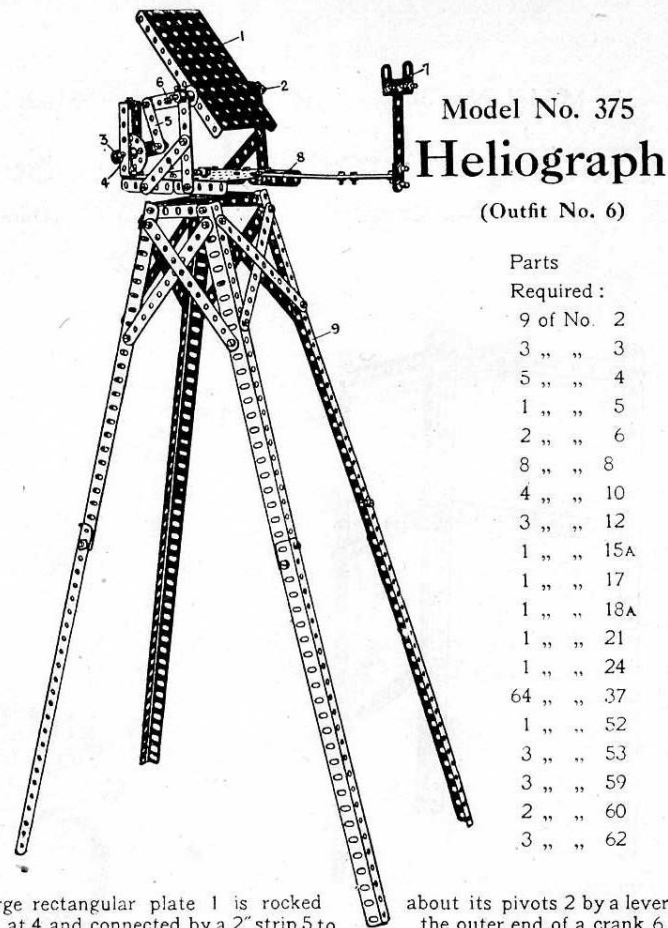
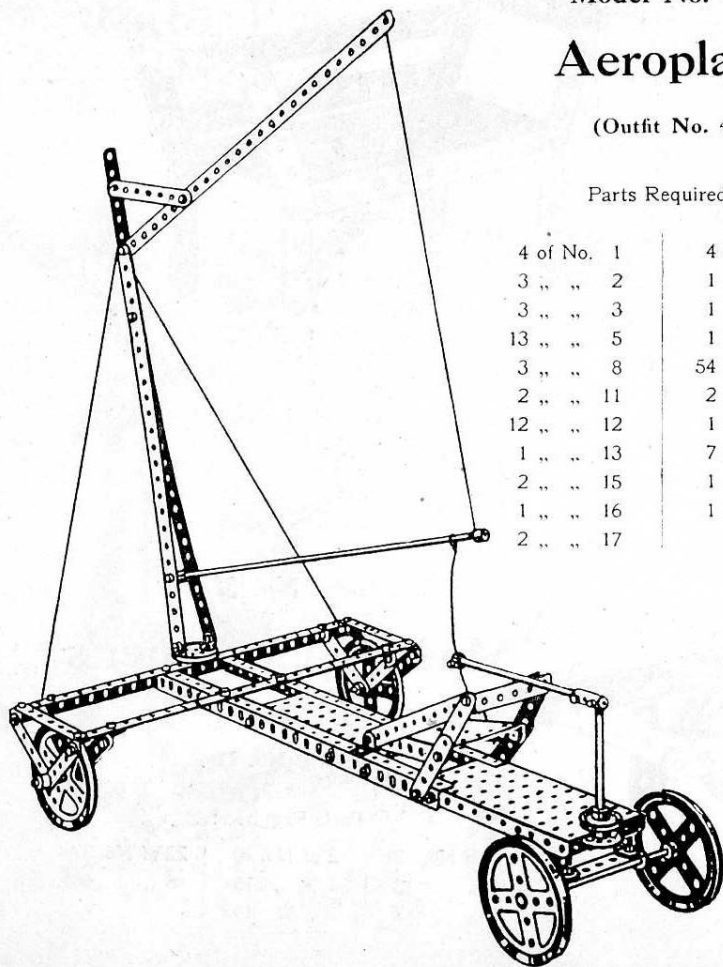
2 of No. 2	2 of No. 10	22 of No. 37
2 " " 3	1 " " 15A	6 " " 60
9 " " 5	2 " " 19A	

Model No. 374 Aeroplage

(Outfit No. 4)

Parts Required :

4 of No. 1	4 of No. 19A
3 " " 2	1 " " 21
3 " " 3	1 " " 22
13 " " 5	1 " " 24
3 " " 8	54 " " 37
2 " " 11	2 " " 52
12 " " 12	1 " " 54
1 " " 13	7 " " 59
2 " " 15	1 " " 60
1 " " 16	1 " " 63
2 " " 17	



Model No. 375 Heliograph

(Outfit No. 6)

Parts

Required :

9 of No. 2
3 " " 3
5 " " 4
1 " " 5
2 " " 6
8 " " 8
4 " " 10
3 " " 12
1 " " 15A
1 " " 17
1 " " 18A
1 " " 21
1 " " 24
64 " " 37
1 " " 52
3 " " 53
3 " " 59
2 " " 60
3 " " 62

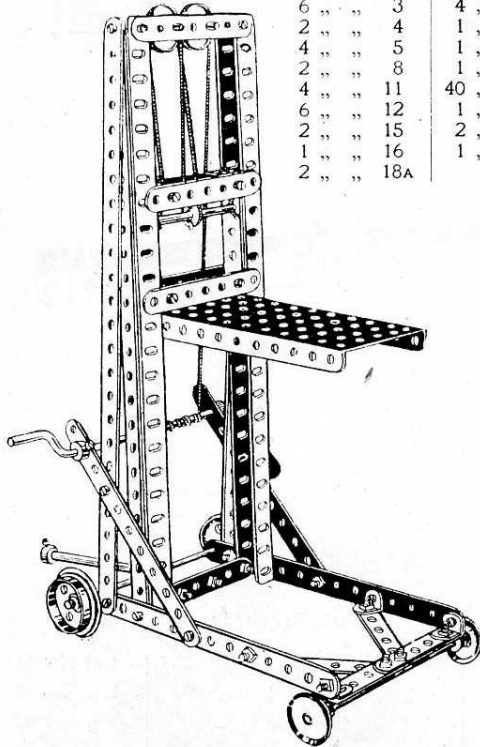
A large rectangular plate 1 is rocked about its pivots 2 by a lever 3, pivoted at 4 and connected by a 2" strip 5 to the outer end of a crank 6, to which is connected a 2" strip. The rectangular plate 1 should be fitted with a mirror, and a sighting aperture 7 is mounted in front, the operator bringing one of the perforations in the plate 1 in line with the aperture 7, while signalling, so that he can see the opposite instrument in the distance. The platform 8 is pivotally mounted on the standard 9 so that it may be swung round to any position, a bush wheel being bolted to the top of the standard in which the pivot works. The platform is made of two small rectangular plates butted together and connected on each side by strips.

Model No. 376 Bale Lifter

(Outfit No. 3)

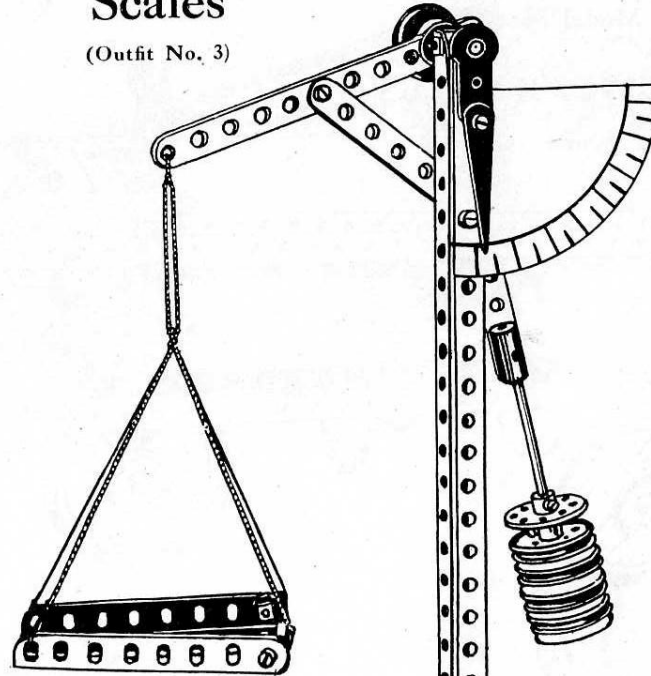
Parts Required :

2 of No.	1	1 of No.	19
6 " "	2	2 " "	20
6 " "	3	4 " "	22
2 " "	4	1 " "	23
4 " "	5	1 " "	26
2 " "	8	1 " "	33
4 " "	11	40 " "	37
6 " "	12	1 " "	52
2 " "	15	2 " "	59
1 " "	16	1 " "	63
2 " "	18A		



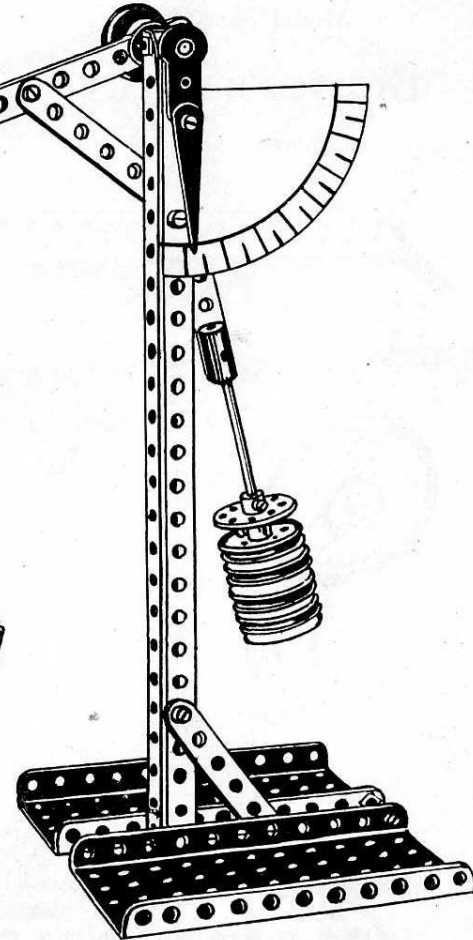
Model No. 377 Scales

(Outfit No. 3)



Parts Required :

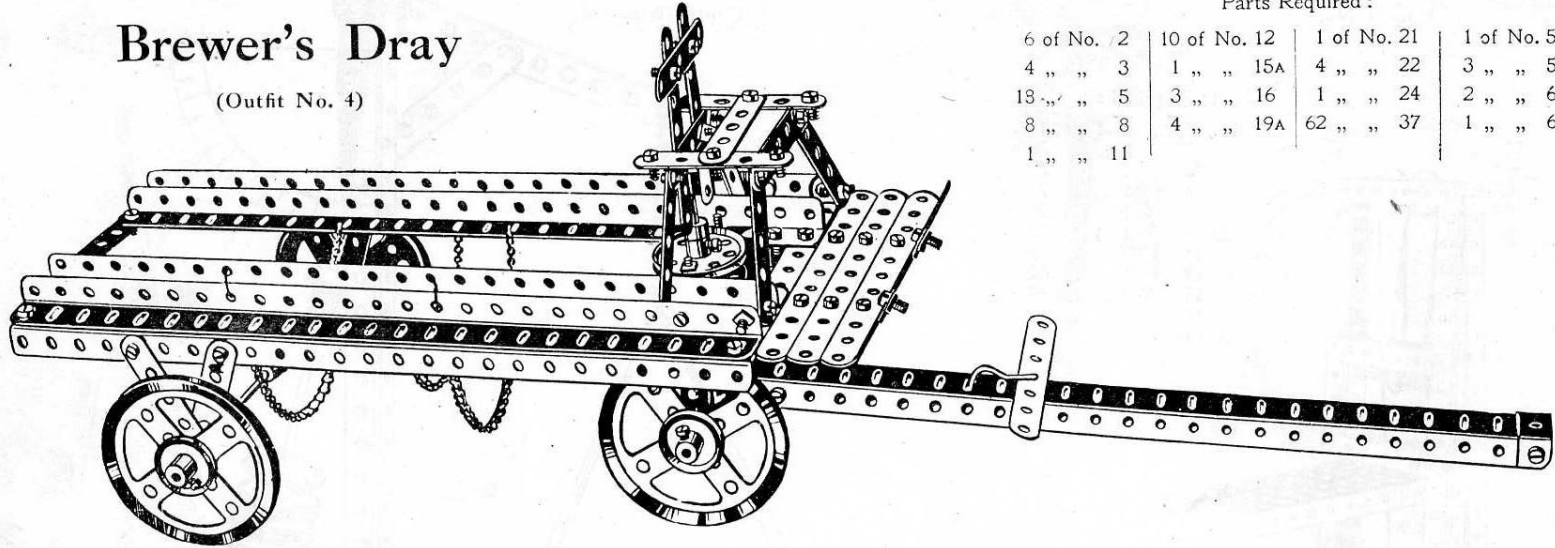
2 of No.	2	2 of No.	22
1 " "	3	1 " "	24
2 " "	4	21 " "	37
2 " "	8	2 " "	52
1 " "	11	1 " "	54
1 " "	15	1 " "	60
1 " "	17	2 " "	62
4 " "	20	1 " "	63



Model No. 378

Brewer's Dray

(Outfit No. 4)



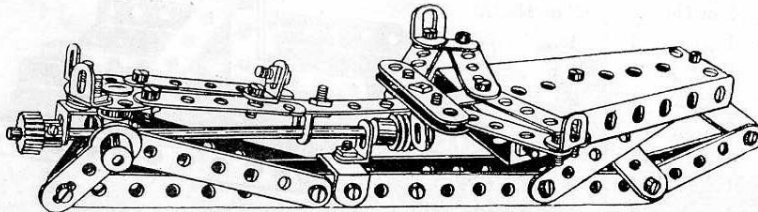
Parts Required :

6 of No. 2	10 of No. 12	1 of No. 21	1 of No. 57
4 " " 3	1 " " 15A	4 " " 22	3 " " 59
18 " " 5	3 " " 16	1 " " 24	2 " " 62
8 " " 8	4 " " 19A	62 " " 37	1 " " 63
1 " " 11			

Model No. 379

Skate

(Outfit No. 4)

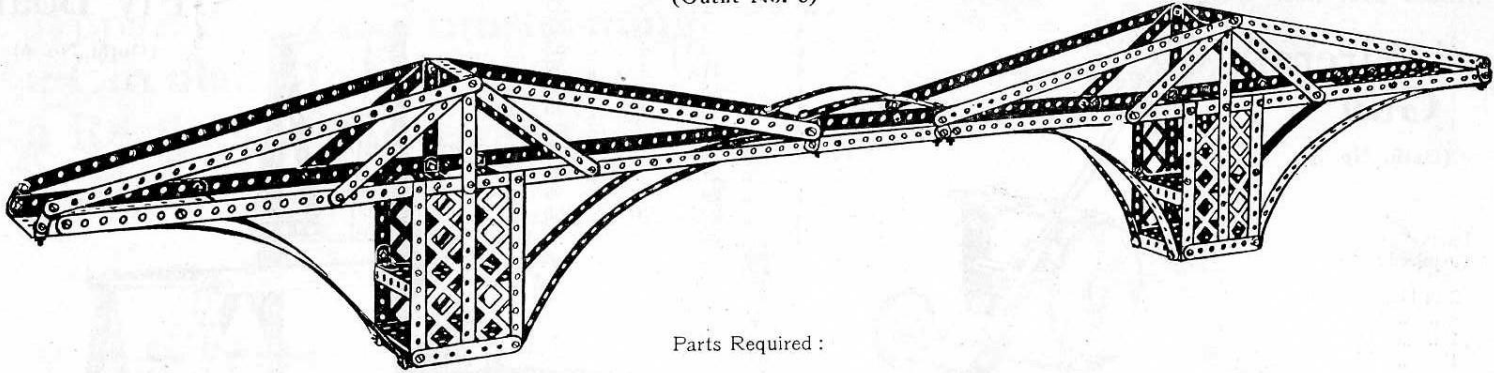


Parts Required :

5 of No. 2	3 of No. 11	1 of No. 26	1 of No. 54
4 " " 3	10 " " 12	1 " " 32	1 " " 60
12 " " 5	1 " " 14	42 " " 37	2 " " 62
5 " " 10	1 " " 24	5 " " 38	

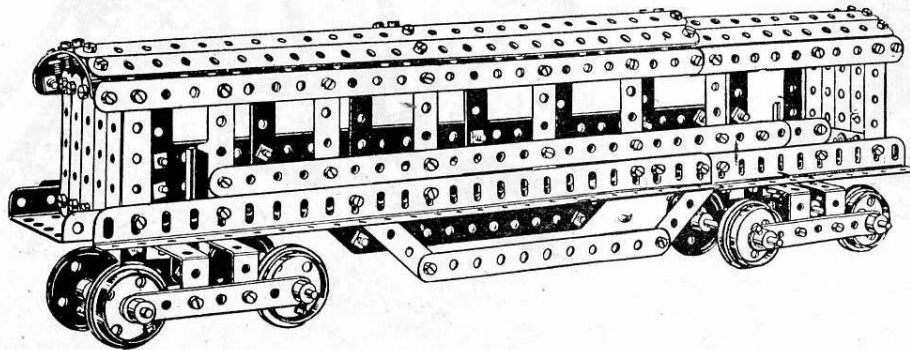
Model No. 380 Cantilever Bridge

(Outfit No. 5)



Parts Required :

24 of No. 1	110 of No. 37
10 " " 2	3 " " 52
8 " " 3	4 " " 53
8 " " 10	8 " " 60
22 " " 12	8 " " 100



Model No. 381 Pullman Car

(Outfit No. 5)

Parts Required :

9 of No. 1	2 of No. 8	10 of No. 20	3 of No. 52
9 " " 2	2 " " 9	116 " " 37	10 " " 59
8 " " 3	4 " " 16	4 " " 46	4 " " 60
34 " " 5	2 " " 17		

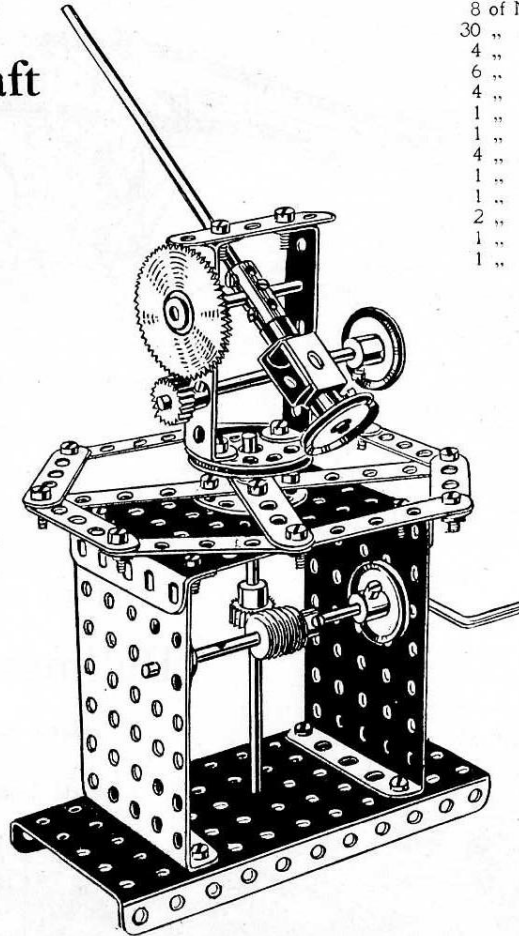
Model No. 382

Anti-Aircraft Gun

(Outfit No. 3)

Parts
Required :

2 of No.	2
9 " "	5
2 " "	11
1 " "	14
1 " "	15
1 " "	16
1 " "	17
1 " "	19
1 " "	21
4 " "	22
1 " "	24
2 " "	26
1 " "	27A
1 " "	32
26 " "	37
1 " "	52
3 " "	53
4 " "	59
2 " "	60
1 " "	63



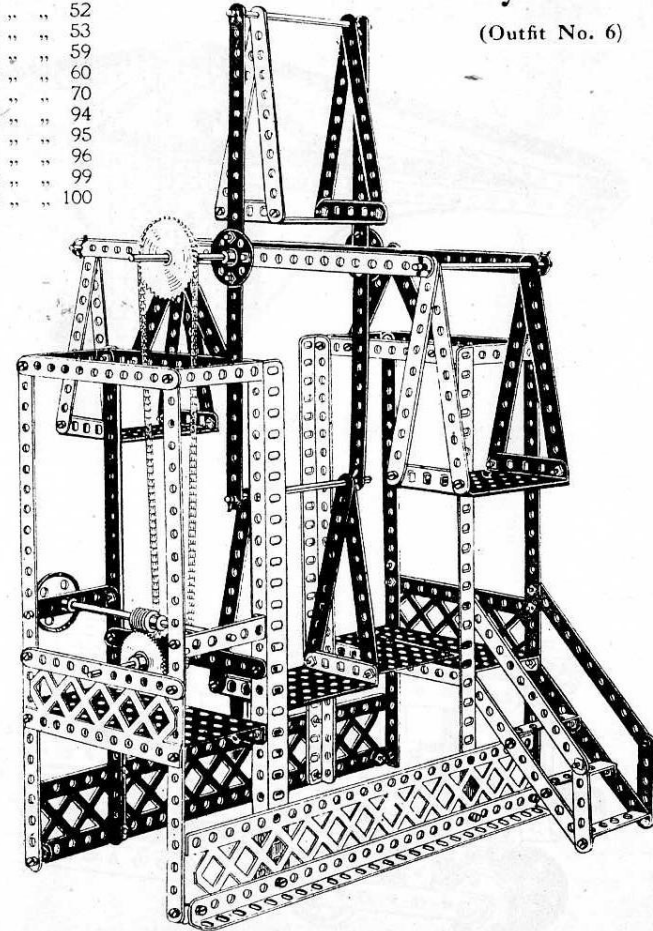
Parts Required :

8 of No.	1	16 of No.	35
30 " "	2	78 " "	37
4 " "	3	2 " "	52
6 " "	8	4 " "	53
4 " "	11	4 " "	59
1 " "	13	12 " "	60
1 " "	14	1 " "	70
4 " "	16	2 " "	94
1 " "	15A	1 " "	95
1 " "	21	1 " "	96
2 " "	24	2 " "	99
1 " "	27A	3 " "	100
1 " "	32		

Model No. 383

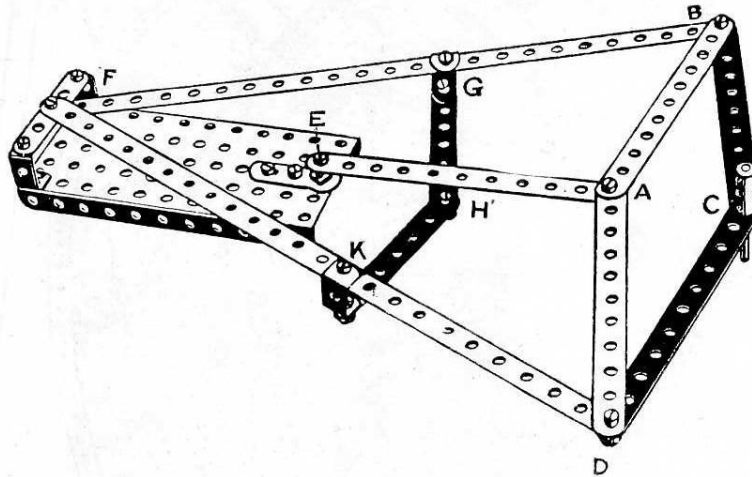
Fly Boats

(Outfit No. 6)



Model No. 384
(Outfit No. 4)

Apparatus for Transforming a Circular Movement into a Rectilinear Movement



This most ingenious model was designed by M. Pierre-Th. Dufour, who used it in his Thesis presented to the Faculty of Science in Paris, to obtain his title of Doctor of the University of Paris. He required an instrument which would transform a circular movement into a movement rigorously rectilinear, and he states in his published work that he was able to do this "with the aid of Meccano parts, which permit of making experiments so easily in mechanisms of the most varied types."

The point F is fixed, and is situated at a distance from the fixed point E, equal to AE, the two arms FB and FD being together equal to the four sides of the lozenge ABCD. The trajectory of the point C is then at right angles to EF. It will be found that whilst the point C is moving in a straight line at right angles to EF, the point A is describing a circle round the fixed point E.

Every Meccano boy should make up this very interesting model, and experiment with it.

Model No. 385

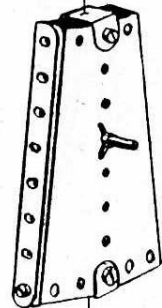
Magic Sector Plates

Parts
Required:

2	of	No. 1
5	"	" 2
2	"	" 3
1	"	" 5
4	"	" 11
1	"	" 17
16	"	" 37
1	"	" 52
7	"	" 59
1	"	" 62
1	"	" 63

Parts
Required:

2	of	No. 11
1	"	" 17
2	"	" 35
6	"	" 37
2	"	" 54

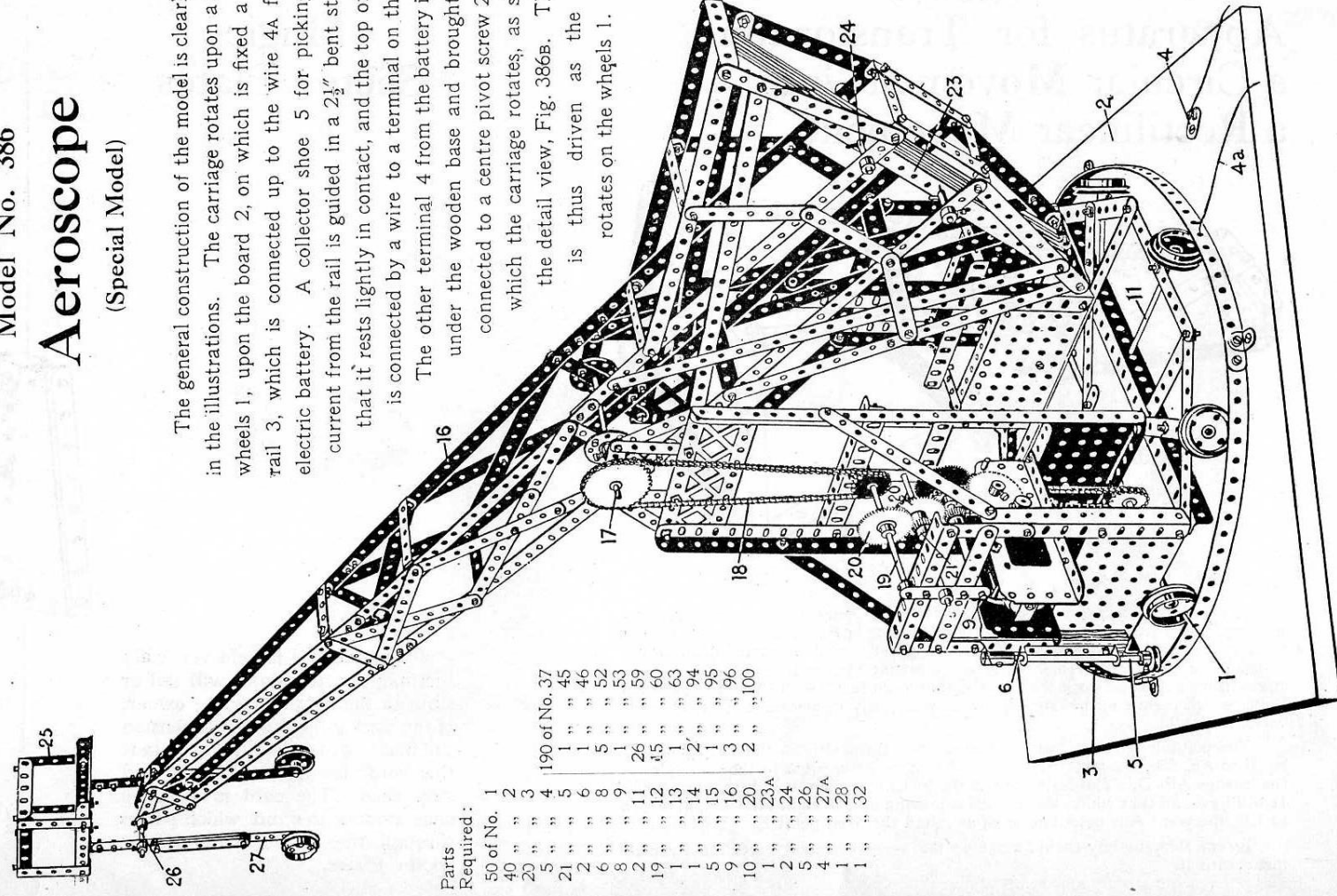


When the cord is held vertically the magic sector plates will fall or stop at the bidding of the owner. If the cord is held without tension the plates will fall, but the instant the cord is tightened they will stop dead. The cord is wrapped once around the rod which passes through the centre holes of the Sector Plates.

Model No. 386 Aeroscope (Special Model)

The general construction of the model is clearly shown in the illustrations. The carriage rotates upon a series of wheels 1, upon the board 2, on which is fixed a circular rail 3, which is connected up to the wire 4A from the electric battery. A collector shoe 5 for picking up the current from the rail is guided in a $2\frac{1}{2}$ " bent strip 6, so that it rests lightly in contact, and the top of the rod is connected by a wire to a terminal on the motor.

The other terminal 4 from the battery is carried under the wooden base and brought up and connected to a centre pivot screw 22, about which the carriage rotates, as shown in the detail view, Fig. 386a. The motor is thus driven as the carriage rotates on the wheels 1.



Parts

Required:

50 of No.	1
40 "	2
20 "	3
5 "	4
21 "	5
2 "	6
6 "	8
8 "	9
2 "	11
19 "	12
1 "	13
1 "	14
5 "	15
9 "	16
10 "	20
1 "	23A
2 "	24
5 "	26
4 "	27A
1 "	28
1 "	32

190 of No.	37
1 "	45
1 "	46
5 "	52
1 "	53
26 "	59
45 "	60
1 "	63
2 "	94
1 "	95
3 "	96
2 "	100

Model No. 386 Aeroscope (contd.)

The rotation of the carriage is effected from the pinion 7, which gears with, and drives a gear wheel on the spindle 8, on which latter is a worm gearing with a gear wheel 9, the spindle of which latter drives through the sprocket chain 10 and rod 11 on the outer ends of which are fixed flanged pulley wheels 12.

The wheels 12 at each end of the rod 11 are caused to rotate in opposite directions by means of the gear shown in Fig. 386B, the rod 11 being divided, and two pinions 13 and 14, secured on the separate parts of the rod, gearing with a contrate wheel 15, so that the flanged wheels at each end rotate in opposite directions. The end of one part of rod 11 is entered into the bore of the pinion 14, which is secured on the other part of the rod, the pinion 14 thus supporting the end of the other part of the rod 11.

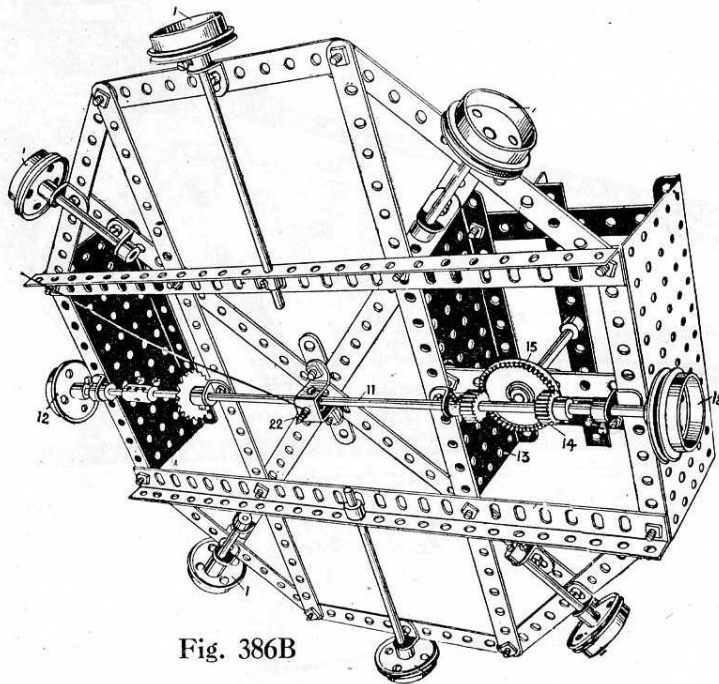


Fig. 386B

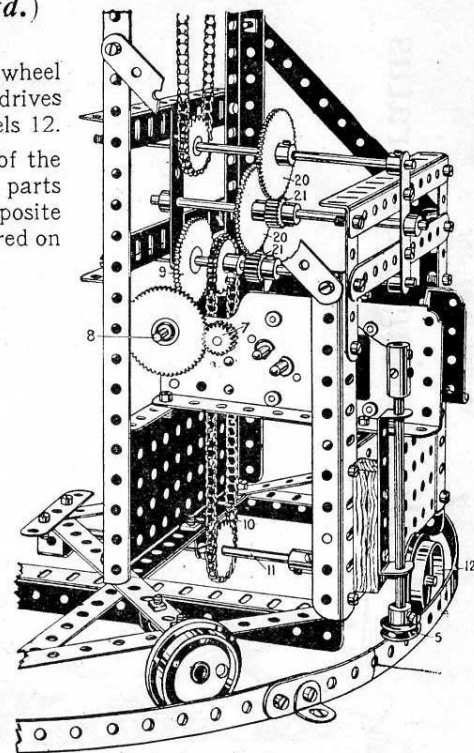


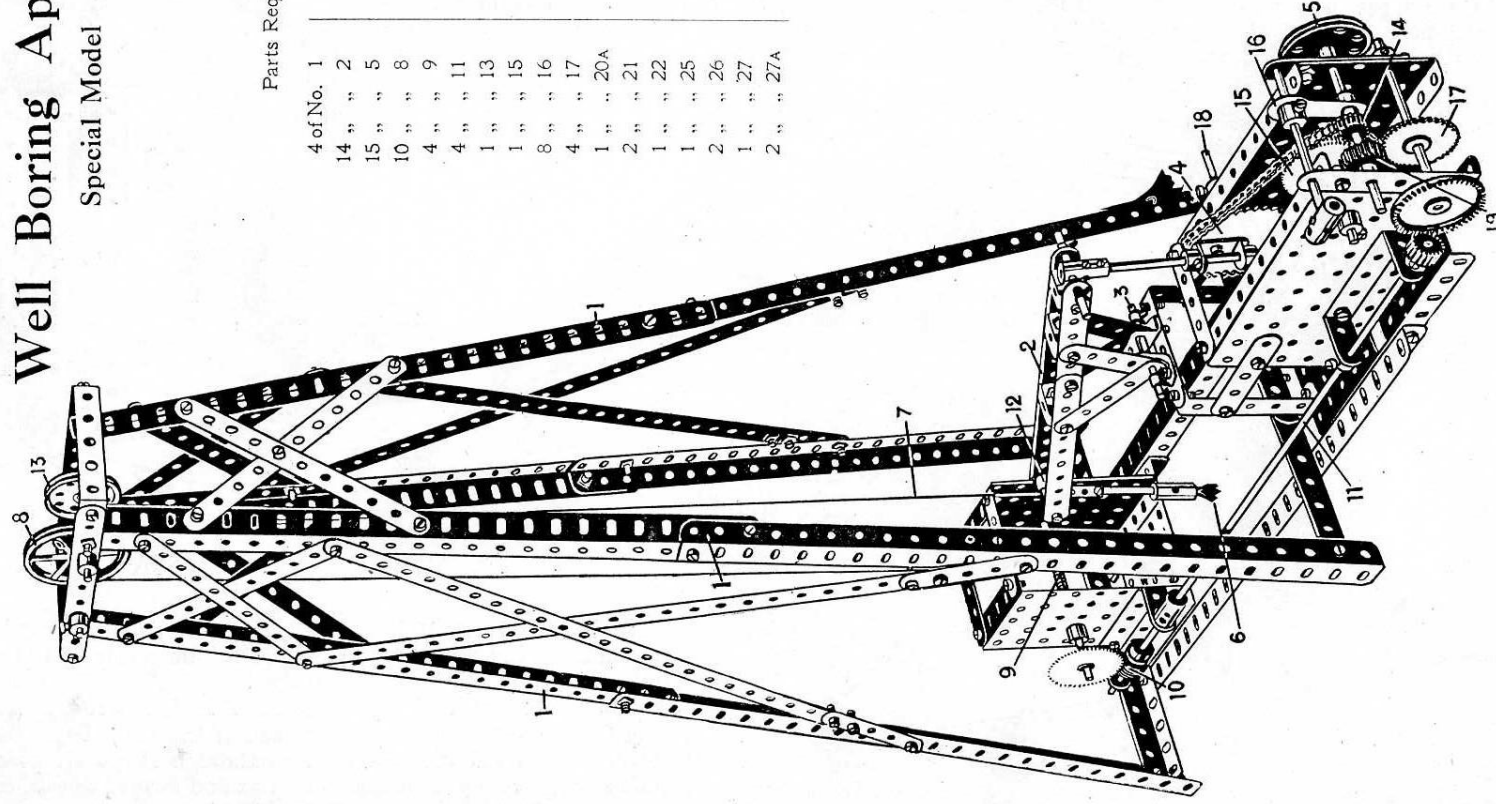
Fig. 386A

The weighted arm 16 is caused to swing about its pivot rod 17 by means of chain and sprocket gear 18 driven from a spindle 19 through a train of gears 20 and pinions 21 from the spindle 9. The arm 16 is balanced by a number of $12\frac{1}{2}$ " strips 23, threaded on rods 24, secured to the framework. At the opposite end of the arm, the carriage 25 is pivoted on a rod 26, which passes through strips 27, which are suitably weighted by a number of strips and flanged wheels, so that the carriage always remains vertical while the arm swings over.

Model No. 387

Well Boring Apparatus

Special Model



Parts Required :

4 of No.	1	1 of No.	23
14	" 2	1	" 32
15	" 5	105	" 37
10	" 8	2	" 38
4	" 9	2	" 45
4	" 11	2	" 46
1	" 13	2	" 52
1	" 15	5	" 53
8	" 16	12	" 59
4	" 17	4	" 60
1	" 20A	1	" 62
2	" 21	6	" 63
1	" 22	1	" 65
1	" 25	1	" 94
2	" 26	1	" 95
1	" 27	1	" 96
2	" 27A		

Model No. 387

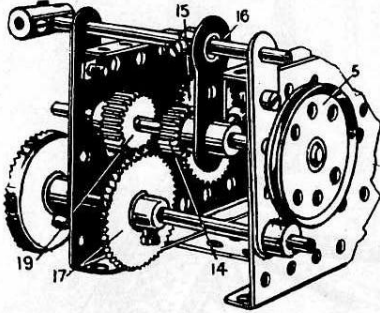
Well Boring Apparatus—*continued*

Fig. A

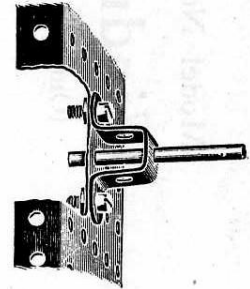


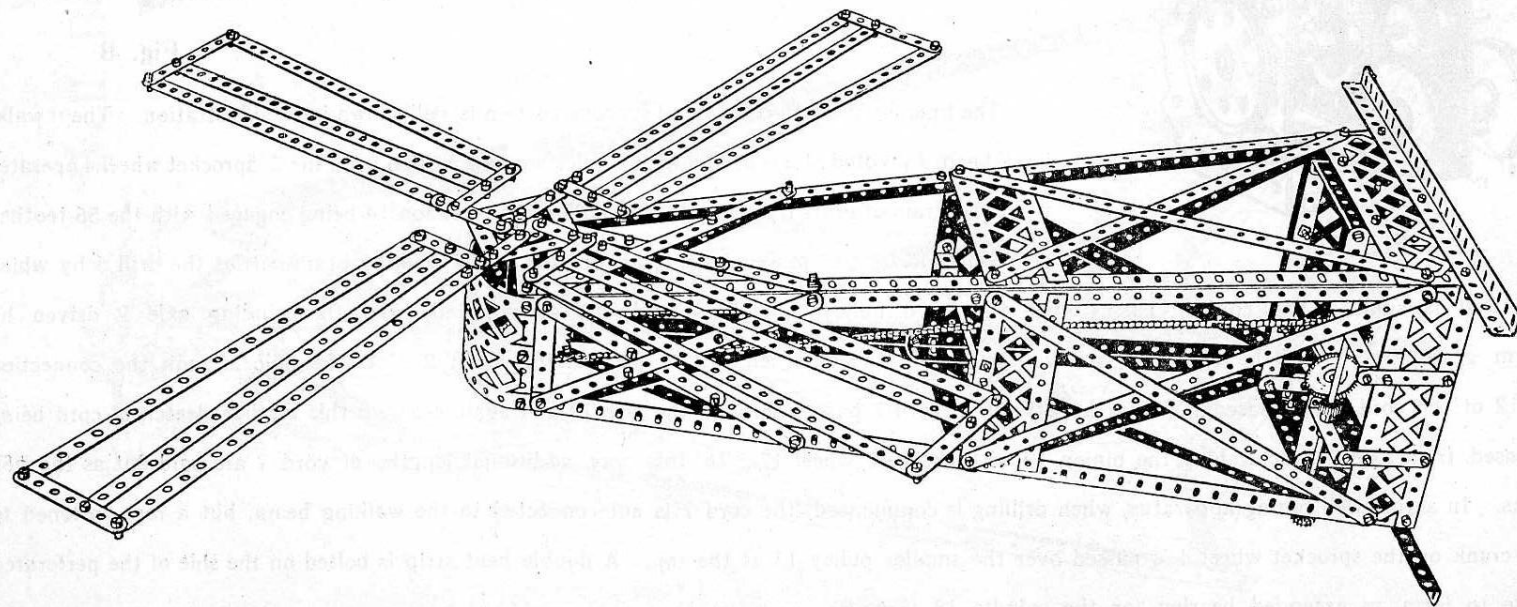
Fig. B

The bracing of the derrick 1 and its construction is well shown in the illustration. The "walking" beam 2 pivoted at 3 is driven with a quick see-saw motion from the 2" sprocket wheel 4 operated through a train of gears from the driving pulley 5, the pinion 14 being engaged with the 56-toothed gear wheel 15 by the crank 16 acting as a clutch. The walking beam carries the drill 6 by which the well is sunk. The cord 7 passes over the large pulley 8 and is paid out as required from the winding axle 9 driven by worm gearing 10 from the shaft 11 and is secured in the outer end 12 of the walking beam 2. As the hole is sunk the connection at 12 of the cord 7 is released and a further stretch of cord 7 passed through the grip 12 and again secured, this further stretch of cord being released from axle 9 by clutching the pinion 19 with the gear wheel 17. In this way additional lengths of cord 7 are paid out as the well sinks. In actual well boring apparatus, when drilling is commenced, the cord 7 is not connected to the walking beam, but a rope fastened to the crank on the sprocket wheel 4 is passed over the smaller pulley 13 at the top. A double bent strip is bolted on the side of the perforated plate to form an extended bearing for the spindle 18 (Fig. B).

Model No. 388

Windmill

(Outfit No. 6)

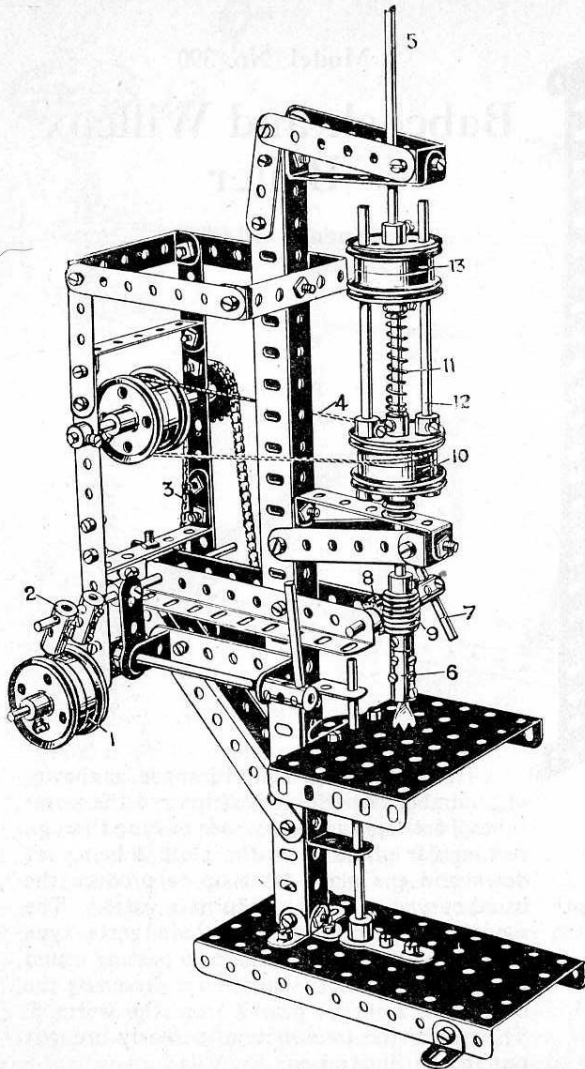


Parts Required :

20 of No.	1
22 "	2
10 "	3
14 "	5
10 "	8
2 "	13A
2 "	14
1 "	15
1 "	24
1 "	26
1 "	27A
1 "	28
1 "	32
2 "	35
130 "	37
1 "	38
2 "	45
2 "	53
5 "	59
4 "	60
1 "	62
4 "	94
1 "	95
1 "	96
14 "	100

Model No. 389 Vertical Drill

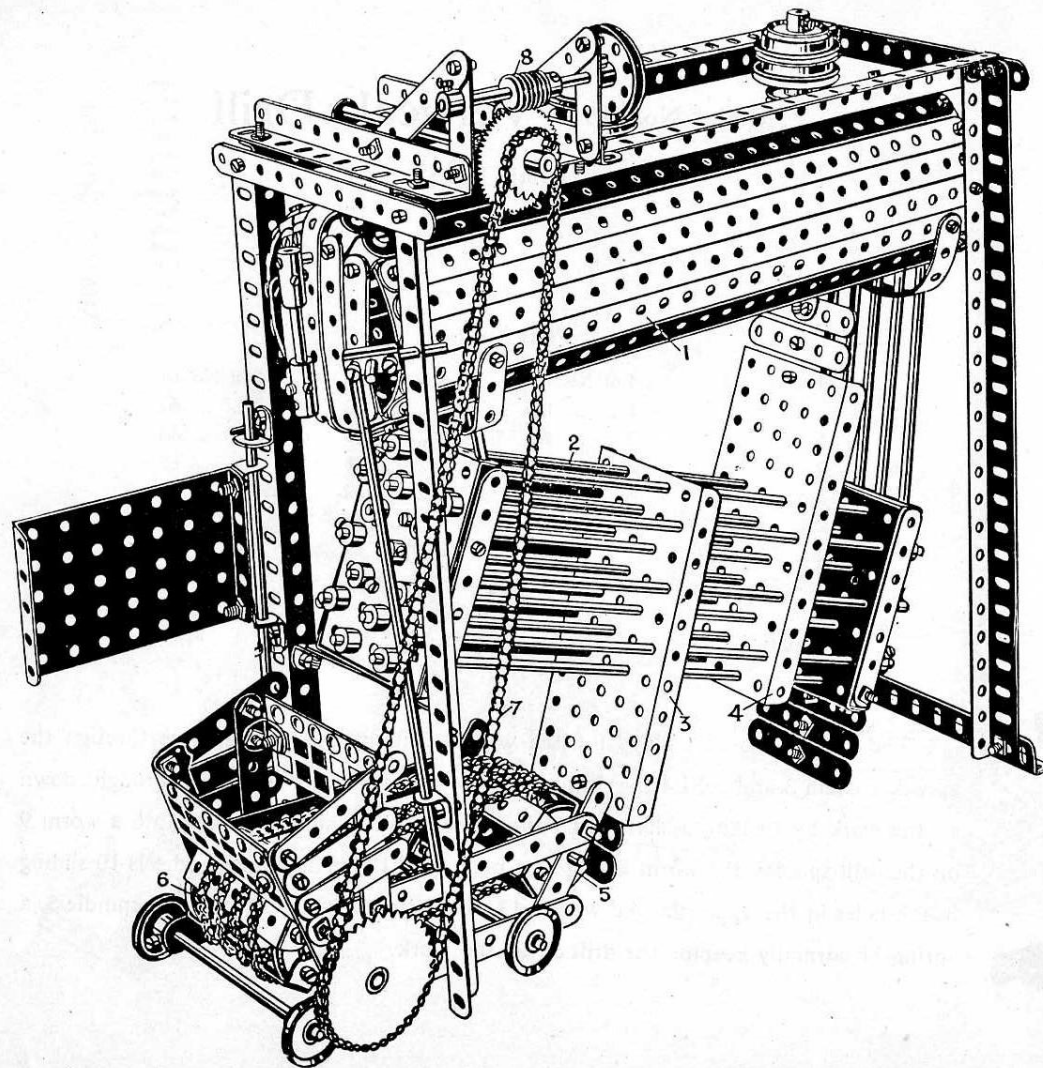
(Outfit No. 5)



Parts Required :

4 of No. 2	4 of No. 15	1 of No. 26	7 of No. 60
2 " " 3	1 " " 15A	1 " " 32	2 " " 62
5 " " 4	2 " " 16	55 " " 37	5 " " 63
2 " " 6	2 " " 17	2 " " 46	1 " " 65
3 " " 8	8 " " 20	1 " " 52	1 " " 94
2 " " 9	2 " " 23	1 " " 53	1 " " 95
2 " " 11	1 " " 24	8 " " 59	1 " " 96
1 " " 13			

The fast and loose pulleys 1 fitted with a belt-shifting gear 2 drive through the sprocket chain 3 and cord 4 the drilling spindle 5. The drill chuck 6 is brought down on the work by turning a short rod 7 which rotates a pinion 8 gearing into a worm 9 on the drill spindle, the worm acting as a rack, rods 12 on the flanged wheels 10 sliding in the holes in the upper flanged wheels 13, the latter being secured to the spindle 5, a spring 11 normally keeping the drill on to the work.



Model No. 390

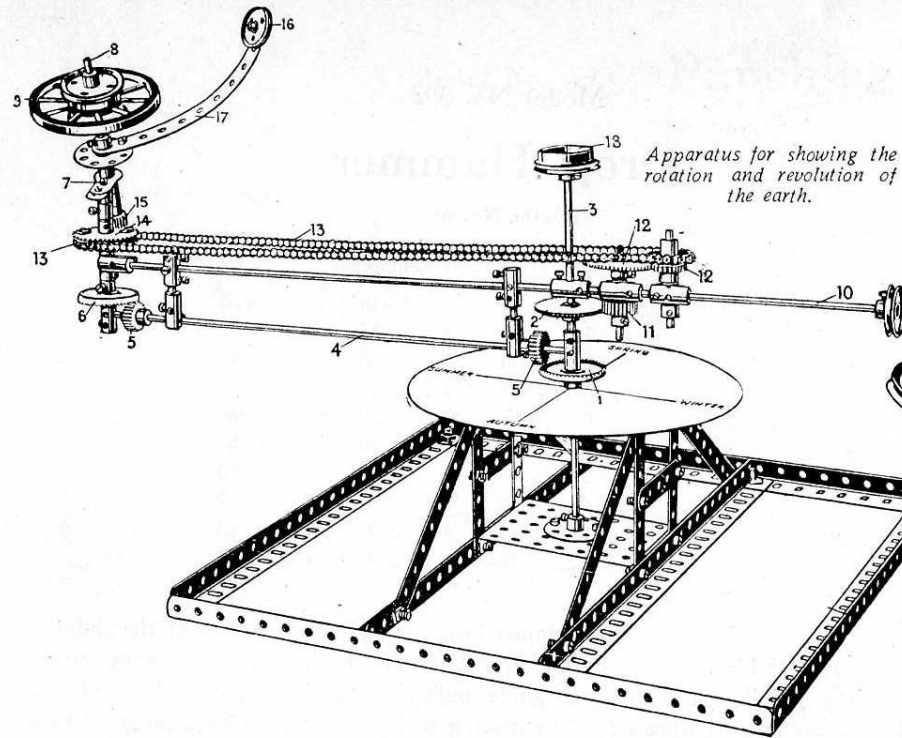
Babcock and Willcox Boiler

(Special Model)

Parts Required :

22 of No. 1	8 of No. 20
9 " " 2	1 " " 21
7 " " 3	8 " " 22
4 " " 4	1 " " 27A
16 " " 5	1 " " 32
6 " " 6	19 " " 35
6 " " 8	103 " " 37
5 " " 9	2 " " 52
11 " " 12	4 " " 53
18 " " 13	24 " " 59
3 " " 15	9 " " 60
7 " " 15A	2 " " 61
2 " " 16	5 " " 94
2 " " 17	1 " " 95
3 " " 18A	1 " " 96

The upper steam drum 1 is made, as shown, of a number of perforated strips and the water tubes 2 are represented by rods passing through rectangular plates 3, 4, the plate 3 being set down and the plate 4 set up to produce the usual curved path for the furnace gases. The movable furnace 5 of the chain grate type consists of a number of chains 6 passing round drums made of short strips and is driven by the chain and sprocket gear 7 from the worm 8. The rest of the construction is clearly brought out in the illustration.

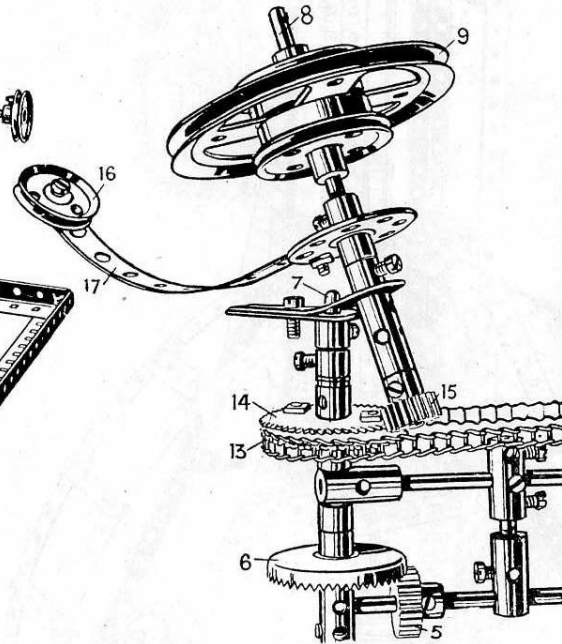


Apparatus for showing the rotation and revolution of the earth.

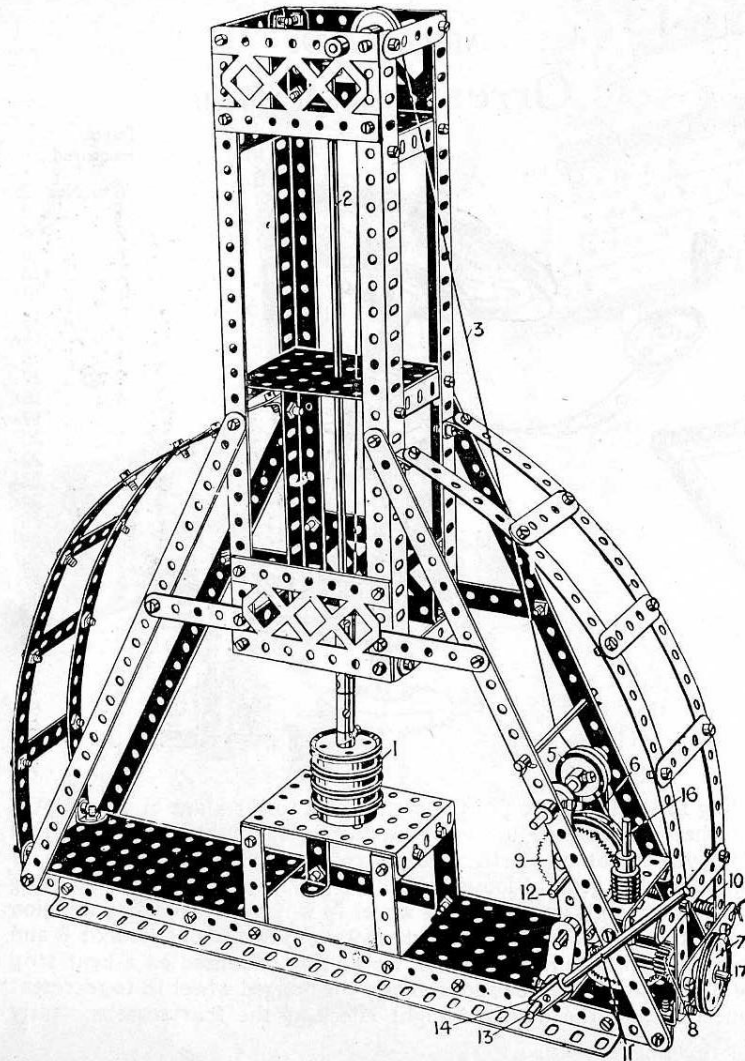
Model No. 391 Orrery (Special Model)

Parts Required :

5 of No.	2
4 "	3
2 "	5
6 "	8
2 "	13
1 "	13A
1 "	15
1 "	15A
1 "	16
2 "	17
4 "	18A
1 "	19A
3 "	20
1 "	22
1 "	22A
2 "	24
4 "	25
1 "	26
2 "	27
2 "	27A
2 "	28
30 "	37
4 "	38
2 "	53
5 "	59
2 "	62
11 "	63
23 "	94
1 "	96



This is an excellent educational model. The contrate wheel 1 and gear wheel 2 are fixed on the vertical spindle 3 which does not rotate. The lower horizontal rod 4 rotates, and by means of the pinions 5 and contrate wheel 6 provides a compensating movement during revolution for the spindle 7, from which the rod 8 is carried at an inclination corresponding to the inclination of the earth's axis to the plane of the ecliptic. As the earth, represented by the large wheel 9 which is clamped by a flanged wheel on each side, is revolved round the spindle 3 by the horizontal rod 10 the direction of the axis 8 remains constant therefore. The rotational movement of the earth about its axis is effected from the pinion 11 engaging the fixed gear 2 and driving through the gear wheels 12 the chain and sprocket gear 13 loose on the spindle 7. Fixed to and rotating with the sprocket wheel 13 (wheel 13 is a 56-toothed gear wheel used as a sprocket wheel) is an upper gear wheel 14 which is engaged by a pinion 15 on the lower end of the rod 8. When, therefore, the system is revolved about the spindle 3 the earth wheel 9 is rotated about its axis 8 and owing to the compensating movement given by the rod 4 the direction of the axis is maintained. The moon wheel 16 is mounted on a bent strip 17 which is secured to a bush wheel which revolves loosely about the axle rod 8. A candle may be supported in the flanged wheel 18 to represent the sun, and a ball fixed on the rod to represent the earth, in place of the wheel 9, and the day and night effect at the four seasons clearly illustrated.



Model No. 392

Drop Hammer

(Outfit No. 6)

Parts Required :

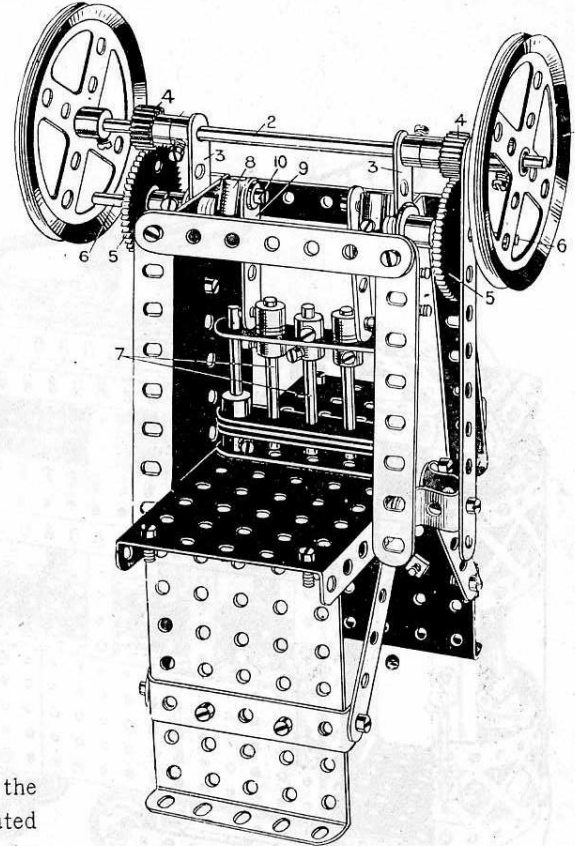
8 of No. 1	3 of No. 16	3 of No. 35
3 " " 3	3 " " 17	112 " " 37
3 " " 4	5 " " 20	1 " " 43
13 " " 5	1 " " 21	2 " " 52
6 " " 8	3 " " 22	2 " " 53
2 " " 11	1 " " 24	5 " " 59
8 " " 12	1 " " 26	8 " " 60
1 " " 13	1 " " 27A	3 " " 62
1 " " 15	1 " " 28	6 " " 63
2 " " 15A	1 " " 32	4 " " 97

The weighted hammer head 1 is fixed at the end of the slidable rod 2 and lifted by a cord 3 connected to the head and passing over a pulley and between guide pulleys 5 on to a winding drum of two flanged wheels 6. The driving pulley 7 is geared by a pinion 8 to a contrate wheel, on the spindle of which is a worm gearing with a 56-toothed gear wheel 9 by which the cord is operated. The coupling 15 is threaded on the upright spindle 16 and forms a bearing for the axle 17. The gear wheel 9 and flanged wheels 6 are held in engagement with the worm by the pull of a spring 10 when raising the hammer, but may be disengaged, in order to drop the hammer, by the handle-rod 11 secured to the rod 12 about which the geared wheel 9 pivots. To the rod 13 a crank is secured on each side of the winding-drum mechanism, to which also is secured the coupling 14 and a corresponding coupling at the other end of the rod to which the spring 10 is attached. This rod is pivotally attached to a $2\frac{1}{2}$ " bent strip bolted to the base plate.

Model No. 393 **Punching Press** (Outfit No. 6)

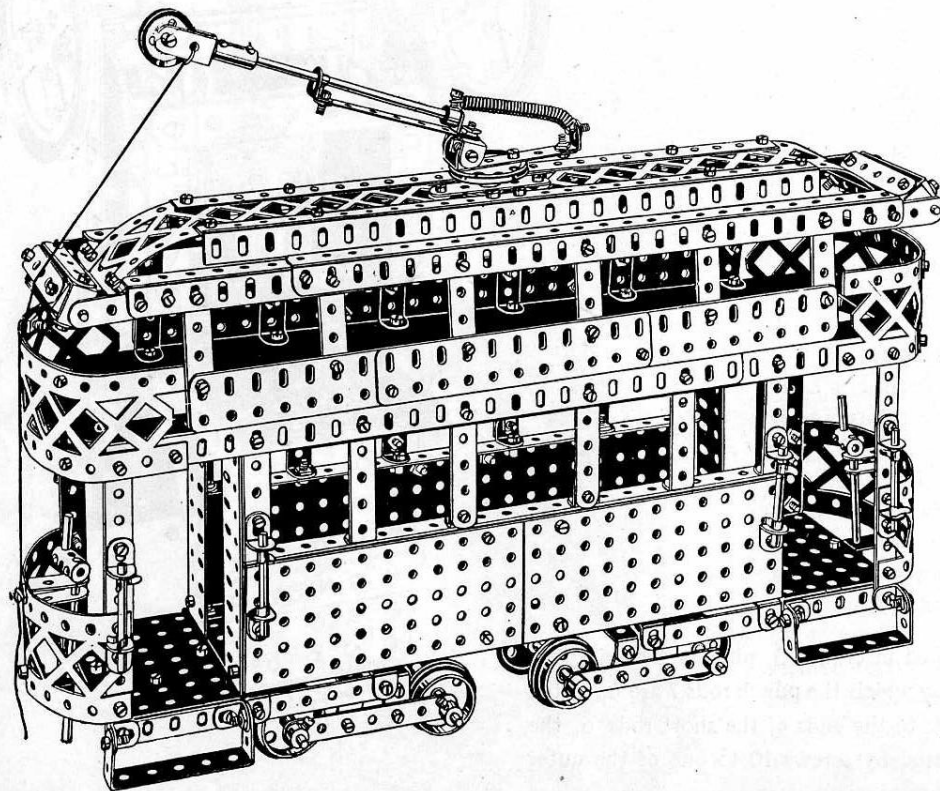
Parts Required :

1 of No. 2	29 of No. 37
2 " " 3	18 " " 38
4 " " 4	1 " " 45
6 " " 5	1 " " 52
2 " " 6	2 " " 53
1 " " 14	2 " " 54
2 " " 16	15 " " 59
5 " " 17	2 " " 60
2 " " 19A	2 " " 62
2 " " 26	2 " " 63
2 " " 27A	



The rod 2 carrying the flywheels 1 is journalled in cranks 3, pinions 4 driving the large gear wheels 5 on short rods 6. The cranks by which the punch rods 7 are operated consist of couplings 8 secured at their middle holes to the ends of the short rods 6, the strips 9 operating the punch rods 7 being connected by screws 10 to one of the outer holes of the coupling.

Model No. 394 Trolley Car (Special Model)

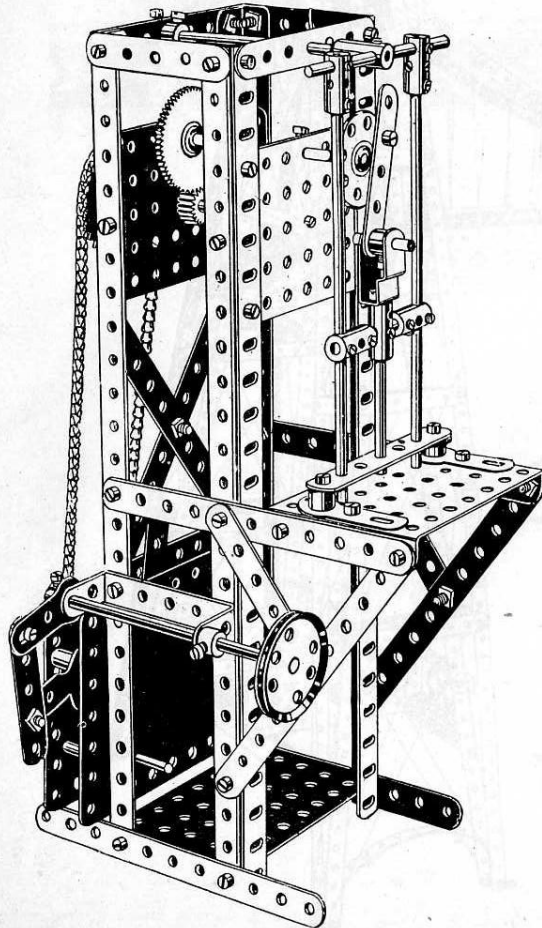


Parts Required :

8 of No. 2	21 of No. 35
11 " " 3	130 " " 37
2 " " 4	1 " " 43
17 " " 5	3 " " 44
8 " " 8	8 " " 46
2 " " 9	4 " " 52
10 " " 11	2 " " 53
49 " " 12	12 " " 59
1 " " 15	24 " " 60
12 " " 16	1 " " 63
8 " " 17	2 " " 99
10 " " 20	6 " " 100
1 " " 21	6 " " 103
1 " " 22A	

Model No. 395 Punching Machine

(Outfit No. 6)

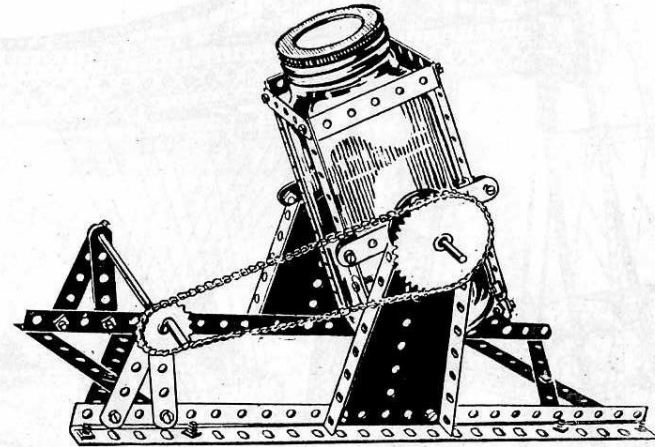


Parts
Required :

6 of No	2
2 " "	3
2 " "	4
4 " "	5
4 " "	8
2 " "	14
3 " "	15
1 " "	15A
1 " "	16
2 " "	17
1 " "	18A
1 " "	21
1 " "	24
1 " "	26
1 " "	27A
50 " "	37
2 " "	38
1 " "	44
1 " "	46
4 " "	53
6 " "	59
3 " "	62
6 " "	63
2 " "	94
1 " "	95
1 " "	96

Model No. 396 Butter Churn

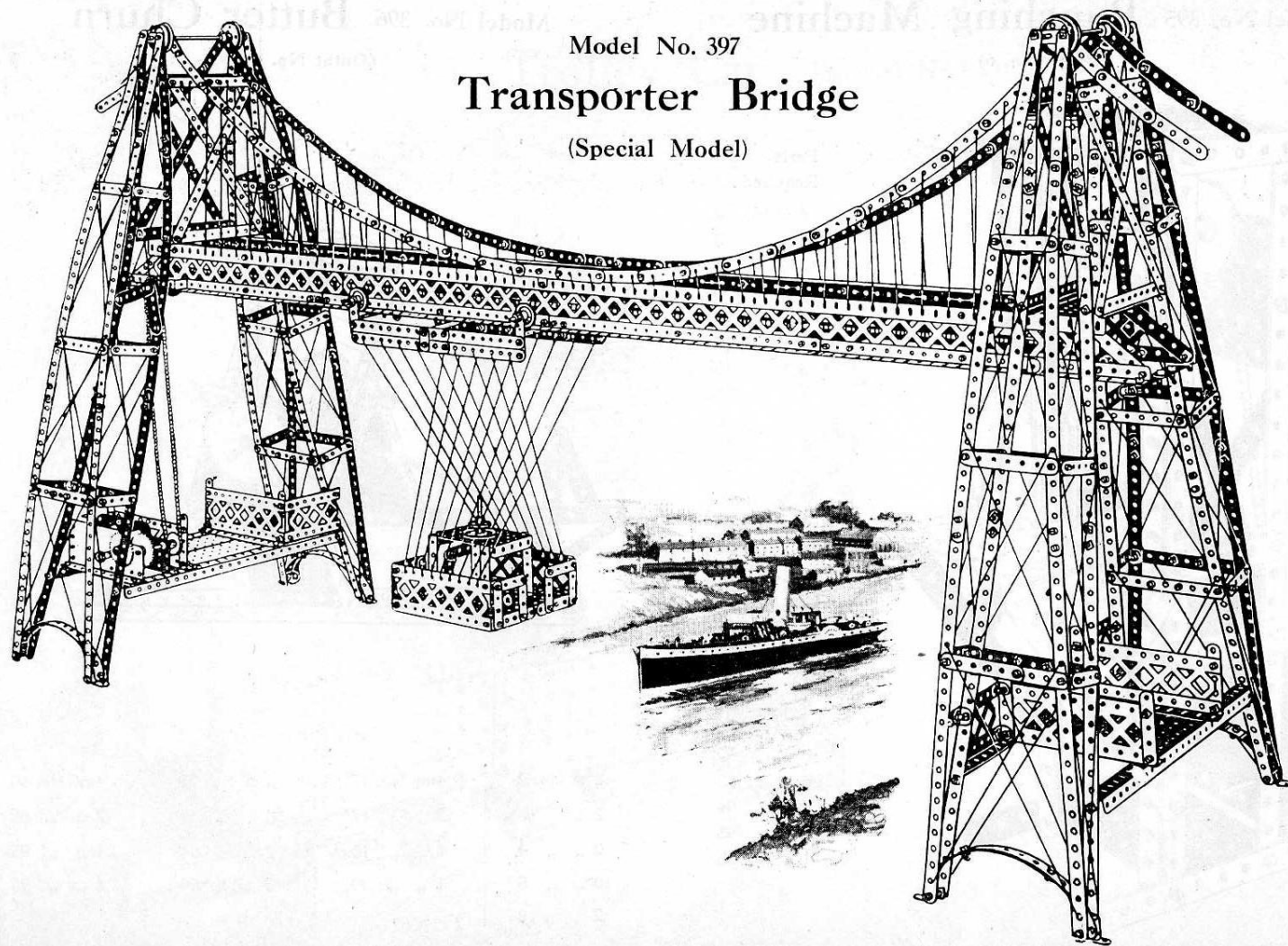
(Outfit No. 4)



Parts Required :

8 of No. 2	4 of No. 12	2 of No. 24	4 of No. 60
2 " " 3	2 " " 17	50 " " 37	2 " " 62
2 " " 4	1 " " 18A	2 " " 54	1 " " 95
10 " " 5	1 " " 19	2 " " 59	1 " " 96
2 " " 8			

Model No. 397
Transporter Bridge
(Special Model)



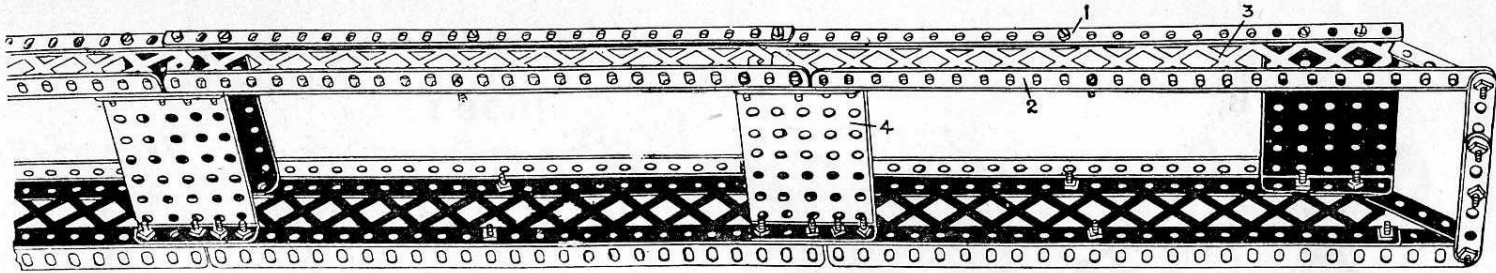


Fig. 397A—Girder Section

Model No. 397
Transporter
 (contd.)

Parts Required :

32 of No. 1	4 of No. 20
52 " " 2	1 " " 21
8 " " 3	5 " " 22
36 " " 4	1 " " 26
118 " " 5	2 " " 27A
32 " " 6	507 " " 37
4 " " 7	6 " " 52
20 " " 8	7 " " 53
8 " " 9	15 " " 59
4 " " 10	10 " " 60
10 " " 11	10 " " 94
80 " " 12	4 " " 96
3 " " 14	3 " " 97
2 " " 15A	8 " " 99
2 " " 17	6 " " 100
4 " " 18A	

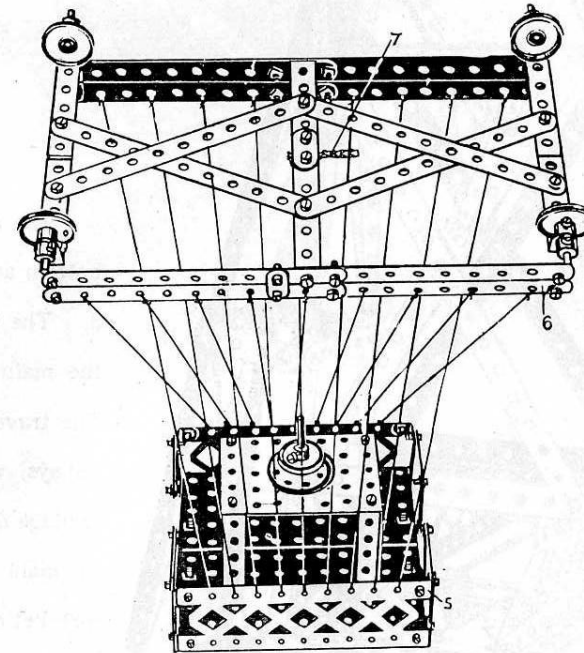
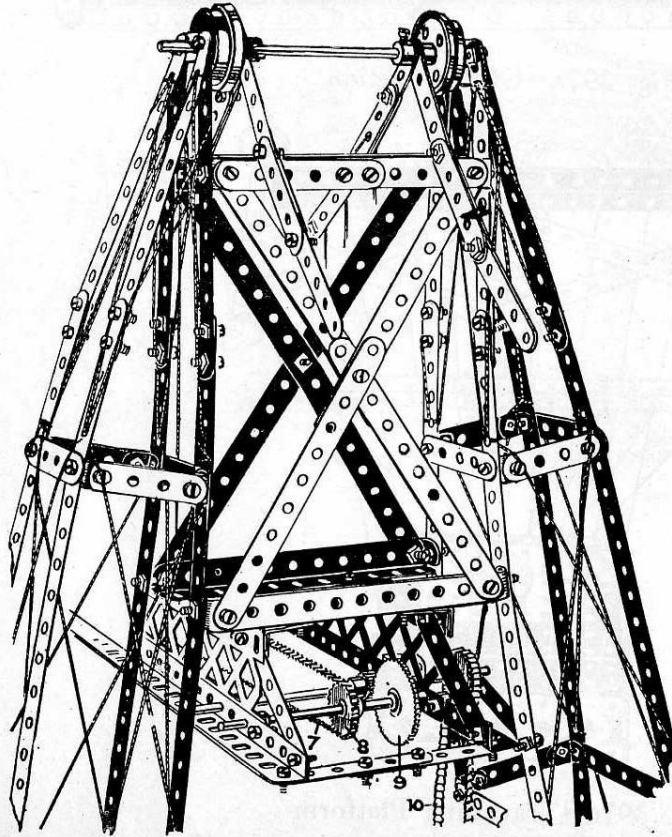


Fig. 397c—Travelling Platform

Fig. 397B



Model No. 397

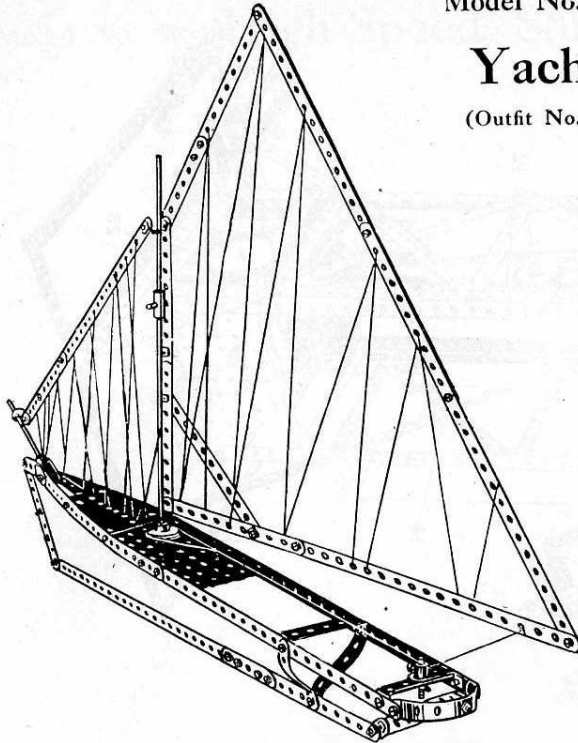
Transporter—*continued*

The main girder is built up of side pieces, Fig. 397A consisting of top and bottom angle girders 1, 2, reversed, and connected together by braced girder strip 3. The sides are connected across by small rectangular plates 4. The ends of the main girder are supported from the end towers, as shown in Fig. 397B. The travelling platform 5, Fig. 397c, supported from the carriage 6, runs on 1" pulleys, which travel along the outer edges of the lower angle girders 2. The carriage 6 is moved by a sprocket chain 7 passing round wheels 8 supported in the main girder and operated from the pinion and 56-toothed gear wheel 9 by the sprocket chain 10 driven by the motor.

Model No. 398

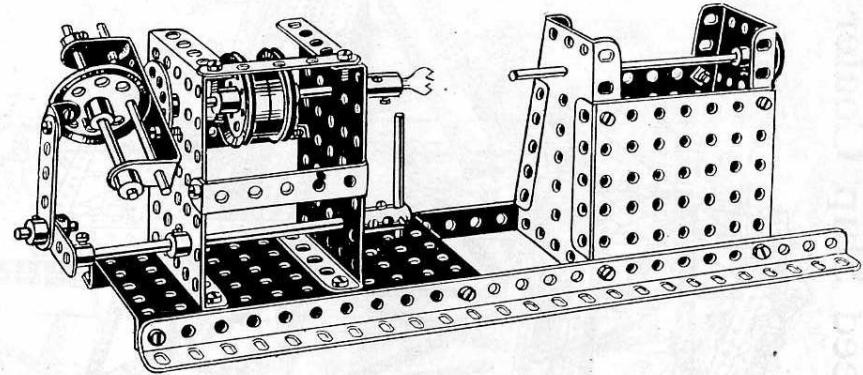
Yacht

(Outfit No. 6)



Parts Required :

9 of No. 1	5 of No. 12	1 of No. 44
7 " " 2	1 " " 13A	1 " " 52
4 " " 3	2 " " 15	1 " " 54
2 " " 4	1 " " 18A	2 " " 60
3 " " 5	1 " " 22	1 " " 63
1 " " 10	51 " " 37	



Model No. 399

Elliptic Lathe

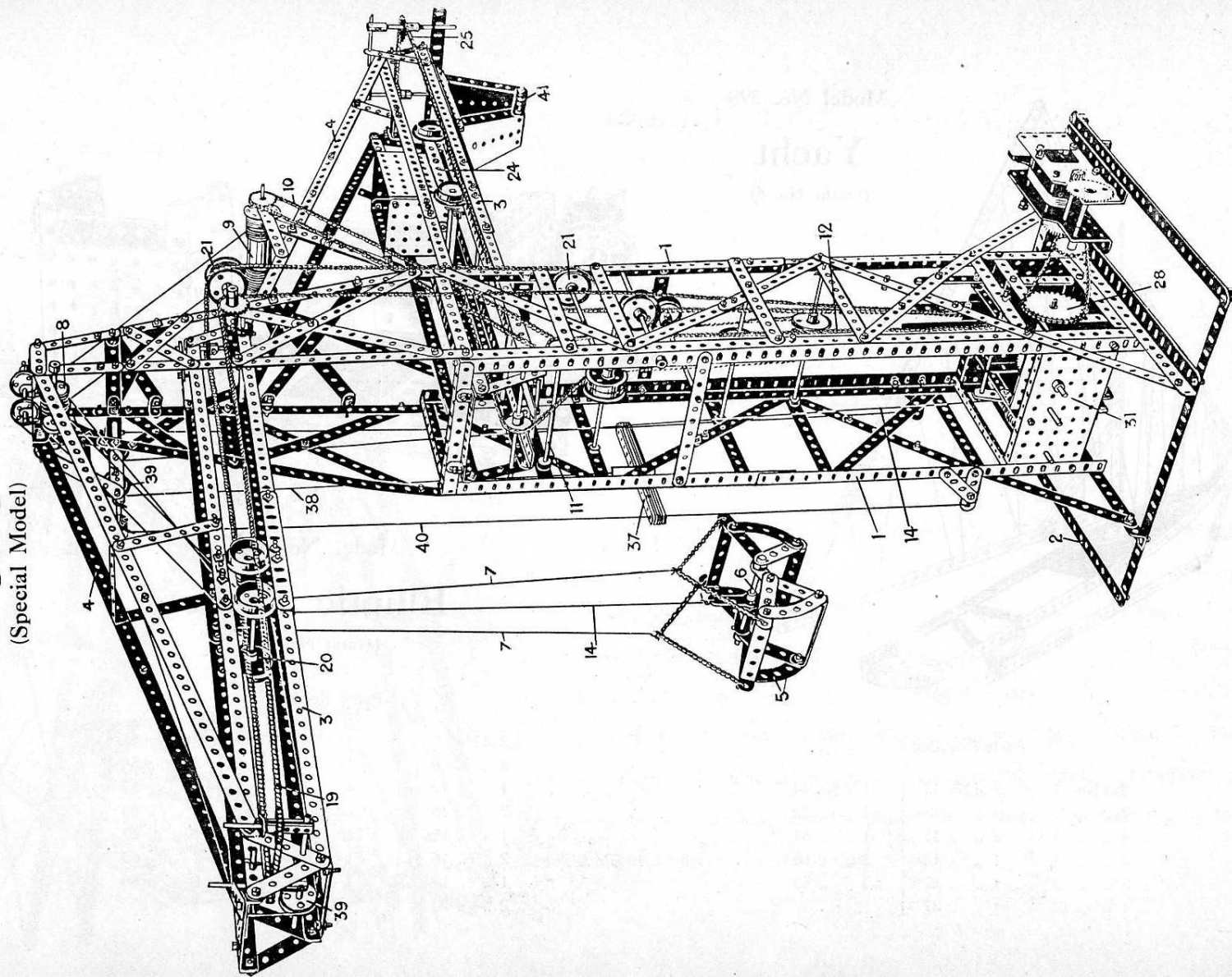
(Outfit No. 4)

Parts Required :

2 of No. 5	1 of No. 21	4 of No. 53
2 " " 8	1 " " 22	2 " " 54
1 " " 12	1 " " 24	8 " " 59
2 " " 15	2 " " 35	2 " " 60
1 " " 15A	26 " " 37	1 " " 62
2 " " 16	1 " " 46	2 " " 63
1 " " 18A	1 " " 52	1 " " 65
2 " " 20		

Model No. 400

(Special Model)



Model No. 400 High-Speed Ship Coaler (contd.)

Parts Required :

24 of No. 1
62 " " 2
23 " " 3
7 " " 4
26 " " 5
12 " " 6
7 " " 7
21 " " 8
8 " " 9
5 " " 10
7 " " 11
35 " " 12
1 " " 13A
8 " " 14
7 " " 15
4 " " 15A

11 of No. 16
3 " " 17
19 " " 20—
9 " " 22A
4 " " 23
5 " " 24
1 " " 25
3 " " 26
1 " " 27
2 " " 27A
2 " " 29
1 " " 32
12 " " 35
353 " " 37
3 " " 43
1 " " 46

4 of No. 52
2 " " 53
2 " " 54
34 " " 59
5 " " 60
3 " " 62
8 " " 63
1 " " 70
2 " " 72
4 " " 90
24 " " 94
1 " " 95
17 " " 96
2 " " 106

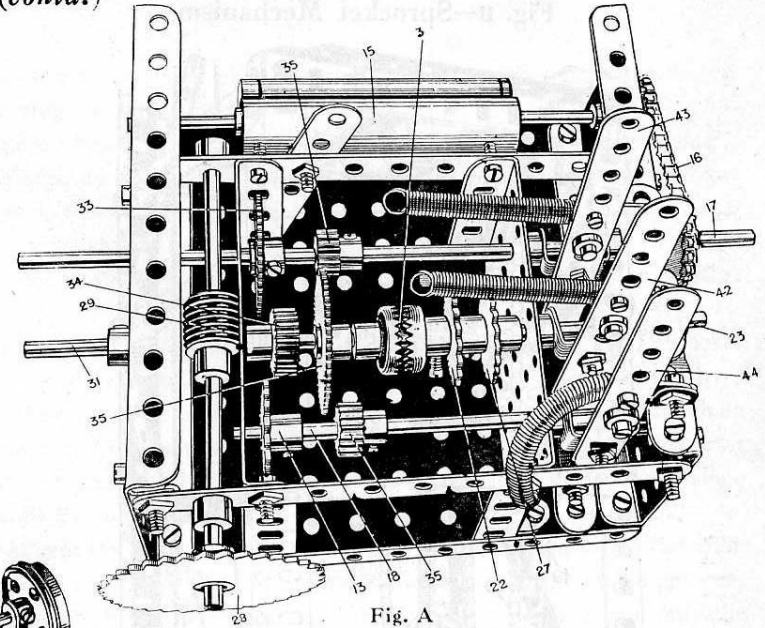


Fig. A

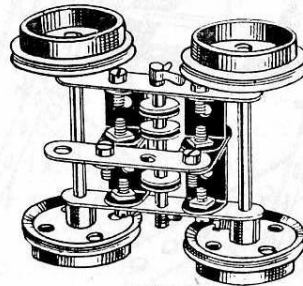


Fig. E

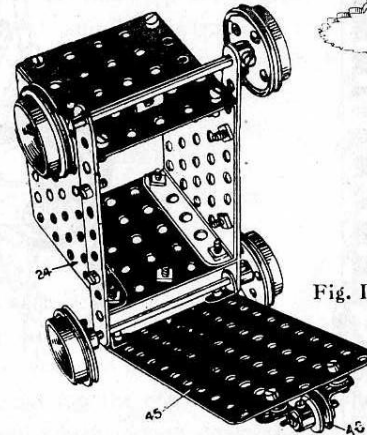


Fig. D

Model No. 400

High-Speed Ship Coaler

(Continued)

Fig. B—Sprocket Mechanism

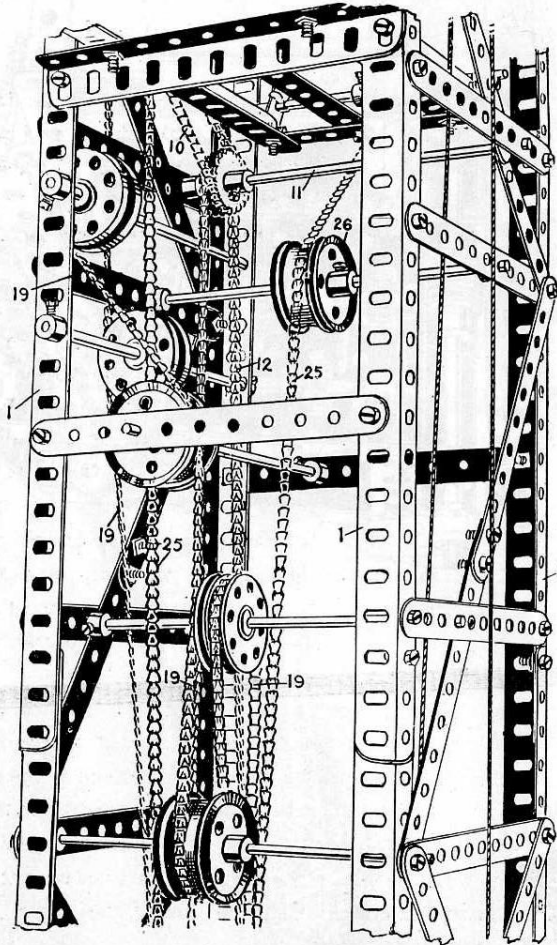
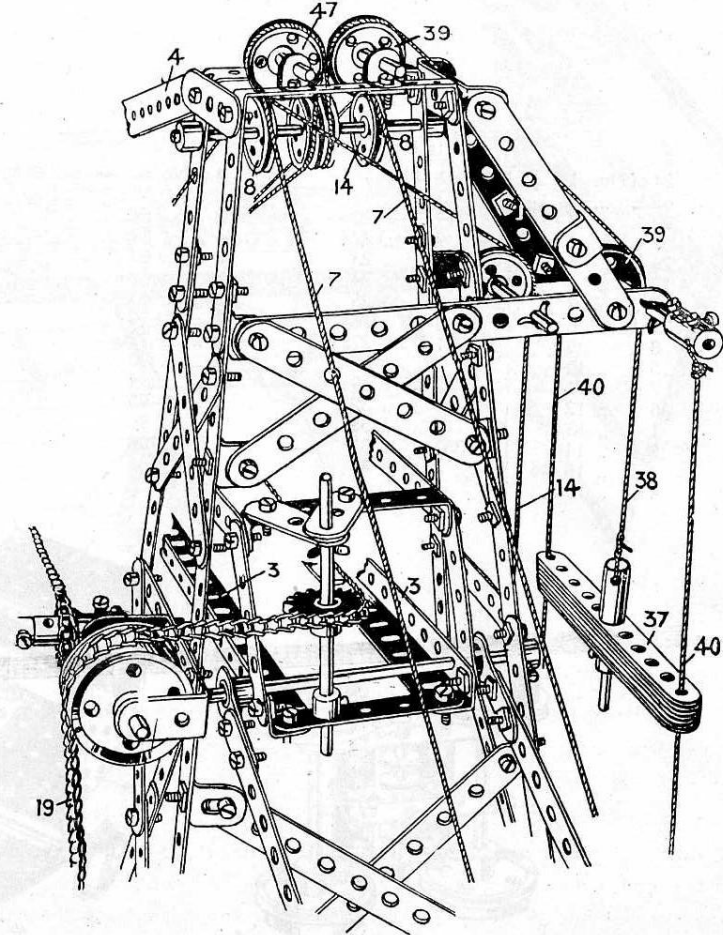


Fig. C



Model No. 400 High-Speed Ship Coaler (Continued)

Fig. 400 A is a detail view of the main driving mechanism.

Fig. 400 B shows the chain and sprocket mechanism, Fig. 400 C is a top view of the head. Fig. 400 D is an underneath view of the wagon, showing the hinged bottom, and Fig. 400 E is an underneath view of the running carriage.

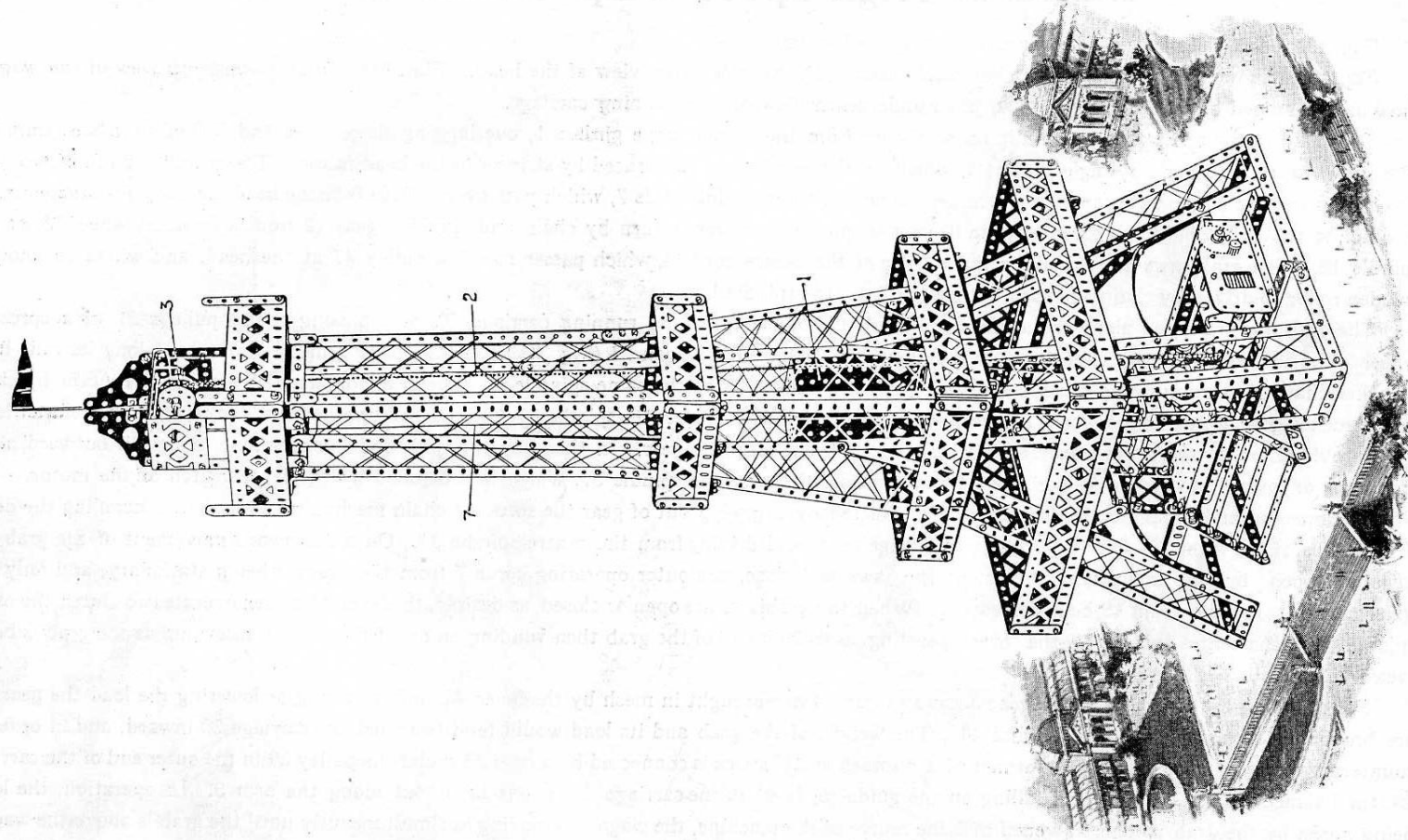
The main upright framework is built up as shown from the corner angle girders 1, overlapping three holes and bolted to a base frame 2. The runways are also built of angle girders 3, which form the rails and are braced by strips 4 to the head frame. The grab 5 is built of two jaws pivoted on the rod 6, the outer ends of which are connected to operating cords 7, which pass over pulleys 8 in the head, and on to a wooden roller 9, which is driven by chain and sprocket gear 10 from a spindle 11 driven in turn by chain and sprocket gear 12 from a sprocket wheel 13 on the spindle 18. The grab jaws are closed by the raising of the centre cord 14, which passes round a pulley 47 at the head, and winds on another wooden roller 15 driven by chain and sprocket gear 16 from the spindle 17.

The grab 5 is traversed along the arm 3 by a chain 19 connected to the running carriage 20, and passing round pulleys 21 to a sprocket wheel 22 on the centre spindle 23 of the main gear box, Fig. 400A. The wagon 24 (Fig. 400D) on the other arm 3 is traversed along its rails by a sprocket chain 25 passing round pulleys 26 on to another sprocket 27 on the same spindle 23. The gear box is actuated from the motor by chain and sprocket gear 28, driving a worm 29 gearing with a $\frac{1}{2}$ " pinion on the centre spindle 31, and a clutch mechanism 30 operated by a clutch lever 42 is provided for throwing the traversing chains 19 and 25 out of, or in, gear. In this way the grab and bucket move in unison outward along the arms, or inward, according to the direction of rotation of the centre spindle 31, which is controlled by the lever switch of the motor.

The opening and closing action of the grab is effected by throwing out of gear the sprocket chain mechanism 10 and 12 controlling the drum 9 by means of the lever 43, spindle 17 being in engagement, and driving from the centre spindle 31. On a downward movement of the grab the jaws will open; but on an upward movement the jaws will close, the outer operating cords 7 from the drum 9 being stationary, and only the inner cord 14 from the drum 15 being operated. When the grabjaws are open or closed, as desired, the lever 44 is then operated to clutch the outer spindle 18 to the centre spindle 31, the three operating cords 7 and 14 of the grab then winding on or off the drums, according as the grab is being raised or lowered.

For grabbing the load, the larger gear 33 and pinion 34 are brought in mesh by the lever 43, and in raising or lowering the load the gears 35 are brought in mesh by the levers 43 and 44. The weight of the grab and its load would tend to thrust the carriage 20 inward, and in order to counteract this, a balance weight 37, formed of a number of $5\frac{1}{2}$ " strips is connected by a cord 38 round the pulley 39 to the outer end of the carriage 20, the balance weight 37 rising and falling on the guide cords 40 as the carriage 20 moves in or out along the arm 3. In operation, the load, being raised by the grab, is then traversed into the centre of the machine, the wagon 24 moving in simultaneously until the grab is above the wagon, when the load is dumped into the wagon and on the next outward movement of the grab the wagon moves outward until it arrives over the chute 41, the pivoted bottom 45 of the wagon falling and permitting the contents to discharge down the chute. The bottom of the wagon falls by reason of the front pulley 46 running down a curved rail which is bent down the inclined side of the chute 41.

Model No. 401 Eiffel Tower (Special Model)

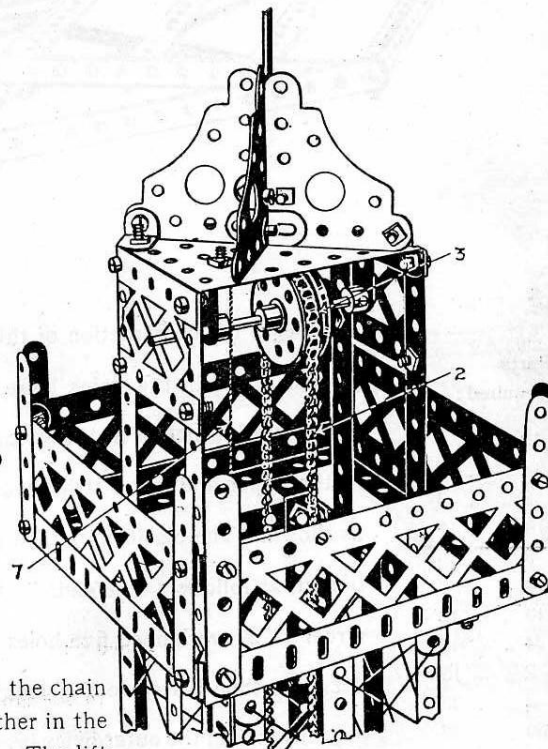
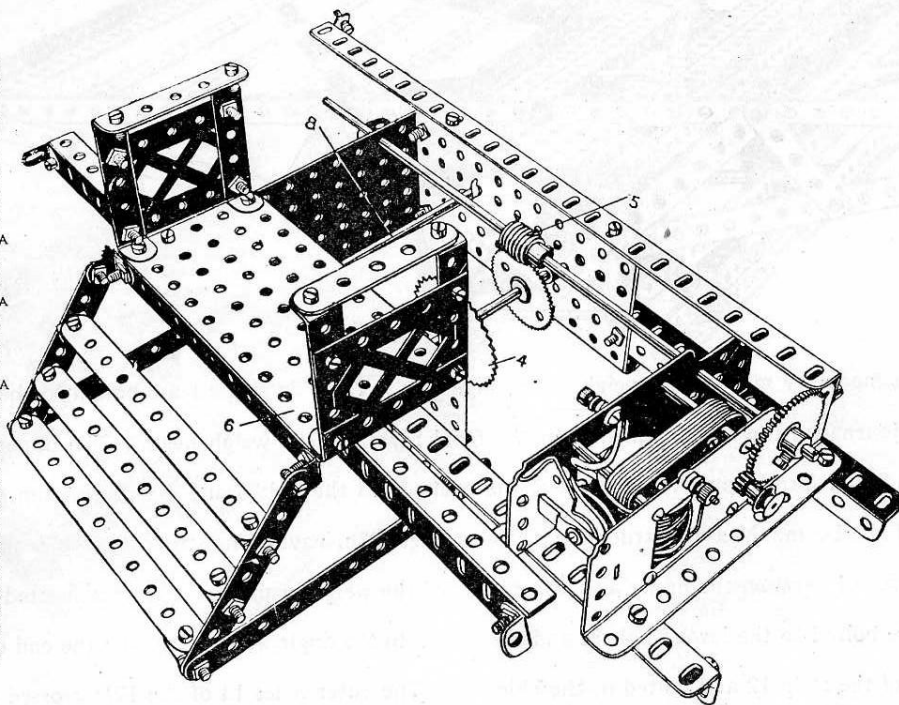


Model No. 401

Eiffel Tower (Continued)

Parts
Required:

22 of No.	1
27 "	2
6 "	3
12 "	4
12 "	5
24 "	6
20 "	8
16 "	9
72 "	12
4 "	12A
1 "	13
1 "	15
2 "	15A
1 "	16
1 "	20
1 "	24
1 "	27A
1 "	32
337 "	37
1 "	46
3 "	52
3 "	53
6 "	59
4 "	60
2 "	72
8 "	94
1 "	95
4 "	99
16 "	100
4 "	108

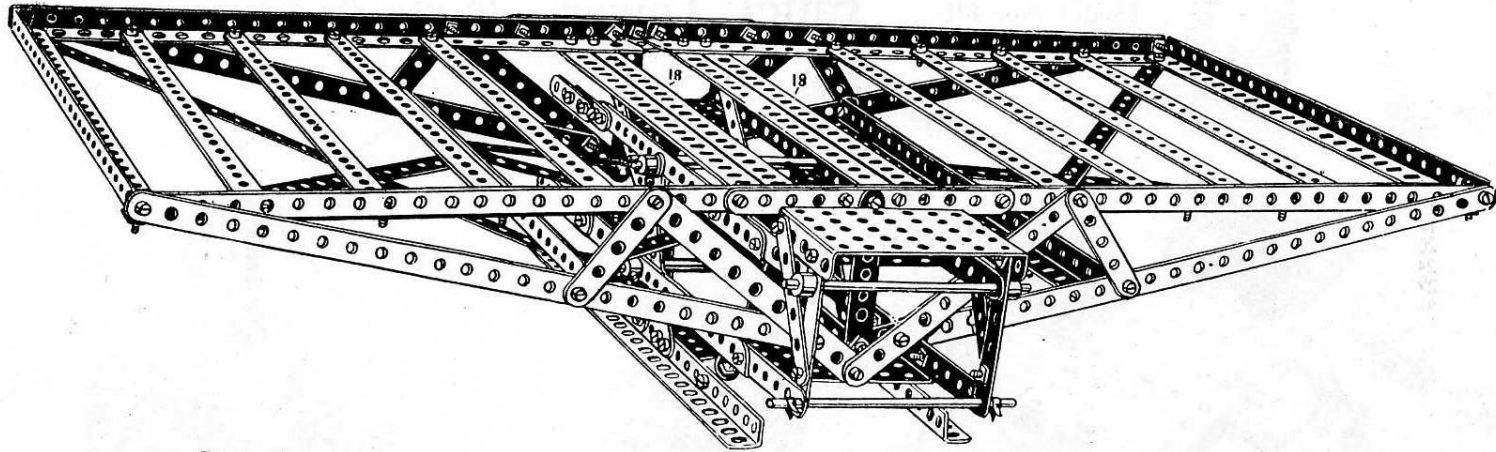


No description is necessary of the tower itself. The lift carriage 1 is raised and lowered by the chain 2 which passes over a pulley wheel 3 formed by butting a flanged wheel and a bush wheel together in the top, and a 2" sprocket wheel 4 in the bottom, driven by the worm gearing 5 from the motor. The lift carriage is brought to rest at the platform 6, and is guided by the cord 7 passing through the holes in the perforated plates of the lift carriages, the cord being secured to the top of the tower and to the rod 8 at the bottom.

Model No. 402

Weighbridge

(Outfit No. 6)

Parts
Required:

18 of No.	1
14 " "	2
8 " "	3
4 " "	4
8 " "	5
14 " "	8
10 " "	12
4 " "	15
2 " "	15A
2 " "	35
130 " "	37
6 " "	53
10 " "	59
1 " "	60

Begin the construction of this model by making the weigh beam, Fig. 402A. The side strips 1 are bolted to the base angle girders 2, and in the strips 1 are journaled the rods 3 which form the fixed pivots of the weigh beam. The upper and lower rods 4 are journaled in the strips 5 and form the moving pivots of the beam. All the rods 3 and 4 pass through perforations in the upper and lower strips 6 of the beam. Next construct the platform, Fig. 402B, leaving the strips at one side unconnected, as shown. The platform is then passed between the upper and lower parts of the weigh beam, and the unconnected strips then, bolted, as follows. The ends 7 are bolted to the lowest hole 8, and the ends 9 to the angle bracket 10, and the end of the angle girder 11 is overlapped five holes of the strip 12 and bolted in the hole 13. The outer holes 14 of the $12\frac{1}{2}$ " crossed strips, Fig. 402A, are then bolted to the same holes 15 in the angle girders 16 as the strips 17. The double angle girders 18 are then bolted in position, and the outer holes 19, Fig. 402A, are bolted to the angle girders 18 in the centre holes and the holes 20, Fig. 402A, to the angle girders 18 at the fifth hole from the girder ends. The load to be weighed rests on the main platform, and the weights are placed on the small rectangular plate 21 at the end of the weigh beam.

Model No. 402 Weighbridge (Continued)

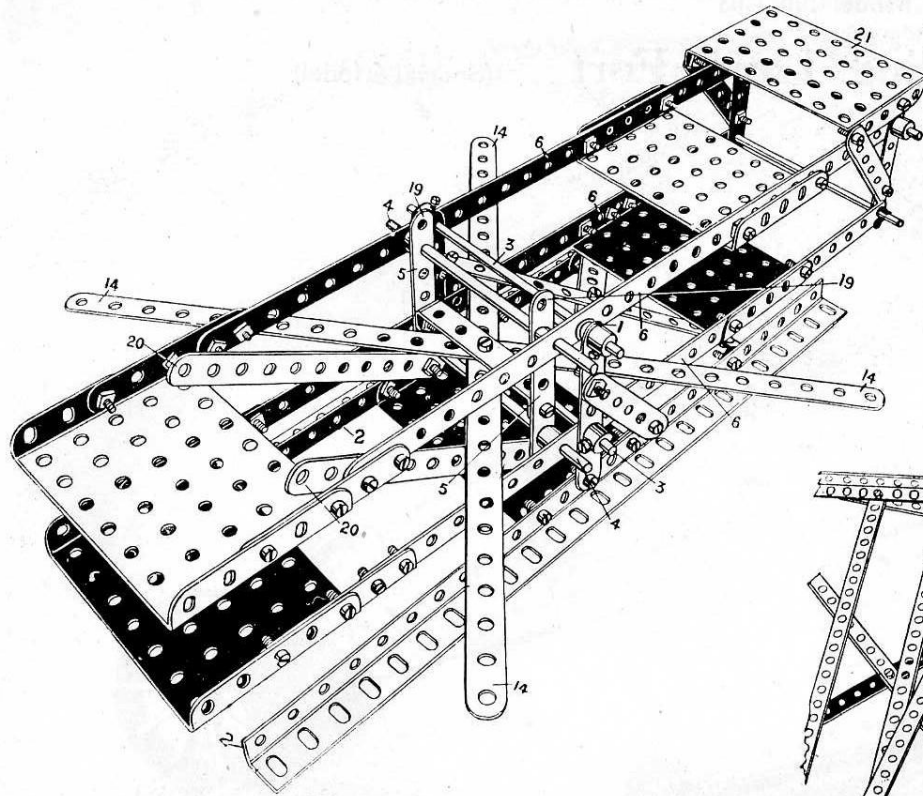


Fig. 402 A

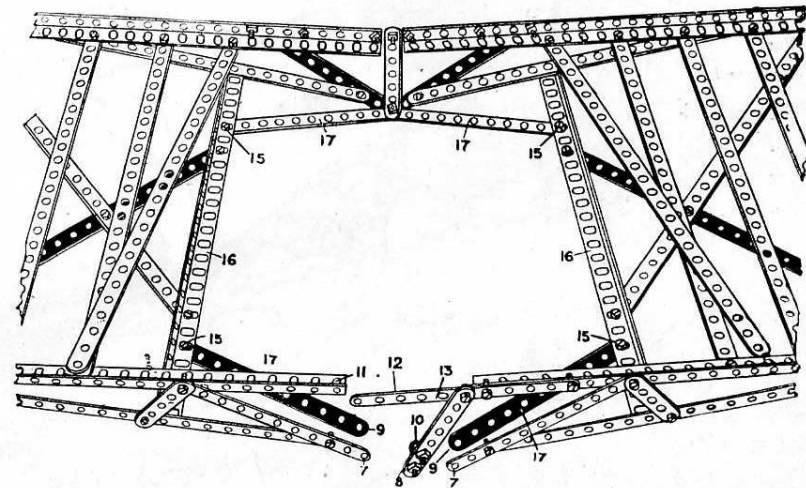
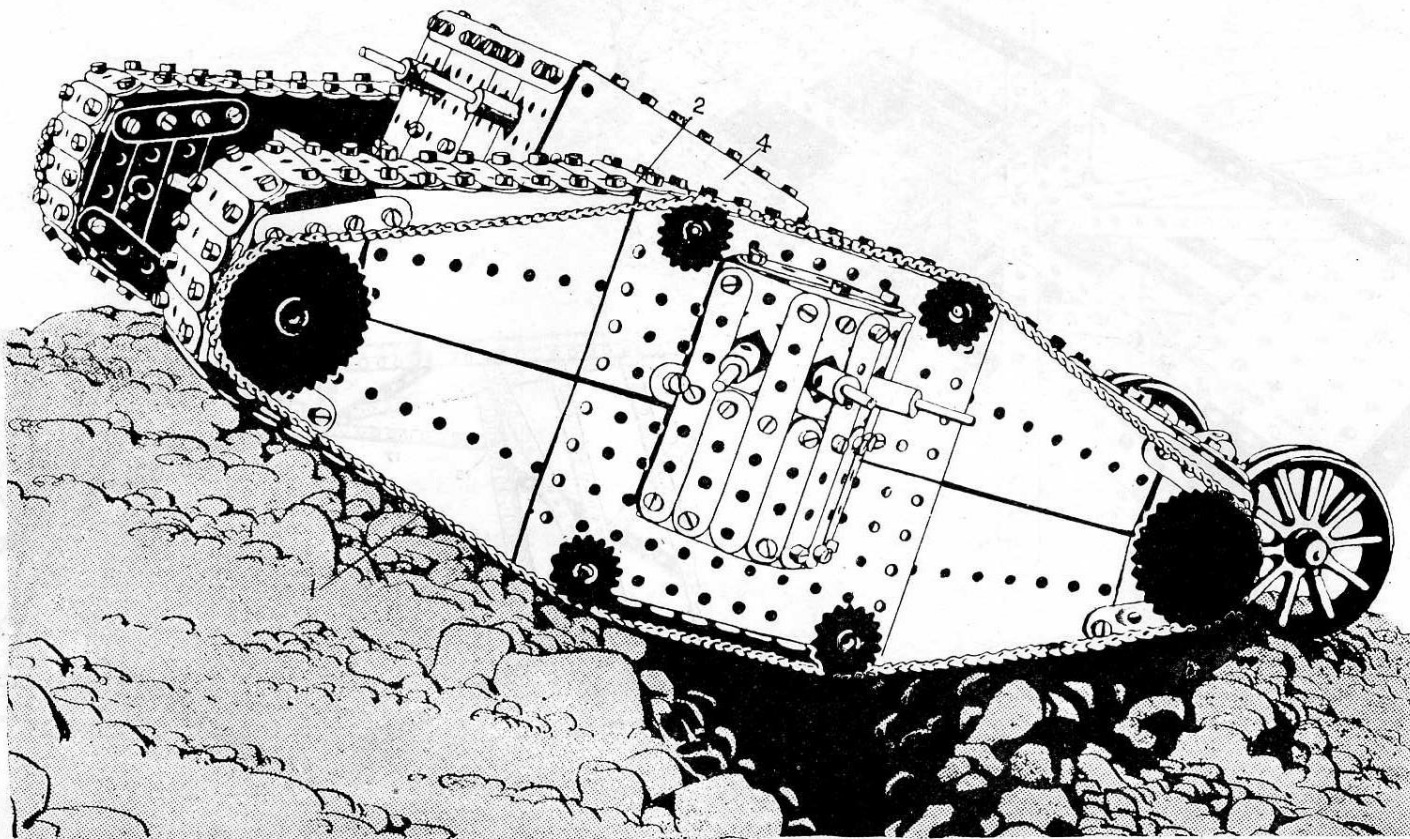


Fig. 402 B

Model No. 403

Tank or Travelling Land Fort (Special Model)



Model No. 403

Tank or Travelling Land Fort (Continued)

Parts Required:

6 of No. 2	461 of No. 37
10 " " 3	1 " " 45
18 " " 5	13 " " 52
70 " " 6	18 " " 54
2 " " 6A	9 " " 59
4 " " 9	1 " " 62
14 " " 12	18 " " 63
1 " " 13	8 " " 90
1 " " 15	2 yds. " 94
4 " " 16	4 " " 95
9 " " 17	8 " " 96
1 " " 18	2 " " 97
4 " " 19A	4 " " 100
2 " " 20A	

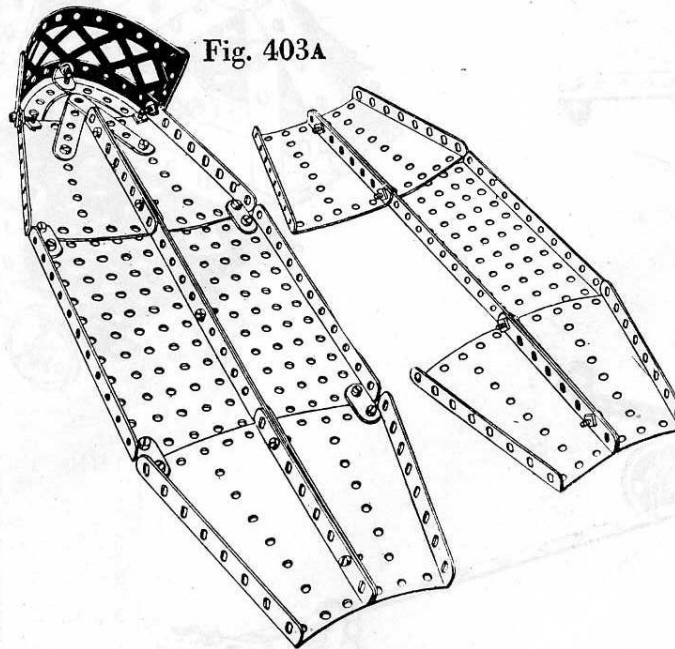


Fig. 403A

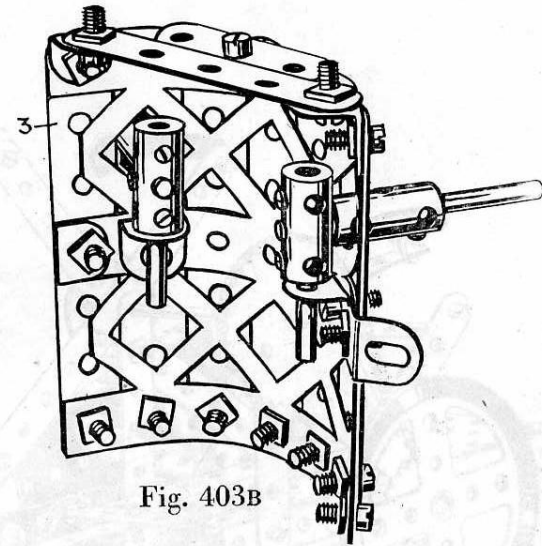
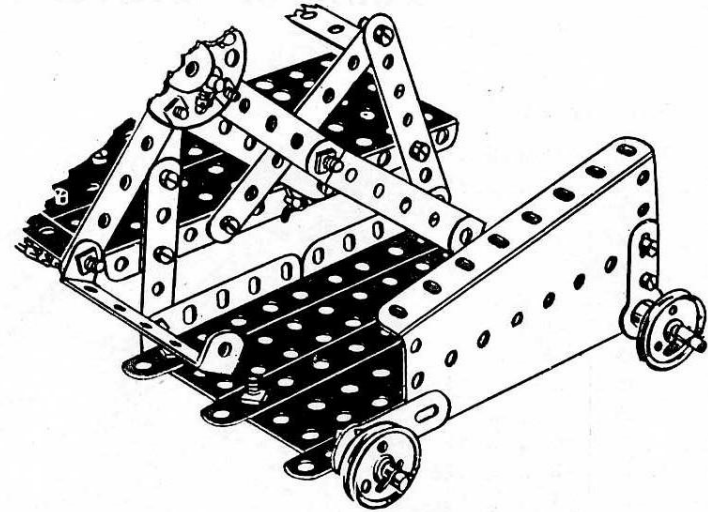
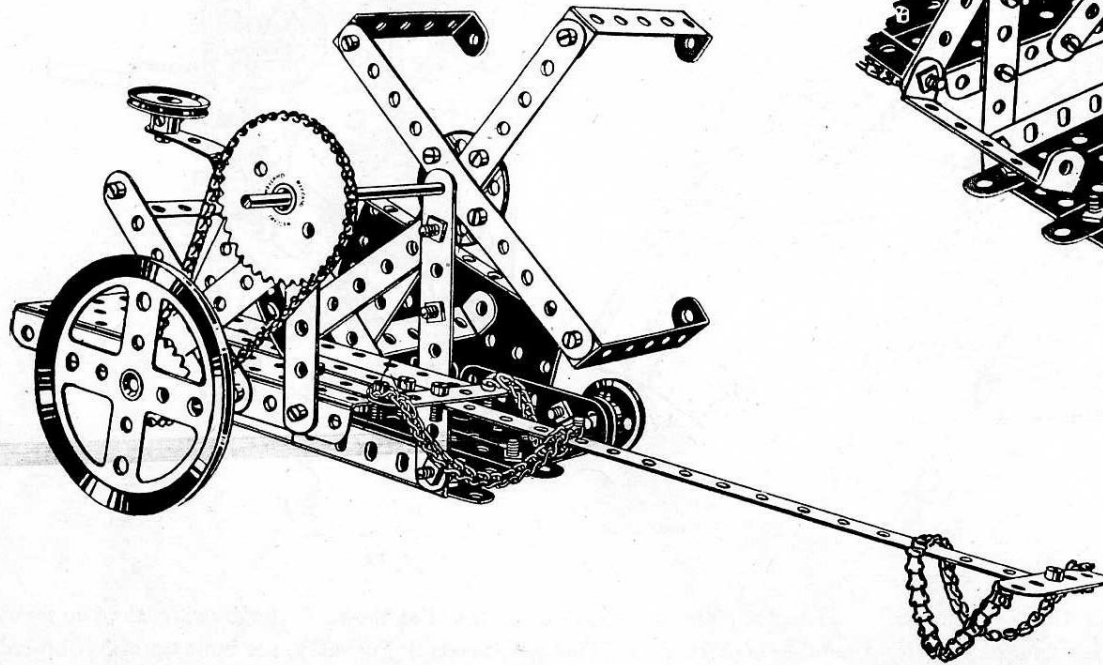


Fig. 403B

The sides of the Tank, Fig. 402A, are built up of rectangular and sector plates connected at each end as shown in the drawing, the two series of plates being then connected across by their flanged ends by a number of 2" strips 2. The gun turrets 3, Fig. 402B, are built up of 3½" braced girders bent round and bolted on the outside with vertical 3½" strips, and bolted on the sides of the tank. The sides of the tank are connected together by the compartment 4, made of rectangular plates bolted together.

Model No. 404 Binder

(Outfit No. 3)



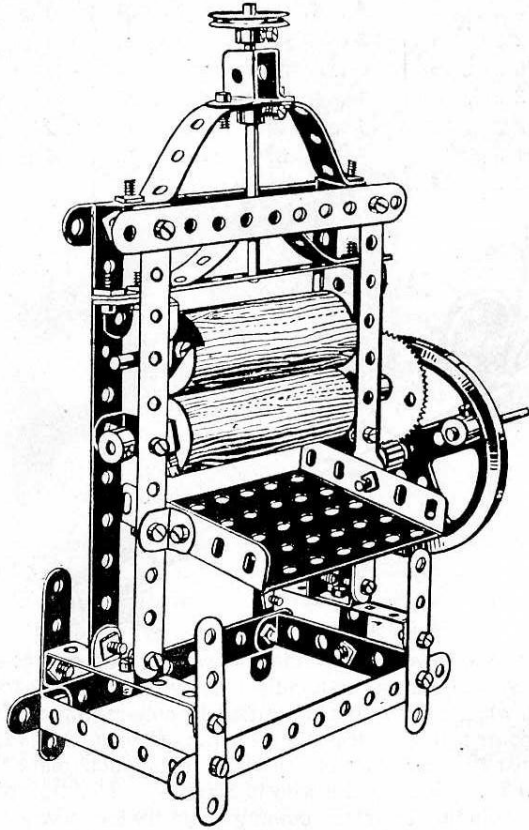
Parts Required:

1 of No. 1	1 of No. 19A	1 of No. 54
5 " " 2	1 " " 22	2 " " 59
5 " " 3	2 " " 22A	5 " " 60
2 " " 4	1 " " 24	2 " " 62
3 " " 5	35 " " 37	6 " " 94
1 " " 15A	1 " " 52	1 " " 95
1 " " 16	2 " " 53	1 " " 96
2 " " 18A		

Model No. 405

Mangling Machine

(Outfit No. 4)



Parts Required :

10 of No. 2

1 " " 3

6 " " 5

7 " " 11

2 " " 12A

2 " " 15

1 " " 16

2 " " 17

1 " " 19A

1 " " 22

1 of No. 26

1 " " 27A

38 " " 37

3 " " 38

1 " " 45

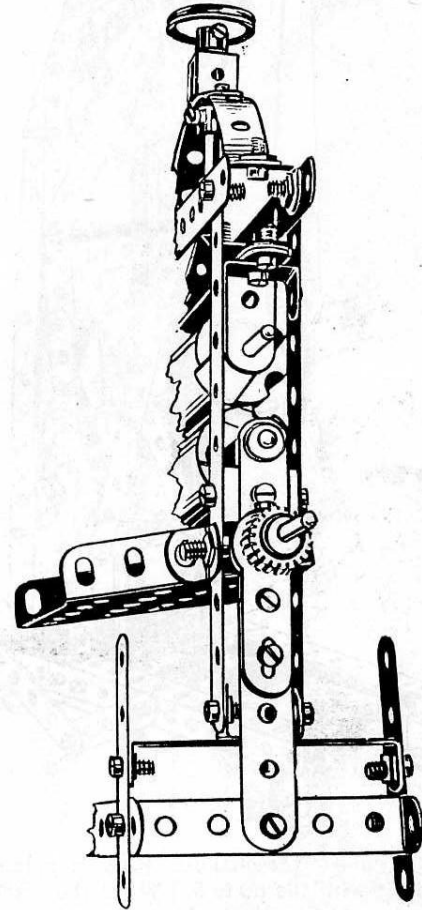
1 " " 53

5 " " 59

4 " " 60

1 " " 62

1 " " 106

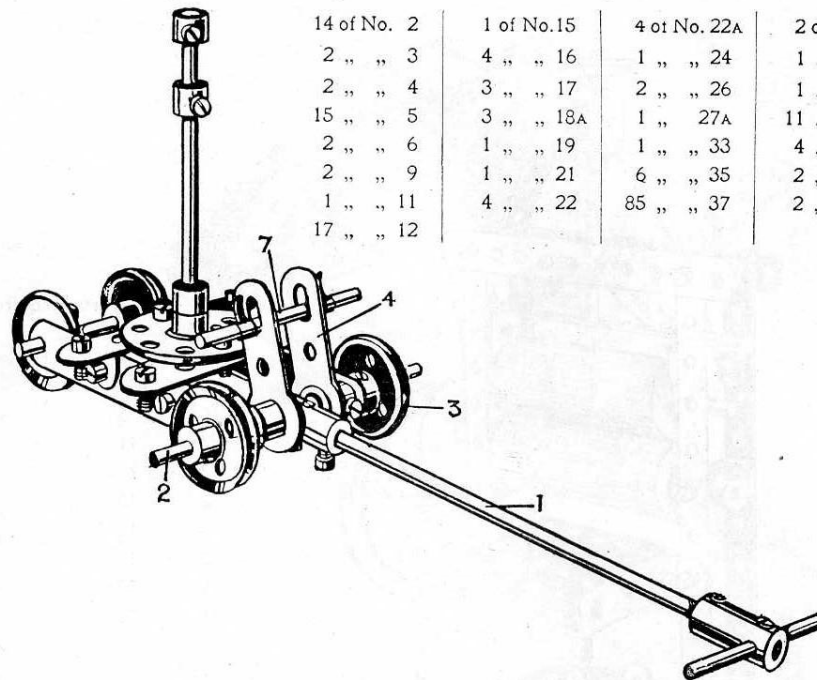
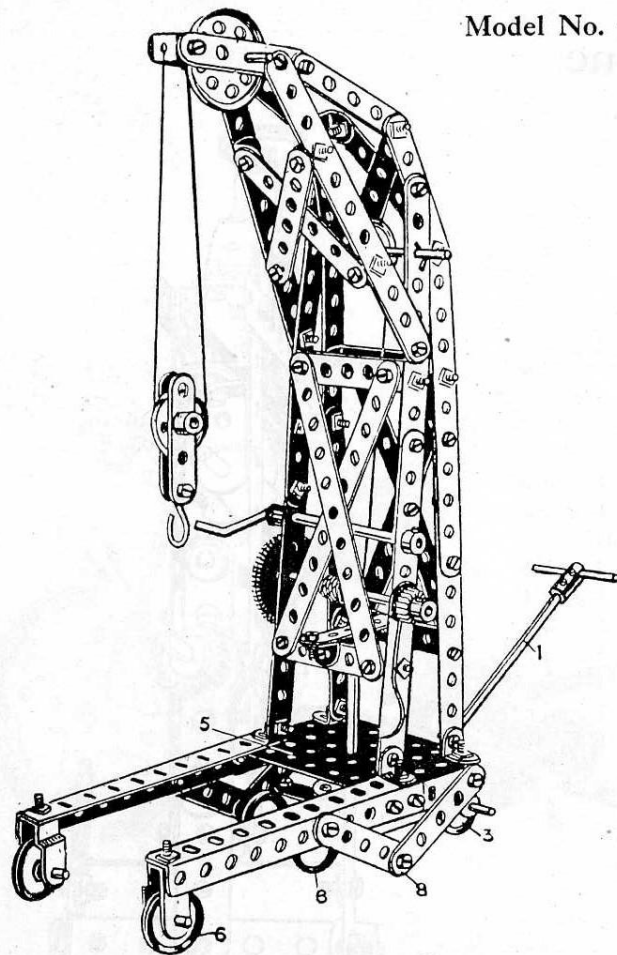


Model No. 406 Portable Crane

(Outfit No. 6)

Parts Required :

14 of No. 2	1 of No. 15	4 of No. 22A	2 of No. 38
2 " " 3	4 " " 16	1 " " 24	1 " " 53
2 " " 4	3 " " 17	2 " " 26	1 " " 57
15 " " 5	3 " " 18A	1 " " 27A	11 " " 59
2 " " 6	1 " " 19	1 " " 33	4 " " 60
2 " " 9	1 " " 21	6 " " 35	2 " " 62
1 " " 11	4 " " 22	85 " " 37	2 " " 63
17 " " 12			



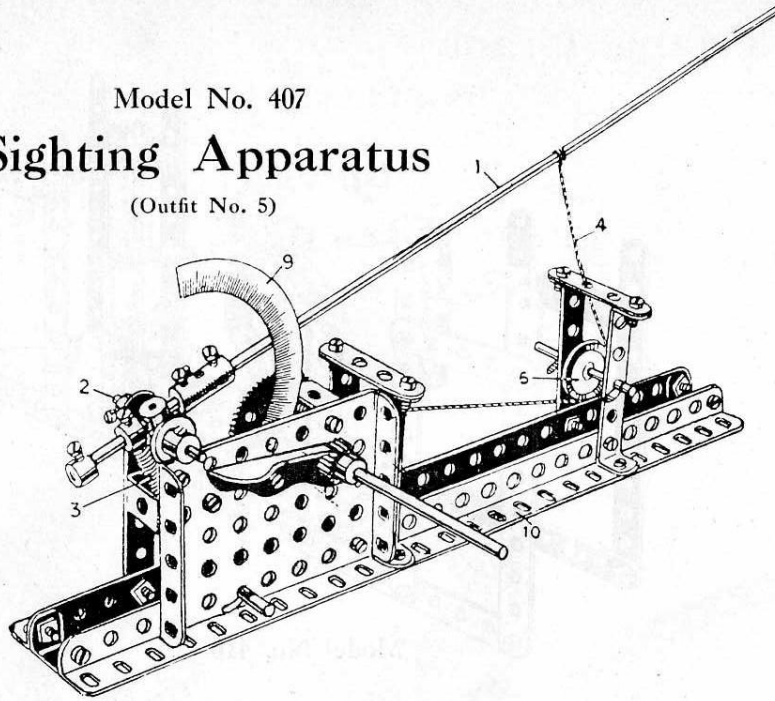
cranks 4 when the handle 1 is depressed engage an angle engagement with the plate 5. When the crane is brought to rest its weight forces down the cranks 4 which raises the handle 1, and the tips 8 of the strips together with the front wheels 6 then support the crane

The construction of the tower is quite clear from the illustration. The crane is moved about by depressing the handle 1 carrying an axle 2 for the 1" loose pulley wheels 3, which are secured in position by collars and set screws. A pair of cranks 4 are secured to the axle 2 and are arranged when the handle is depressed to bear against the underface of the small rectangular plate 5 and lift the crane so that it then runs on the wheels 3 and 6. The tips of the bracket to stop the spindle 7 from coming completely away from

Model No. 407

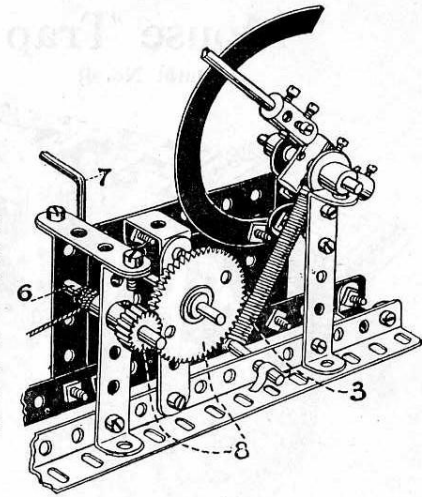
Sighting Apparatus

(Outfit No. 5)



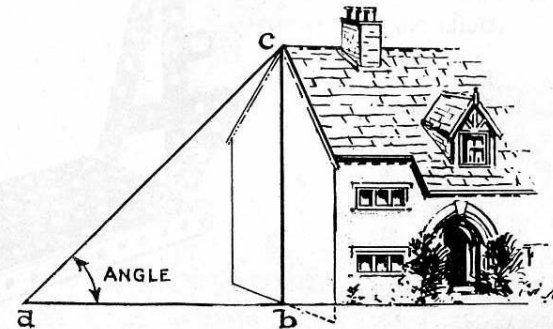
Parts Required :

2 of No. 6	1 of No. 33
2 " " 8	2 " " 35
3 " " 11	24 " " 37
1 " " 13	1 " " 43
4 " " 17	1 " " 53
1 " " 19	3 " " 59
1 " " 22	5 " " 60
2 " " 26	2 " " 62
1 " " 27A	



This model is for determining the heights of buildings, towers, etc. The pointer 11½" rod 1 is pivotted on the 2" rod 2 and controlled by a spring 3, the pointer 1 being adjusted by the cord 4 which passes round a guide pulley 5 and on to the axle 6 upon which it is wound by the crank handle 7 which operates the gear wheel and pinion 8. A graduated scale of degrees 9 made of cardboard, or a protractor, is mounted in order to read off the angle of inclination of the pointer.

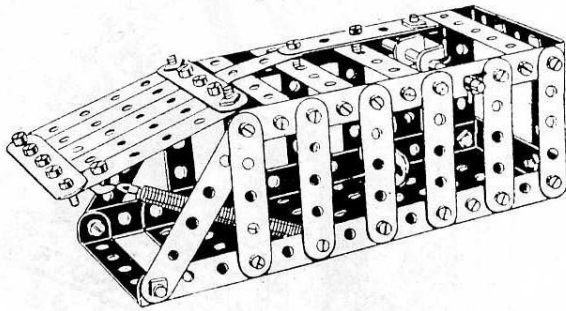
In finding the height of a building, measure out a number of feet or yards from the foot of the building, and set this out to some scale corresponding to the line *a, b*, in the diagram, then, standing at the point *a* furthest from the building, and keeping the angle girders 10 horizontal, move the pointer 1 until it is directed towards the top of the building. Then read off the angle on the scale 9, and draw a line *a, c*, making the angle *b a c* equal to the angle read off. Then draw a vertical line *b c* from the point *b*, and with the same scale used for setting off the distance *a b* measure the height *b c*, which will be the height of the building.



Model No. 408

Mouse Trap

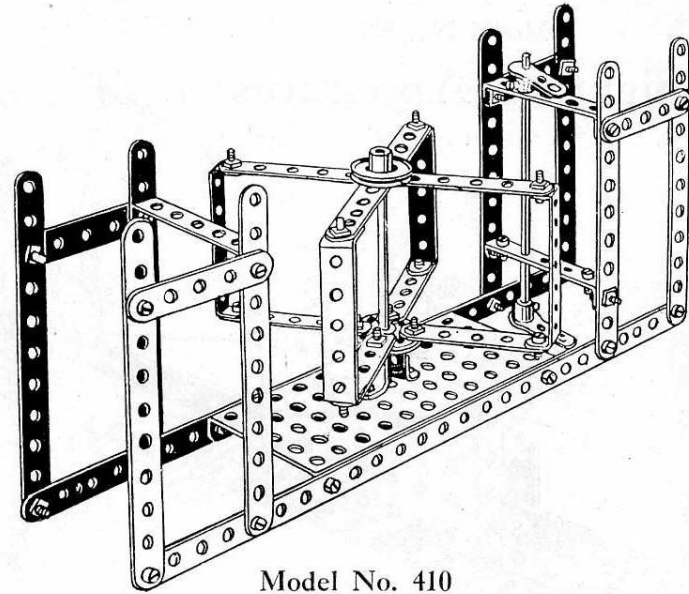
(Outfit No. 4)



Parts

Required :

3 of No. 2
5 4
17 5
5 10
1 11
3 12
1 16
4 35
59 37
5 38
1 43
1 52
8 60



Model No. 410

Turnstile

(Outfit No. 2)

Parts Required :

2 of No. 1	1 of No. 24
10 2	1 35
7 5	38 37
2 12	1 45
1 15	1 52
1 15A	6 60
2 22	2 62

Model No. 409

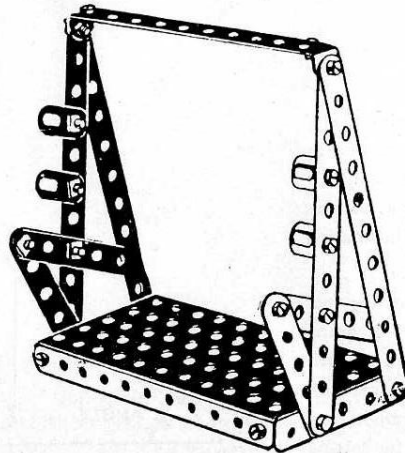
Pen Rack

(Outfit No. 1)

Parts

Required :

5 of No. 2
4 5
4 10
2 12
20 37
1 52
2 60



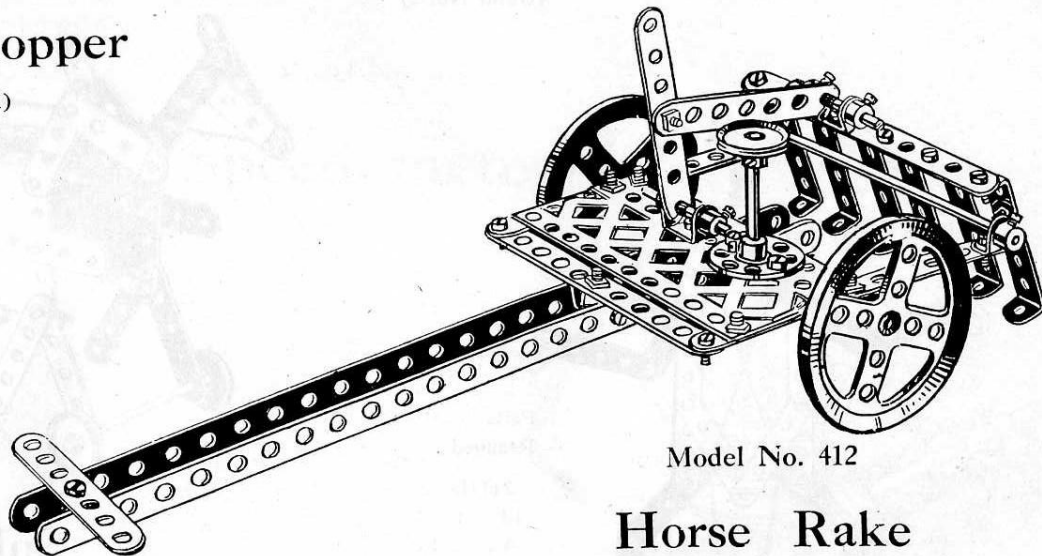
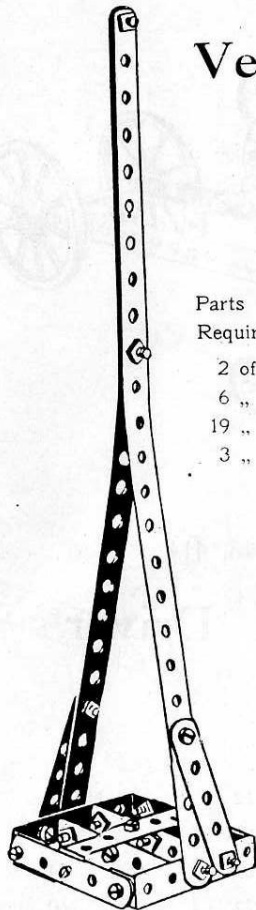
Model No. 411

Vegetable Chopper

(Outfit No. 1)

Parts
Required :

2 of No. 1
6 " " 5
19 " " 37
3 " " 60



Model No. 412

Horse Rake

(Outfit No. 4)

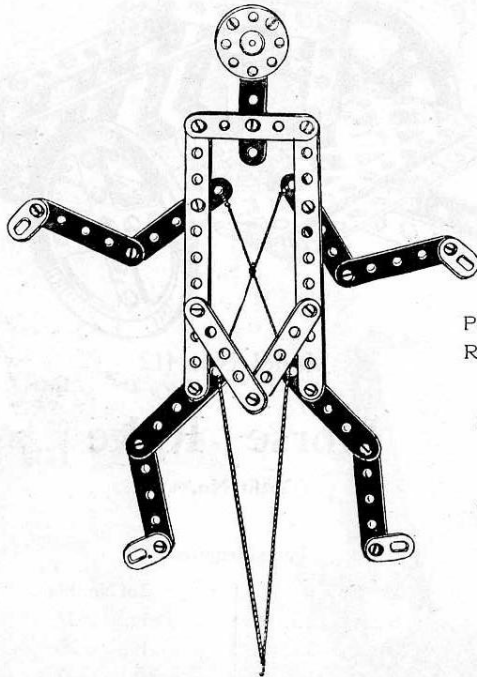
Parts Required :

2 of No. 1	2 of No. 19A
5 " " 2	1 " " 22
3 " " 3	1 " " 24
3 " " 11	27 " " 37
6 " " 12	6 " " 59
2 " " 14	6 " " 60
3 " " 17	1 " " 100

Model No. 413

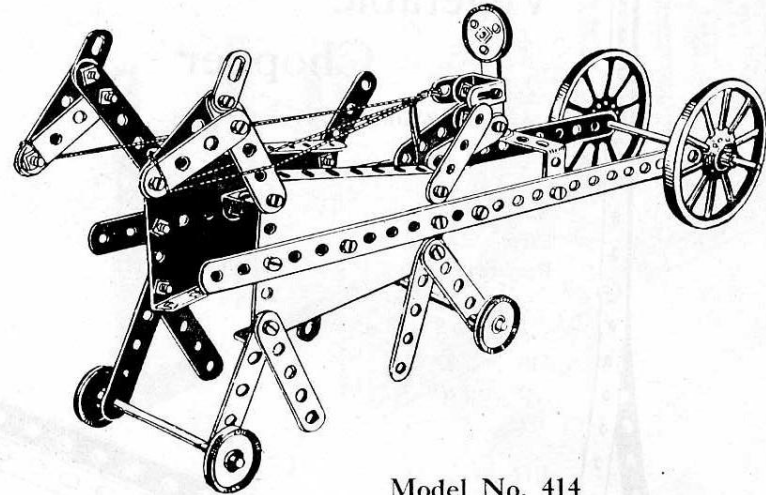
Jumping Jack

(Outfit No. 2)



Parts
Required :

2 of No. 2
12 " " 5
4 " " 10
1 " " 24
18 " " 37



Model No. 414

Sulky and Driver

(Outfit No. 5)

Parts Required :

2 of No. 1	1 of No. 12	32 of No. 37
13 " " 5	3 " " 15A	1 " " 46
6 " " 6	2 " " 19A	2 " " 54
4 " " 10	4 " " 22	2 " " 60
2 " " 11	1 " " 22A	

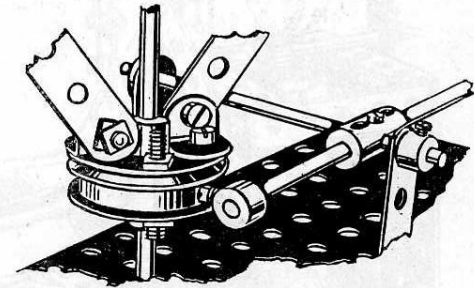
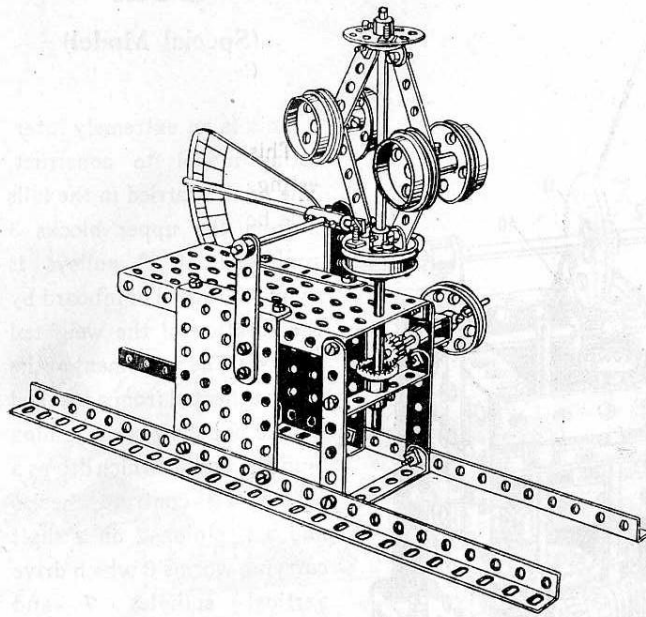
Model No. 415

Speedometer

(Outfit No. 4)

Parts Required :

2 of No. 3	1 of No. 26
2 " " 4	1 " " 29
4 " " 5	32 " " 37
2 " " 8	1 " " 38
4 " " 12	1 " " 45
1 " " 13A	1 " " 52
3 " " 16	2 " " 53
1 " " 17	5 " " 59
5 " " 20	3 " " 60
1 " " 21	1 " " 63
2 " " 24	



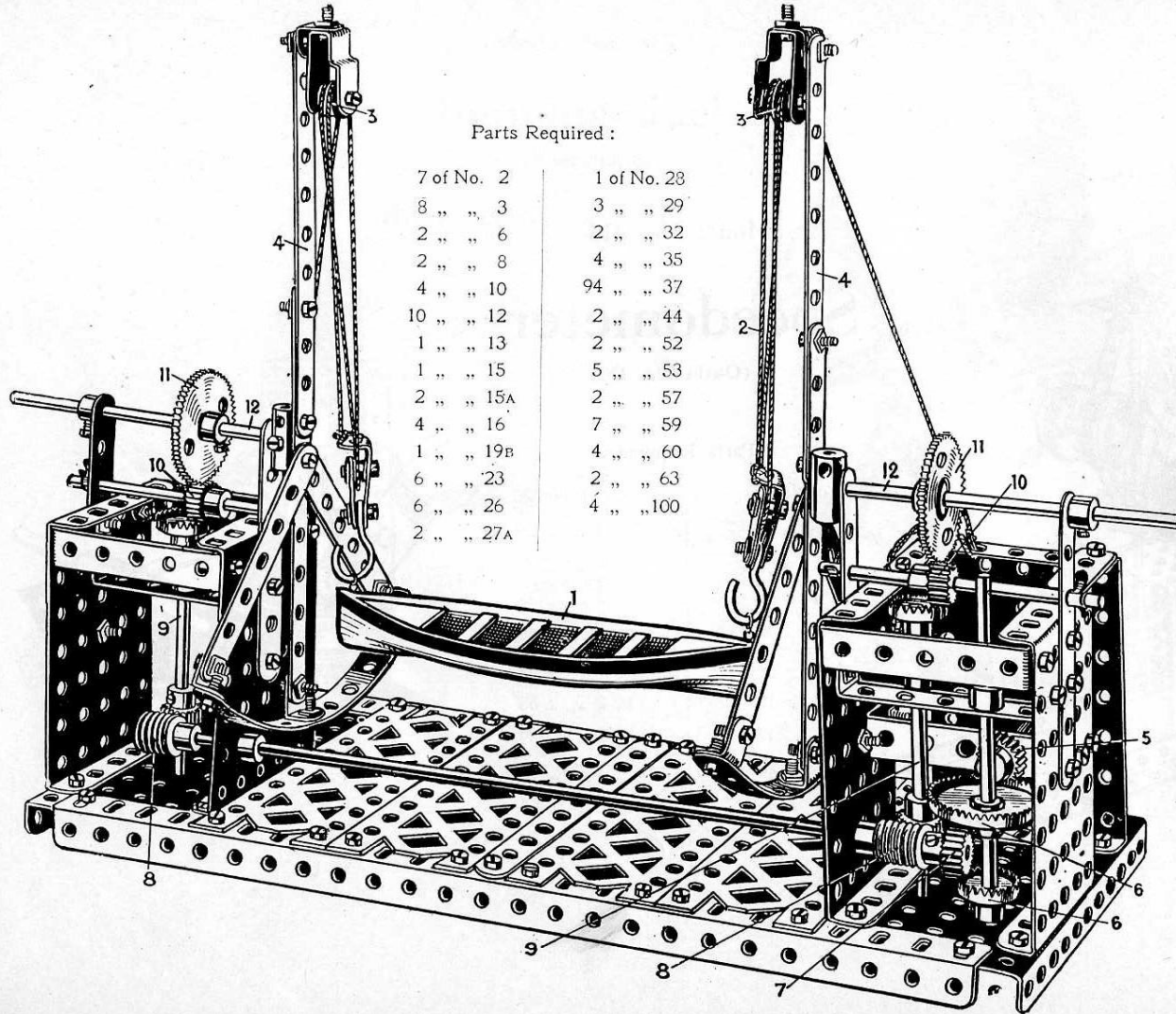
Model No. 416

Boat Launching Gear (Special Model)

This is an extremely interesting model to construct. The boat 1 carried in the falls 2 from the upper blocks 3 composed of $\frac{1}{2}$ " pulleys is swung outboard or inboard by the rotation of the weighted arms 4. The movement of the arms is effected from a cranked handle not shown, a $\frac{1}{2}$ " pinion 5 on the end of which drives a $1\frac{1}{2}$ " and a $\frac{3}{4}$ " contrate wheel 6 and a $\frac{1}{2}$ " pinion 7 on a shaft carrying worms 8 which drive vertical spindles 9 and through $\frac{1}{2}$ " pinions, 10 and 56-toothed gear wheels 11 the axle rods 12 upon which the arms 4 are pivotally supported.

Parts Required :

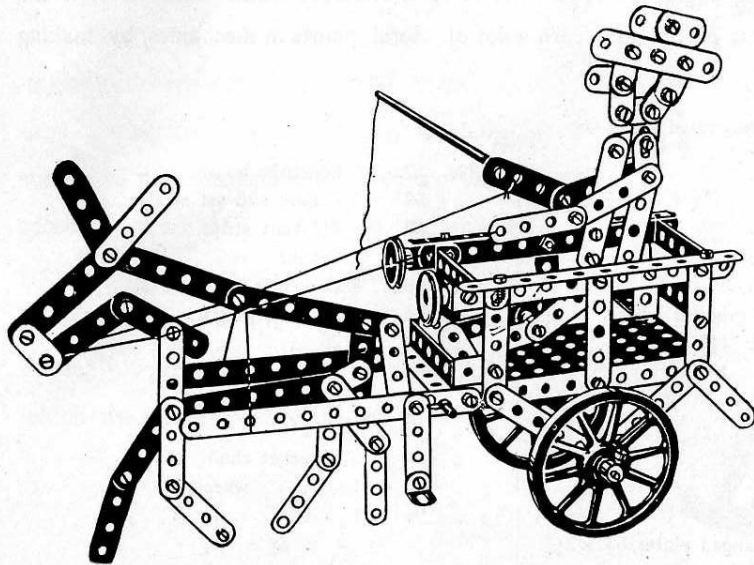
7 of No. 2	1 of No. 28
8 " " 3	3 " " 29
2 " " 6	2 " " 32
2 " " 8	4 " " 35
4 " " 10	94 " " 37
10 " " 12	2 " " 44
1 " " 13	2 " " 52
1 " " 15	5 " " 53
2 " " 15A	2 " " 57
4 " " 16	7 " " 59
1 " " 19B	4 " " 60
6 " " 23	2 " " 63
6 " " 26	4 " " 100
2 " " 27A	



Model No. 417

A Gay Start

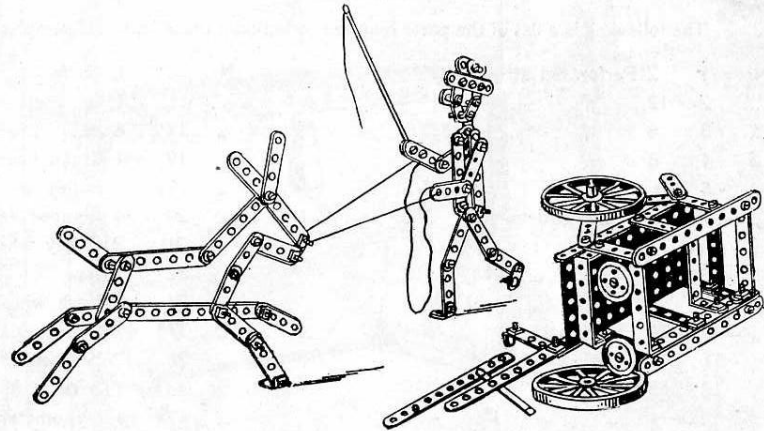
(Outfit No. 6)

Parts
Required :

6 of No.	2
2 " "	3
5 " "	4
10 " "	5
22 " "	6
19 " "	10
8 " "	12
1 " "	15
1 " "	15A
1 " "	16
2 " "	19A
2 " "	22
2 " "	35
71 " "	37
2 " "	46
1 " "	52
3 " "	60

Model No. 418

The End of a Perfect Day



Interesting Experiments in Applied Mechanics with Meccano

Few boys know what an important part the science of "Applied Mechanics" plays in everything which they see around them. It is this science which enables engineers to design machines, so that they will withstand all kinds of strains. It enables bridge builders to make their constructions so that they are able to guarantee them to bear certain weights. When an engineer builds a crane and guarantees it to lift a load of so many tons, "Applied Mechanics" tell him where the strain will come, exactly what strength of materials he must use, and how his crane ought to be designed.

Of course "Applied Mechanics" is a big subject, and you can only grasp its principles thoroughly after a lot of study; but it is a very fascinating subject, and some of the elementary principles are most interesting and novel and not at all difficult to understand. To simplify the working out of the examples which will be found on the following pages, we have introduced a standard frame work, so that the various examples may be easily and quickly set up. Any boy can get lots of fun and learn a lot of useful points in mechanics, by making these experiments.

The following is a list of the parts required to build all the Scientific Examples illustrated here:—

No.	1	2 Perforated strips, 12½"
"	2	12 " " 5½"
"	3	6 " " 3½"
"	4	6 " " 3"
"	5	6 " " 2½"
"	7	4 Angle girders, 24½"
"	7A	4 " " 18½"
"	8	6 " " 12½"
"	9	1 " " 5½"
"	10	24 Flat brackets
"	11	2 Double "
"	12	12 Angle "
"	12A	4 " " 1"
"	13	1 Rod, 11½"
"	13A	1 " 8"

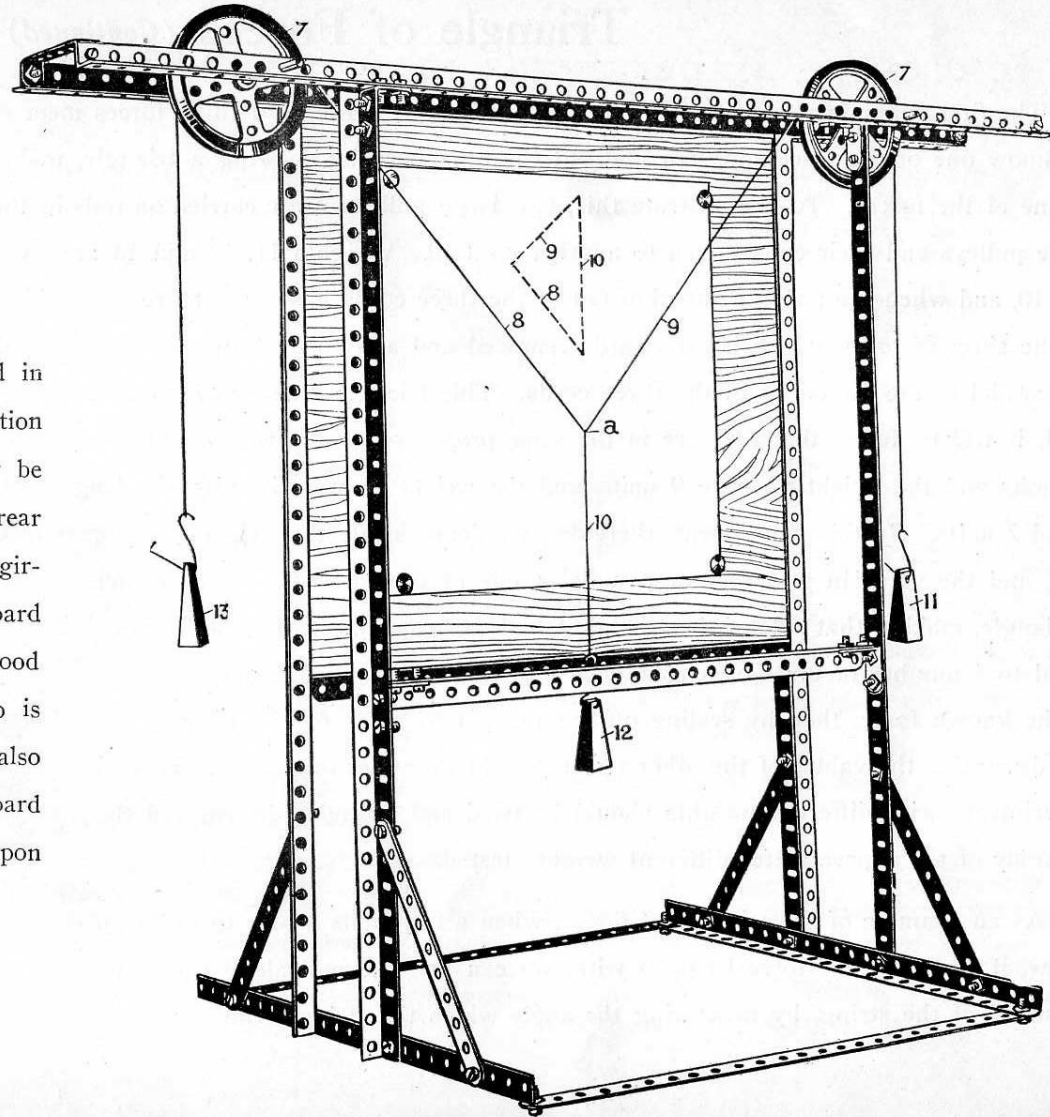
No.	15	6 Rods, 5"
"	16	1 " 3½"
"	17	6 " 2"
"	19	1 Crank handle
"	19B	6 Pulley wheels, 3"
"	20	4 Flanged and grooved wheels
"	21	2 Pulley wheels, 1½"
"	22	1 " " 1"
"	24	1 Bush wheel
"	37	48 Nuts and bolts
"	38	12 Washers
"	43	1 Spring
"	47A	1 Dynamometer
"	52	3 Perforated flanged plates, 5½" × 2½"

No.	57A	6 Scientific hooks
"	59	12 Collars and set screws
"	60	6 2½" bent strips
"	62	2 Cranks
"	63	4 Couplings
"	66	12 50-gram weights
"	67	2 25 " "
"	68	12 ½" wood screws
"	81	3 Screwed rods, 2"
"	82	1 " " 1"
"	94	5 Sprocket chain
"	95	1 " wheel, 2"
"	96	1 " " 1"

Model No. 419

Triangle of Forces

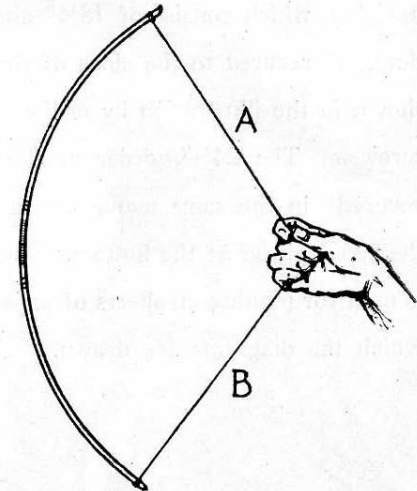
Little difficulty will be experienced in constructing the Meccano Demonstration Frame from this illustration. It may be well to mention, however, that the rear uprights, which consist of $18\frac{1}{2}$ " angle girders, are secured to the sides of the board shown in the illustration by ordinary wood screws. The $24\frac{1}{2}$ " girder at the top is secured in the same manner, as is also the $12\frac{1}{2}$ " girder at the bottom. The board is used for pinning on sheets of paper, upon which the diagrams are drawn.



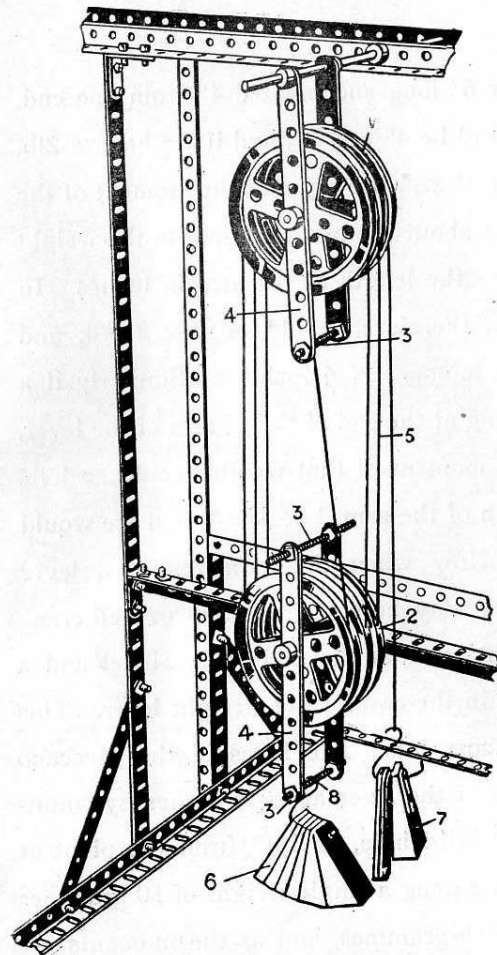
Triangle of Forces (*Continued*)

The first example is called the "Triangle of Forces." Briefly, if three forces meet at a point and balance each other, and we know one of the forces, we can find out the other two by drawing a triangle, making each side parallel to the direction of one of the forces. To demonstrate this, two large pulleys 7 are carried on rods in the top rails, and cords 8, 9, passed over these pulleys and their ends joined to another cord 10. Weights 11, 12 and 13 are then hung on the ends of the cords 8, 9, and 10, and when the point of junction (a) of the three cords has come to rest, lines in the direction of the cords are drawn on the sheet of paper which is afterwards removed and a triangle drawn, as shown in the illustration, with its sides 8, 9 and 10 parallel to the directions of the three cords. This triangle is shown in dotted lines. If the sides of the triangle are measured, it will be found that they are in the same proportion as the weights 11, 12 and 13. For instance, if the weight 12 were 15 units and the weight 13 were 9 units, and the weight 11 were 7 units, the lengths of the sides of the triangle would be 15, 9 and 7 units. By this experiment, therefore, we demonstrate that when three forces meet at a point, and we know their direction, and the value in grammes or pounds of one of the forces, if we construct a triangle, making that side of the triangle which corresponds to the known force equal to a number of units of length, each unit representing a gramme or pound of the known force, then by scaling off the other two sides of the triangle we can determine the values of the other two forces in grammes or pounds. Several experiments with different weights should be tried and triangles drawn, and the accuracy of the apparatus for different weights tested.

As an example of the triangle of forces, when a boy pulls a bow to shoot an arrow, if we know the force he pulls with, we can find the pull along each part A and B of the string, by measuring the angle which the string forms.



Model No. 420 Pulleys



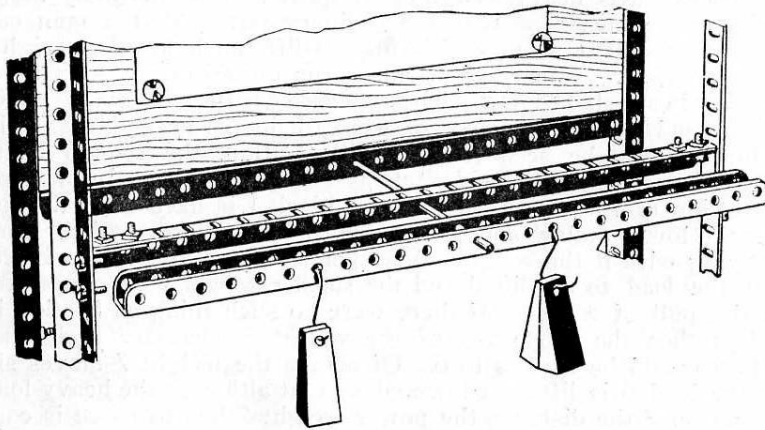
In this model the principle of a purchase pulley block is demonstrated. In engineering shops and other places where heavy weights are required to be lifted by hand, it is necessary to provide some means so that the ordinary power that a man can exert is multiplied to such an extent as to enable him to lift much heavier weights than would otherwise be possible. Whenever an apparatus for this purpose is used, what is gained in power is lost in speed. The pulley block shown consists of three 3" pulley wheels 1 in the upper block and a similar number of wheels 2 in the lower block. The construction of these blocks may be seen from the illustration, the rods 3 being screwed throughout their length, and the side strips 4 held thereon by nuts on the rods 3 inside and outside of the strips. The upper block 1 is fixed from the top girders of the frame, but the lower pulley block 2 is supported on the loops of the cord 5 and rises and falls carrying with it the weights 6 suspended from the lower block. The weights 6 represent the load to be lifted and the smaller weight 7 represents the power applied such as the pull of a man. If there were no such thing as friction in the bearings of the pulleys then the proportion of the weight 7 necessary to balance or just raise the weights 6 would be as 1 is to 6. Of course the weight 7 moves six times the distance that the load 6 is lifted or lowered, so that although the heavy load 6 is overcome by a light power 7 the distance the power weight 7 has to move is considerably greater, in fact it is six times as great. In order to ascertain the amount of friction to be overcome, it is necessary in the first place to attach small weights to the hook 7, sufficient to counterbalance the weight of the lower block to the point when it commences to move. After the weights have been added as indicated above, that is, in the proportion of 1 to 6, the amount of friction can be ascertained by again adding small weights to the point when it commences to move, the weights added representing the amount of friction.

Different load weights 6 should be hung on the lower pulley, and it should be noted what are the corresponding power weights 7 required just to overcome the load weights. These results should be tabulated like the following, which were obtained by experiment:

Power	Grammes	Load	Friction
25+3.3	= 28.3	150 Grammes	2.2 per cent
50+6.6	= 56.6	300 "	2.2 " "
75+8.8	= 83.8	450 "	1.9 " "

Model No. 421

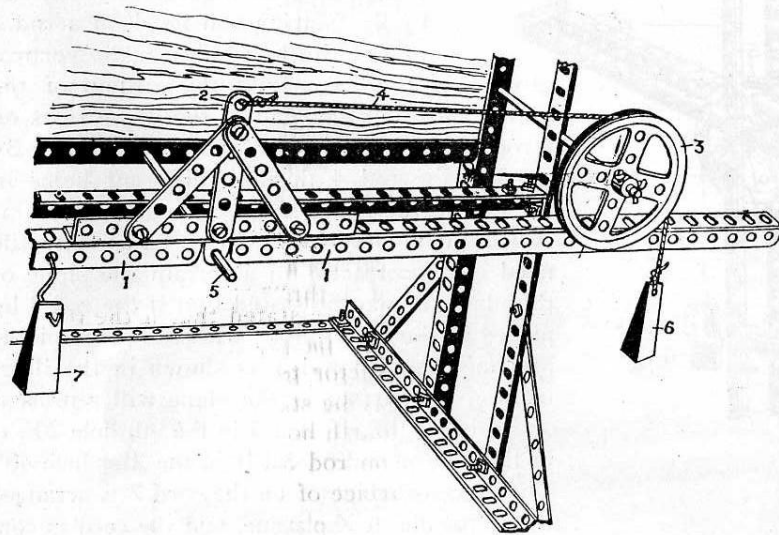
Levers



If we have a lever 6" long and pivoted 4" from one end, the arms of the lever will be 4" and 2", and if we hang a 2lb. weight at the end of the 2" arm, we say that the moment of the force of the 2 lb. weight about the pivot is equal to the weight in pounds multiplied by the length of the arm in inches. In this case the moment, therefore, would be $2 \times 2 = 4$, and this would be called a moment of 4 inch-lbs. Similarly if a weight of 1 lb. were hung at the end of the 4" arm of the lever, we would say that the moment of that weight would be 1 lb. multiplied by the length of the arm, $1 \times 4 = 4$, and we would call this 4 inch-lbs. Now when the moments of a lever

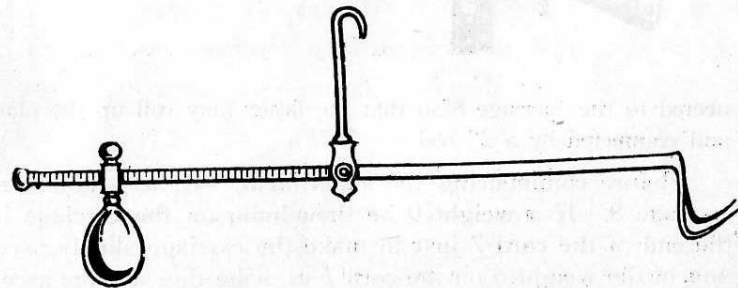
obtained in this way are equal, the lever is balanced. Levers are of various kinds; they may be straight levers or bell-crank levers—that is to say, where one of the arms is at right angles to the other. A straight lever is shown in this Model and a bell crank lever in Model No. 422. Now we will demonstrate the principle of moments in the case of the straight lever. This is made up of two $12\frac{1}{2}$ " angle girders bolted together as shown, and pivoted on a short rod. The holes in the Meccano strips are all at a standard distance of $\frac{1}{2}$ " apart, so that we can easily fix the lengths of the lever arms in inches by counting the holes. If we hang two weights of 50 grammes (that is 100 grammes) from the third hole, or $1\frac{1}{2}$ " from the pivot at one side, the moment of that weight will be $100 \times 1\frac{1}{2} = 150$ inch-grammes. Now if we hang a single weight of 50 grammes on the other side at six holes or 3" from the pivot the moment will be $50 \times 3 = 150$ inch-grammes, and as the moments are equal the lever will balance, though the weights themselves are unequal.

Model No. 422 Levers (contd.) Bell Crank



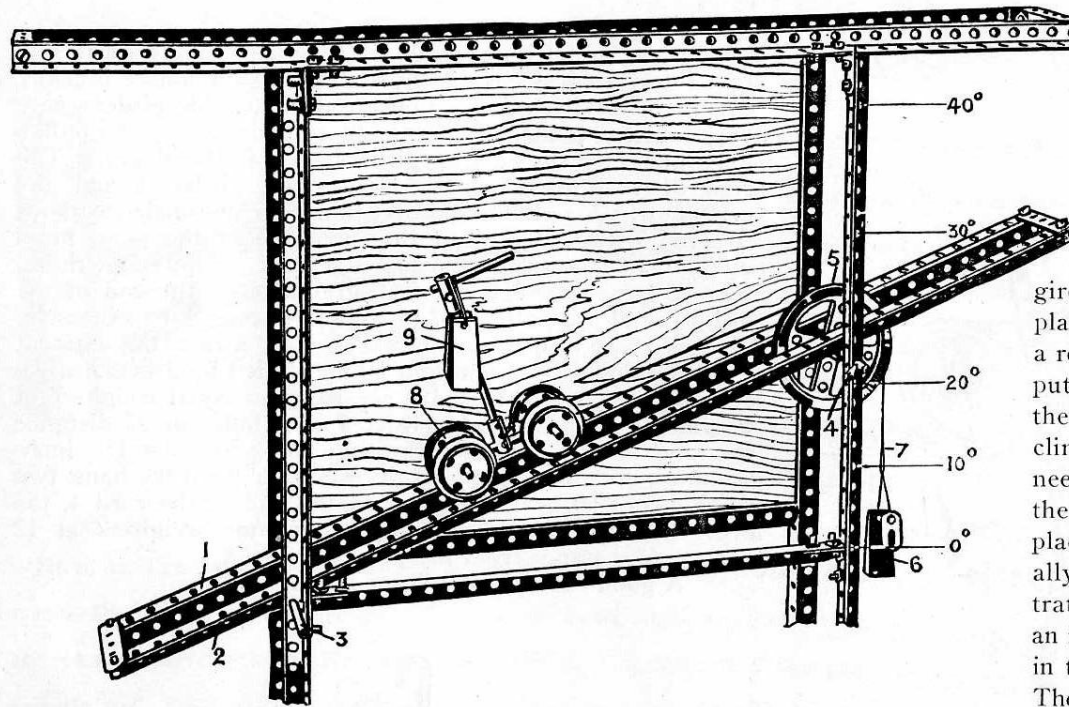
This Model is made up of two $12\frac{1}{2}$ " angle girders, 1 braced to a vertical strip 2, pivoted through a double bracket. A large wheel 3 is mounted on a rod in the side girders, care being taken that the cord 4 coming over the top of the pulley is parallel to the angle girders 1 of the lever. The arms of this lever are the left angle girder 1 and the vertical strip 2, and in order that this lever may balance about its pivot 5, the moment of the forces about the pivot must be equal, as we have previously described. Supposing, therefore, we hang a weight 6 of 50 grammes on the end of the cord 4 round the pulley 3, and connect the cord 4 to the strip 2 at 6 holes or 3" distance from the pivot 5, then the moment of the force will be the weight 50 multiplied by 3 = 150. The lever will be kept balanced if we hang an equal weight 7 of 50 grammes on the angle girder 1 at 6 holes or 3" distance from the pivot 5, because the moments, $50 \times 3 = 150$ inch-grammes, are then equal. If on the other hand we hang two weights 6 of 50 grammes each on the end of the cord 4, the lever will be balanced by one 50 gramme weight 7 at 12 holes or 6" distance from the pivot.

A good example of a lever is a steelyard.



Model No. 423

Inclined Plane



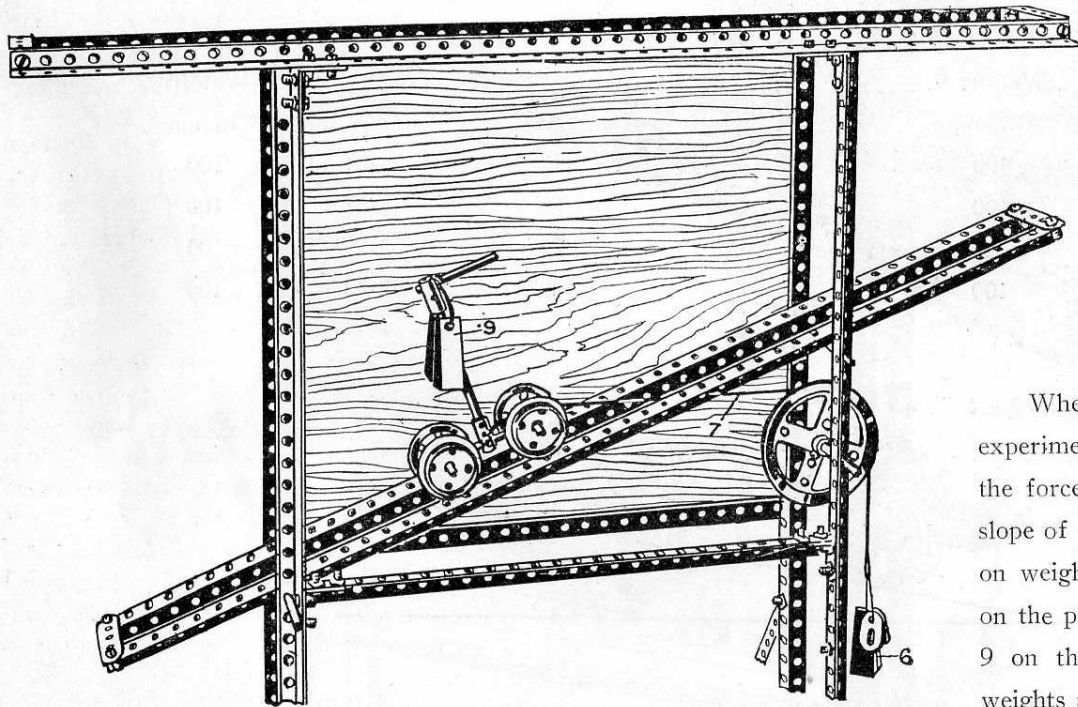
Another interesting principle which may be demonstrated on this apparatus is that known as the Inclined Plane. The force required to raise a body up an inclined plane varies according to the angle of the plane, that is to say, the slope. The plane is made of two angle girders 1, 2, connected together at each end by $2\frac{1}{2}$ " strips and fixed on a rod 3 passed through holes in the vertical girders of the frame and the girders of the plane, and the other end of the plane rests on a rod 4 which carries a 3" pulley wheel 5. By putting the rod 4 through different holes in the side girders the slope or angle of the inclined plane may be varied. To obviate the need of a protractor to ascertain the slope of the plane, it may be stated that if the rod 4 be placed in the fourth hole, with the plane pivotally mounted on rod 3 as shown in the illustration, the surface of the plane will represent an incline of 10° , if placed in the 9th hole 20° , if in the 15th hole 30° , and if in the 21st hole 40° . The force or weight 6 on the cord 7 is arranged to act parallel to the plane, and the cord is con-

nected to the carriage 8 so that the latter may roll up the plane. The bearings for the axles of the wheels are formed of couplings and connected by a 2" rod.

Before commencing the experiment, weights should be hung on the cord 7, which are just sufficient to balance the carriage 8. If a weight 9 be then hung on the carriage it should be noted what additional weight is required to be hung on the end of the cord 7 just to make the carriage slowly ascend the plane. The weight 9 should then be varied and the alteration in the weight 6 on the cord 7 to make the carriage ascend the plane noted, and these results should be tabulated.

Model No. 424

Inclined Plane



When the student has finished the preceding experiment he should try this example, where the force along the cord 7 is not parallel to the slope of the plane, but is horizontal, first hanging on weights 6 until the carriage is just balanced on the plane, and then hanging different weights 9 on the carriage and noting what additional weights at 6 are necessary just to cause the carriage to begin to move up the plane. These results should also be tabulated.

Inclined Plane (*contd.*)

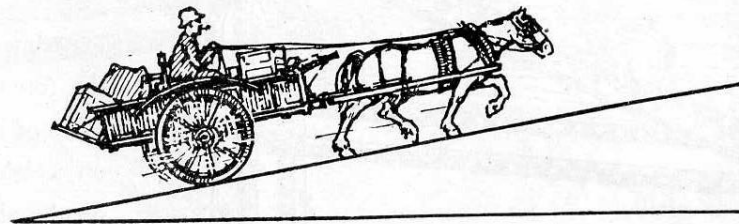
Experiments made with the apparatus have yielded the following results:—

When forces are parallel to the plane :

At	FORCE 6. Grammes.	WEIGHT 9. Grammes.
10°	22.2	100
20°	40.54	100
30°	58.8	100
40°	70	100

When forces are horizontal :

At	FORCE 6. Grammes.	WEIGHT 9. Grammes.
10°	23.31	100
20°	43.87	100
30°	63.2	100
40°	89.43	100

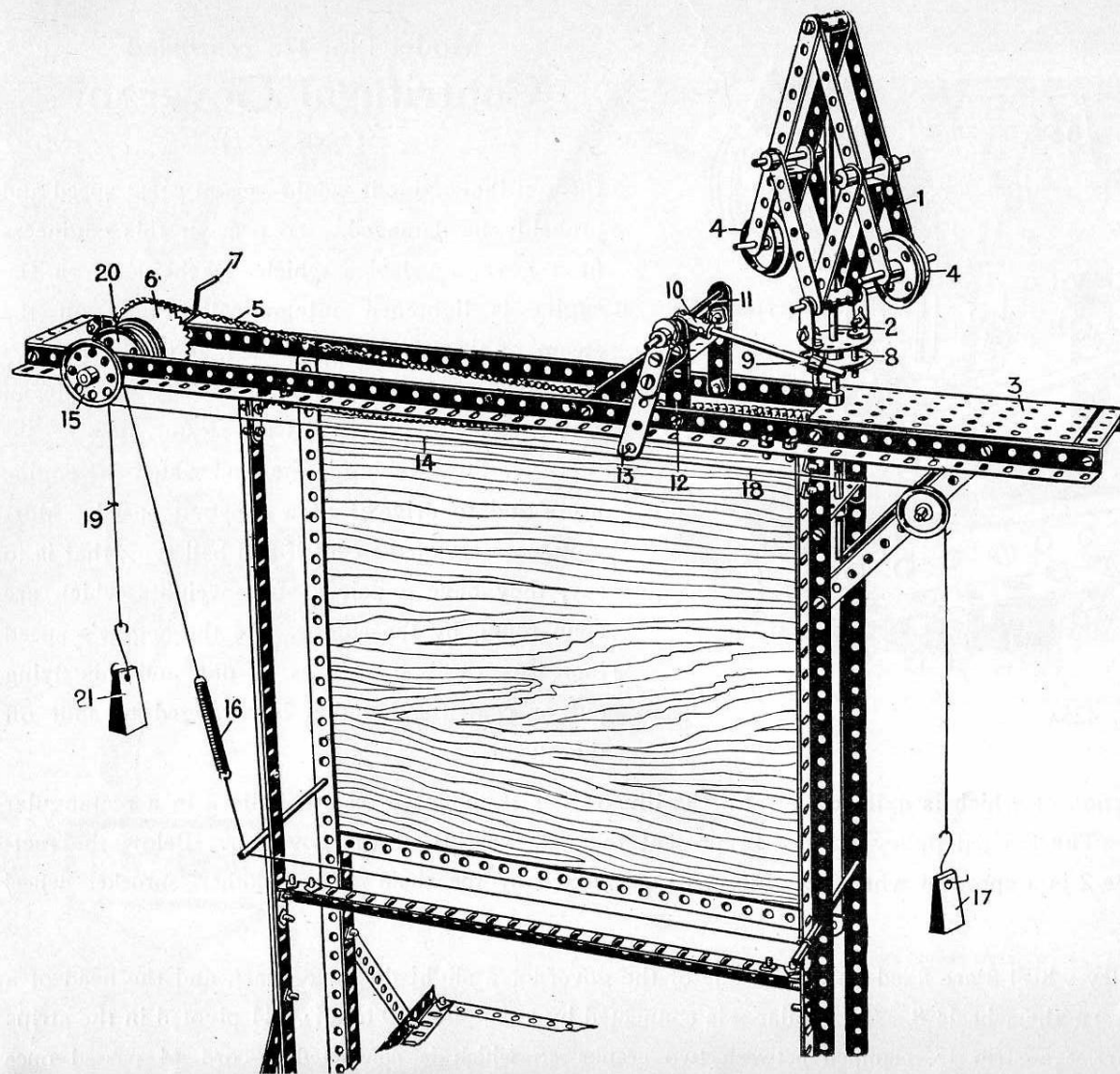


A good example of an inclined plane is a horse pulling a cart up a slope, the horse being the force and the cart the weight.

Model No. 425

Centrifugal Governor

In this model an apparatus is shown for demonstrating the controlling effect of a governor. A governor is a device which is fitted on an engine in order to make its speed constant. In the case of an engine driving a works for instance, if all the machinery in the shop were running, the engine would be driving a heavy load, and would be using a certain amount of steam. If a great portion of the machinery were stopped and the engine were allowed to take the same amount of steam, owing to the lightness of the load



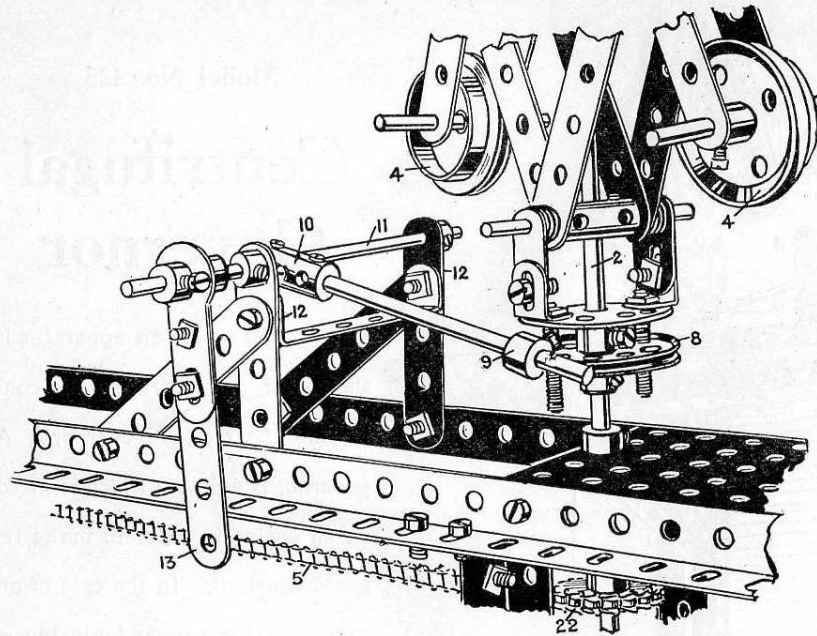


FIG. 425A

Model No. 425 *continued*

Centrifugal Governor

(*Continued*)

then on the engine it would race at great speed and probably be damaged. To prevent this engineers fit a governor device which, as the load on the engine is lightened automatically shuts off the steam, or throttles it, and which, as the load comes again on the engine, permits it to take more steam. The governor thus arranges the steam supply to the engine to be suitable for the load which the engine bears and to drive it at a constant speed. Most governors are of the centrifugal ball type, that is to say, they have a pair of ball weights which are spun round by the engine. As the engine's speed increases, the ball weights fly out, and this flying out or centrifugal action is arranged to shut off the steam.

The governor 1, the construction of which is quite clear from the illustration, is mounted on a spindle 2 in a rectangular plate 3 fitted in the top girders. The flanged pulley wheels 4 represent the ball weights of the governor. Below the rectangular plate 3 and on the spindle 2 is a sprocket wheel 22, Fig. 425A, connected by the chain 5 to another sprocket wheel 6 on the cranked axle 7.

A bush wheel and a $1\frac{1}{2}$ " pulley wheel 8 are fixed on the spindle of the governor a slight distance apart, and the head of a bolt in the collar 9 engages between the wheels 8. The collar 9 is connected by a coupling 10 to a rod 11 pivoted in the strips 12. The near end of the rod carries a strip 13, clamped between two cranks, to which is connected a cord 14 passed once

round the $1\frac{1}{2}$ " pulley 15 and connected to the spring 16. The cord 14 acts as a brake on the pulley 15; another cord 18 connected to the strip 13 carries a weight 17, and another cord 19, which is wound on the flanges of two reversed flanged and grooved wheels, is loaded with different weights 21 in order to conduct the experiments. The weights 21 correspond to the driving force of the engine, and the governor controls this varying driving force by applying the brake which is the cord 14. Different weights 21 should be hung on the cord 19, and the cord then wound up to the top by the crank axle 7. The time taken for different weights 21 to fall should be noted, and if the apparatus has been properly adjusted the different weights 21 should take nearly the same time to fall to the floor. If heavy weights are hung on, the governor ball weights 4 fly out and raise the discs 8 which swing the strip 13 and apply the brake thus retarding the fall of the weights. The student should tabulate his results, using different weights and noting the variation in seconds taken for the weights to fall. The following are examples:

Weight.		Time in Falling.	
75 grammes	12 secs.	
100 "	11 "	
200 "	10 "	

Model No. 426

Roof Truss

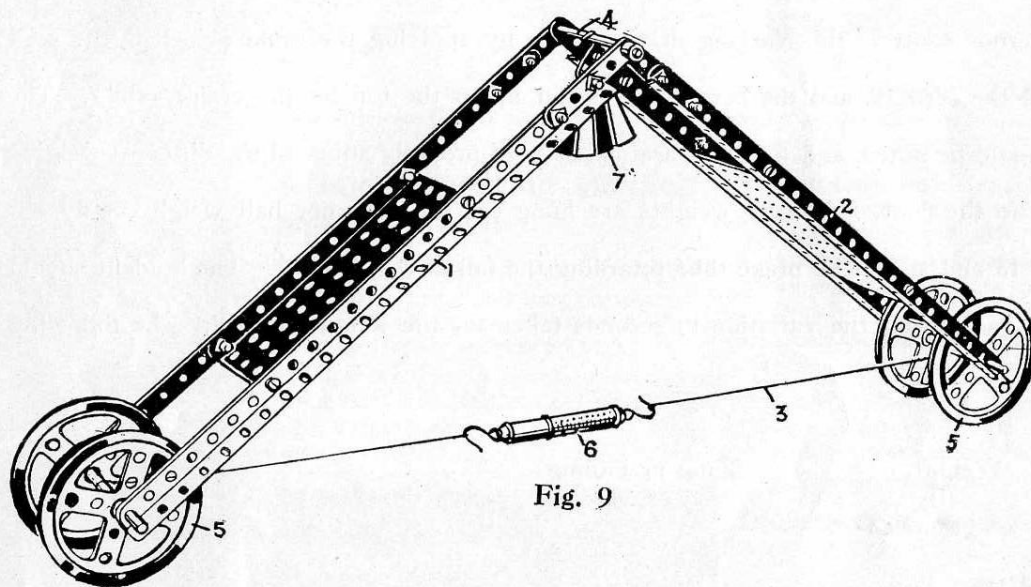


Fig. 9

This is an apparatus for finding out the stresses in a roof-truss. The material in the inclined girders 1, 2, of any roof-truss frame are in compression, but the tie rod represented by the cord 3 is in tension, that is to say it is being pulled apart. The compression members in such a roof-truss are, therefore, made rigid so that they will not bend, but the tie rod 3 being in tension could not possibly bend, and is usually, therefore, made of thin bar or rod. The two compression members are pivotally connected at the apex by a rod 4 and large wheels 5 are fitted at the feet.

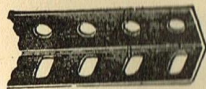
The cord 3 connects across to the axles of the wheels 5 and a spring balance 6 for registering the pull is inserted. Various weights 7 should be hung on the rod 4 and the different pulls registered by the spring balance 6 should be noted, and these results should be tabulated by the student. When this has been done for a number of weights the angle between the compression girders 1 and 2 should be altered by shortening or lengthening the string 3 and a new series of experiments with different weights 7 should be conducted and the results tabulated.

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1X	"	"	5	"	"	3.00	Meccano Motors, E1	...	3.00	
2	"	"	5X	"	"	6.00	"	E2	4.50
2X	"	"	6	"	"	5.00	Spring Motors, S1	3.00	
3	"	"					20.00	Transformer	3.25	
										(110 a. c. 60 cycles)		



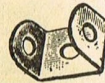
Part No.				Cents
1.	Perf. Strip, 12½" long	(½ doz.)	45	
2.	"	5½"	"	25
3.	"	3½"	"	20
4.	"	3"	"	20
5.	"	2½"	"	15
6.	"	2"	"	15
6A.	"	1½"	"	15



7.	Angle Girders, 24½" long, each	25
7A.	" " 18½" " "	20
8.	" " 12½" " ½ doz.	60
9.	" " 5½" " "	45



10.	Flat Brackets ½ doz.	05
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11.	Double Brackets each	03
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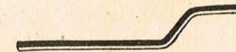
12.	Angle Brackets doz.	12
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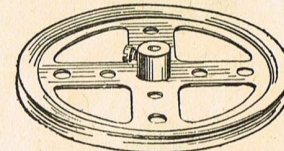
12A.	Angle Brackets, 1" each	05
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13.	Axle Rod, 11½" long each	10
13A.	" " 8" " "	10
14.	" " 6" " "	5
15.	" " 5" " "	5
15A.	" " 4½" " "	5
16.	" " 3½" " "	5
17.	" " 2" " "	2
18A.	" " 1" " "	2



19.	Crank Handles each	10
-----	---------------	------------	----



19A.	Pulley Wheel, 3" diam. with centre boss and set screw, each	25
------	--	----

19B.	Wagon Wheels, 3" diam.	"	20
------	-----------------------------	---	----



20.	Flanged Wheel each	25
-----	---------------	------------	----



20A. Pulley Wheel, 2" diam. with
set screw each 20



21. Pulley Wheel, 1 1/2" diam. with
set screw " 20

22. Pulley Wheel, 1" diam. with
set screw " 10

22A. Pulley Wheel, 1" diam. with-
out set screw " 05

23. Pulley Wheel, 1/2" diam. with-
out set screw " 05

23A. Pulley Wheel, 1/2" diam. with
set screw " 10



24. Bush Wheel each 15



25. Pinion Wheel, 3/4" diam. .. each 25

26. " " 1/2" " " 15



27. Gear Wheel, 50 teeth (to gear
with 3/4" pinion) each 30

27A. Gear Wheel, 56 teeth (to gear
with 1/2" pinion) " 35

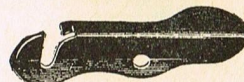


28. Contrate Wheel, 1 1/2" diam., each 50

29. " " 3/4" " " 30



32. Worm Wheel " 25



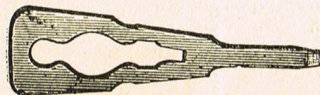
33. Pawl " 05



34. Spanner " 10



35. Spring Clip, per box doz. 15



36. Screw Driver each 10

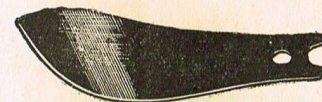


37. Nuts and Bolts, per box doz. 15

37A. Nuts, per box " 05

38. Washers " 05

40. Hank of Cord each 05



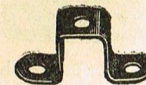
41. Propeller Blades per pair 15



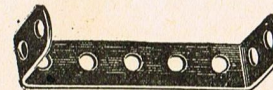
43. Spring each 05



44. Cranked Bent Strip " 05



45. Double Bent Strip " 05



46. Large Bent Strip " 05



47A. Dynamometer (tension) each 1.50



50. Eye Piece " 05



52. Perf. Flanged Plate, $5\frac{1}{2}" \times 2\frac{1}{2}"$ " 25



53. Perf. Flanged Plate, $3\frac{1}{2}" \times 2\frac{1}{2}"$ " 20



54. Perforated Sector Plate " 20

56. Manual of Instructions " 35

56A. Instruction Manual, No. 2 ... " 35



57. Hook " 02

57A. Hook (Scientific) " 02



58. Spring Cord, per length .. each 30



59. Collar and Set Screw " 05

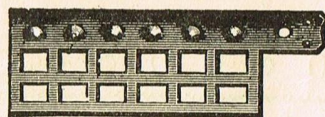


60. Bent Strip, $2\frac{1}{2}"$ long $\frac{1}{2}$ doz. 20

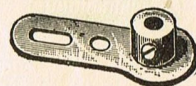
60A. Double Angle Strip, $1\frac{1}{2}"$ long " 18

60B. Bent Strip, $3\frac{1}{2}"$ long " 25

60C. " " $5\frac{1}{2}"$ " " 36



61. Windmill Sail each 10

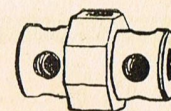


62. Crank " 15

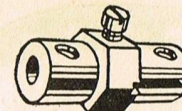
62A. Threaded Crank " 15



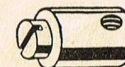
63. Coupling " 15



63A. Octagonal Coupling each 20



63B. Strip Coupling " 20



64. Threaded Boss " 06

65. Centre Fork " 10

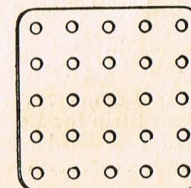
66. Weight, 50 grms. " 20

67. " 25 " " 15

68. Wood Screws, $\frac{1}{2}"$ doz. 10

69. Set Screws " 10

69A. Grub Screws " 10



70. Flat Plates, $5\frac{1}{2}" \times 2\frac{1}{2}"$ each 15

72. " " $2\frac{1}{2}" \times 2\frac{1}{2}"$ " 10



80. Screwed Rods, 5" each 15
 81. " " 2" " 10
 82. " " 1" " 05



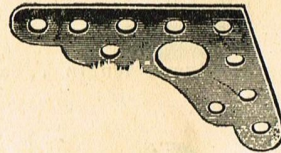
90. Curved Strip, 2½" ½ doz. 25
 94. Sprocket Chain per yard 25



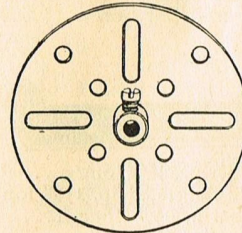
95. " Wheel, 2" each 25
 96. " " 1" " 20



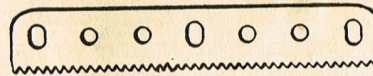
97. Braced Girder, 3½" long .. ½ doz. 20
 98. " " 2½" " .. " 15
 99. " " 1½" " .. " 75
 100. " " 5½" " .. " 50
 101. Healds for Looms doz. 45
 102. Single Bent Strip for Looms, each 05
 103. Perforated Flat Girder Strip,
 5½" long " 10
 104. Shuttle each 50
 105. Reed Hook " 05
 106. Roller " 15
 107. Tables for Designing Machines " 25



108. Architraves each 09



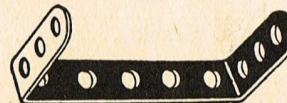
109. Face Plate " 20



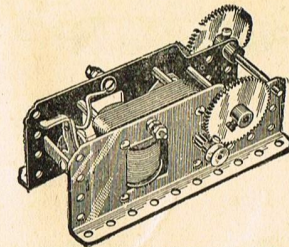
110. Rack Strip, 3½" " 10



111. Bolt, ¾" " 02



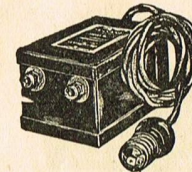
112. Double Angle Strip, 2½"x1½" " 06
 Brushes and Springs for Electric
 Motor per pair 40



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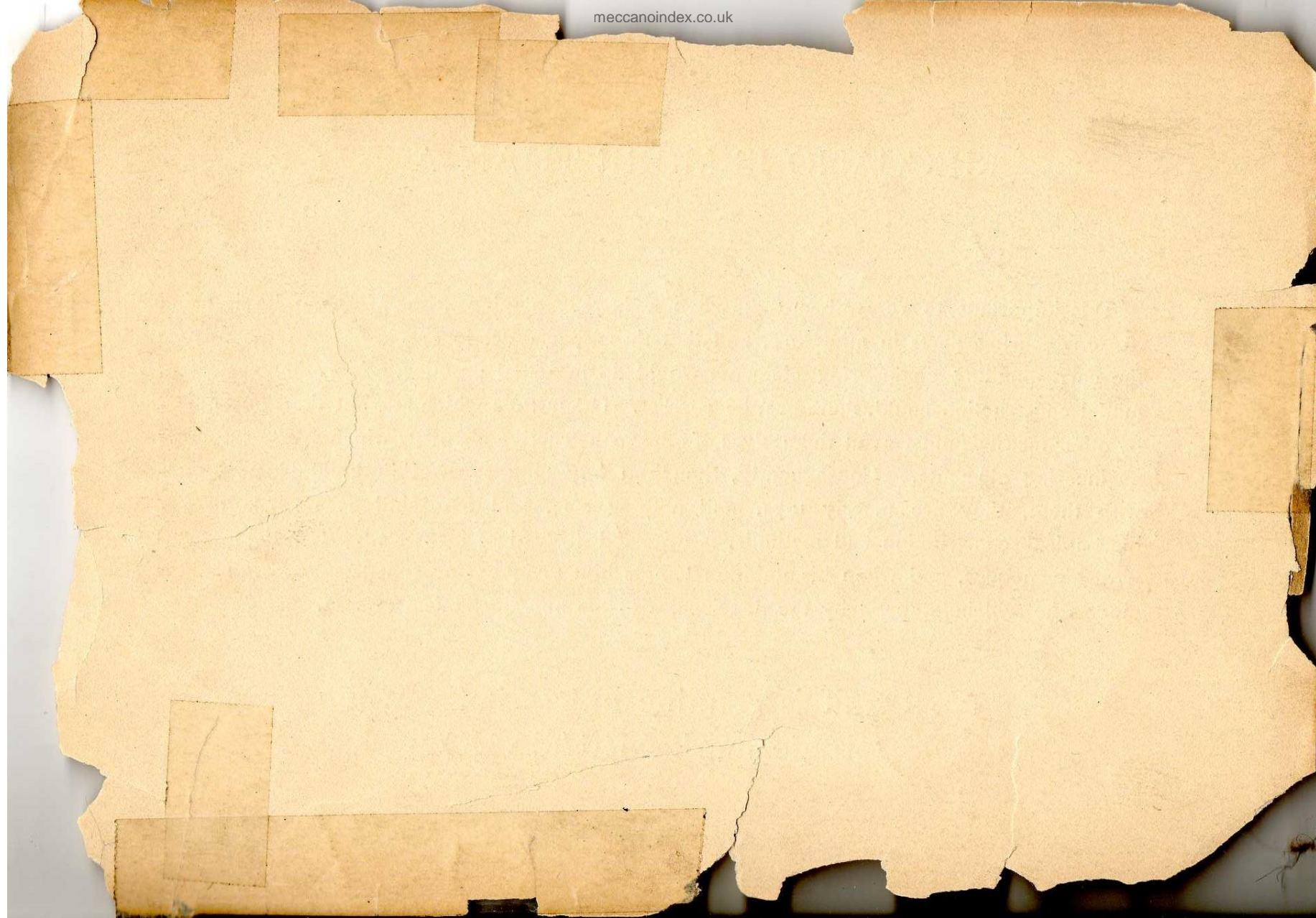
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