

**MECCANO**

# *Elektrikit*

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**Book of Electrical Models**

The image is a collage of electrical components. The top section features a white rectangular box with the text 'MECCANO Elektrikit' and '© MECCANO LTD. LIVERPOOL - ENGLAND'. Below this, the left side shows a blue-tinted image of a transformer core with a bright light emanating from it. The right side shows a black high-voltage insulator against a red background. The bottom section contains the text 'Book of Electrical Models'.

# Contents of Meccano ELEKTRIKIT

Part No.	Quantity	
10	Fishplate	5
12	Angle Bracket - $\frac{1}{2}'' \times \frac{1}{2}''$	2
12b	" " - $1'' \times \frac{1}{2}''$	2
12c	" " - Obtuse	2
16b	Axle Rod - 3"	1
19b	Pulley - 3" dia.	1
24a	Wheel Disc - 8 holes	2
37a	Nut	55
37b	Bolt - $\frac{3}{8}''$	30
38	Washer	46
59	Collar	1
69a	Grub Screw - $\frac{3}{8}''$	6
111	Bolt - $\frac{1}{2}''$	4
111a	" - $\frac{3}{8}''$	8
111c	" - $\frac{3}{4}''$	7
111d	" - $1\frac{1}{2}''$	4
115	Threaded Pin	2
120b	Compression Spring	1
140y	Collar, 4 holes	2
147b	Pivot Bolt	1
186a	Driving Band - 6"	1
186b	" " - 10"	2
501	Insulating Strip - $5\frac{1}{2}''$	2
502	" " - $2\frac{1}{2}''$	2
503	" " - $1\frac{1}{2}''$	2
507	" Flat Girder - $2\frac{1}{2}''$	1
508	" " " - $1\frac{1}{2}''$	1
510	" Plate - $5\frac{1}{2}'' \times 2\frac{1}{2}''$	1
511	" " - $2\frac{1}{2}'' \times 2\frac{1}{2}''$	1
513	" Fishplate	2
514	" Bush Wheel - 8 holes	1
516	" " " - 6 "	1
518	Bush Wheel - 1" dia.	1
520	Rectangular Coil, with base	2
522	Cylindrical Coil	5
525	Core Holder for Rectangular Coil	4
526	Core for Rectangular Coil	2
527	Core for Cylindrical Coil - Slotted	2
528	" " " " - 1"	2
529	Strip - 2"	2
530	Flexible Strip - 2"	2
531	Wiper Arm - 1" Radius - Flexible	2
532	" " - $1\frac{1}{2}''$	2
533	" " - 2" " - Bent	2
534	Slotted Strip - 2"	2
537	Permanent Magnet	2
538	Magnet Holder	2
539	Lamp Holder	4
540c	Lamp - Clear	1
540j	" - Yellow	1

Part No.	Quantity	
540r	Lamp - Red	1
540v	" - Green	1
542	Terminal Nut	4
543	Contact Screw	2
544	" Stud	8
545	Pivot Bolt - $\frac{1}{2}''$	2
548	Pivot Rod - $3\frac{1}{2}''$	1
549	" " - 2"	1
550	Short Pivot	2
551	Flat Commutator	1
554	Short Circuit Piece	2
555	Rod with Square End - 4"	1
556	Reel of PVC Insulating Sleeving	1
557	" " Bare Copper Wire	1
558	Coil of Connecting Wire	1
559	Coil of Paper	1
560	Dial Card	1
561	Washer - Thin	13
562	Bell	1
563	Screwed Rod - 2"	2
564	Insulating Spacer	2
1585	Tube of Oil	1

## More New Models for You to Build!

New and fascinating models designed for construction from Elektrikit and standard Meccano Parts are illustrated and described from time to time in the *Meccano Magazine*, published monthly.

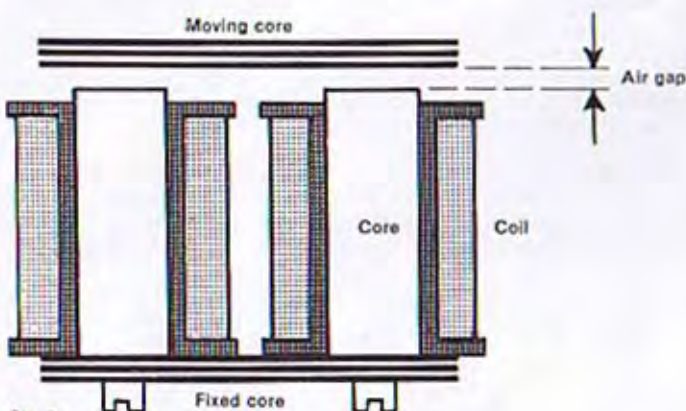
A Postcard to: The Editor, *Meccano Magazine*, Binns Road, Liverpool 13, will bring you full particulars of how to obtain this publication.

Additional Meccano Standard Parts required to build the models shown in this book (except E36 & E37).

Part No.	Quantity	
i	Perforated Strip - $12\frac{1}{2}''$	2
2	" " - $5\frac{1}{2}''$	6
5	" " - $2\frac{1}{2}''$	9
10	Fishplate	5
11	Double Bracket	2
12	Angle Bracket - $\frac{1}{2}'' \times \frac{1}{2}''$	9
15b	Axle Rod - 4"	1
16	" " - $3\frac{1}{2}''$	2
17	" " - 2"	1
18a	" " - $1\frac{1}{2}''$	1
18b	" " - 1"	1
19g	Crank Handle - $3\frac{1}{2}''$ shaft (with grip)	1
20a	Pulley - 2" dia., with boss	1
22	" - 1" " " "	4
22a	" - 1" " without boss	1
23	" - $\frac{1}{2}''$ " " "	1
24	Bush Wheel - $1\frac{3}{8}''$ dia., 8 holes	1
35	Spring Clip	5
37a	Nut	47
37b	Bolt	47
38	Washer	4
38d	" - $\frac{3}{4}''$	2
40	Hank of Cord	1
48a	Double Angle Strip - $2\frac{1}{2}'' \times \frac{1}{2}''$	2
52	Flanged Plate - $5\frac{1}{2}'' \times 2\frac{1}{2}''$	1
90a	Curved Strip - stepped $2\frac{1}{2}'' \times 1\frac{3}{8}''$ radius	2
111c	Bolt - $\frac{3}{8}''$	5
125	Reversed Angle Bracket - $\frac{1}{2}''$	2
126	Trunnion	2
126a	Flat Trunnion	2
155	Rubber Ring (for 1" Pulley)	2
176	Anchoring Spring for Cord	1
186	Driving Band - $2\frac{1}{2}''$ Light	1
188	Flexible Plate - $2\frac{1}{2}'' \times 1\frac{1}{2}''$	2
189	" " - $5\frac{1}{2}'' \times 1\frac{1}{2}''$	2
190	" " - $2\frac{1}{2}'' \times 2\frac{1}{2}''$	2
191	" " - $4\frac{1}{2}'' \times 2\frac{1}{2}''$	1
192	" " - $5\frac{1}{2}'' \times 2\frac{1}{2}''$	2
212	Rod and Strip Connector	1
213	Rod Connector	1
214	Semi-Circular Plate - $2\frac{1}{2}''$	2
215	Formed Slotted Strip - 3"	4
221	Triangular Flexible Plate - $2\frac{1}{2}'' \times 1\frac{1}{2}''$	4

All the standard Parts listed above are included in Meccano Outfit No. 3 or one larger, or they may be bought separately if desired.

You should never introduce a Permanent Magnet into a Coil which is connected to a current supply. If you do you will run the risk of de-magnetizing your magnet.



### Electro-Magnets

Unlike a permanent magnet, such as part 537, an electro-magnet is not constantly magnetized or 'alive'. It consists of a core of soft iron which is placed in the centre of an insulated copper wire coil, through which current from a battery or other suitable source can be passed. As soon as the current is switched on the 'core' becomes magnetized and remains so until the current is switched off again, when it once more becomes de-magnetized.

Electro-magnets (so far as our models are concerned) can be single or double. In the case of a double magnet, the two cores are connected at one end by Meccano Strips, which form a yoke, or magnetic path, and their other free ends form the 'North' and 'South' poles. They can be used to produce a mechanical motion by means of a moving core (see Fig. 2).

Another use for an electro-magnet is shown in Fig. 3, which shows a Core free to move inside its Coil. If the Core is pushed about one-third of its length into the Coil and the current is then switched on, the Core will be 'sucked' right into the Coil.

### Coils (Electrical parts 520, Rectangular, with base, and 522, Cylindrical)

These Coils are designed for use with a current supply at 4 to 6 volts, which may be either AC or DC.

If you examine one of the Coils you will see that it carries the letters E (in) and S (out) near the connecting eyelets or terminals. In wiring your models it is important to make sure that the connecting wires are attached to the correct eyelets. Bolts passed through the eyelets should not be tightened unduly.

*Coils should not be kept continuously fed with current, otherwise they may tend to overheat.*

### The 'Air Gap'

So far as the models in this book are concerned the term 'Air Gap' refers to the space between two magnetic cores, one stationary and the other movable. The extent of this gap varies

according to the requirements of a particular model, and is usually measured either by the thickness of a Meccano Strip or of parts 531 or 532.

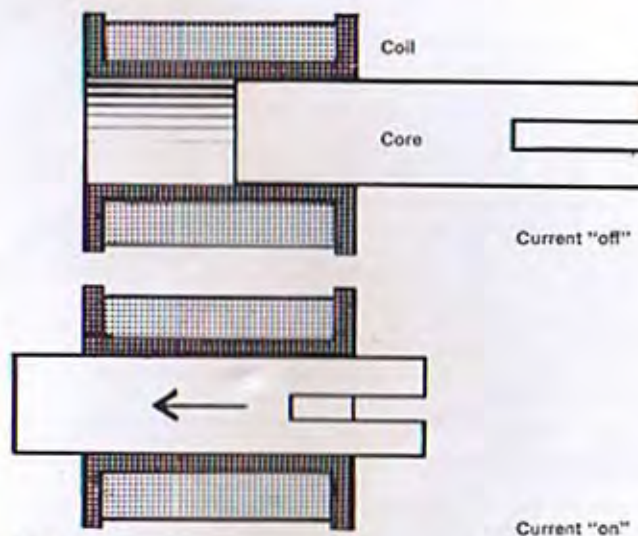


Fig. 3

### Series and Parallel Wiring Circuits

An ordinary simple electrical circuit consists of a battery or other supply source, an 'on-off' switch and the apparatus to be operated, for example a lamp or a buzzer (Fig. 4). For the circuit to operate there must be no break in the connections between the various components which would interrupt the current flow.

There are two principal forms of wiring up the various elements of a circuit, which are known as 'series' and 'parallel' wiring respectively. The series system of wiring is shown in Fig. 4. In 'series' wiring the various elements in the circuit, i.e. battery, switch and model are connected up one after the other like the links of a chain, which will be clear from Fig. 5.

In 'parallel' wiring on the other hand each element is connected across the two leads from the battery or other power source (see Fig. 6).

### List of Models operated by 4.5 volt battery

Of the models shown in this book the following can be operated from a 4.5 volt battery:

Model No.	E5	Model No.	E20	Model No.	E30
" "	E7	" "	E26	" "	E32
" "	E8	" "	E27	" "	E33
" "	E9	" "	E28	" "	E34
" "	E11	" "	E29	" "	E36
" "	E14				

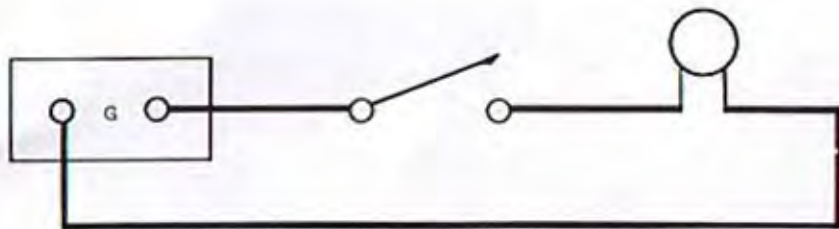


Fig. 4

### Glossary of Basic Electrical Terms

An understanding of basic electrical terms listed below will enable you to obtain the greatest pleasure and interest from your Elektrikit.

#### Ampere:

Ampere is the unit by which the rate of flow of an electrical current is measured. The term is sometimes abbreviated to AMP.

#### Volt:

is the term used for measuring electrical force or pressure. If you imagine a flow of electrical current as being something like water flowing out of a tap, the term volt can be likened to the pressure behind the water, while the quantity of water passing through the tap can be likened to the term AMPERE.

#### Ohm:

The resistance offered by a wire to the flow of current can be likened to the resistance of a pipe to the flow of water. Ohm is the unit of electrical resistance (resistance to the flow of an electrical current through a conductor).

In electrical circuits a pressure of 1 volt is required to overcome resistance of 1 ohm in order that 1 ampere of current may flow.

Materials possess the property to conduct the flow of electricity through them to a greater or lesser degree. Those materials that offer little resistance, for example copper and silver, are known as good CONDUCTORS. Other metals, such as iron and steel, whilst still able to conduct current, do so less readily than copper. For instance, steel has approximately six times the resistance of copper.

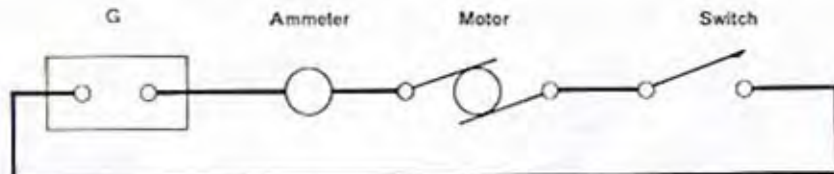


Fig. 5

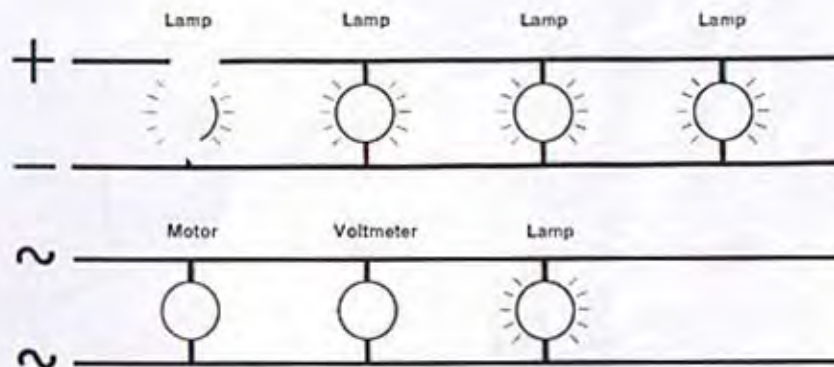


Fig. 6

Sometimes it is necessary to use materials which are deliberately chosen for their high resistance to current flow, and these are called resistances. They are generally alloys: an alloy of copper and nickel has a specific resistance about twenty-eight times that of copper. Non-metallic materials generally are very bad conductors of electricity. They may have specific resistances of many millions of ohms (1 million ohms = 1 megohm) and they are then called INSULATORS. Rubber, plastics, glass, paper and wood are examples of this kind of material.

#### Watt:

The unit for measuring the electrical energy which is produced or consumed is the watt, which is the product of the voltage and the amperage of the circuit, i.e.  $V \times A = W$ .

### MECCANO SERVICE

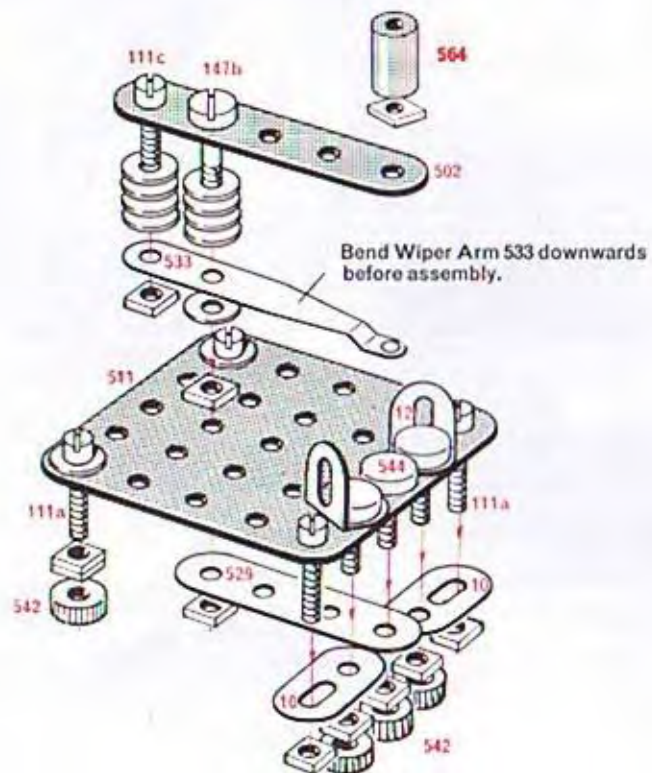
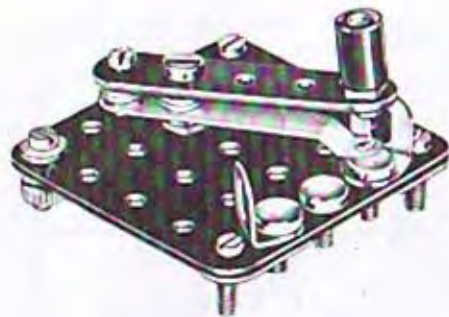
The models shown in this book represent only a few of the many ways in which the electrical parts can be used with your ordinary Meccano Outfit. After you have built these models you will have gained experience and will be able to devise other models for yourself.

We have done our best to make the building of the models as clear and easy as possible and if you find some difficulties at first please do not give up. If there are any points that puzzle you, write to us and tell us your problem. We shall always be pleased to help you. Address your letter to Information Service, Meccano Ltd, Binns Road, Liverpool 13.

# E1 2-Way Switch

A single pole two-way switch with an 'off' position.  
Never use more than 15 to 20v AC or DC.

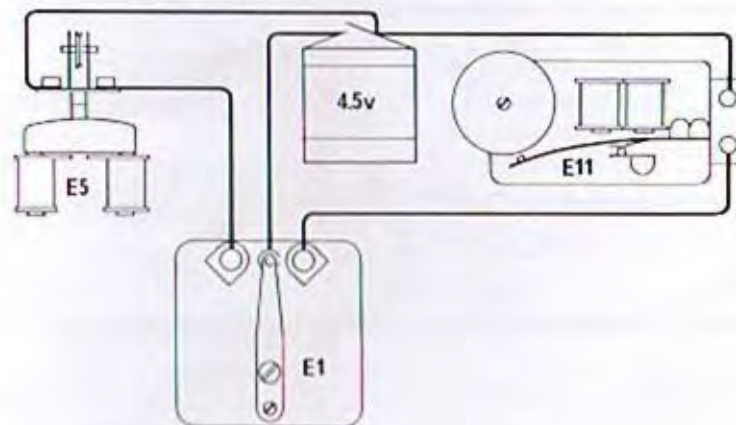
2 - 10  
2 - 12  
12 - 37a  
11 - 38  
4 - 111a  
2 - 111c  
1 - 502  
1 - 511  
1 - 529  
1 - 533  
3 - 542  
3 - 544  
1 - 564



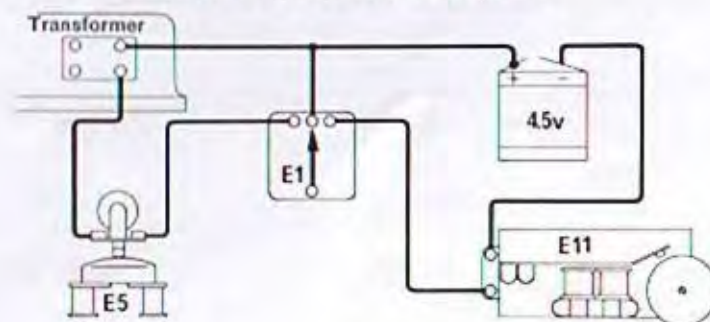
## Some of the uses for a two-way switch

- (1) As a switch between a power supply and an appliance.
- (2) As a switch between an appliance and either of two alternative power supplies.

- (3) For controlling either of two appliances from the same power supply.

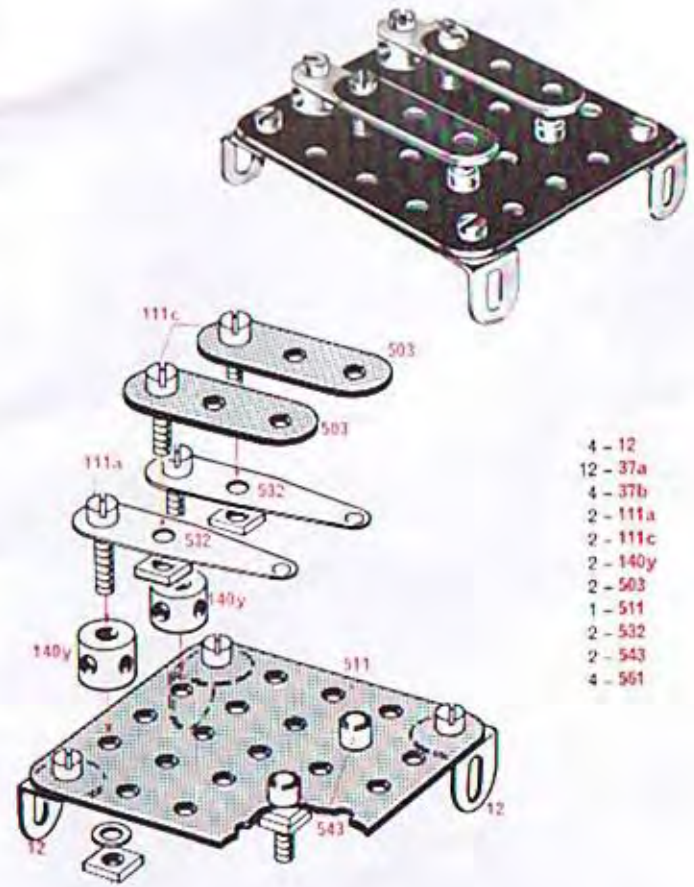


- (4) For controlling either of two separate circuits each consisting of a power supply and an appliance.

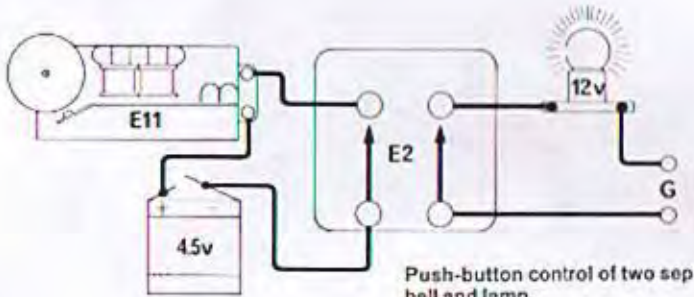


# E2 Twin Push-Button Switch

A switch for push-button control of an appliance such as a doorbell.



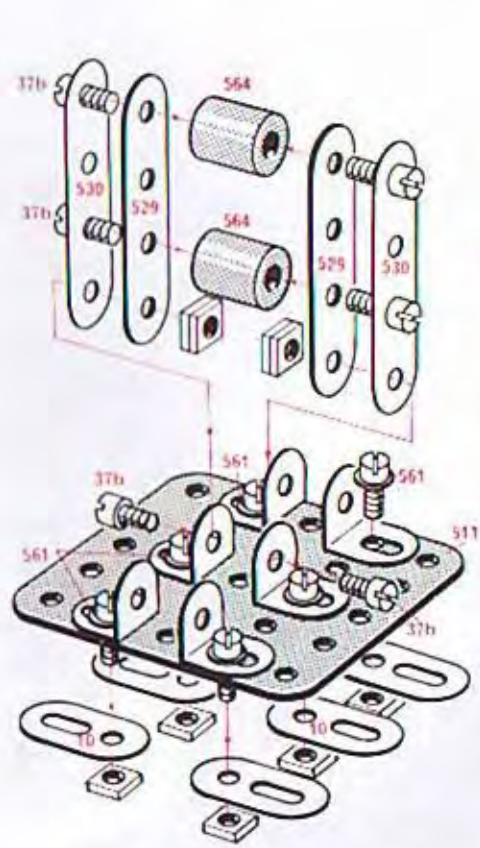
- 4 - 12
- 12 - 37a
- 4 - 37b
- 2 - 111a
- 2 - 111c
- 2 - 140y
- 2 - 503
- 1 - 511
- 2 - 532
- 2 - 543
- 4 - 561



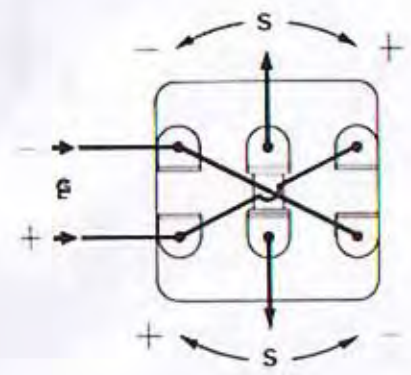
Push-button control of two separate circuits — electric bell and lamp.

# E3 2-Pole Reversing Switch (knife Switch)

This type of switch is frequently found on electrical switchboards. It is particularly useful in that it is able to reverse the polarity of a direct current supply source. For example it can be used for reversing a permanent magnet electric motor, such as model E21.



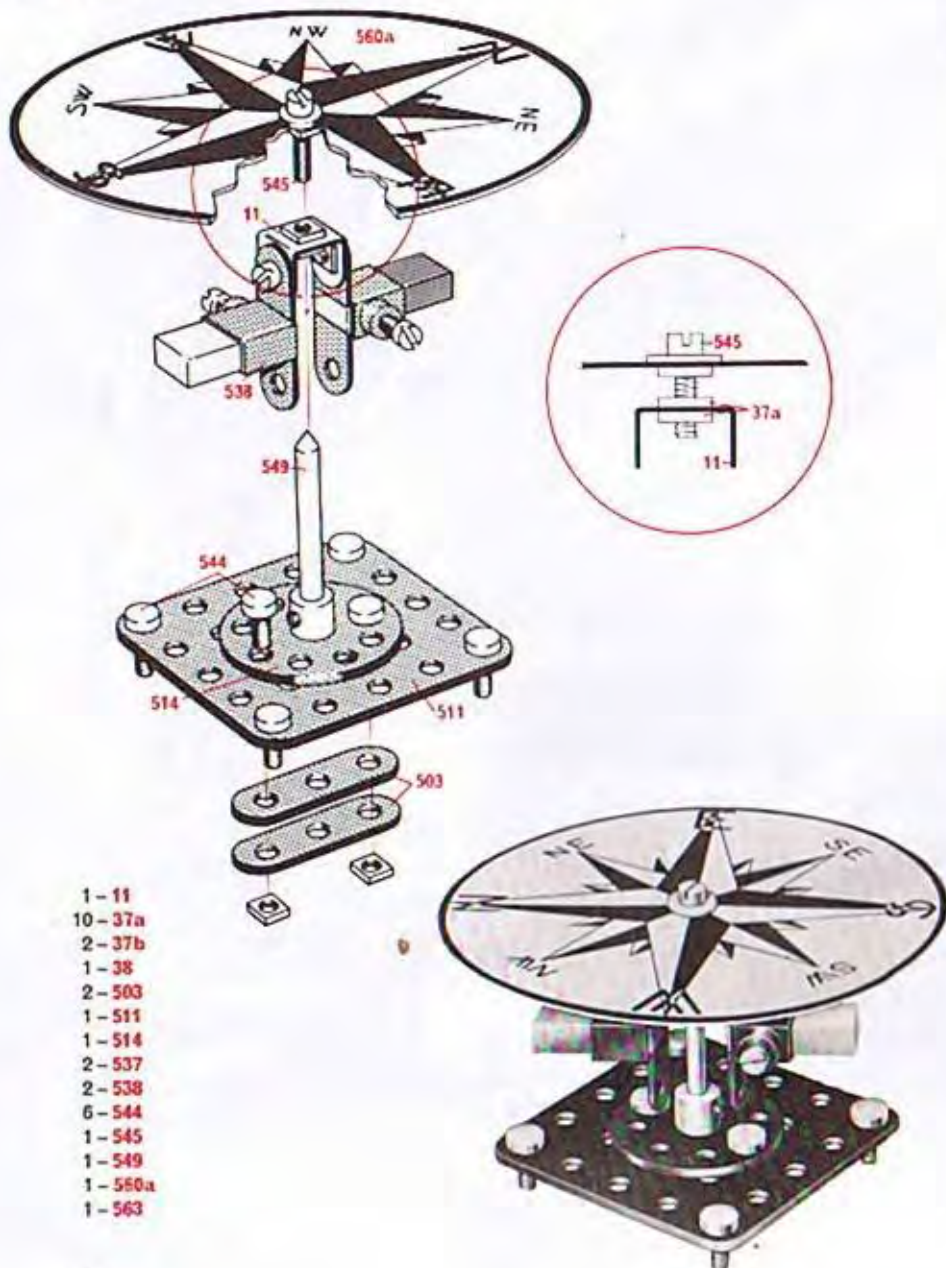
- 6 - 10
- 6 - 12
- 10 - 37a
- 12 - 37b
- 1 - 511
- 2 - 529
- 2 - 530
- 6 - 561
- 2 - 564



## E4 Compass

This is a sensitive instrument which will be caused to deviate from its normal position if a magnet or steel object is brought near it.

Magnetic compasses, such as this, make use of the fact that a freely suspended permanent magnet always tends to align itself with the earth's magnetic field.



- 1 - 11
- 10 - 37a
- 2 - 37b
- 1 - 38
- 2 - 503
- 1 - 511
- 1 - 514
- 2 - 537
- 2 - 538
- 6 - 544
- 1 - 545
- 1 - 549
- 1 - 550a
- 1 - 563

## E5 Electromagnetic Grab

An electromagnet of a type commonly used on cranes dealing with iron based metal.

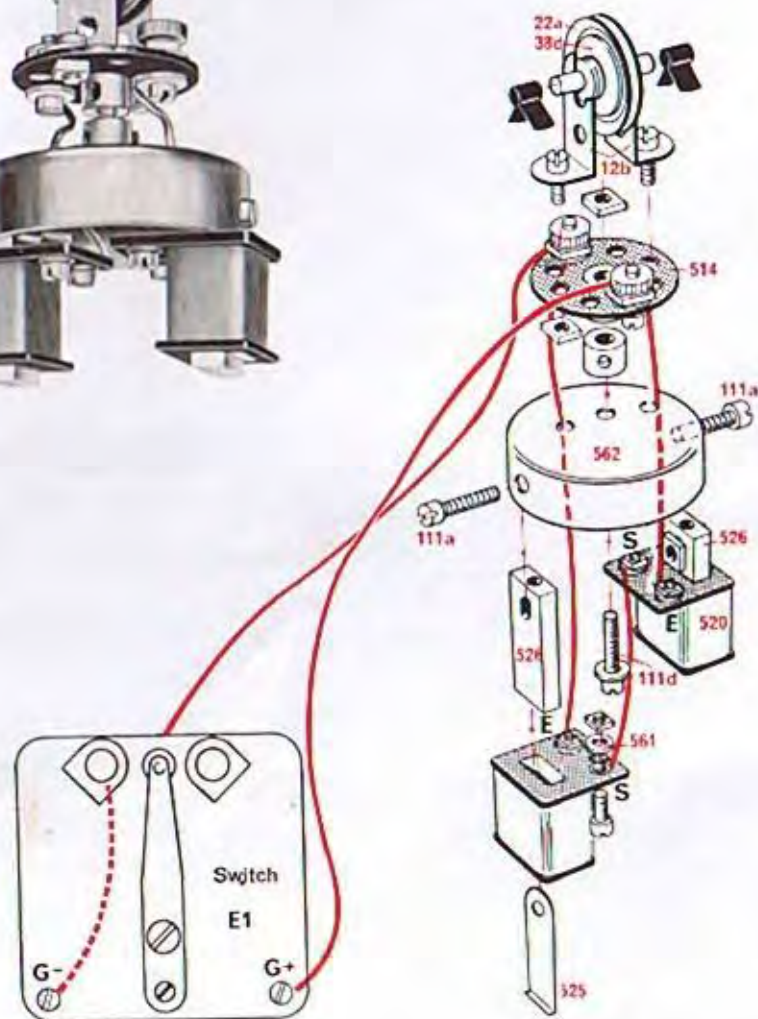
4-5v battery.

6-15v AC or DC.

12v DC gives the best results but when using 12-15v DC avoid leaving the current on too long to prevent damage to the coils through overheating.

This model can be controlled with switch E1 and an example of its use with a crane is shown in E36.

- 2 - 12b
- 1 - 18b
- 1 - 22a
- 2 - 35
- 11 - 37a
- 2 - 37b
- 12 - 38
- 2 - 38d
- 1 - 59
- 1 - 111
- 4 - 111a
- 1 - 111d
- 1 - 514
- 2 - 520
- 2 - 525
- 2 - 526
- 2 - 542
- 4 - 561
- 1 - 562



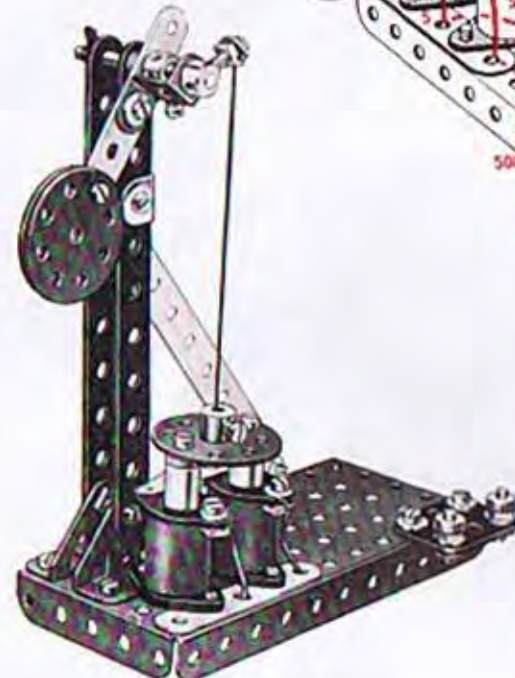
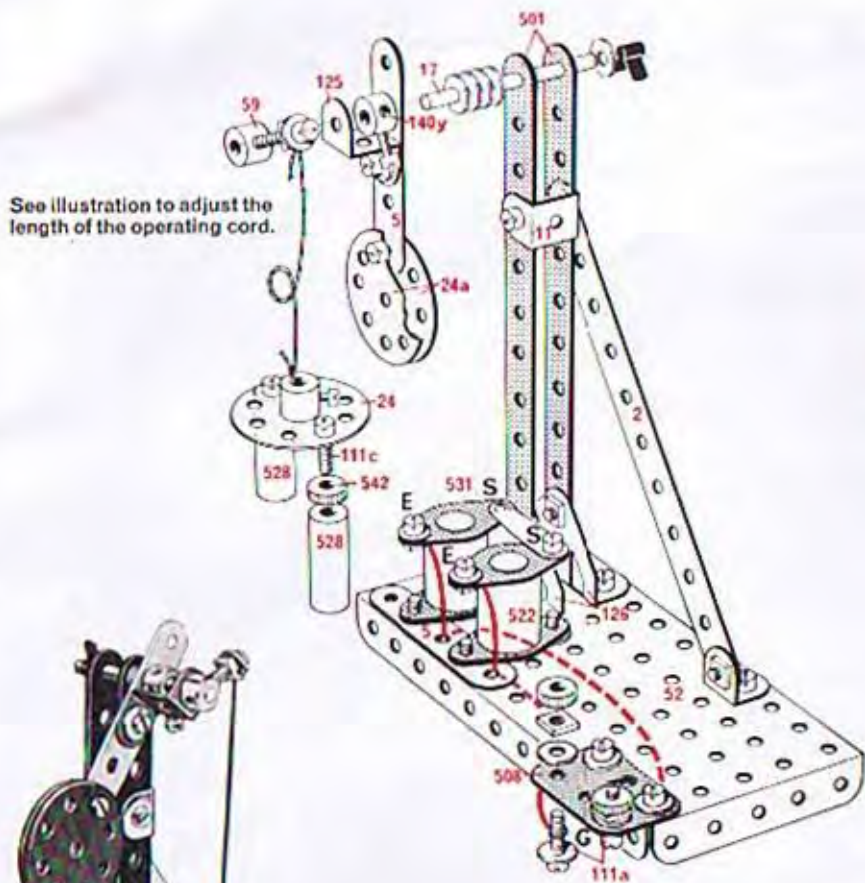
Switch  
E1

G-

G+

# E6 Signal

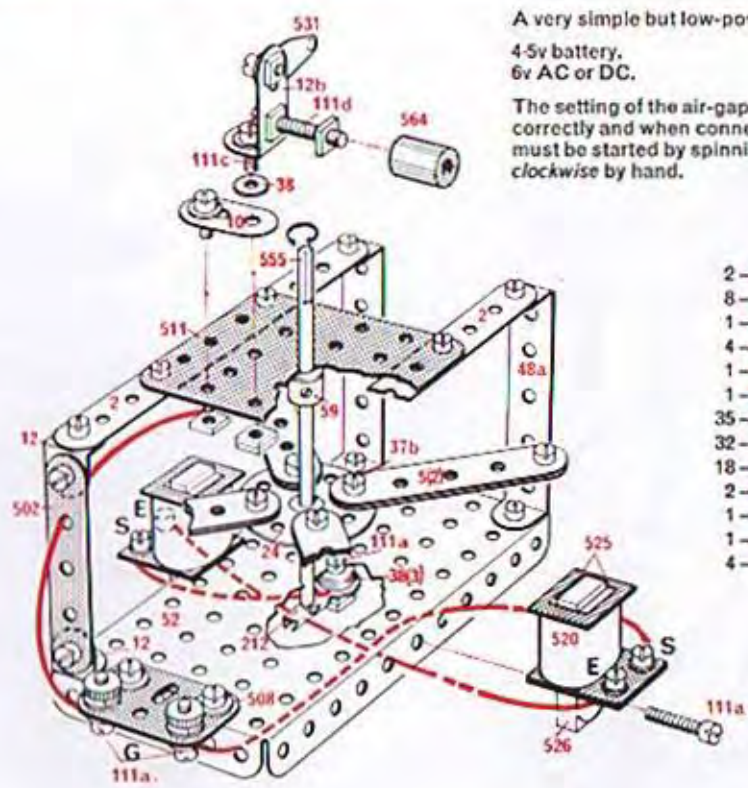
A signal of a type used on continental railways. It can be used with 'O' gauge railways.  
 12v DC or 15v AC. A voltage of less than 12v does not give good results.



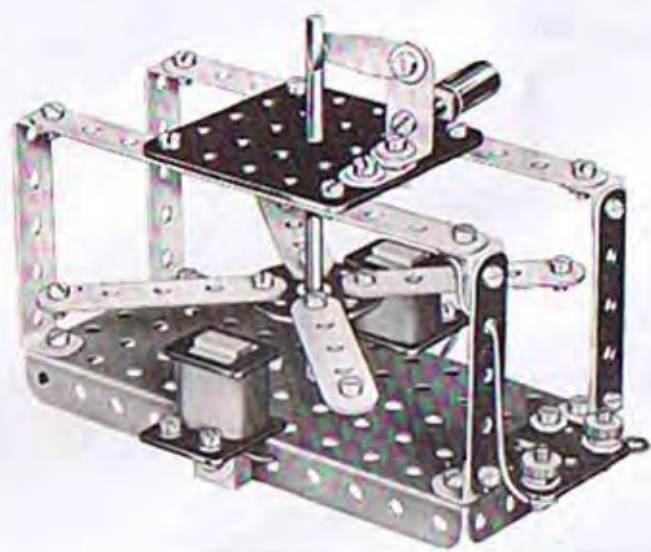
- |        |        |
|--------|--------|
| 1-2    | 3-111a |
| 2-5    | 2-111c |
| 1-11   | 1-125  |
| 1-12   | 2-126  |
| 1-17   | 1-140y |
| 1-24   | 2-501  |
| 2-24a  | 1-508  |
| 1-35   | 2-522  |
| 21-37a | 2-528  |
| 23-37b | 1-531  |
| 15-38  | 4-542  |
| 1-52   | 2-561  |
| 1-59   |        |

# E7 4-Bladed Motor

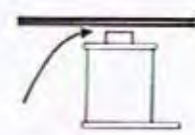
A very simple but low-powered electric motor.  
 4-5v battery.  
 6v AC or DC.  
 The setting of the air-gaps must be carried out correctly and when connected up the motor must be started by spinning the rotor clockwise by hand.



- |        |        |
|--------|--------|
| 2-2    | 2-111c |
| 8-5    | 1-111d |
| 1-10   | 1-212  |
| 4-12   | 1-502  |
| 1-12b  | 1-508  |
| 1-24   | 1-511  |
| 35-37a | 2-520  |
| 32-37b | 4-525  |
| 18-38  | 2-526  |
| 2-48a  | 1-531  |
| 1-52   | 2-542  |
| 1-59   | 1-555  |
| 4-111a | 1-564  |



Air gap = thickness of part 532.



Air gap = thickness of Strip part 5.



# E8 Buzzer

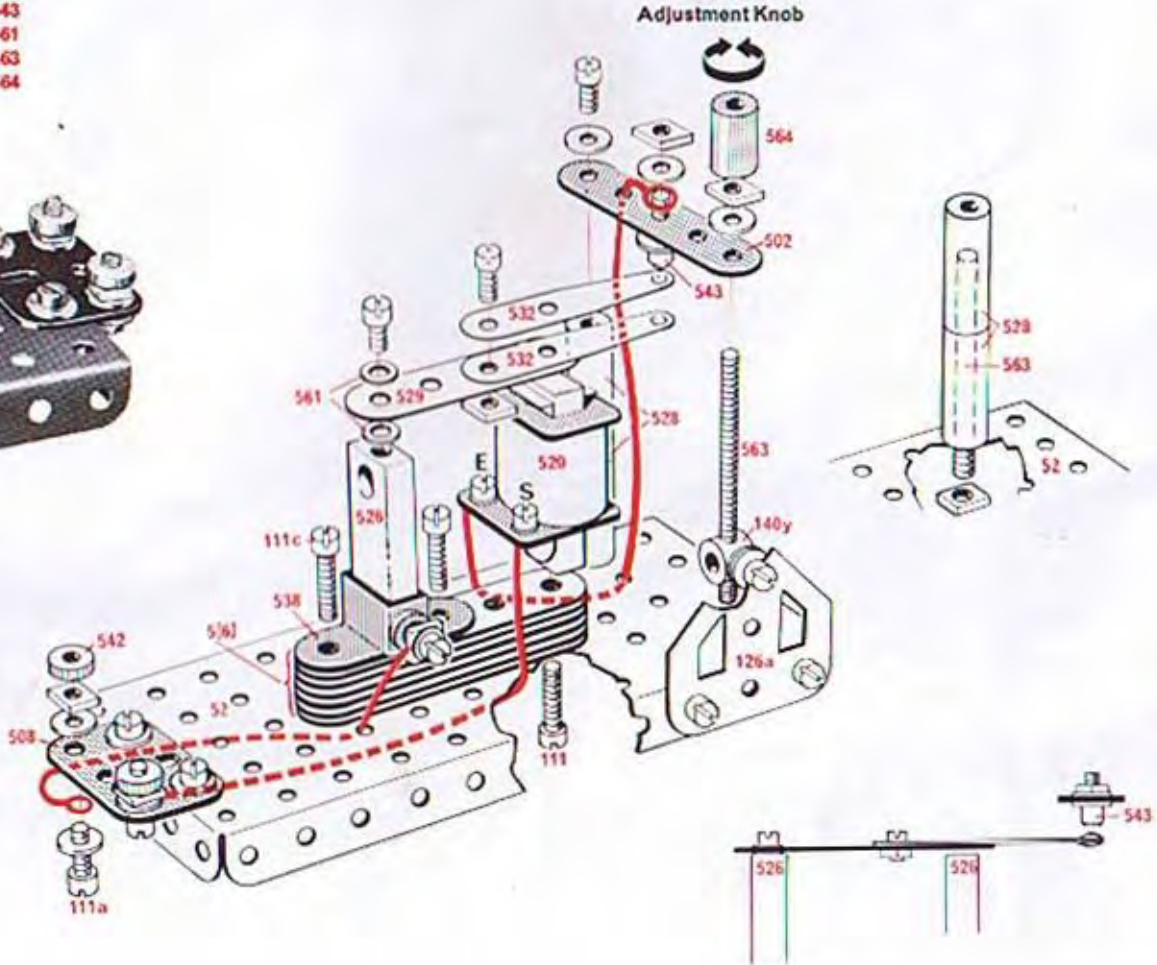
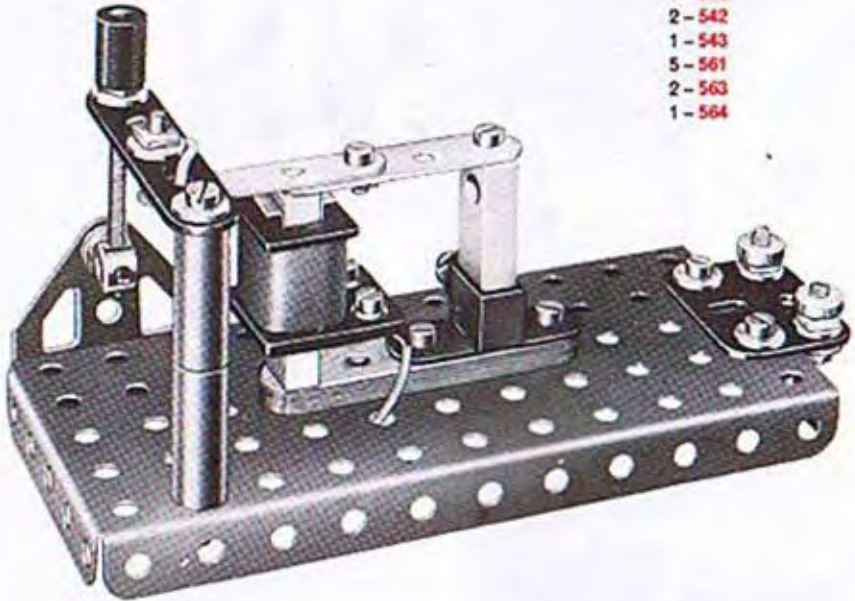
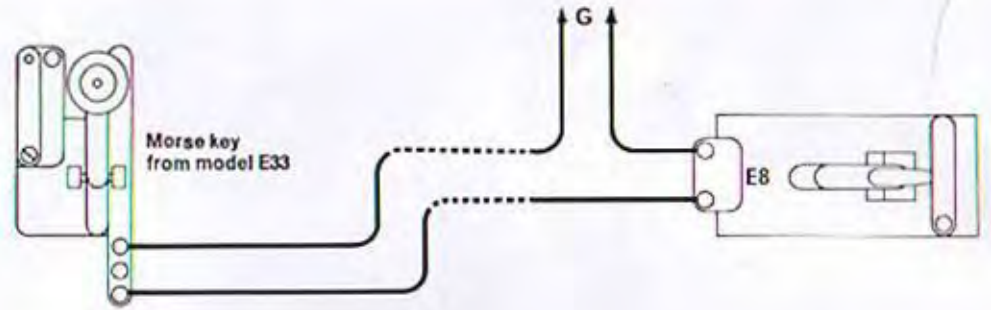
This buzzer can be used with the morse key from model E33.

The tone of the buzzer can be adjusted by means of the Insulating Spacer 564.

The contacts should be kept clean with fine glasspaper.

4-5v battery, not more than 6v DC.

- 6-5
- 16-37a
- 10-37b
- 12-38
- 1-52
- 2-111a
- 5-111c
- 1-126a
- 1-502
- 1-508
- 1-520
- 2-525
- 2-526
- 2-528
- 1-529
- 2-532
- 1-538
- 2-542
- 1-543
- 5-561
- 2-563
- 1-564



## MORSE ALPHABET

A	· -	M	- -	Y	- - -
B	· · ·	N	- ·	Z	· - -
C	- · ·	O	- - -	1	· - -
D	· · -	P	- · -	2	· - -
E	·	Q	- · -	3	· - -
F	· · ·	R	- · -	4	· - -
G	- · -	S	· -	5	· - -
H	· · -	T	- · -	6	· - -
I	· ·	U	- · -	7	· - -
J	- · -	V	· - ·	8	· - -
K	· - ·	W	- · -	9	· - -
L	· · ·	X	- · -	0	- - -

# E9 Electric Shock Machine

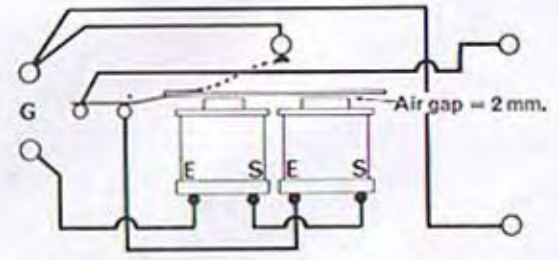
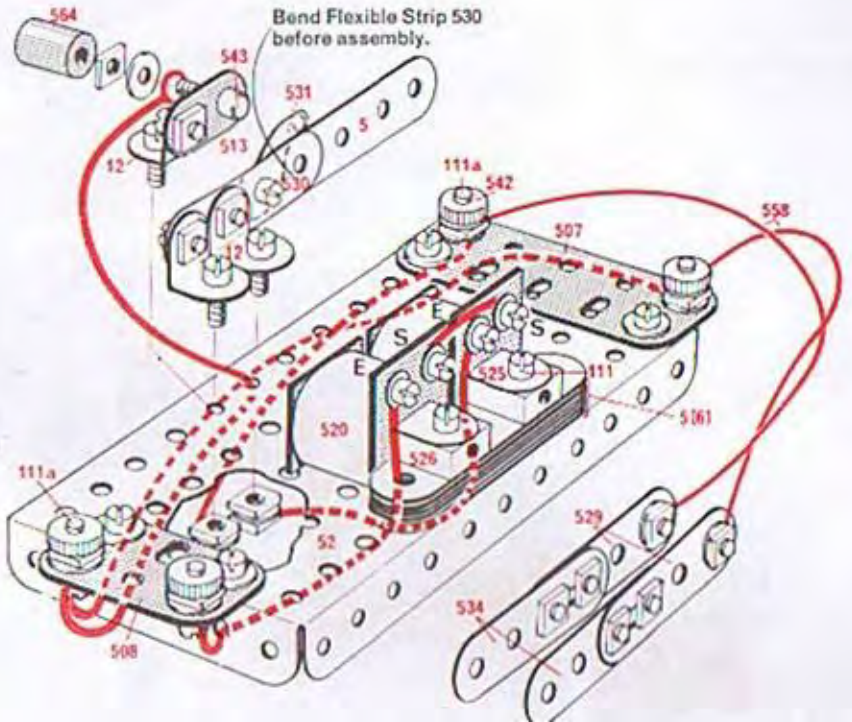
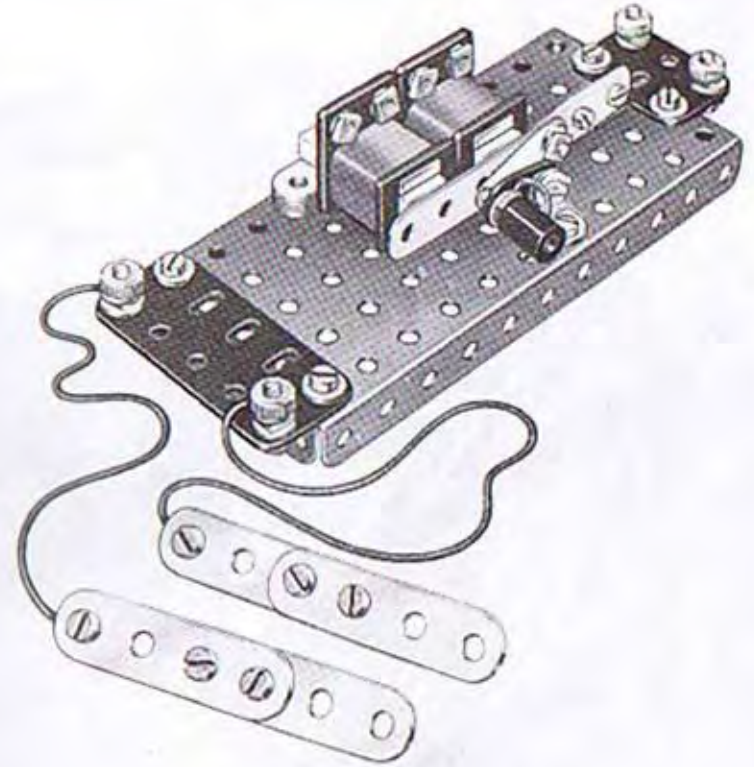
The use of this apparatus is perfectly safe. If two, three or four people join hands, with those at each end holding one of the leads 534, a mild shock is felt by everyone in the chain.

This model incorporates the primary coil and contact breaker of the famous Ruhmkorff induction coil which induces a current of very low amperage and greatly increased voltage.

Operate from 4-5v battery only.

A higher voltage than 4-5v DC gives an unpleasantly strong shock and should not be exceeded.

- 7 - 5
- 3 - 12
- 30 - 37a
- 21 - 37b
- 19 - 38
- 1 - 52
- 2 - 111
- 4 - 111a
- 1 - 507
- 1 - 508
- 1 - 513
- 2 - 520
- 4 - 525
- 2 - 526
- 2 - 529
- 1 - 530
- 1 - 531
- 2 - 534
- 4 - 542
- 1 - 543
- 6 - 561
- 1 - 564



## E10 Vibratory Motor

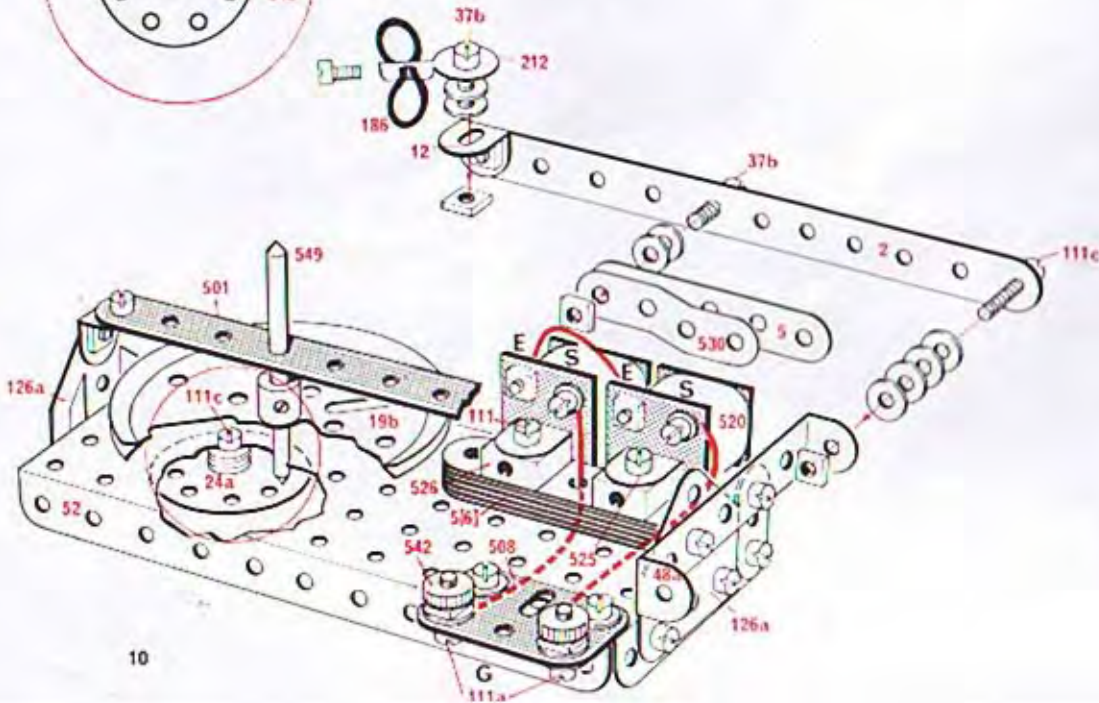
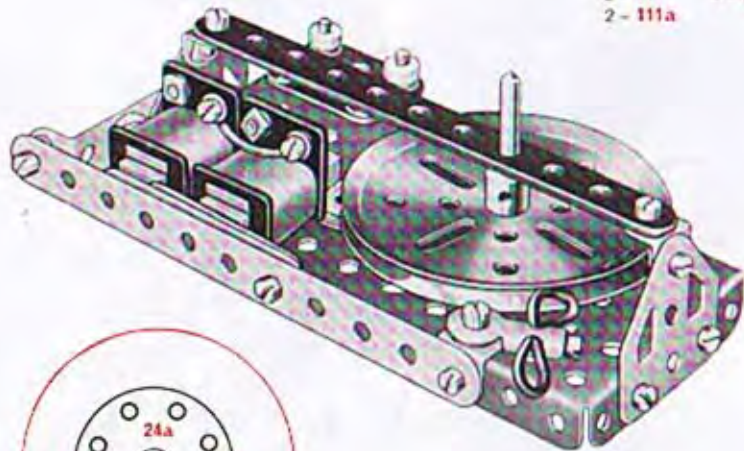
Motors working on this principle are used for operating shop window models and displays.

15v AC only.

The rubber band on the end of the arm vibrates against the Pulley Wheel and causes it to rotate.

Adjust the rubber band by trial and error to obtain the maximum speed.

- |          |          |
|----------|----------|
| 1 - 2    | 3 - 111c |
| 7 - 5    | 2 - 126a |
| 1 - 10   | 1 - 186  |
| 3 - 12   | 1 - 212  |
| 1 - 19b  | 1 - 501  |
| 1 - 24a  | 1 - 508  |
| 26 - 37a | 2 - 520  |
| 20 - 37b | 2 - 525  |
| 18 - 38  | 2 - 526  |
| 1 - 48a  | 1 - 530  |
| 1 - 52   | 1 - 549  |
| 2 - 111  | 4 - 561  |
| 2 - 111a |          |



## E11 Electric Bell

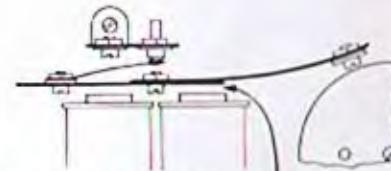
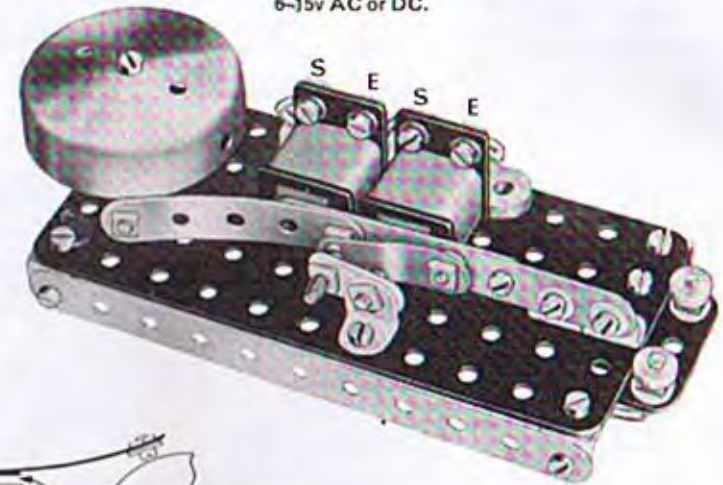
- |          |
|----------|
| 2 - 2    |
| 8 - 5    |
| 1 - 10   |
| 5 - 12   |
| 32 - 37a |
| 23 - 37b |
| 11 - 38  |
| 1 - 48a  |
| 2 - 111  |
| 3 - 111a |
| 1 - 111d |
| 1 - 508  |
| 1 - 510  |
| 2 - 520  |
| 4 - 525  |
| 2 - 526  |
| 1 - 530  |
| 1 - 531  |
| 2 - 542  |
| 1 - 543  |
| 1 - 562  |

This is an electric bell of the most common type.

The tone of the "ring" can be adjusted by moving the Contact Screw 543.

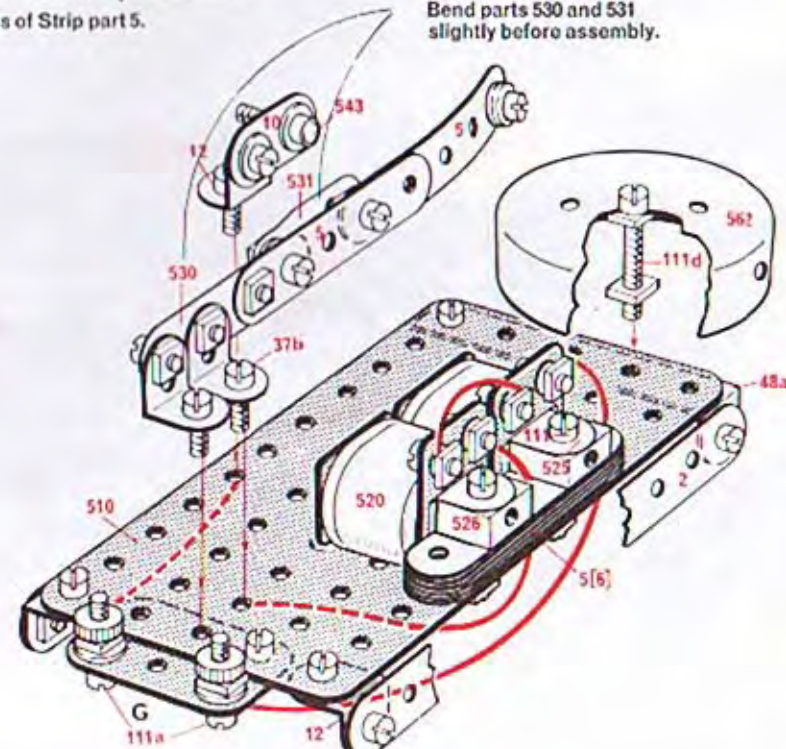
4-5v battery.

6-15v AC or DC.



Air gap = thickness of Strip part 5.

Bend parts 530 and 531 slightly before assembly.



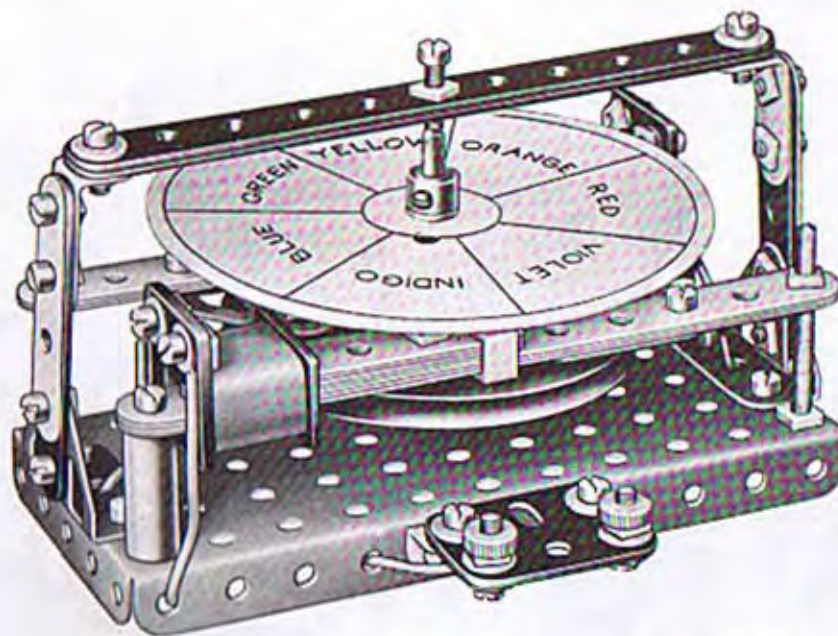
# E12 Asynchronous Motor

A low-powered motor of a type often used in animated shop window displays. It is very silent in operation and capable of running for long periods without attention. It is an induction motor and does not have either brushes or commutator.

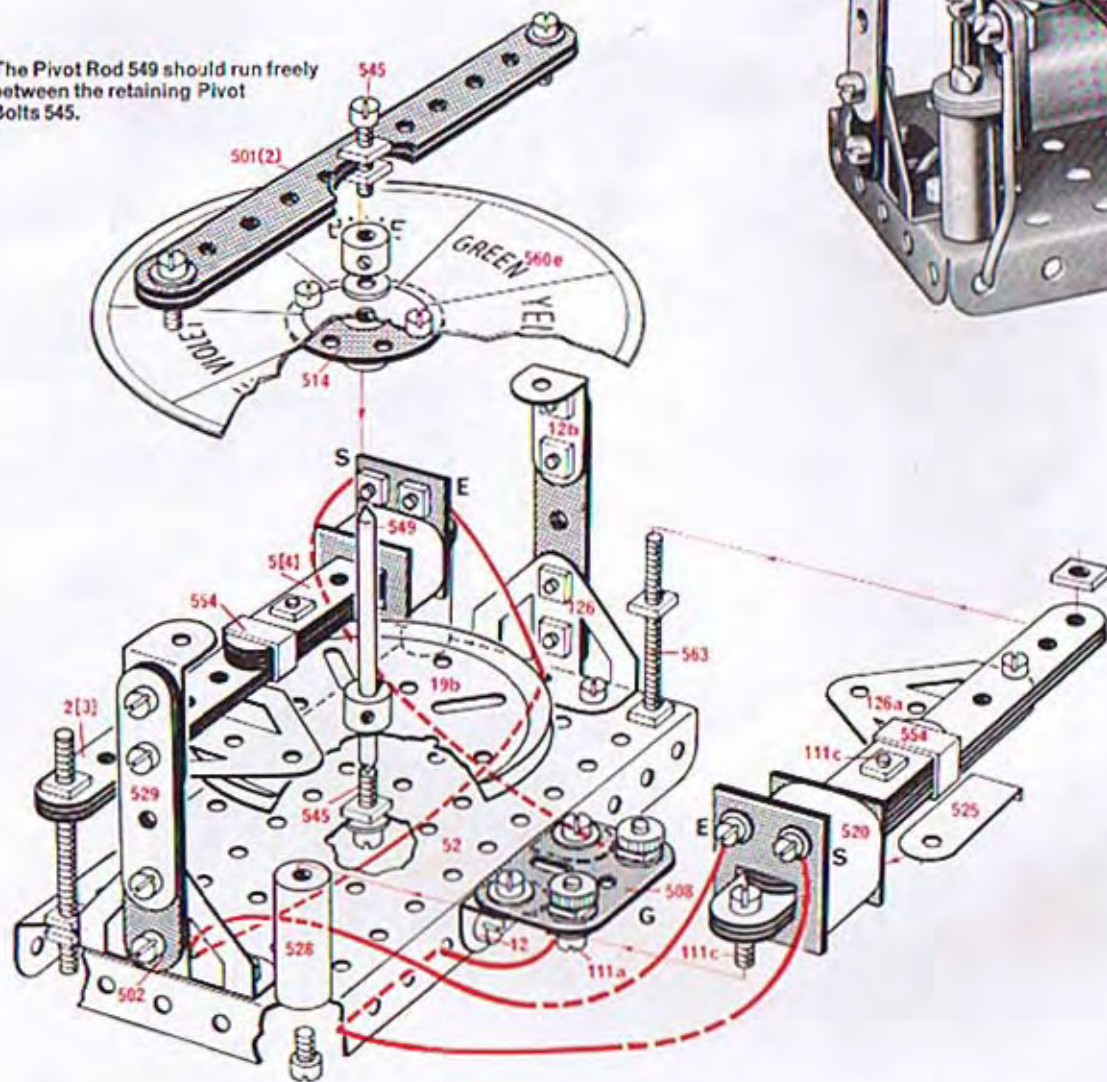
The motor starts and runs through the action of the copper Short Circuit Pieces 554 which cause a displacement of magnetic flux.

15v AC only.

This model can be fitted with cardboard dials 560b and 560c.



The Pivot Rod 549 should run freely between the retaining Pivot Bolts 545.



6-2	2-502
8-5	1-508
2-12	1-514
2-12b	2-520
1-19b	2-525
39-37a	2-528
25-37b	2-529
10-38	2-542
1-52	2-545
1-59	1-549
2-111a	2-554
4-111c	1-560b
2-111d	1-560e
2-126	4-561
2-126a	2-563
2-501	



This clearance should be as small as possible.

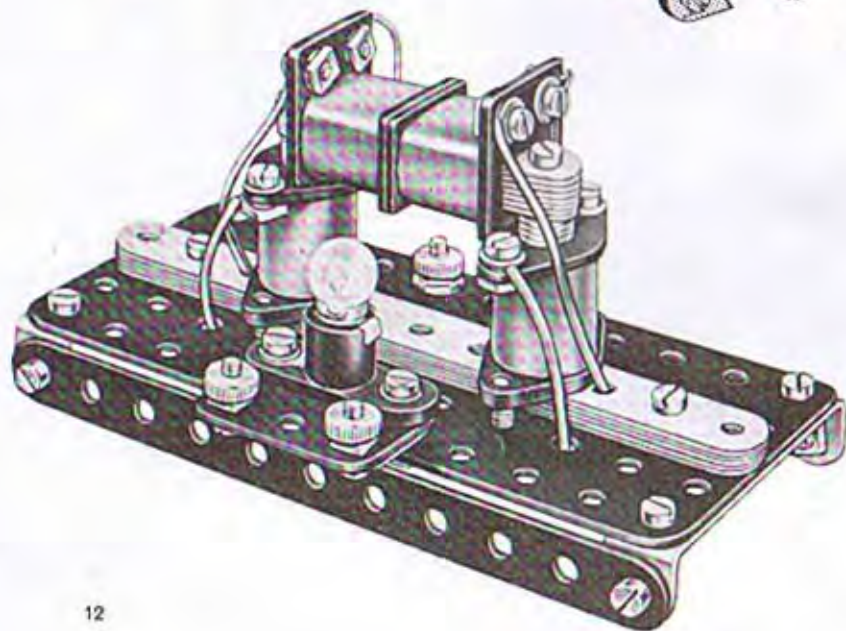
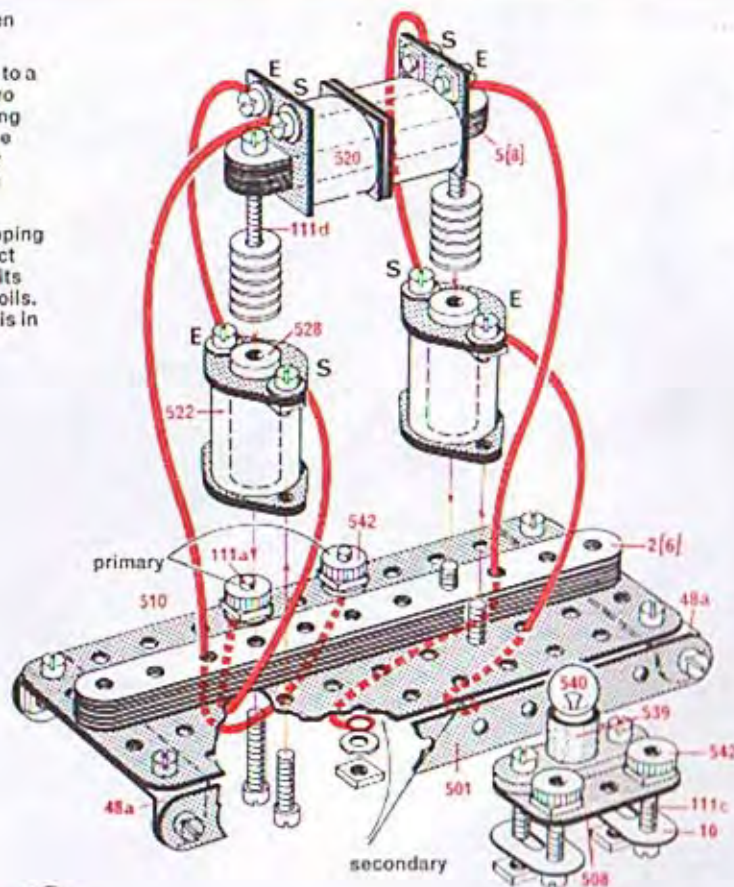
## E13 Transformer (1-1)

Transformers play a large part in industry and are often the principal elements in an electrical installation.

This model consists of two Coils connected in series to a supply at 15 volt AC forming the primary circuit, and two more Coils, also in series, connected to a lamp, forming the secondary circuit. The Coils are all mounted on the same core. When the AC current flows in the primary circuit the Lamp lights up showing the presence of an induced current in the secondary circuit.

Transformers are usually used for stepping up or stepping down the voltage of one winding (primary) with respect to the other (secondary), the currents in the two circuits being proportional to the number of windings in the coils. As the two pairs of coils in this model are the same it is in fact a 1 to 1 transformer.

6-2	2-501
8-5	1-508
2-10	1-510
26-37a	2-520
16-37b	2-522
16-38	2-528
2-48a	1-539
2-111	1-540c
4-111a	4-542
8-111c	10-561
2-111d	



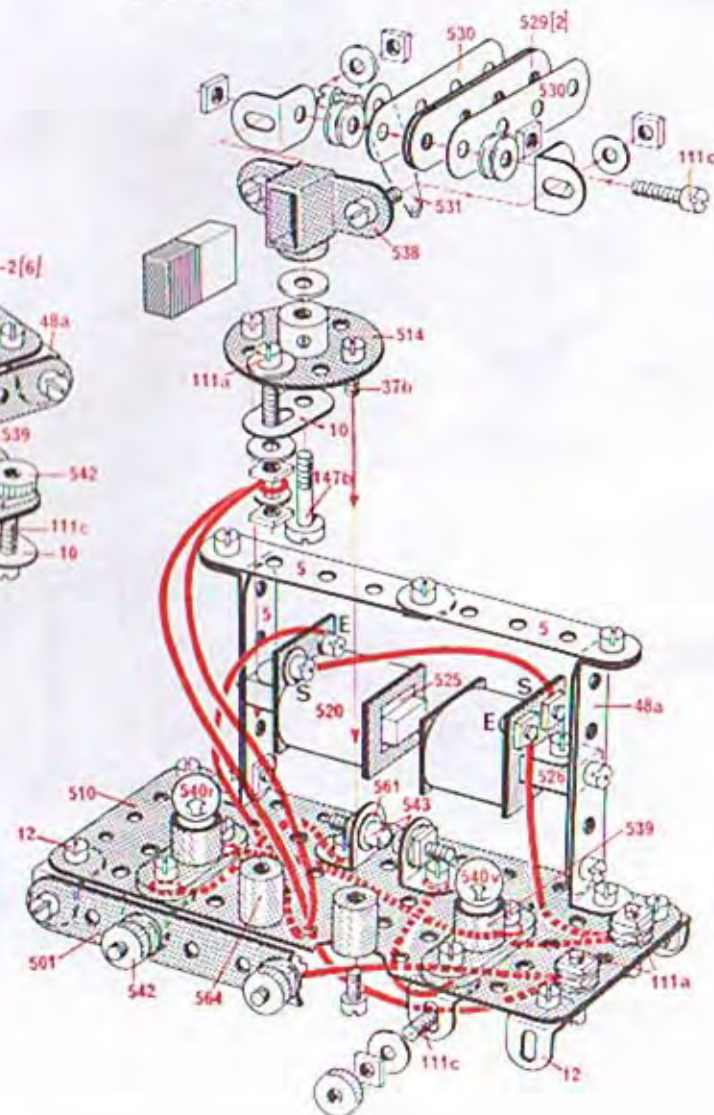
## E14 Two-way Relay Switch with

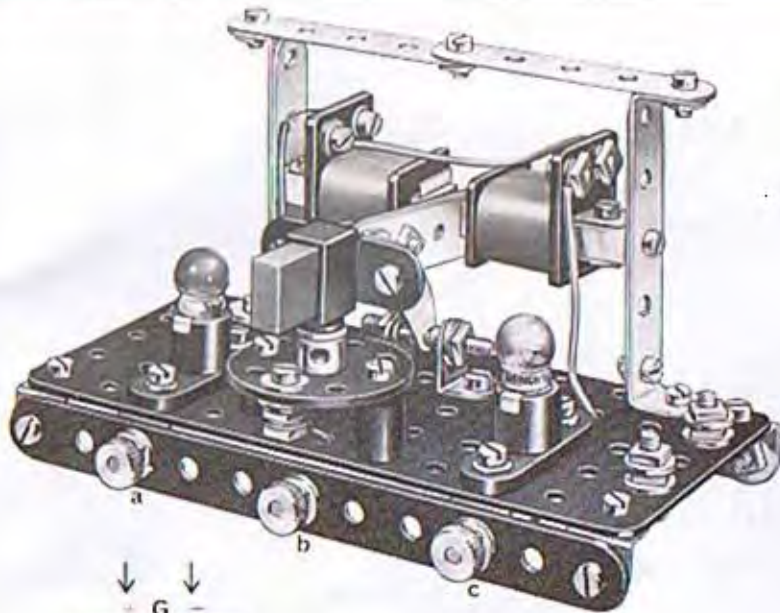
Depending upon the polarity of the current fed into it, this relay switch will operate either of two separate circuits.

One of the two Lamps lights up showing which of the circuits is closed.

4-5v battery.  
6-12v DC only.

**NB** An independent current supply G2 is required to operate the separate circuits.  
The Permanent Magnet in this model acts only as a counterweight.



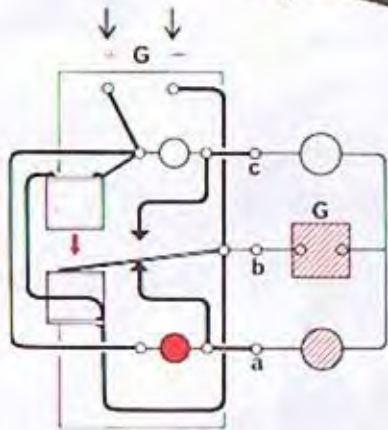
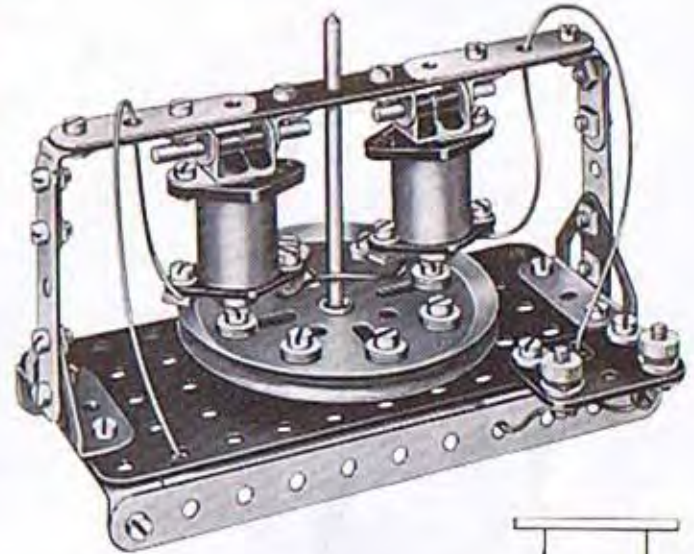


A very low-powered motor of the type used in electric clocks.

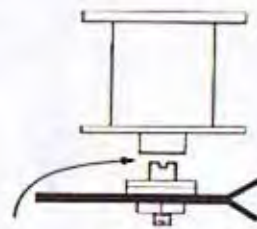
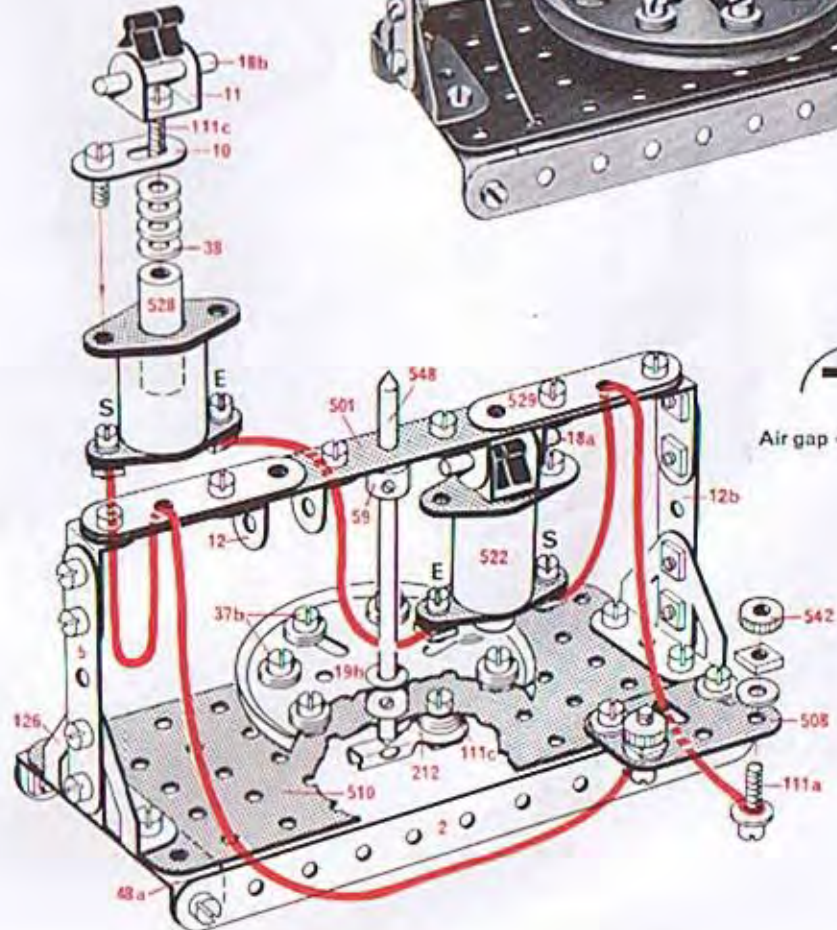
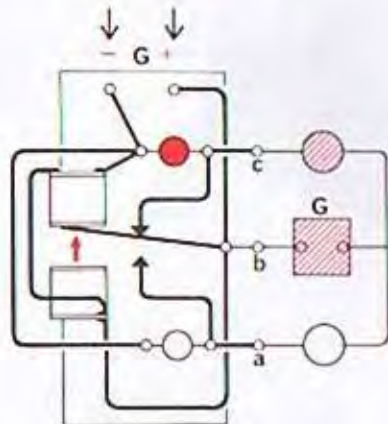
15v AC only.

To start the motor the Pivot Rod should be spun at a speed synchronous with the AC current (i.e. 750 r.p.m.) until the Coils are gently swinging above the wheel.

2 - 2	4 - 35	1 - 212
2 - 5	32 - 37a	1 - 501
2 - 10	32 - 37b	1 - 508
2 - 11	26 - 38	1 - 510
4 - 12	2 - 48a	2 - 522
2 - 12b	1 - 59	2 - 528
1 - 18a	2 - 111a	2 - 529
1 - 18b	3 - 111c	4 - 542
1 - 19b	2 - 126	1 - 548



4 - 5
1 - 10
10 - 12
40 - 37a
28 - 37b
20 - 38
2 - 48a
2 - 111a
13 - 111c
1 - 147b
2 - 501
1 - 510
1 - 514
2 - 520
4 - 525
2 - 526
2 - 529
2 - 530
1 - 531
1 - 537
1 - 538
2 - 539
1 - 540r
1 - 540v
3 - 542
2 - 543
11 - 561
2 - 564



Air gap = thickness of Strip part 5

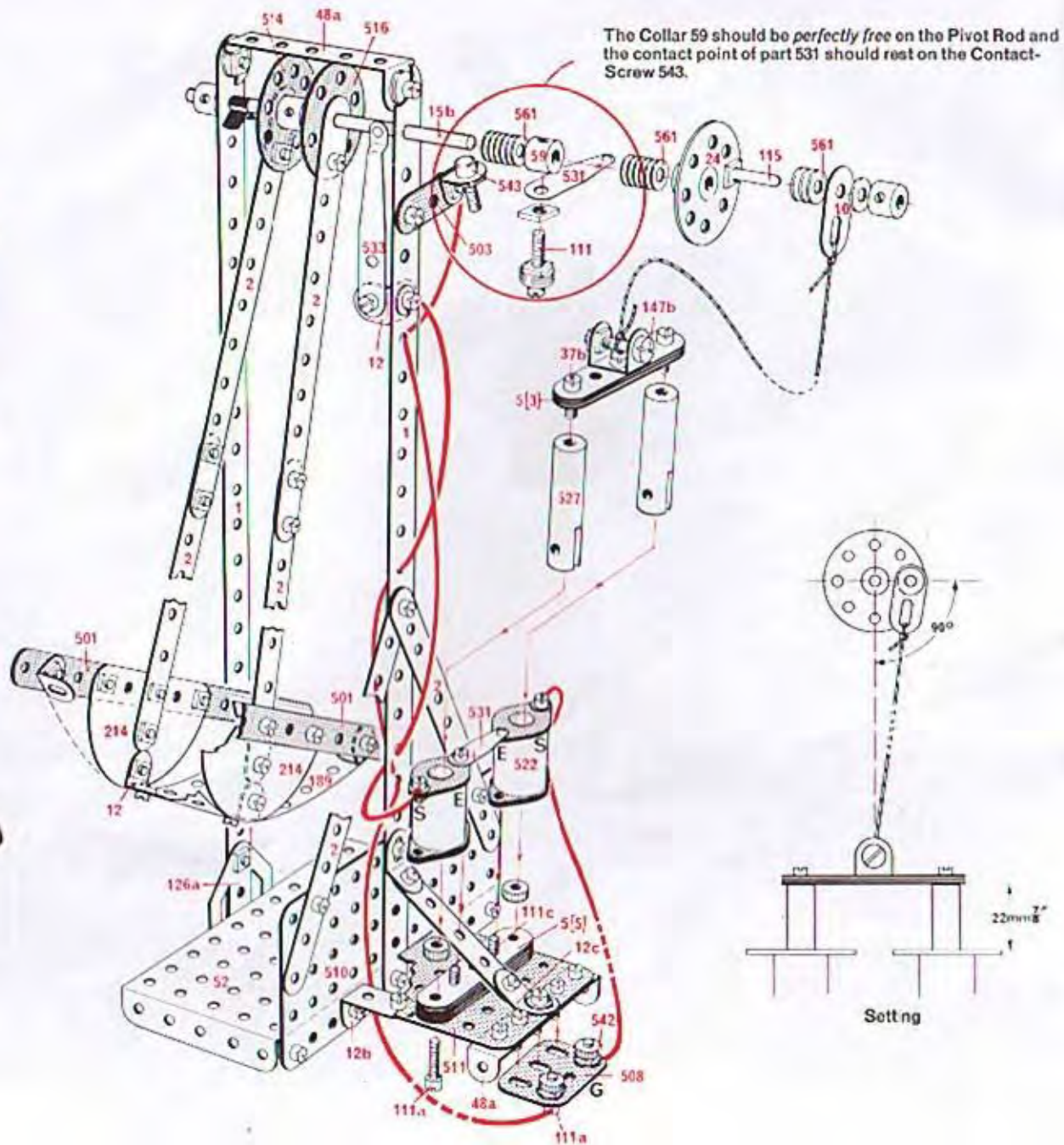
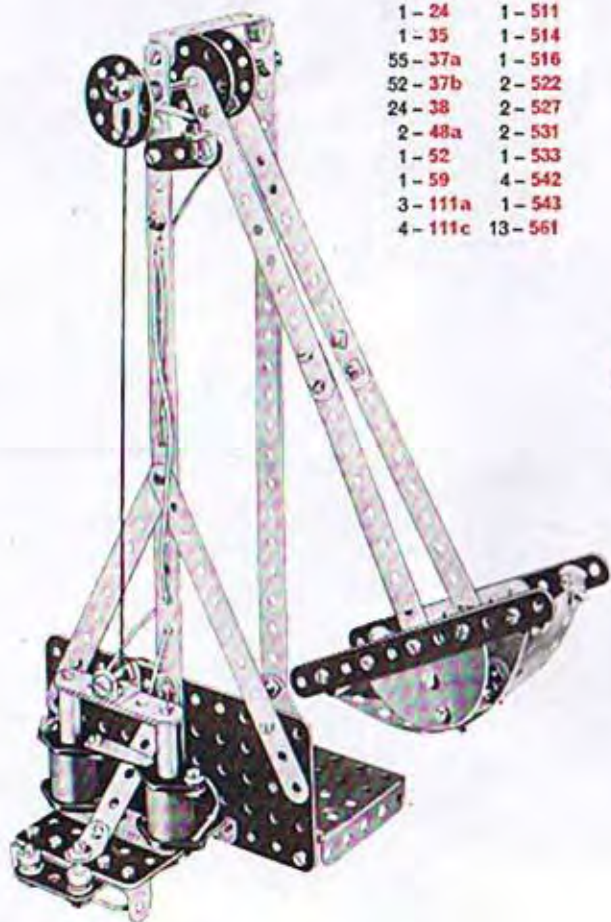
# E16 Swing

12-15v AC or DC. This model will not work efficiently on a power supply below 12 volts.

At the end of each swing in one direction part 531 makes contact supplying current to the Coils, which attract the Cores attached to the string and thus pull the swing in the other direction.

To set the model in motion give the swing a gentle push.

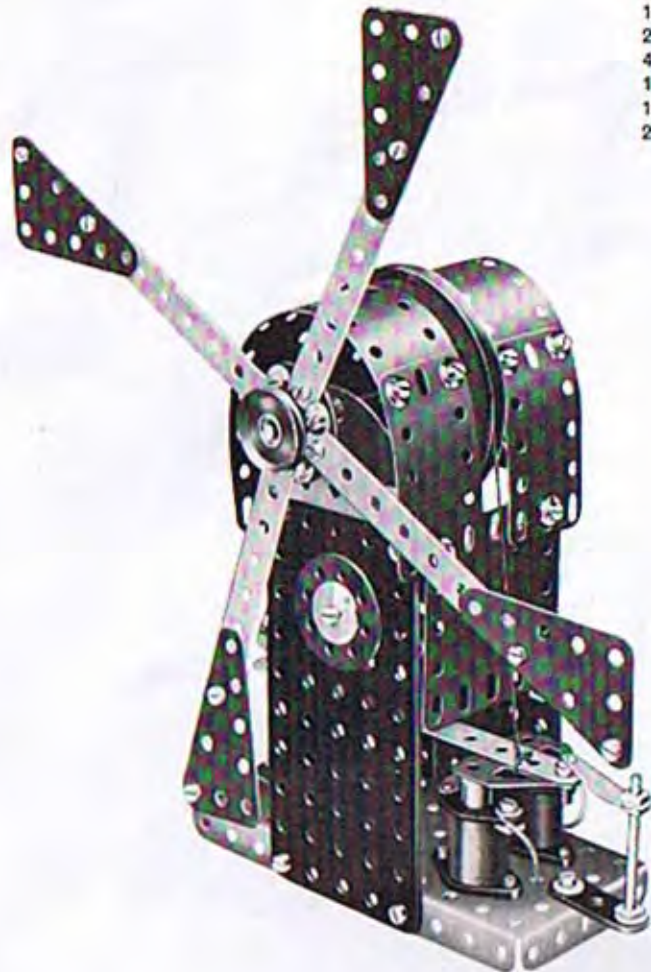
2-1	1-115
6-2	1-126a
9-5	2-140y
1-10	1-147b
1-11	2-214
8-12	2-501
2-12b	1-503
2-12c	1-508
1-15b	1-510
1-24	1-511
1-35	1-514
55-37a	1-516
52-37b	2-522
24-38	2-527
2-48a	2-531
1-52	1-533
1-59	4-542
3-111a	1-543
4-111c	13-561



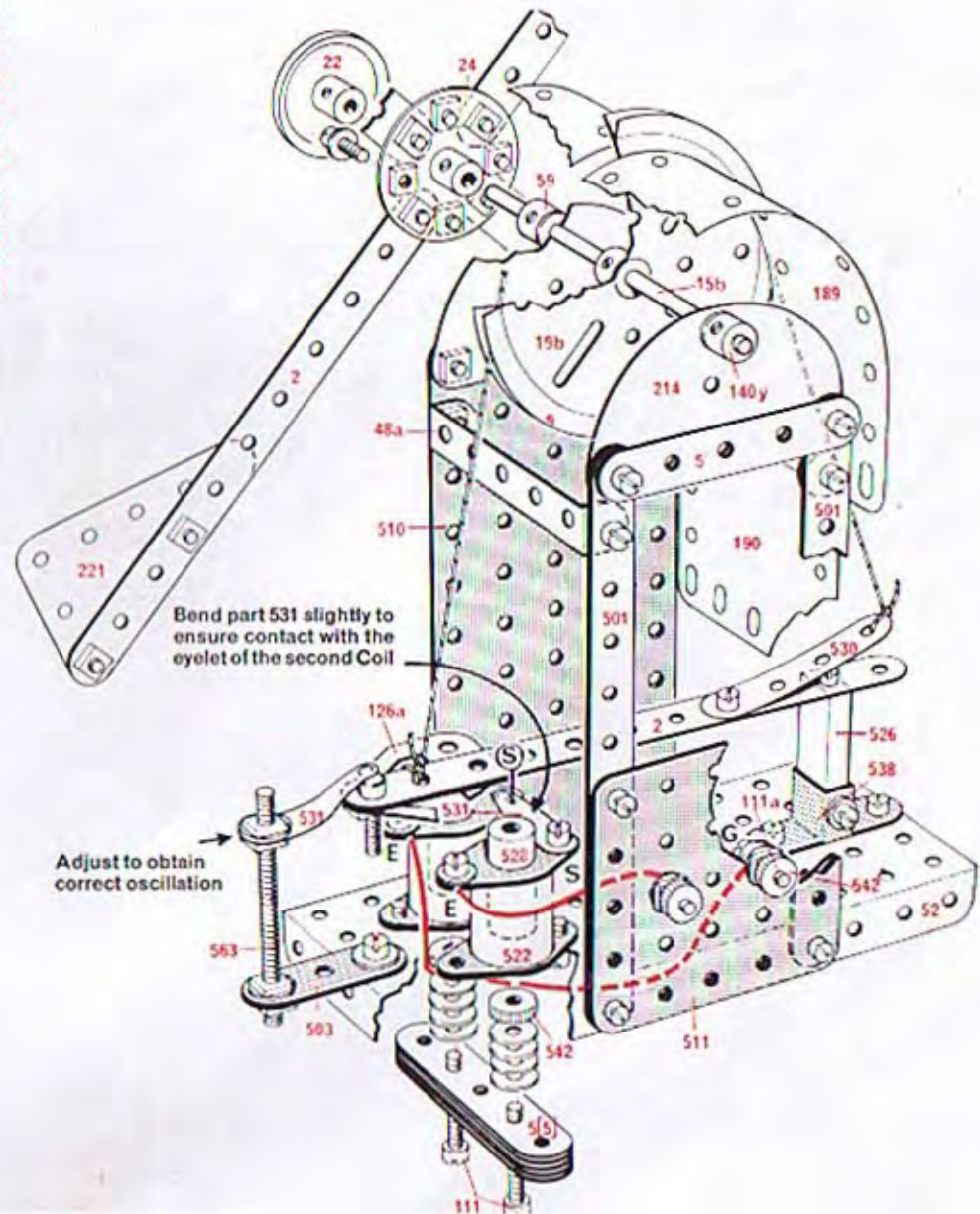
# E17 Windmill

This model incorporates a novel motor. The rotary motion is caused by short, jerky movements of the cord over the large Pulley 19b.

15v AC only.



5-2	2-189
2-5	2-190
1-15b	2-214
1-19b	4-221
1-22	2-501
1-24	1-503
1-24a	1-510
53-37a	1-511
48-37b	2-522
27-38	1-526
1-38d	2-528
2-48a	1-530
1-52	2-531
1-59	1-538
2-111	4-542
4-111a	1-543
1-126a	2-561
1-140y	1-563
2-188	





# E18 Level-Crossing

A level-crossing of the type used on Continental railways. It can be used with 'O' gauge railways. The warning lamps light up when the barriers are down.

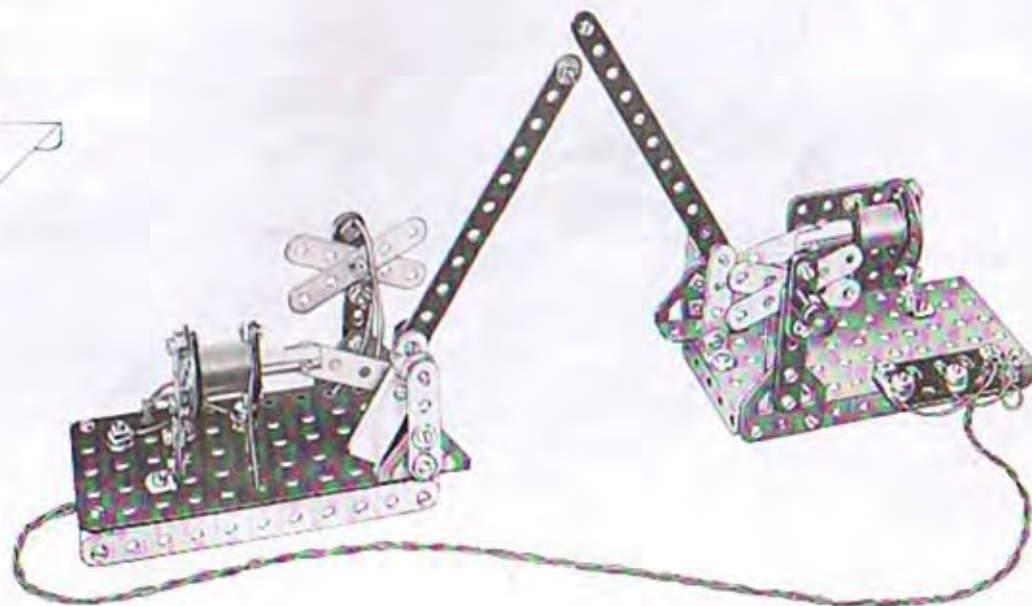
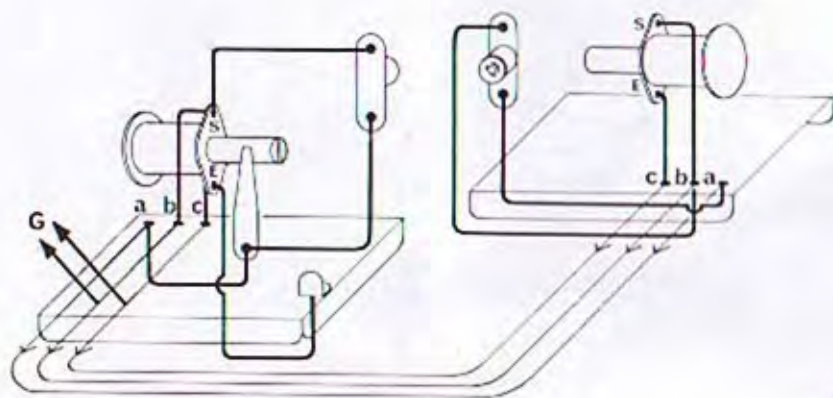
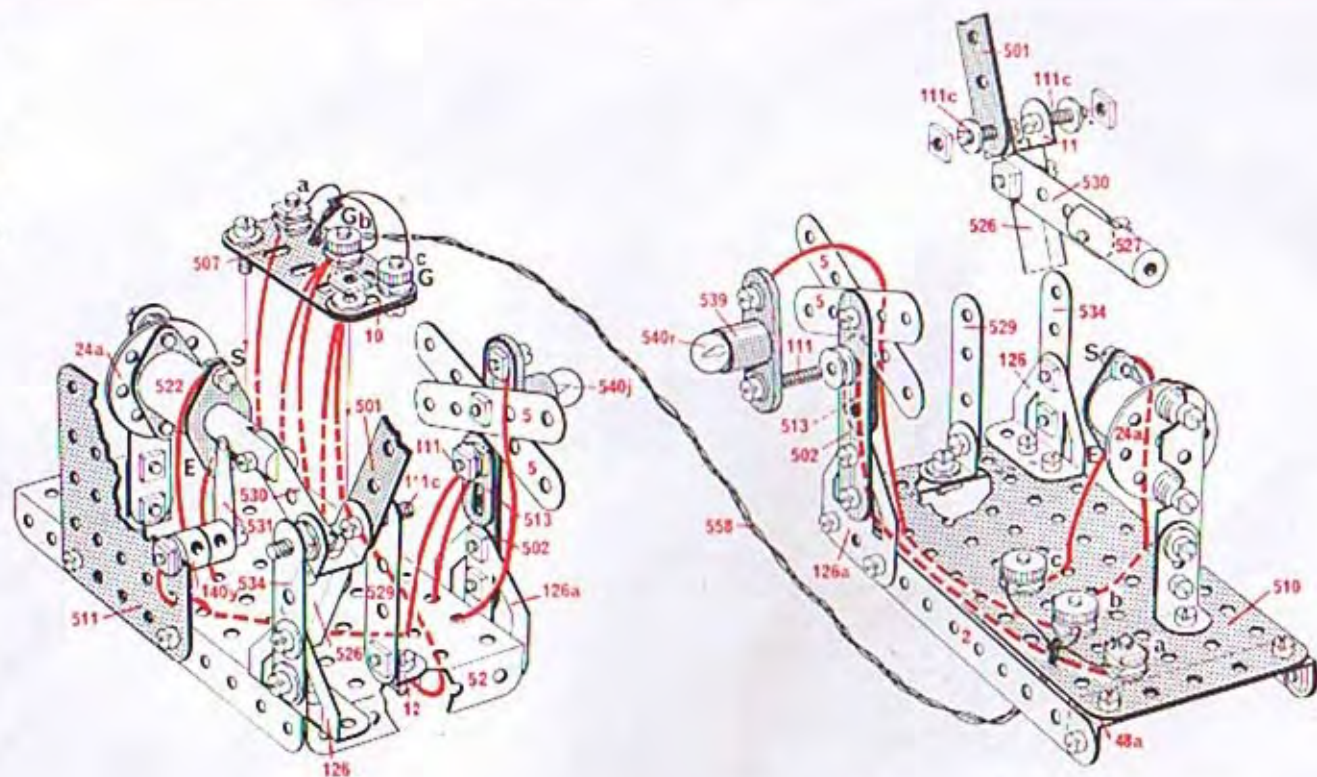
12v DC or 15v AC.

This model does not work efficiently below 12 volts.

When connecting the two parts of the level-crossing together follow the letters a, b and c on the diagrams carefully.

The yellow Lamp can be painted red with poster paint.

- |           |          |
|-----------|----------|
| 2 - 2     | 2 - 501  |
| 6 - 5     | 2 - 502  |
| 1 - 10    | 1 - 507  |
| 2 - 11    | 1 - 510  |
| 2 - 12    | 1 - 511  |
| 2 - 12b   | 2 - 513  |
| 2 - 24a   | 2 - 522  |
| 64 - 37a  | 2 - 526  |
| 44 - 37b  | 2 - 527  |
| 50 - 38   | 2 - 529  |
| 2 - 48a   | 2 - 530  |
| 1 - 52    | 1 - 531  |
| 3 - 111   | 2 - 534  |
| 6 - 111a  | 2 - 539  |
| 12 - 111c | 1 - 540r |
| 2 - 126   | 1 - 540j |
| 2 - 126a  | 4 - 542  |
| 2 - 140y  |          |



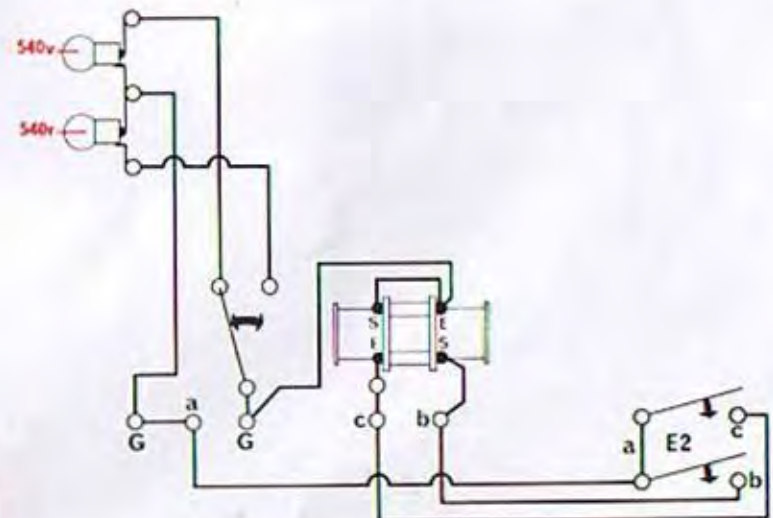
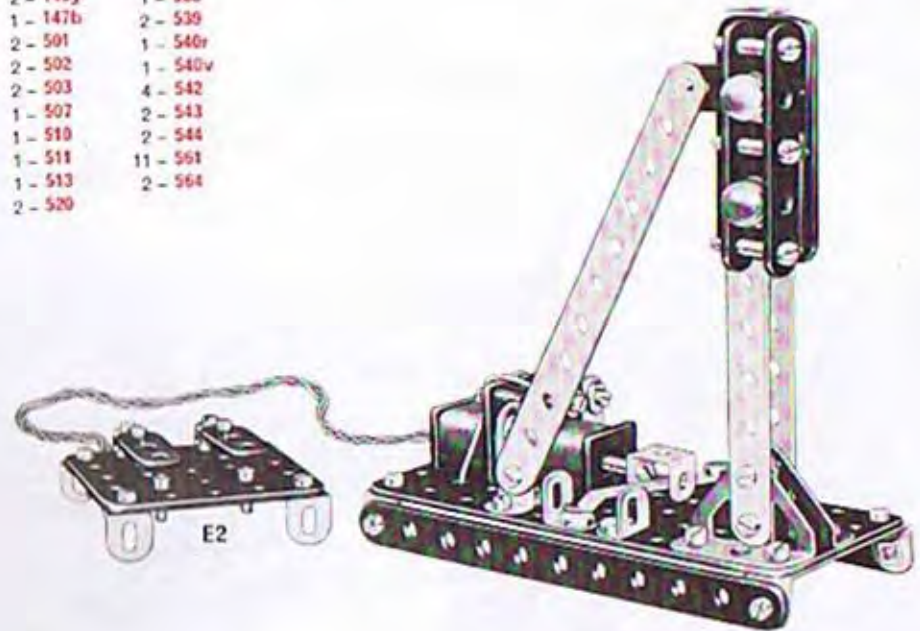
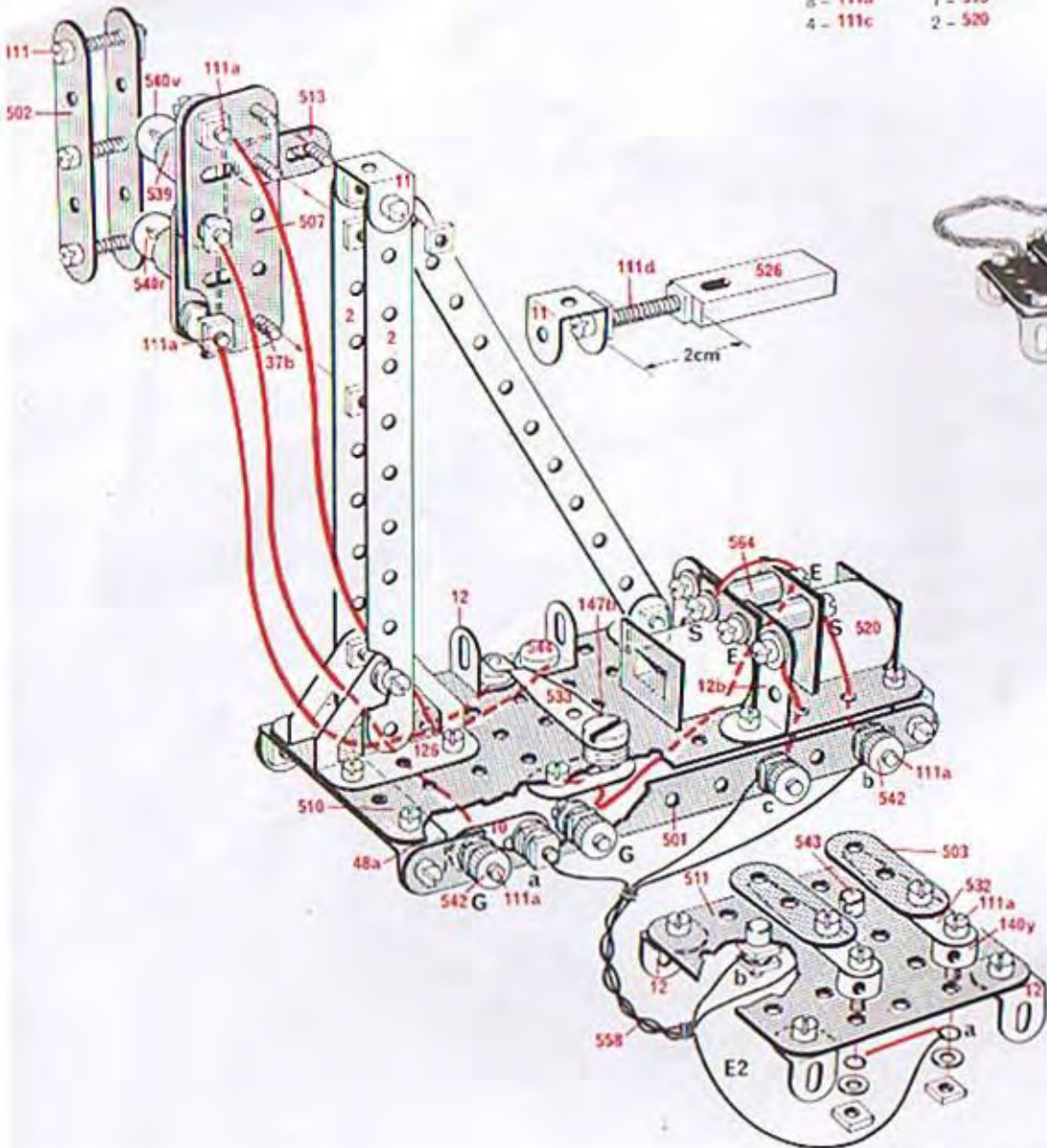
# E19 2-Light Signal with Relay Switch

This remote control signal, which incorporates a relay switch, can be used with an 'O' gauge railway.

12v DC or 15v AC.

This model does not work efficiently on a current supply below 12 volts.

3 - 2	1 - 111d	1 - 526
4 - 10	2 - 126	2 - 532
2 - 11	2 - 140y	1 - 533
7 - 12	1 - 147b	2 - 539
2 - 12b	2 - 501	1 - 540r
57 - 37a	2 - 502	1 - 540v
33 - 37b	2 - 503	4 - 542
10 - 38	1 - 507	2 - 543
2 - 48a	1 - 510	2 - 544
3 - 111	1 - 511	11 - 561
8 - 111a	1 - 513	2 - 564
4 - 111c	2 - 520	

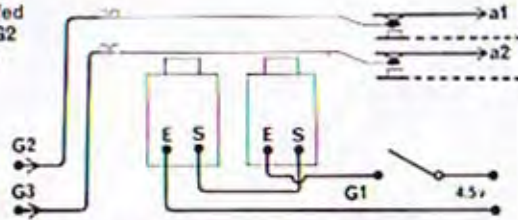


# E20 2-Pole Relay Switch

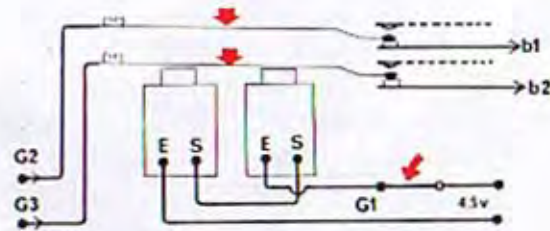
This is a model of a two-pole relay switch which, when actuated by an electric current fed to terminals G1, switches a second current G2 and G3 from one pair of contacts to another.

4.5v battery.  
6-15v AC or DC.

- |        |       |
|--------|-------|
| 8-5    | 1-508 |
| 6-10   | 2-520 |
| 44-37a | 4-525 |
| 25-37b | 2-526 |
| 22-38  | 2-528 |
| 1-52   | 1-529 |
| 2-111  | 2-530 |
| 4-111a | 2-531 |
| 5-111c | 2-533 |
| 2-125  | 4-542 |
| 2-140y | 2-543 |
| 2-502  | 4-561 |
| 2-503  | 2-563 |
| 1-507  |       |

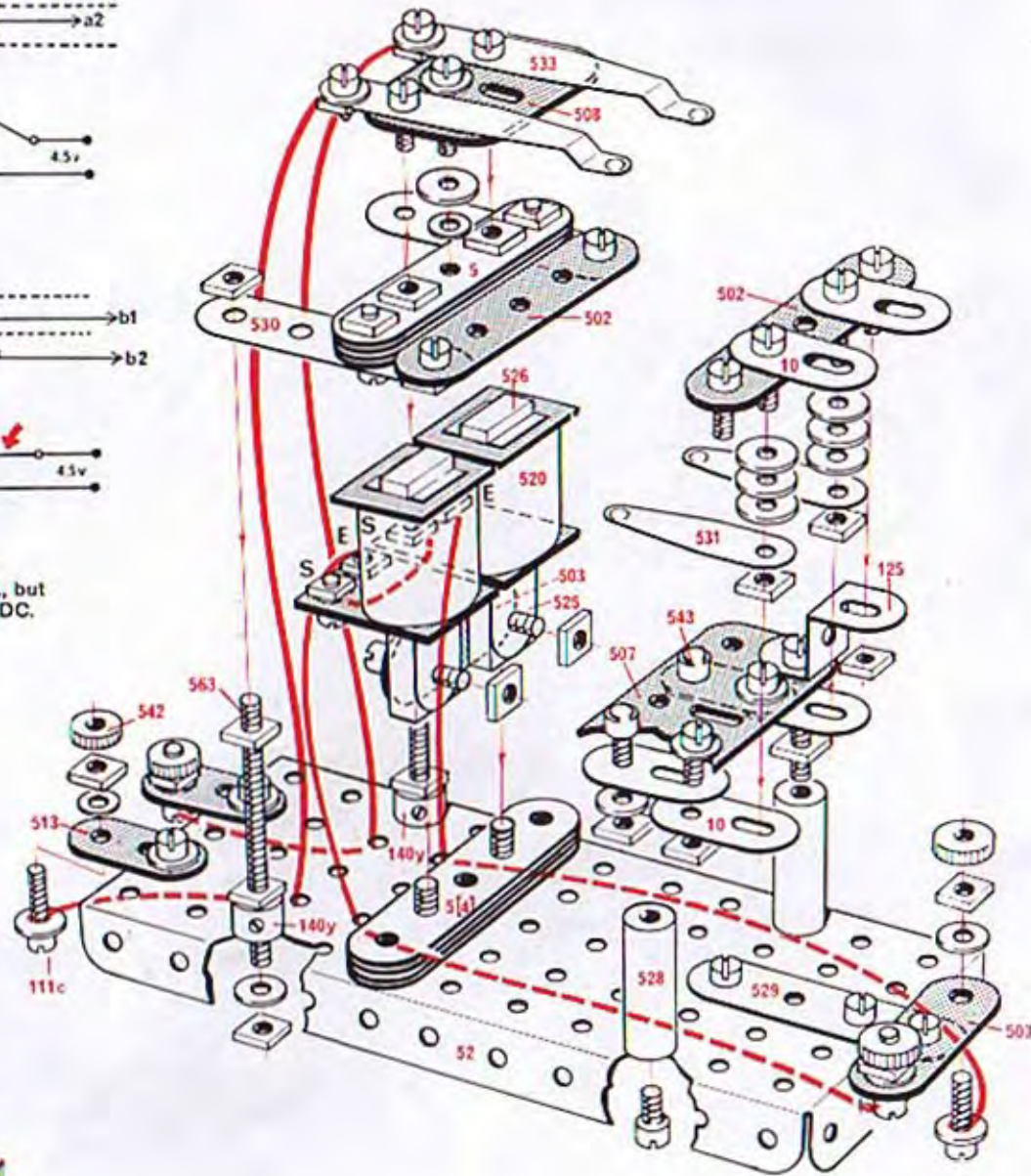
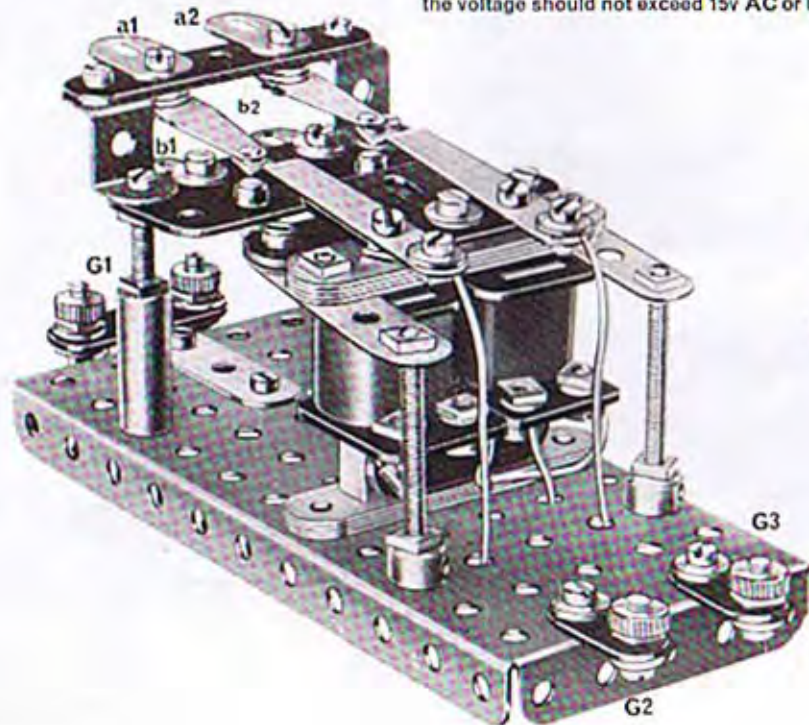


(1) Coils dead — contact at a1 and a2.



(2) Coils live — contact at b1 and b2.

This model can deal with a current in the second circuit G2 and G3 of up to 5 amps., but the voltage should not exceed 15v AC or DC.



## E21 Permanent Magnet Motor with reducing pulley

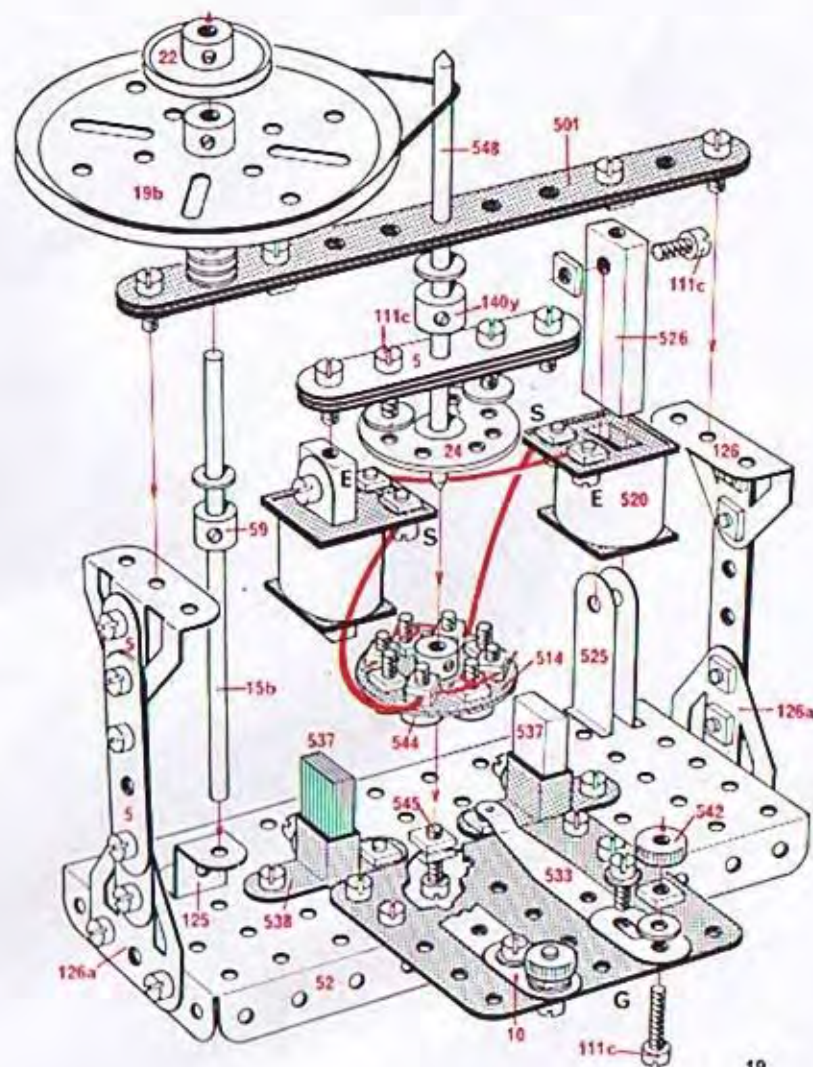
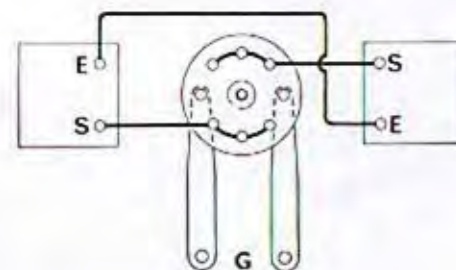
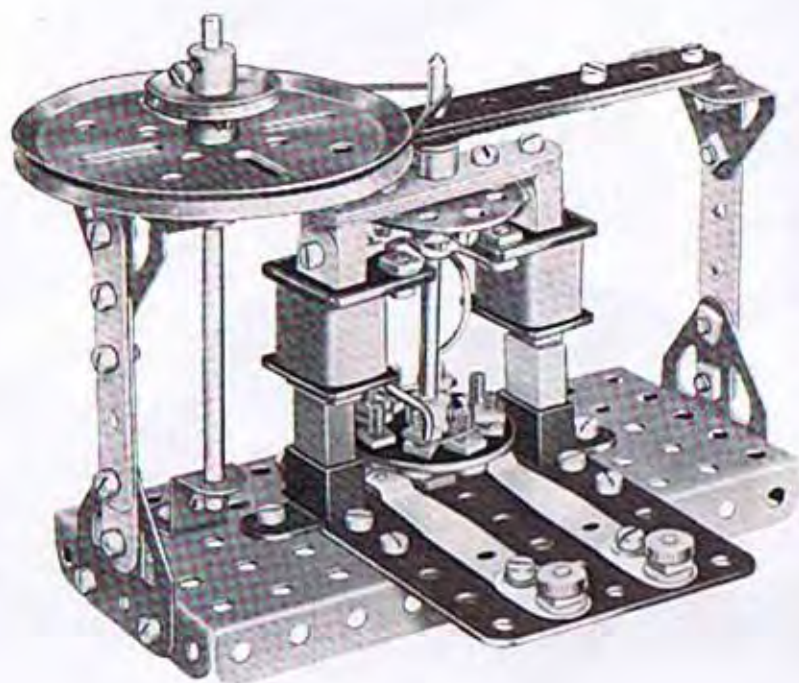
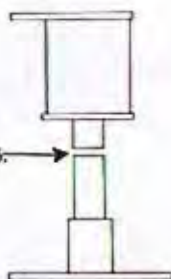
A very useful low-power motor for driving light Meccano models (model E37 for example).

12v DC only.

The motor will not start by itself unless the Coils are in line with the Magnets (as in the illustration) before it is switched on. Otherwise it is easily started by hand. The motor can be reversed by reversing the current at the terminals (for which switch E3 could be used).

The Wiper Arms 533 should be bent in such a way as to ensure light contact with the commutator formed by the Insulating Bush Wheel 514.

7- 5	1- 140y
2- 10	1- 186a
1- 15b	2- 501
1- 19b	1- 511
1- 22	1- 514
1- 24	2- 520
51- 37a	2- 525
33- 37b	2- 526
11- 38	2- 533
1- 52	2- 537
1- 59	2- 538
2- 111a	2- 542
4- 111c	8- 544
1- 125	1- 545
2- 126	1- 548
2- 126a	2- 561



## E22 Single Cylinder Vertical Engine

An experimental engine in which movement is induced in the Core, which represents a piston, when current flows in the Coil (cylinder).

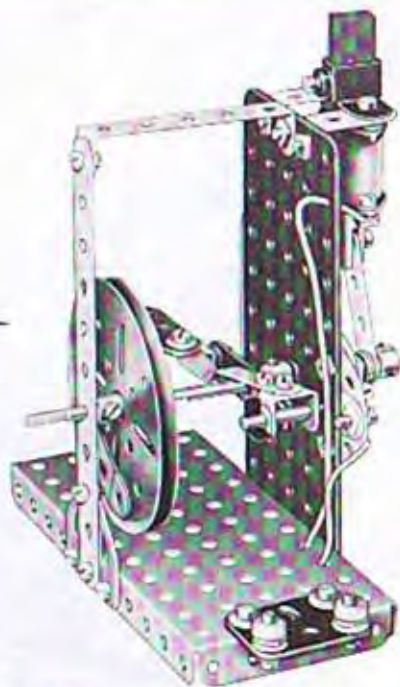
12v DC only.

The engine must be started by hand by spinning in the direction of the arrow. It will only run in this direction and if it fails to start the current should be reversed at the terminals.

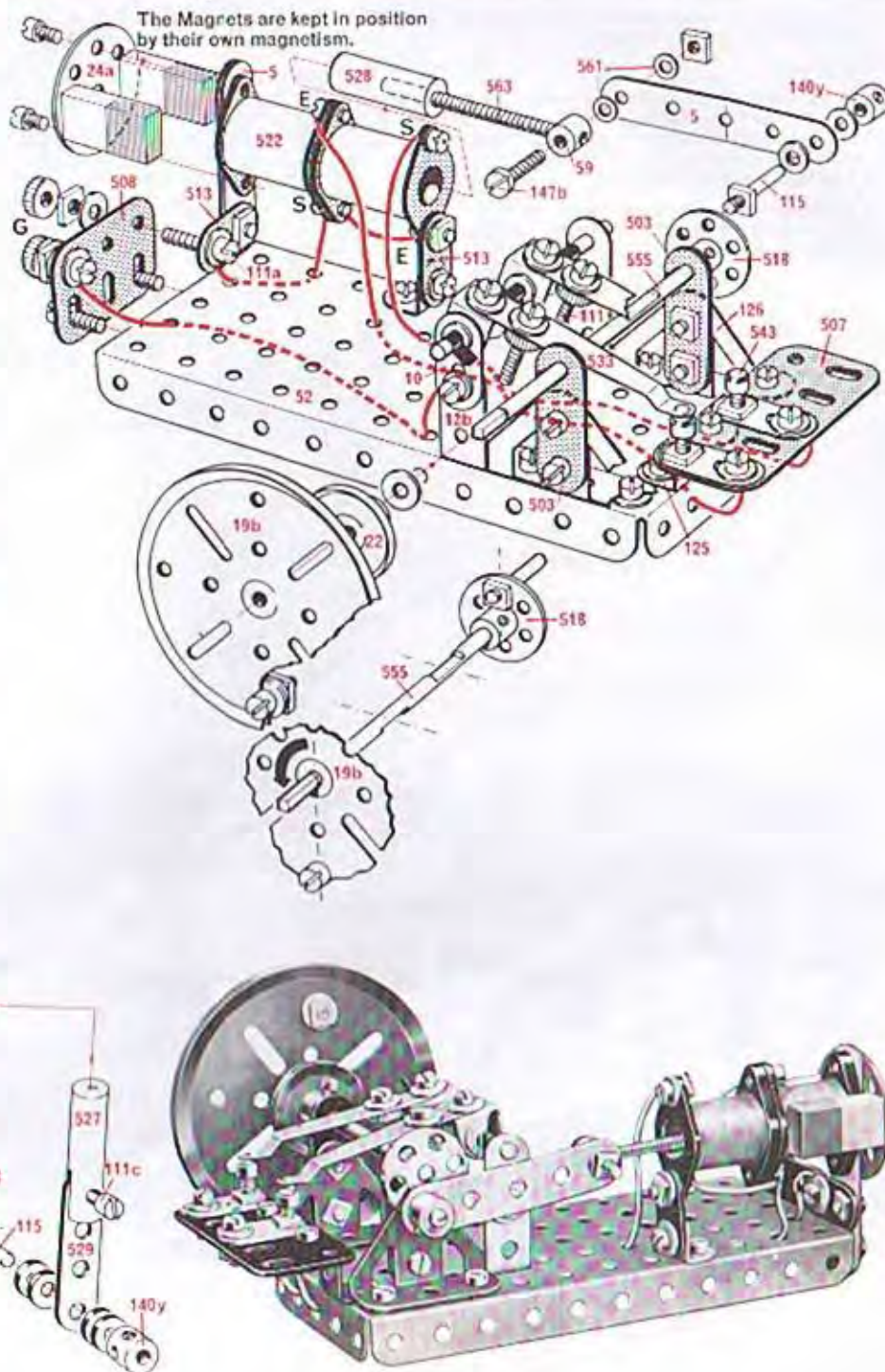


Air gap = thickness of Wiper Arm 531.

- |          |          |
|----------|----------|
| 1 - 2    | 1 - 126a |
| 1 - 10   | 2 - 140y |
| 2 - 11   | 1 - 502  |
| 2 - 12b  | 1 - 503  |
| 1 - 18a  | 1 - 506  |
| 1 - 19b  | 1 - 510  |
| 1 - 24   | 1 - 518  |
| 2 - 35   | 1 - 522  |
| 24 - 37a | 1 - 527  |
| 19 - 37b | 1 - 529  |
| 28 - 38  | 1 - 531  |
| 1 - 48a  | 1 - 533  |
| 1 - 52   | 1 - 537  |
| 2 - 90a  | 1 - 538  |
| 2 - 111a | 3 - 542  |
| 7 - 111c | 1 - 555  |
| 1 - 115  | 2 - 561  |



## E23 Horizontal Electric Engine

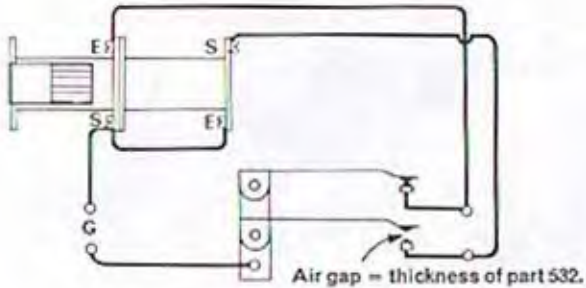


# E24 Horizontally-opposed 2-Cylinder Engine

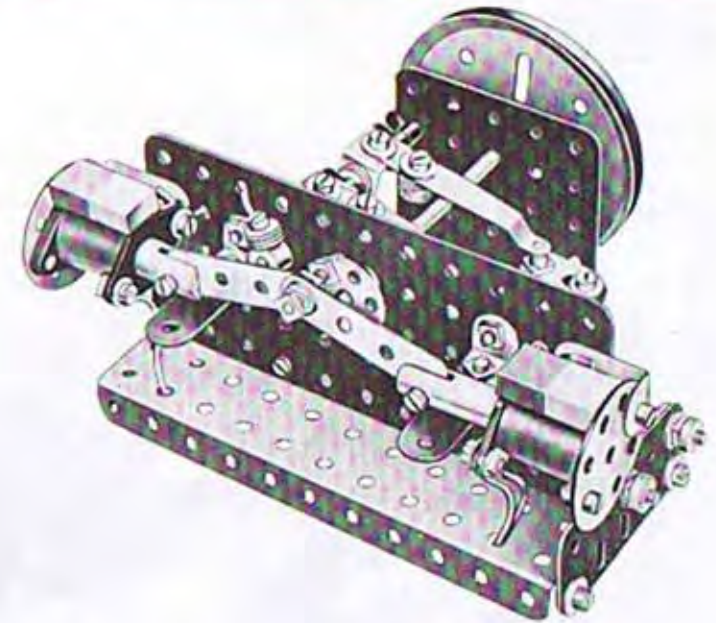
Models E23 and E24 work on the same principle as model E22 but here two Coils are used to give a power stroke in both directions. Two contacts timed by the Rod with Square End 555 direct the current alternately to the two Coils.

12v DC only.

It may be necessary to start the motor by hand in the direction of the arrow. It will only run in this direction and if it fails to start the current should be reversed at the terminals.

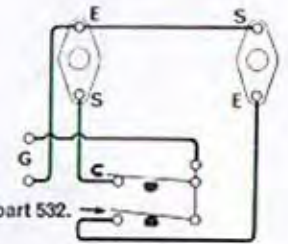
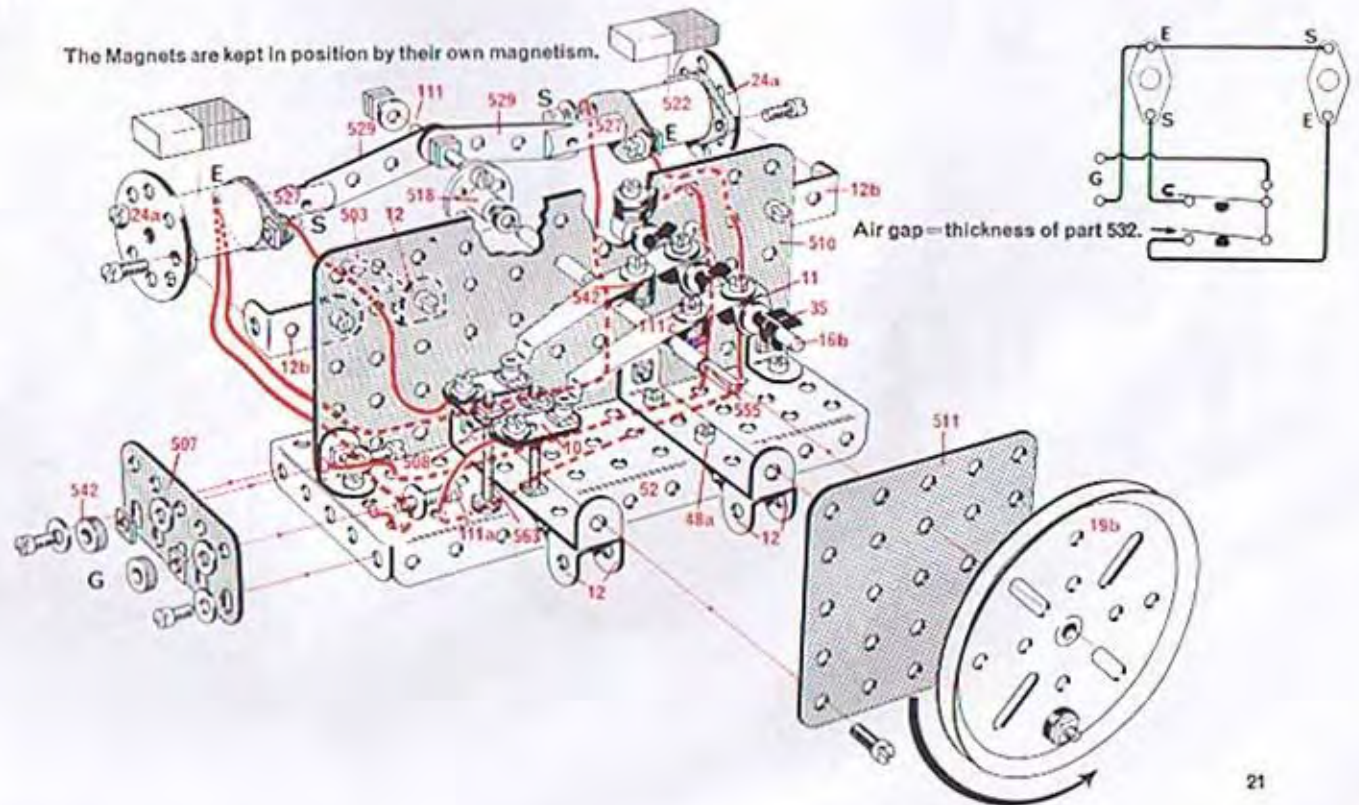


2 - 10	2 - 503
2 - 11	1 - 507
8 - 12	1 - 508
2 - 12b	1 - 510
1 - 16b	1 - 511
1 - 19b	1 - 518
2 - 24a	2 - 522
4 - 35	2 - 527
47 - 37a	2 - 529
33 - 37b	2 - 533
33 - 38	2 - 537
2 - 48a	4 - 542
1 - 52	2 - 543
1 - 59	1 - 555
1 - 111	6 - 561
4 - 111a	2 - 563
3 - 111c	



The Magnets are kept in position by their own magnetism.

3 - 5	2 - 126
4 - 10	1 - 140y
2 - 11	1 - 147b
2 - 12b	2 - 503
1 - 19b	1 - 507
1 - 22	1 - 508
1 - 24a	2 - 513
3 - 35	1 - 518
37 - 37a	2 - 522
33 - 37b	1 - 528
28 - 38	2 - 533
1 - 52	2 - 537
1 - 59	4 - 542
2 - 111	2 - 543
2 - 111a	1 - 555
1 - 111c	3 - 561
1 - 115	1 - 563
2 - 125	



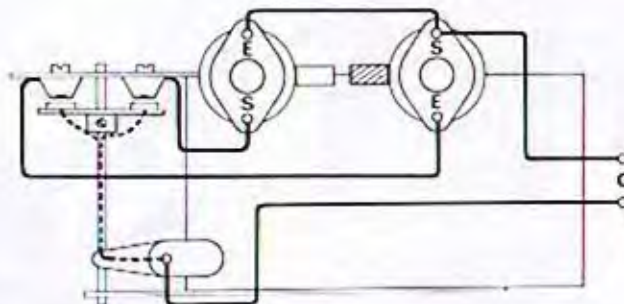
# E25 Beam Engine

This model is based on the same electrical principle as models E22-24 but in this case the reciprocal motion of the Cores (pistons) is transferred to the connecting rod and crankshaft by means of a pivoted balance beam. Two brushes pick up current alternately from the Commutator and direct it to the Coils.

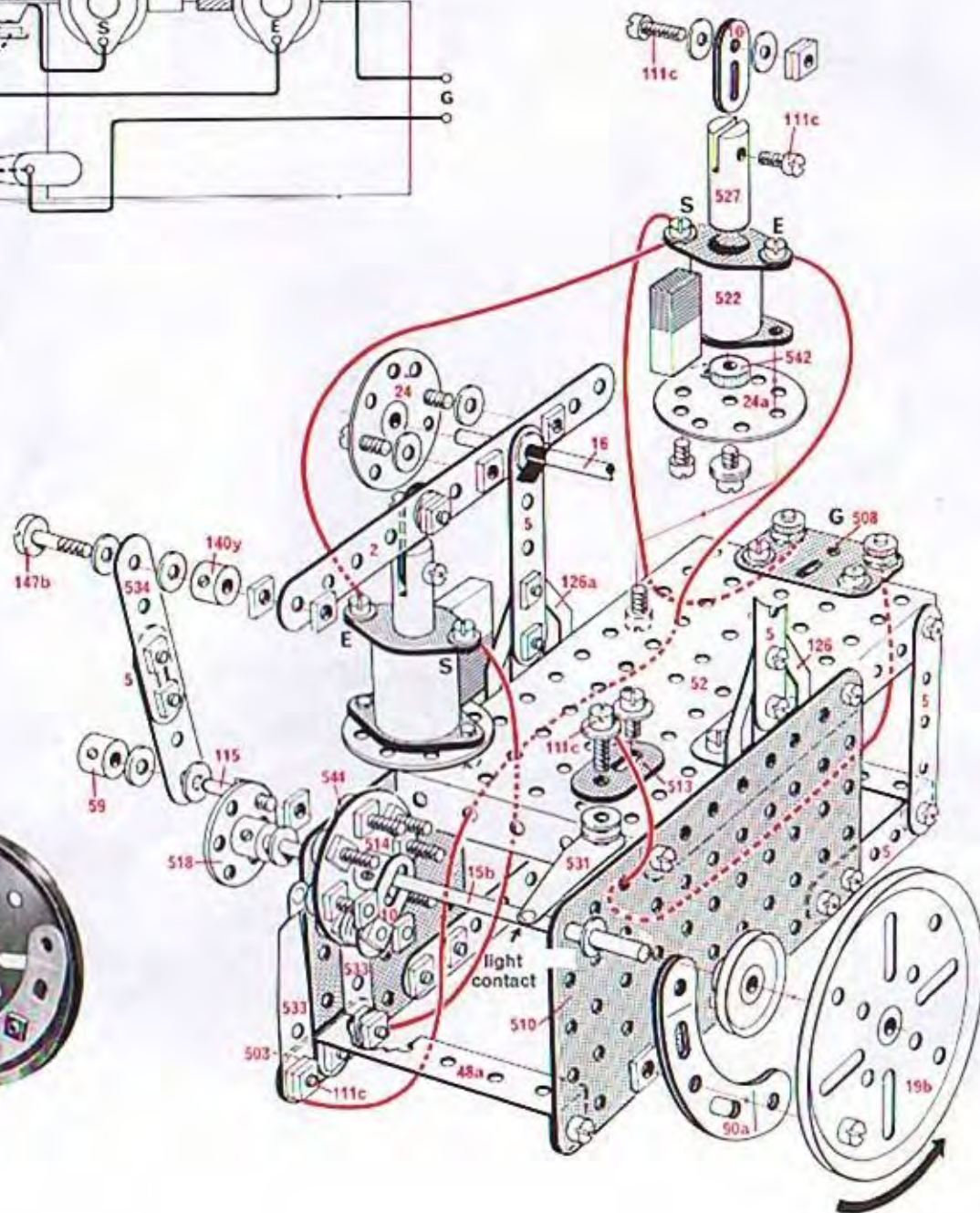
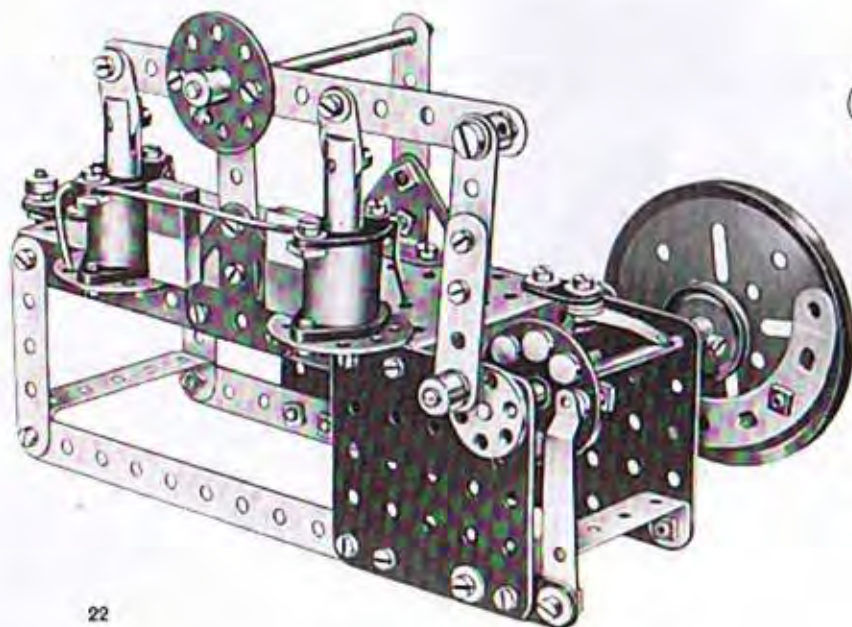
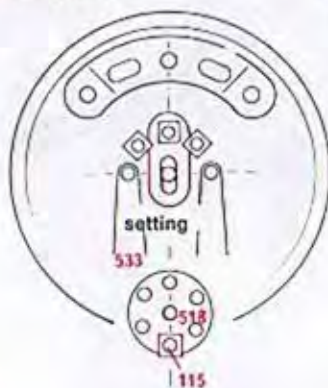
12v DC only.

It may be necessary to start the engine by hand in the direction of the arrow. It will only run in this direction and if it fails to start the current should be reversed at the terminals.

The Wiper Arms 533 forming the brushes should be bent in such a way as to ensure light contact with the Contact Studs 544 on the commutator formed by Insulating Bush Wheel 514.



- |          |          |         |
|----------|----------|---------|
| 2 - 2    | 1 - 52   | 1 - 513 |
| 4 - 5    | 1 - 59   | 1 - 514 |
| 5 - 10   | 2 - 90a  | 1 - 518 |
| 1 - 15b  | 3 - 111a | 2 - 522 |
| 1 - 16   | 6 - 111c | 2 - 527 |
| 1 - 19b  | 1 - 115  | 1 - 529 |
| 1 - 22   | 1 - 126  | 1 - 531 |
| 1 - 24   | 1 - 126a | 1 - 533 |
| 2 - 24a  | 1 - 140y | 1 - 534 |
| 58 - 37a | 1 - 147b | 2 - 537 |
| 40 - 37b | 1 - 508  | 4 - 542 |
| 31 - 38  | 1 - 510  | 8 - 544 |
| 2 - 48a  | 1 - 511  | 4 - 561 |



## E26 Circuit Breaker with Warning Light

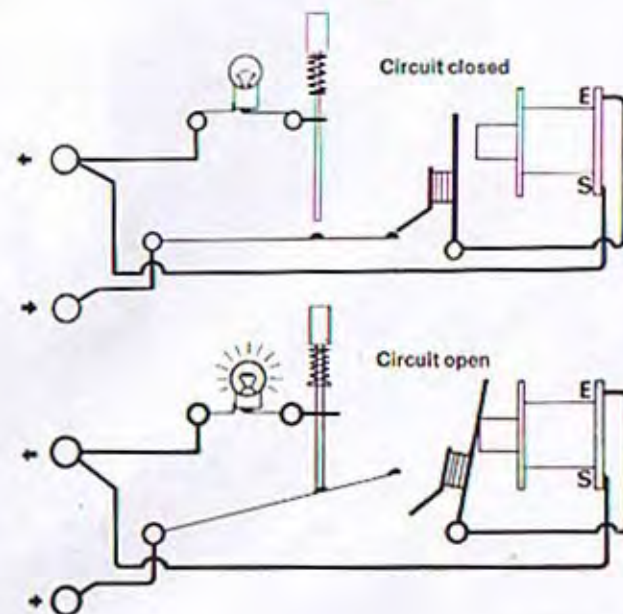
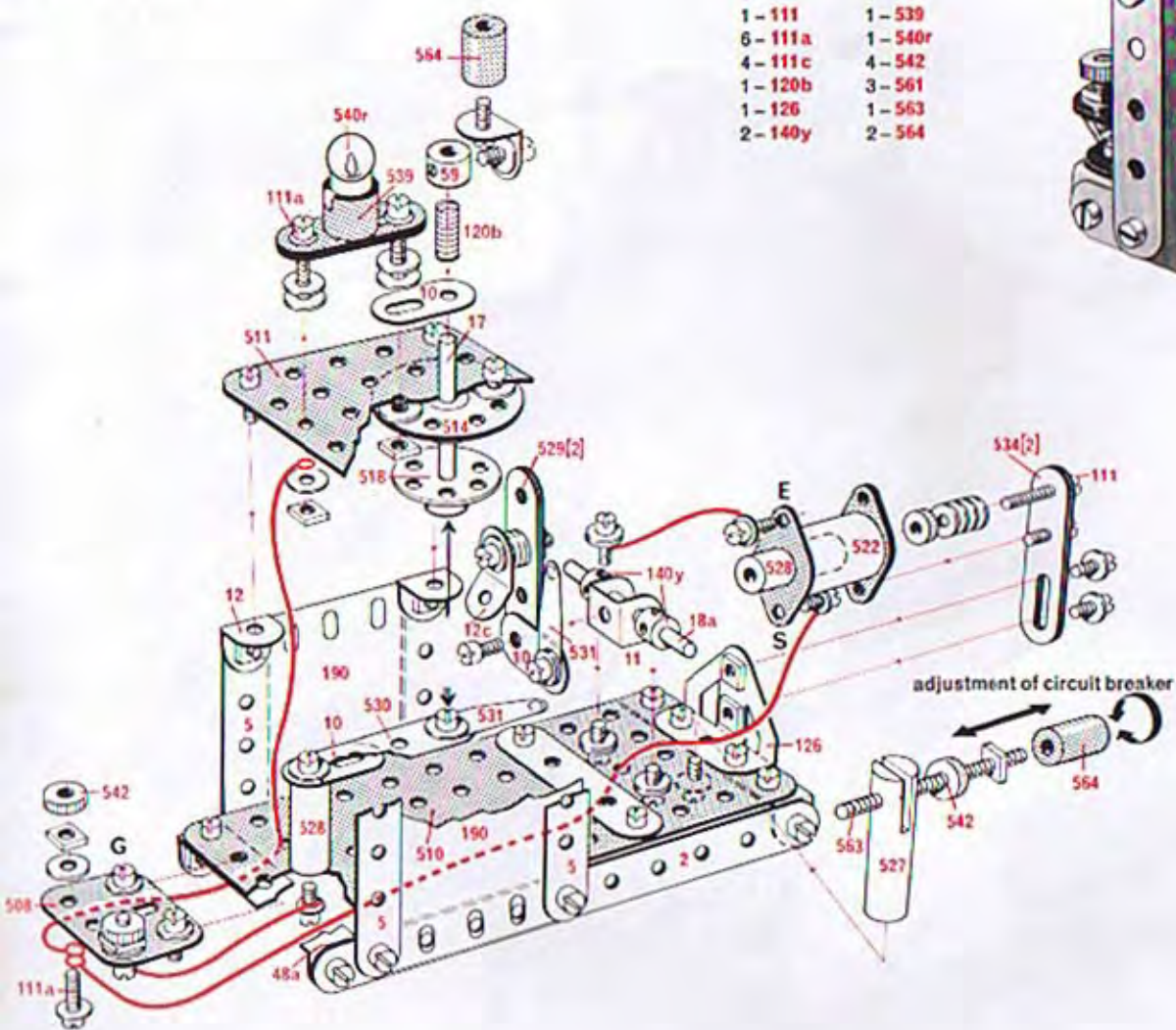
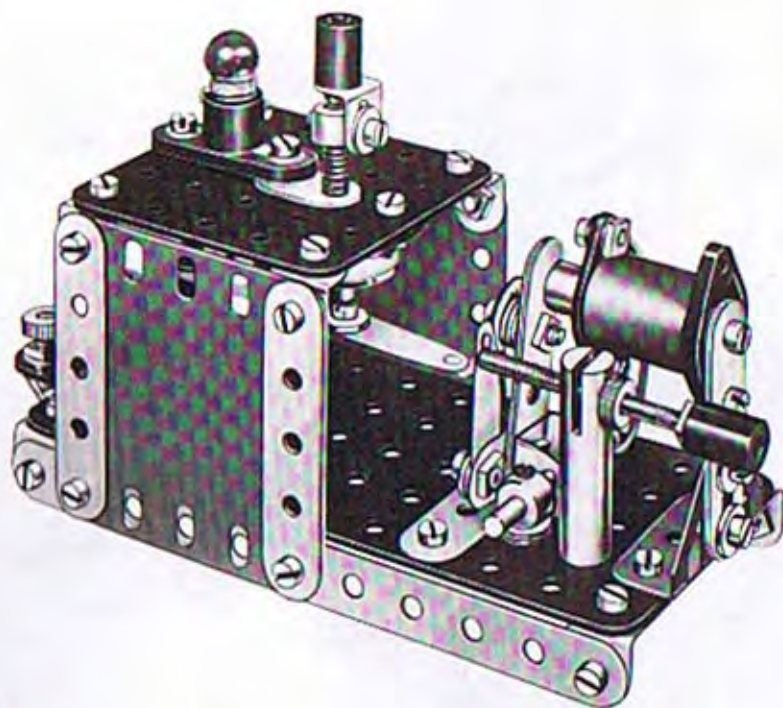
A safety device, taking the place of a fuse, which automatically breaks the circuit in which it is used when the current exceeds a certain voltage or when there is a short-circuit. When the circuit is broken the warning light comes on. It must always be connected in series with the circuit it is protecting, i.e. a Meccano Motor.

Flexible Strip 530 must be bent before assembly in such a way that when the circuit is broken it will spring upwards and bring the bolthead into contact with the boss of Insulating Bush Wheel 518.

4-5v battery.

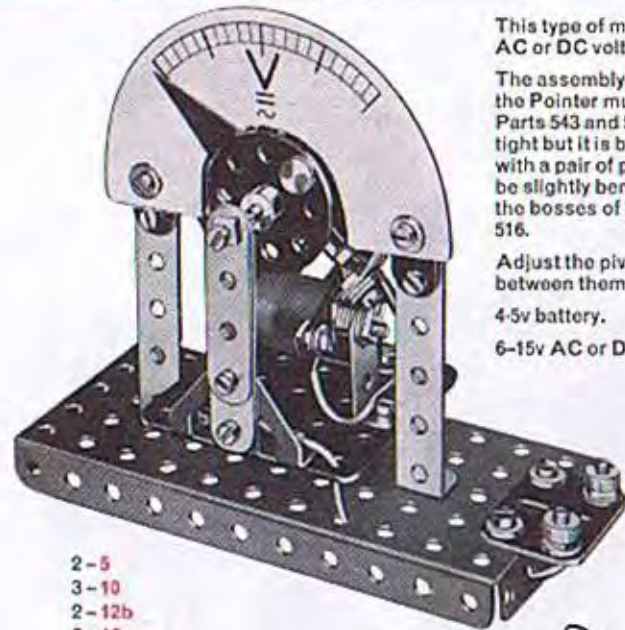
6-15v AC or DC.

2-2	2-190
5-5	1-508
2-10	1-510
1-11	1-511
5-12	1-514
1-12c	1-518
1-17	1-522
1-18a	1-527
40-37a	2-528
39-37b	2-529
35-38	1-530
2-48a	2-531
1-59	2-534
1-111	1-539
6-111a	1-540r
4-111c	4-542
1-120b	3-561
1-126	1-563
2-140y	2-564





## E27 Universal Dynamometer Voltmeter



This type of meter is used to measure either AC or DC voltages.

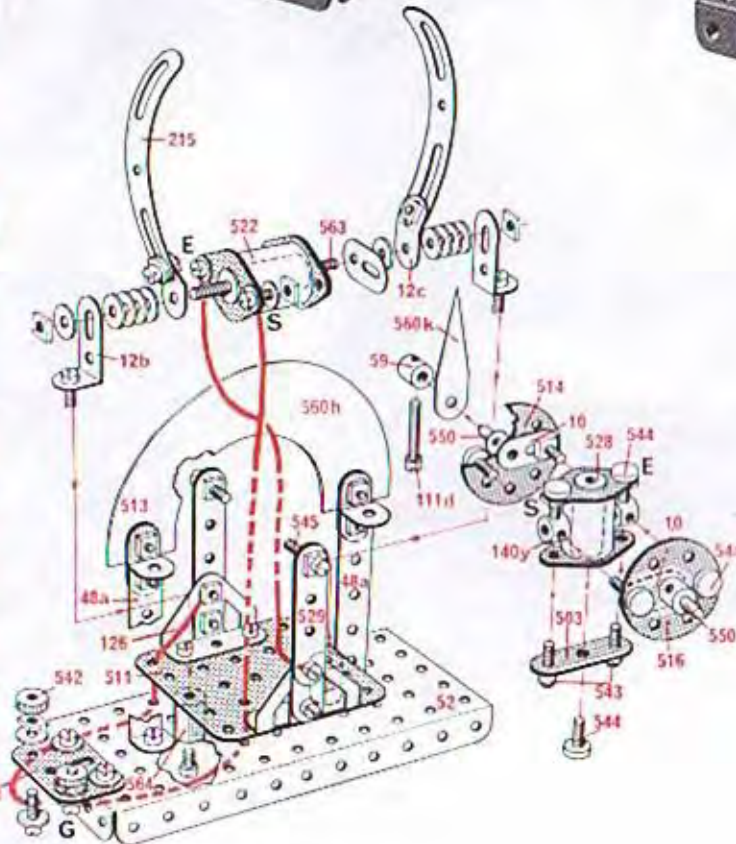
The assembly of the moving part that carries the Pointer must be carried out carefully. Parts 543 and 544 can be screwed up finger tight but it is better to tighten them a little more with a pair of pliers. The Fishplates 10 should be slightly bent to ensure proper contact with the bosses of Insulating Bush Wheels 514 and 516.

Adjust the pivots so that the axle swings freely between them.

4-5v battery.

6-15v AC or DC.

- 2-5
- 3-10
- 2-12b
- 2-12c
- 30-37a
- 26-37b
- 22-38
- 2-48a
- 1-52
- 1-59
- 1-111
- 2-111a
- 1-111d
- 2-126
- 2-140y
- 2-215
- 1-503
- 1-508
- 1-511
- 2-513
- 1-514
- 1-516
- 2-522
- 2-528
- 1-511
- 2-529
- 2-542
- 2-543
- 7-544
- 2-545
- 2-550
- 1-560h
- 1-560k
- 2-561
- 1-563
- 2-564



## E28 DC Moving Coil Voltmeter

This type of meter is used to measure DC voltages or currents only.

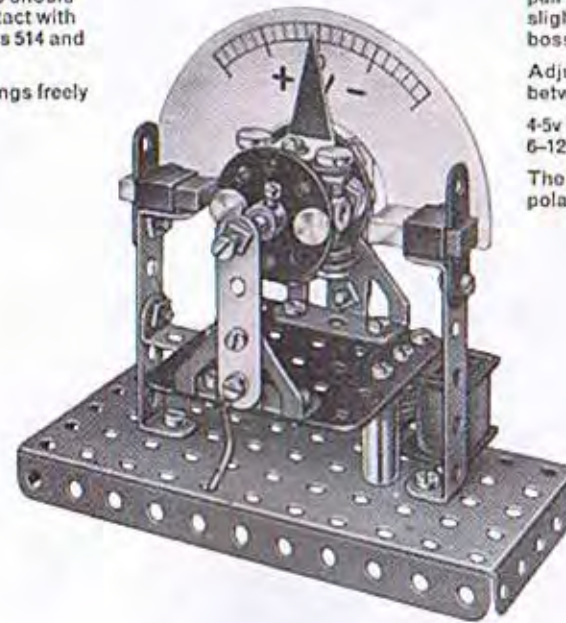
The assembly of the moving part that carries the Pointer must be carried out carefully. Parts 543 and 544 can be screwed up finger tight but it is better to tighten them a little more with a pair of pliers. The Fishplates 10 should be slightly bent to ensure proper contact with the bosses of Insulating Bush Wheels 514 and 516.

Adjust the pivots so that the axle swings freely between them.

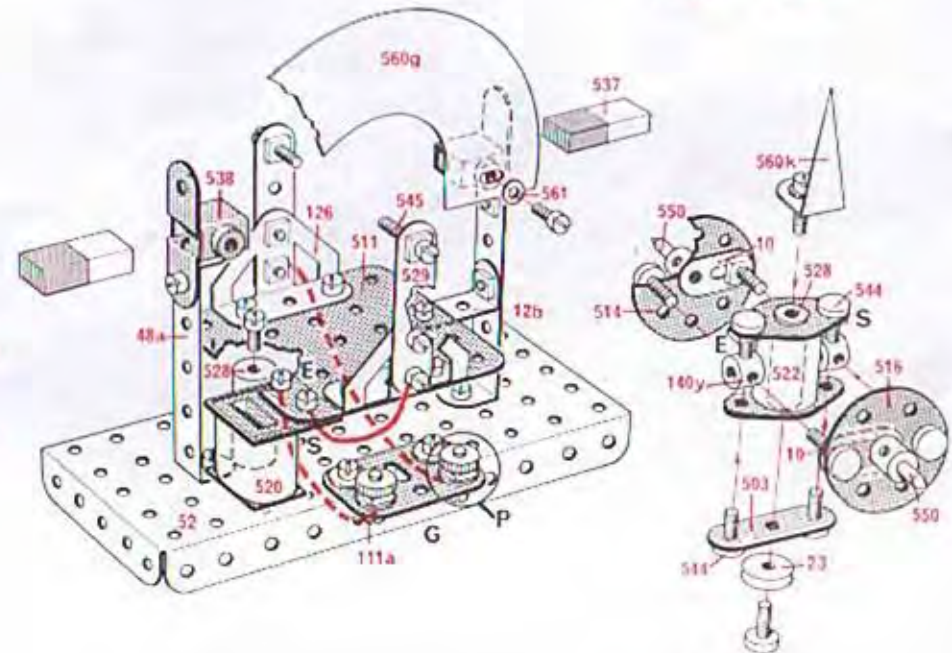
4-5v battery.

6-12v DC only.

The + and - signs on the dial indicate the polarity of the terminal marked P.



- 2-10
- 1-23
- 28-37a
- 19-37b
- 1-38
- 2-48a
- 1-52
- 2-111a
- 2-126
- 2-140y
- 1-508
- 1-511
- 1-514
- 1-516
- 1-520
- 1-522
- 2-528
- 2-529
- 2-537
- 2-538
- 2-542
- 2-543
- 8-544
- 2-545
- 2-550
- 1-560g
- 1-560K
- 3-561



# E29 DC Ammeter

This type of meter has two uses :

(1) As a Galvanometer for measuring very low voltages with a maximum of 1-5v DC. For this purpose it should be connected in parallel with the supply source it is measuring.

(2) As an Ammeter for measuring the rate of flow (ampereage) of current. For this use it is connected in series with the circuit through which the current it is required to measure is flowing.

4-5v battery.  
6-12v DC only.

### Assembly of the coil :

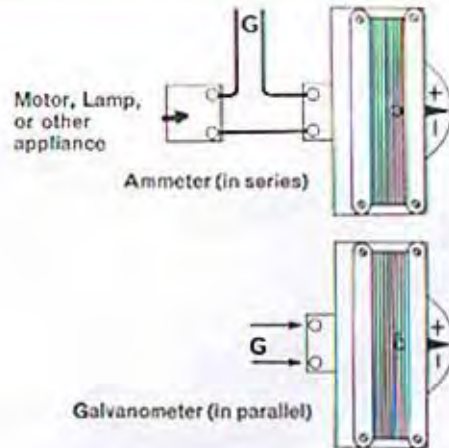
Remove the wire from the two Reels 556 and 557 and attach Angle Brackets to them with nuts and Bolts 111d. Connect the Reels together with Insulating Strips 501 at the top and Strips 2 at the bottom and wind them as shown with Wire 558. Remove Strips 2 and attach the bottom Angle Brackets to the baseplate 52.

The + and - signs on the Dial indicate the polarity of the terminal marked P.

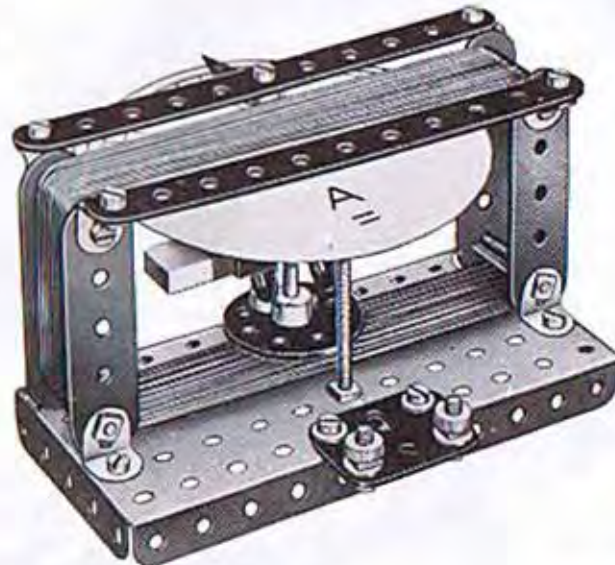
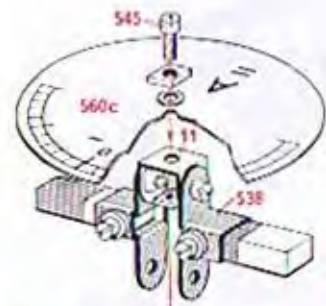
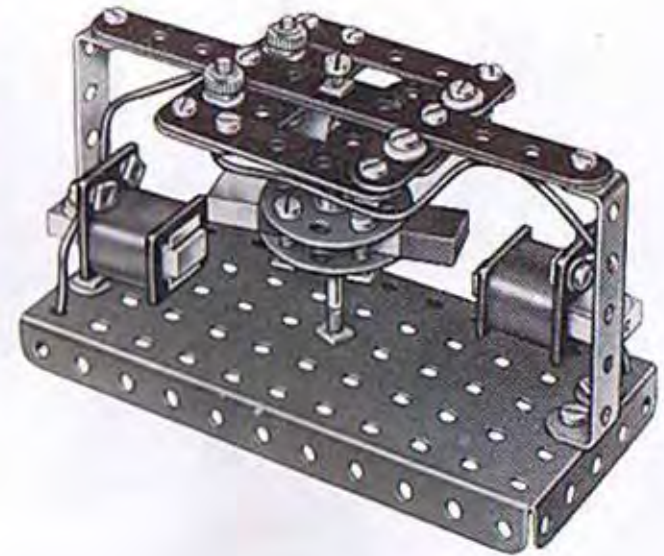
# E30 Polarity Indicator

A useful piece of apparatus, which, when connected to a DC current shows which side of the supply is positive and which negative. The + and - signs appear accordingly in the two small windows beside the terminals.

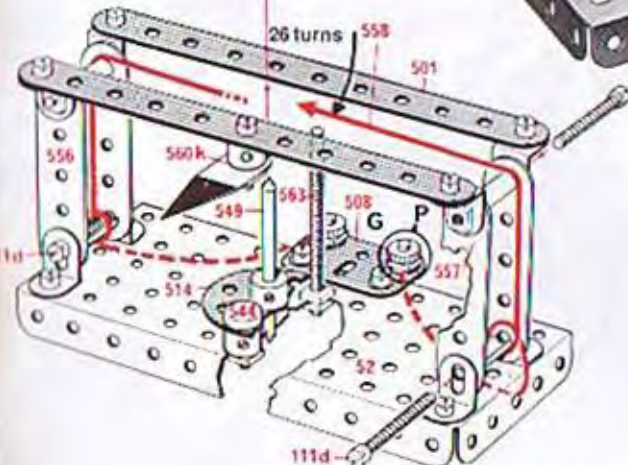
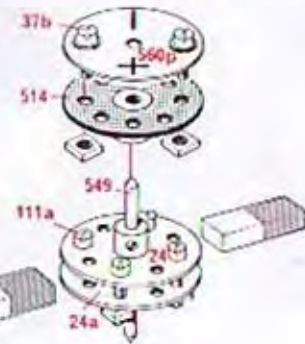
4-5v battery.  
6-12v DC only.



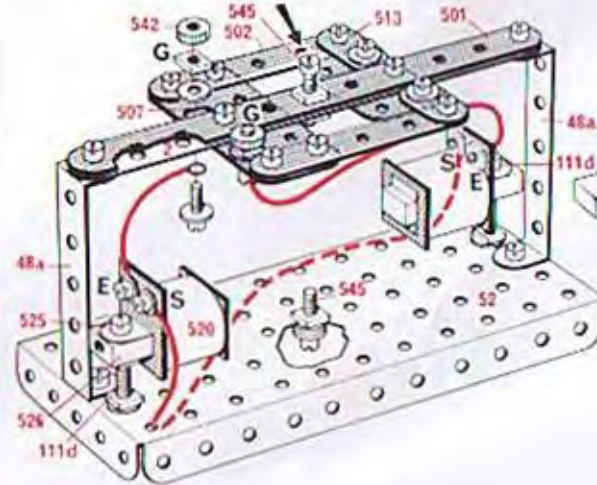
- 1-2
- 1-24
- 1-24a
- 34-37a
- 15-37b
- 10-38
- 2-48a
- 1-52
- 6-111a
- 1-111c
- 2-111d
- 1-501
- 2-502
- 1-507
- 1-508
- 2-513
- 1-514
- 2-520
- 4-525
- 2-526
- 2-537
- 2-542
- 2-545
- 1-549
- 1-560p
- 4-561



The axle must run freely between the Pivot Bolts 545.



- 1-11
- 8-12
- 22-37a
- 13-37b
- 4-38
- 1-52
- 1-59
- 4-111
- 2-111a
- 4-111d
- 1-140y
- 2-501
- 1-508
- 1-514
- 2-537
- 2-538
- 2-542
- 1-544
- 1-545
- 1-549
- 1-556
- 1-557
- 1-560c
- 2-561
- 1-563





# E32 Electric Field Gun

This novel gun has a range of several yards, 'firing' a Driving Band 186b.

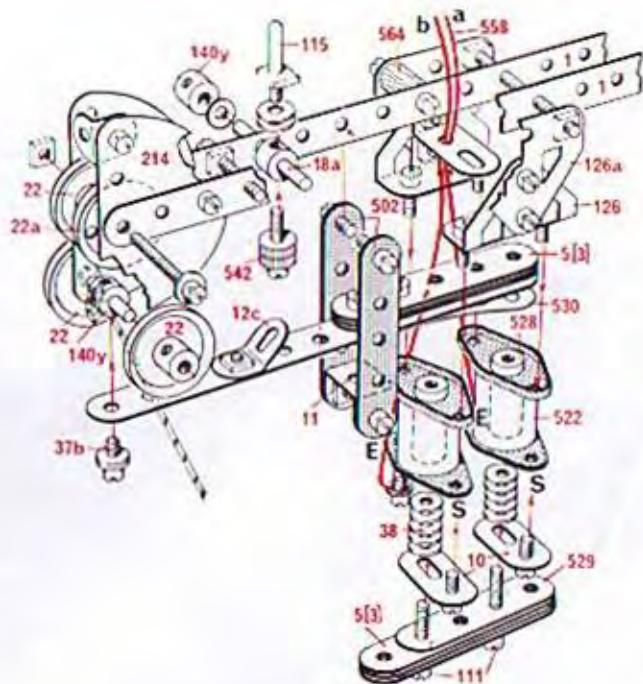
It has a handwheel to raise and lower the barrel and it can be fired by remote control (using switch E2 for example).

**To load and fire the gun (see diagram):**

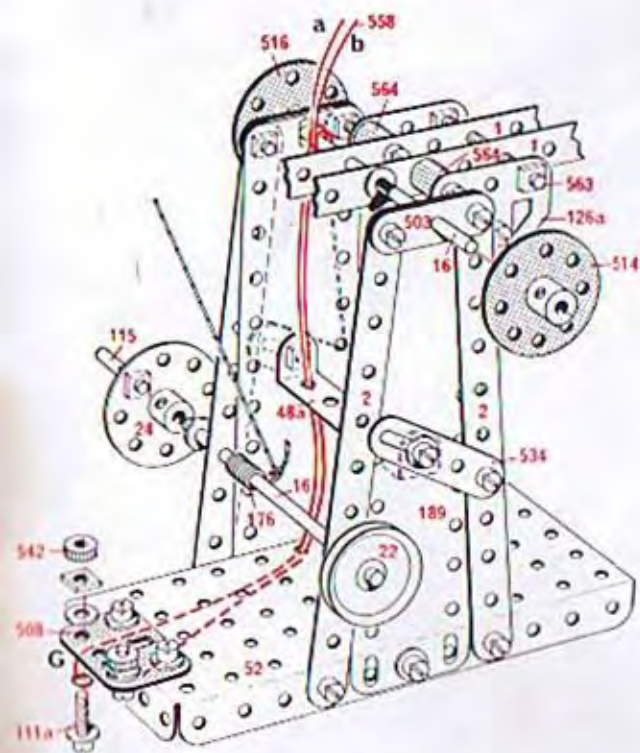
Push the Threaded Pin 115 backwards and stretch the Driving Band between it and the bolt at the end of the barrel. When an electric current is fed to the terminals the Coils attract the moving arm thus pulling the Angle Bracket 12c downwards and allowing the Threaded Pin 115 to release the Band.

4-5v battery.

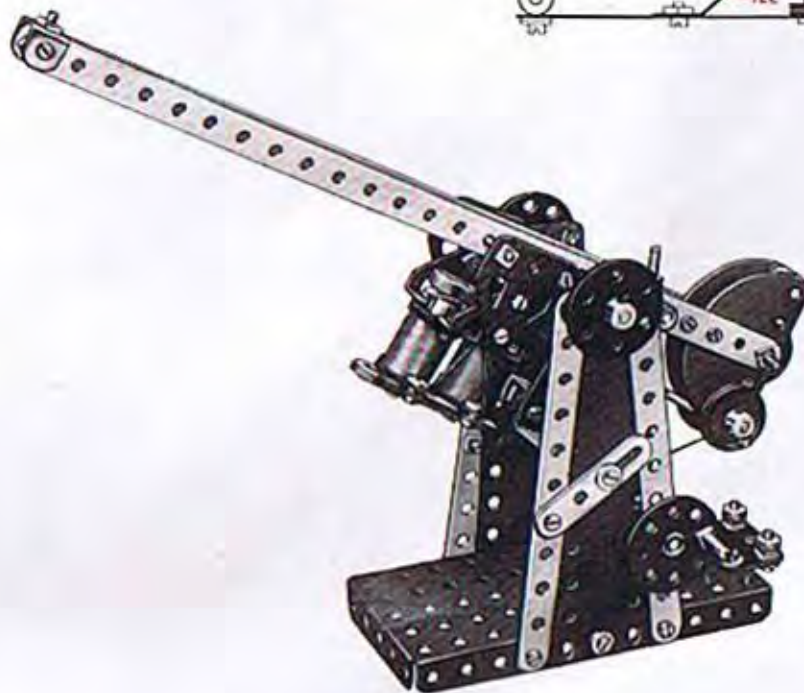
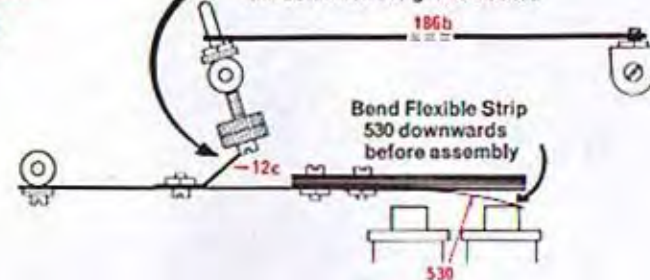
6-15v AC or DC.



2 - 1	46 - 37b	2 - 214
5 - 2	31 - 38	2 - 502
6 - 5	1 - 48a	2 - 503
2 - 10	1 - 52	1 - 508
2 - 11	1 - 59	1 - 514
1 - 12	2 - 111	1 - 516
1 - 12b	4 - 111a	2 - 522
1 - 12c	1 - 111c	2 - 528
2 - 16	2 - 115	1 - 529
1 - 18a	2 - 126	1 - 530
1 - 18b	2 - 126a	2 - 534
4 - 22	2 - 140y	4 - 542
1 - 22a	1 - 176	2 - 561
1 - 24	1 - 186b	1 - 563
2 - 35	2 - 189	2 - 564
46 - 37a		



The Obtuse Angle Bracket 12c should be adjusted so as only just to hold the bolt when the gun is cocked



# E33 Telegraph Receiver with Bell and Morse Key

This model is simpler to use and more interesting when operated by two people. One person can then call up and transmit a message to the second person who can receive and decode it some distance away.

**R.** Adjust the height of the paper support at these three points so that the pen touches the paper when the moving arm is drawn downwards by the electro-magnets.

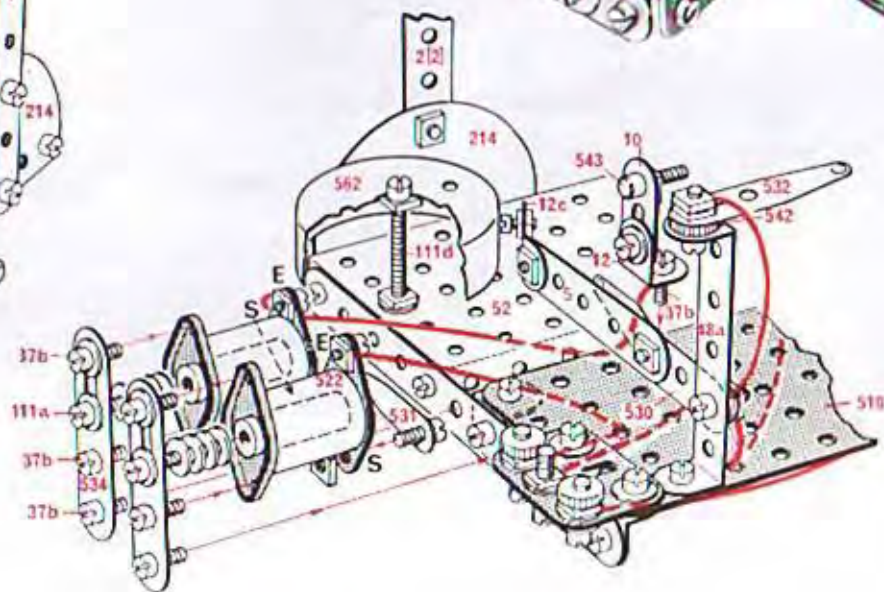
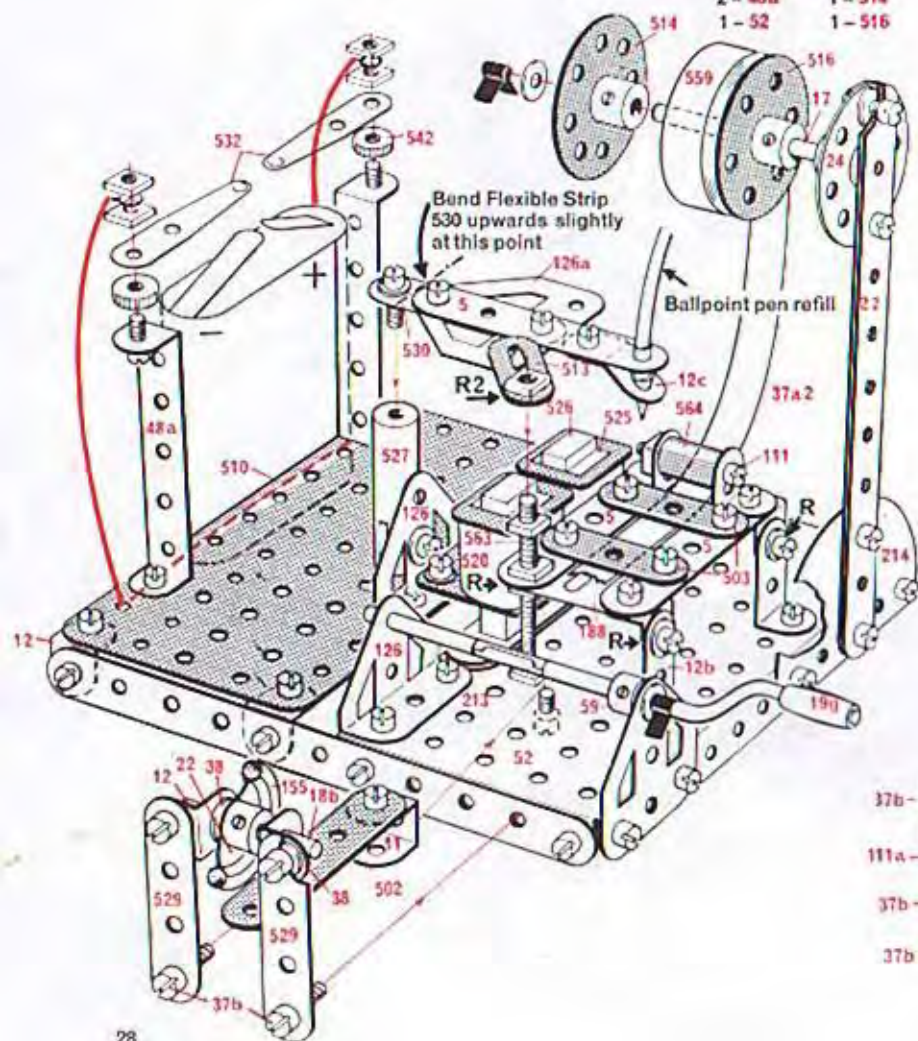
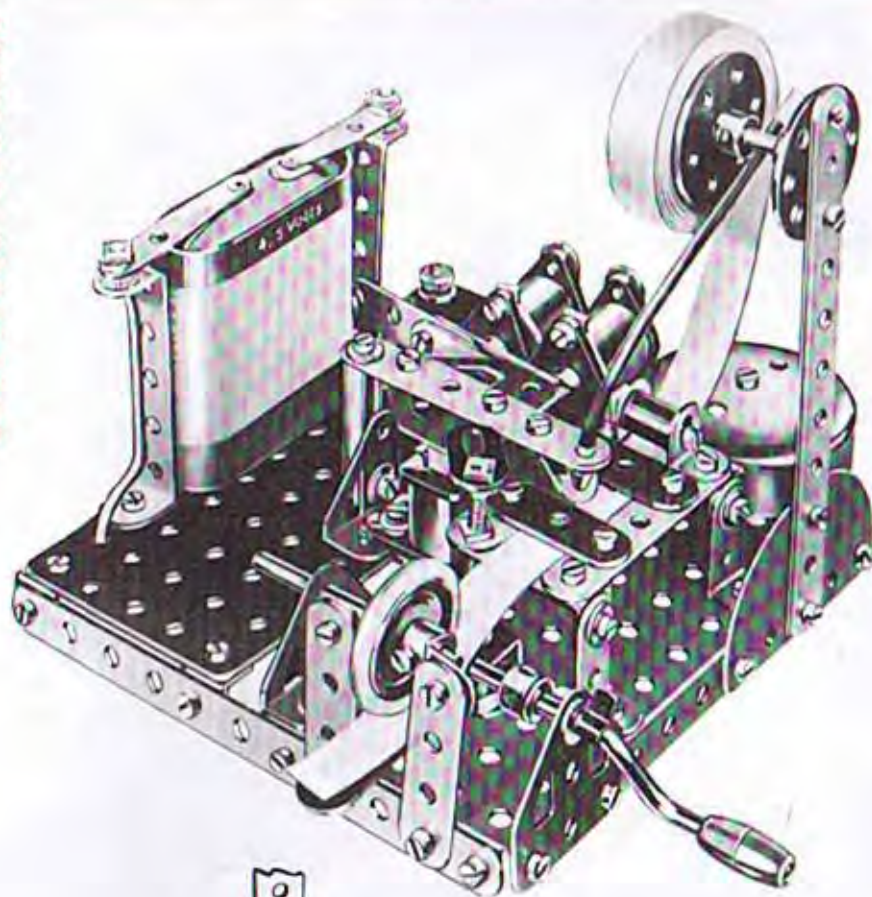
**R2.** Adjuster for limiting the upward movement of the arm that carries the pen.

Follow the wiring diagrams carefully when wiring up the models.

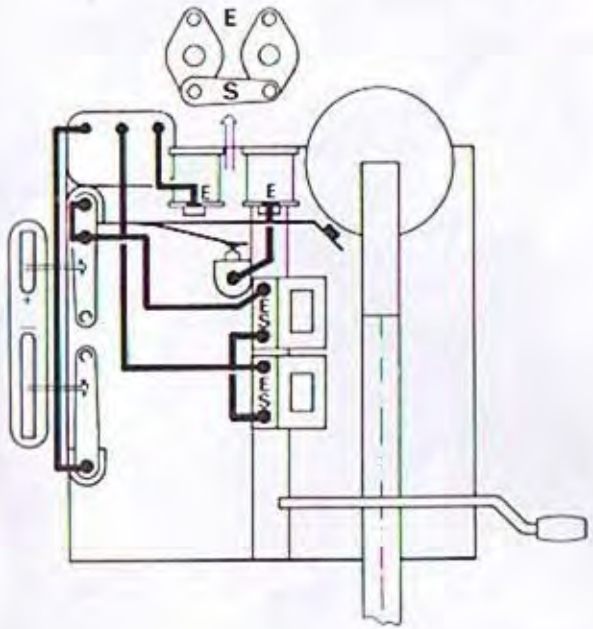
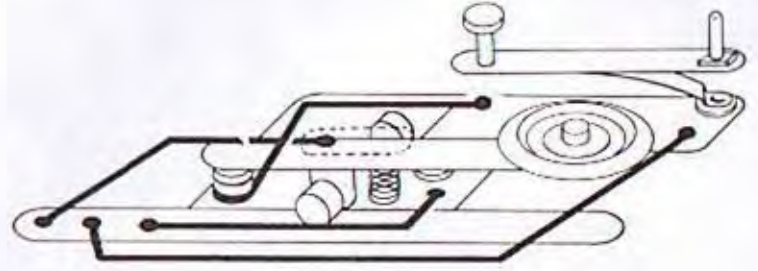
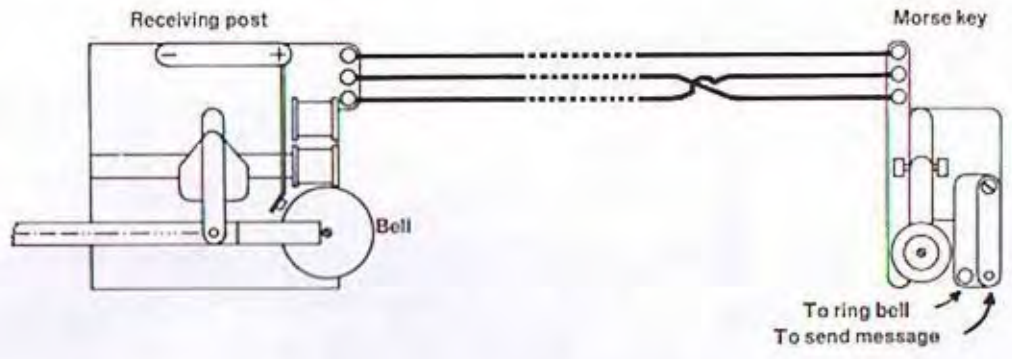
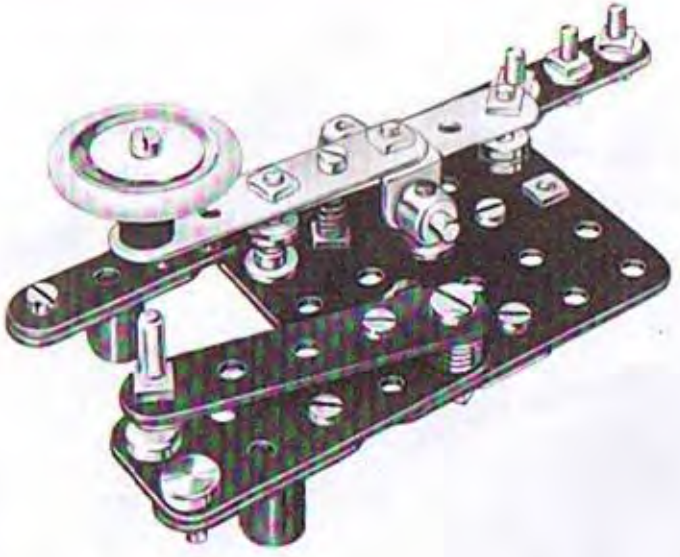
4.5v battery.

6-15v AC or DC.

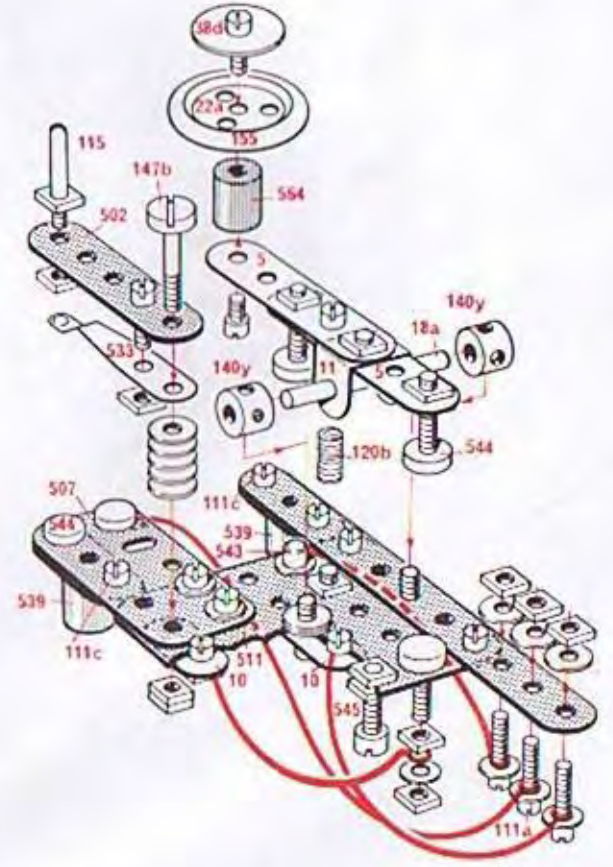
4-2	1-59	2-520
6-5	1-111	2-522
1-10	4-111a	4-525
1-11	8-111c	2-526
11-12	1-111d	1-527
2-12b	2-126	2-528
2-12c	2-126a	2-529
1-17	1-155	2-530
1-18b	1-188	2-531
1-19g	1-213	2-532
1-22	1-214	2-534
1-24	1-502	4-542
2-35	2-503	1-543
60-37a	1-508	1-559
56-37b	1-510	10-561
40-38	1-513	1-562
2-48a	1-514	1-563
1-52	1-516	1-564



# Morse Key



- |          |          |
|----------|----------|
| 2 - 5    | 1 - 147b |
| 2 - 10   | 1 - 155  |
| 1 - 11   | 1 - 501  |
| 1 - 18a  | 1 - 502  |
| 1 - 22a  | 1 - 507  |
| 29 - 37a | 1 - 511  |
| 16 - 37b | 1 - 533  |
| 16 - 38  | 2 - 539  |
| 1 - 38d  | 1 - 543  |
| 3 - 111a | 5 - 544  |
| 3 - 111c | 1 - 545  |
| 1 - 115  | 4 - 561  |
| 1 - 120b | 1 - 564  |
| 2 - 140y |          |



For the Morse alphabet see E8 (Buzzer)

# E34 Complete Morse Telegraph

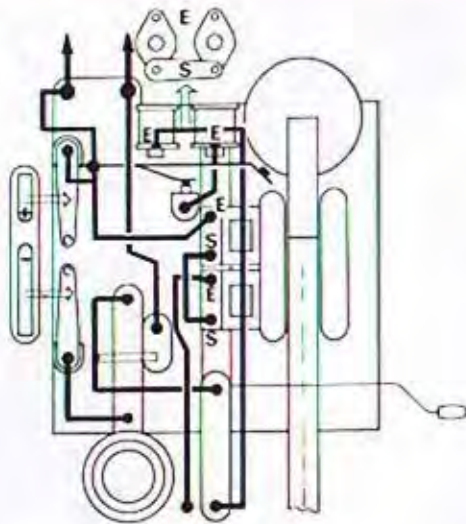
In order to build this complete two-way telegraph system two Meccano Elektrikits are required. Only two wires are required to connect the two telegraph posts and one of these can be connected through the domestic water pipes or some similar earth.

4-5v battery.

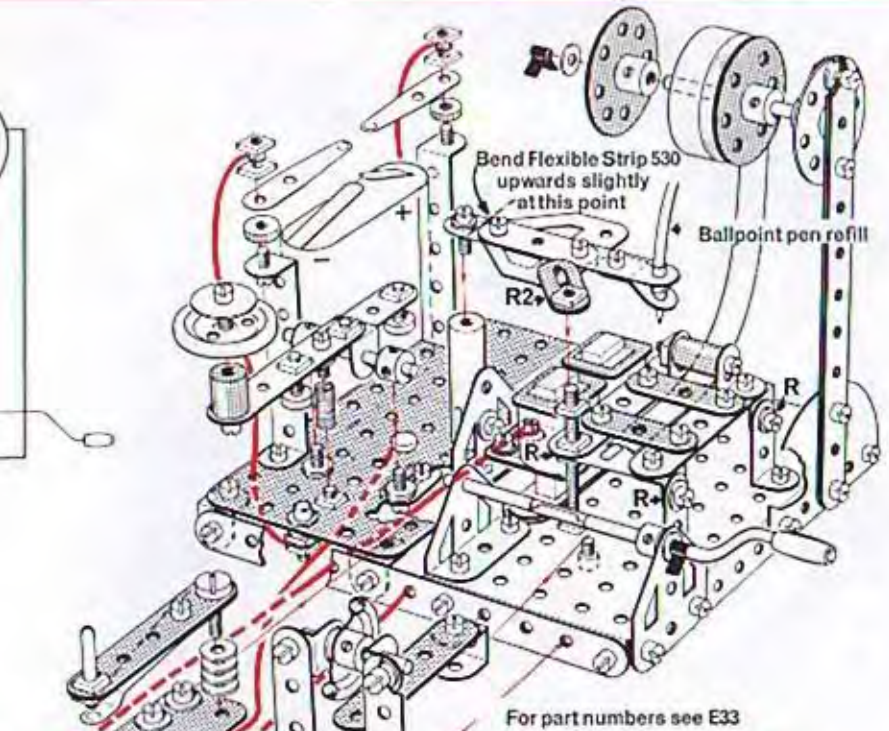
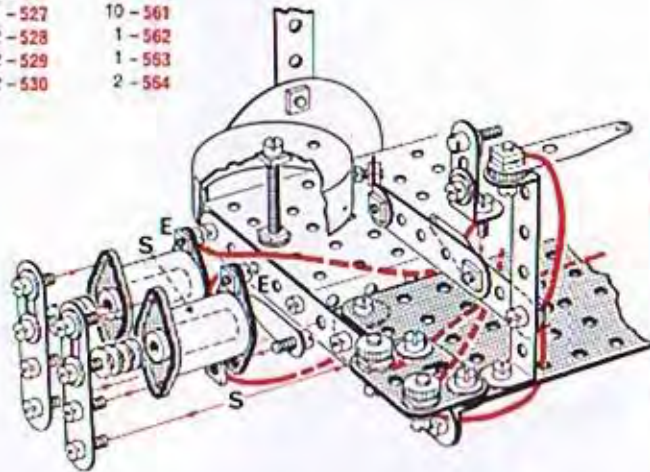
6-15v AC or DC.

R and R2. Same as in model E33.

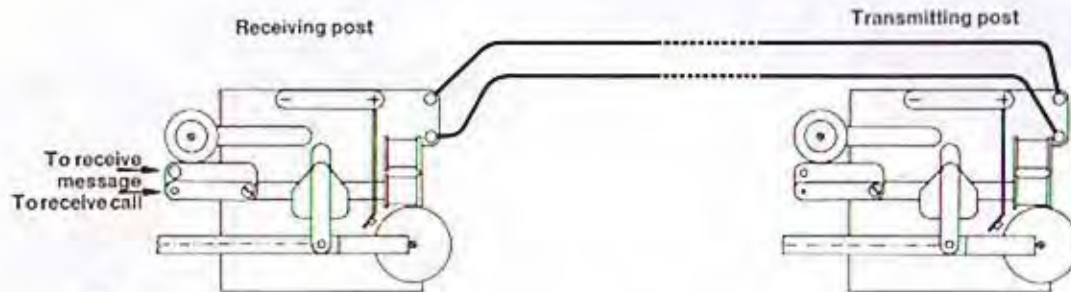
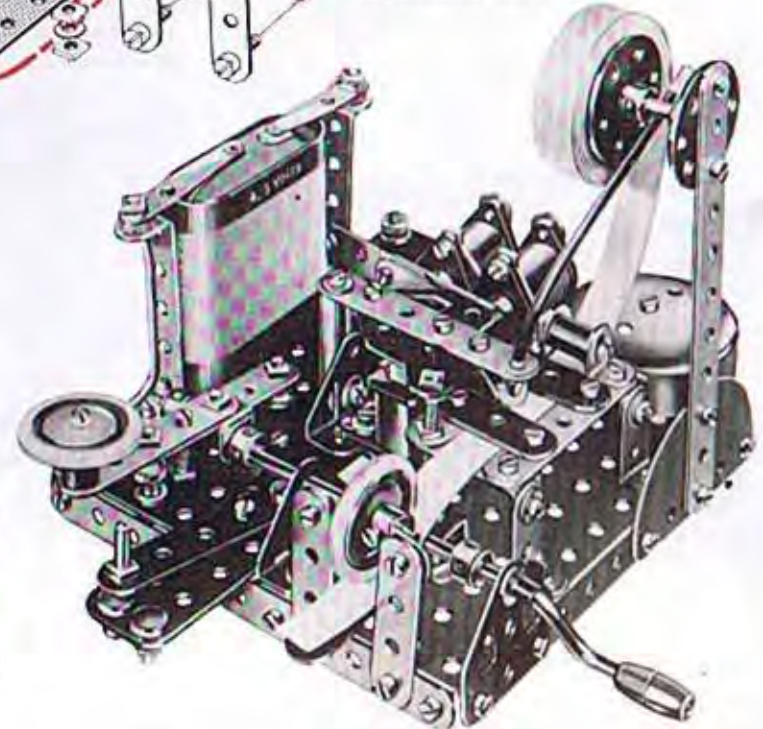
Follow the wiring diagrams carefully when wiring up the models and make sure that the battery is connected the right way round.



3-2	1-52	1-510	2-531
8-3	1-59	1-513	2-532
2-10	1-111	1-514	1-533
2-11	3-111a	1-516	2-534
11-12	9-111c	2-520	4-542
2-12b	1-111d	2-522	2-543
2-12c	1-115	4-525	5-544
1-17	1-120b	2-526	1-559
1-18a	2-126	1-527	10-561
1-18b	2-126a	2-528	1-562
1-19g	2-140y	2-529	1-563
1-22	1-147b	2-530	2-564
1-22a	2-155		
1-24	1-188		
2-35	1-213		
102-37a	1-214		
77-37b	2-502		
44-38	2-503		
1-38d	1-507		
2-48a	1-508		



For part numbers see E33



## E35 Windmill (with illuminated sails)

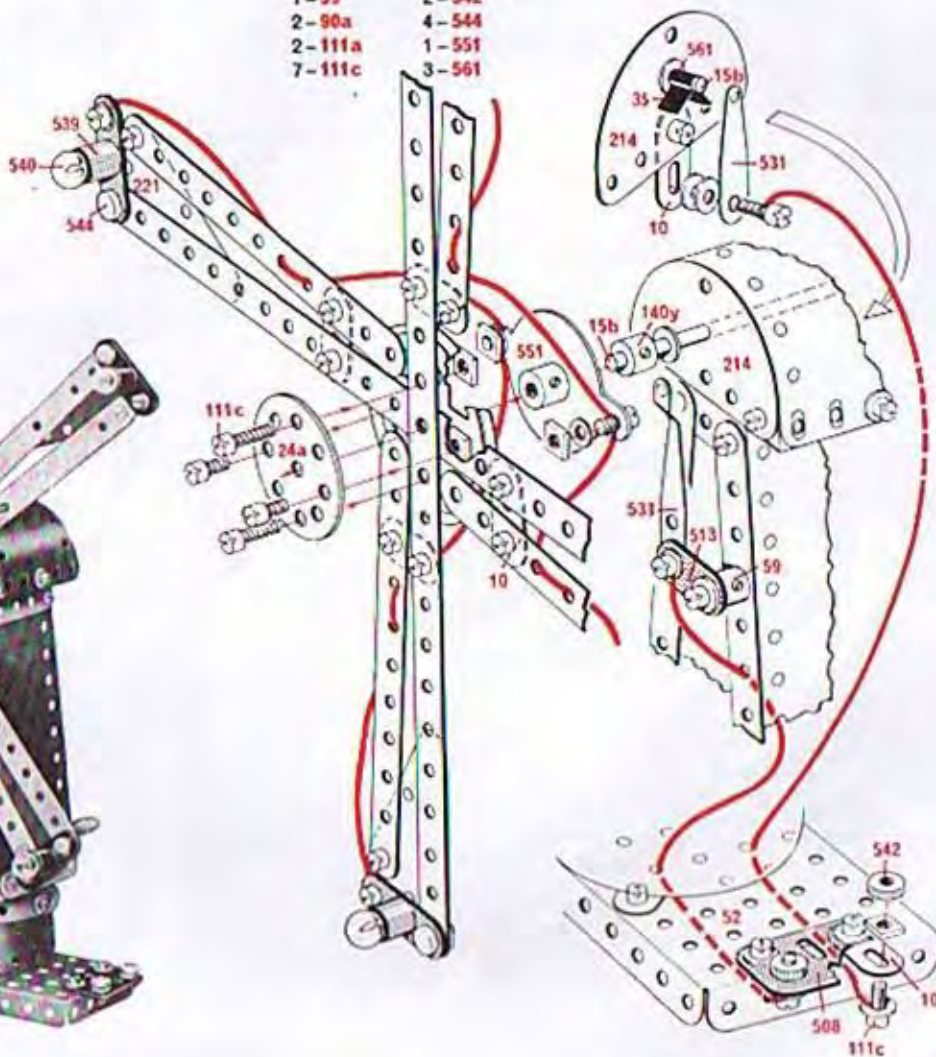
The nuts and bolts holding the Lamp Holders to the sails and those connecting the sails to the centre wheel must be screwed up tight and it may even be necessary to scrape a little paint from the metal parts to ensure proper contact.

Building instructions for the model windmill itself will be found under 3.11 in the 2/3 Meccano Book of Models.

12-15v AC or DC.



2-1	2-125
6-2	2-125
8-5	2-125a
6-10	1-176
2-11	2-188
9-12	2-189
1-15b	1-191
1-19g	2-192
1-29a	2-214
3-22	4-215
2-35	4-221
72-37a	1-508
59-37b	1-513
11-38	1-531
1-40	1-533
2-48a	4-539
1-52	4-540
1-59	2-542
2-80a	4-544
2-111a	1-551
7-111c	3-561



## E36 Crane with Electromagnetic Grab

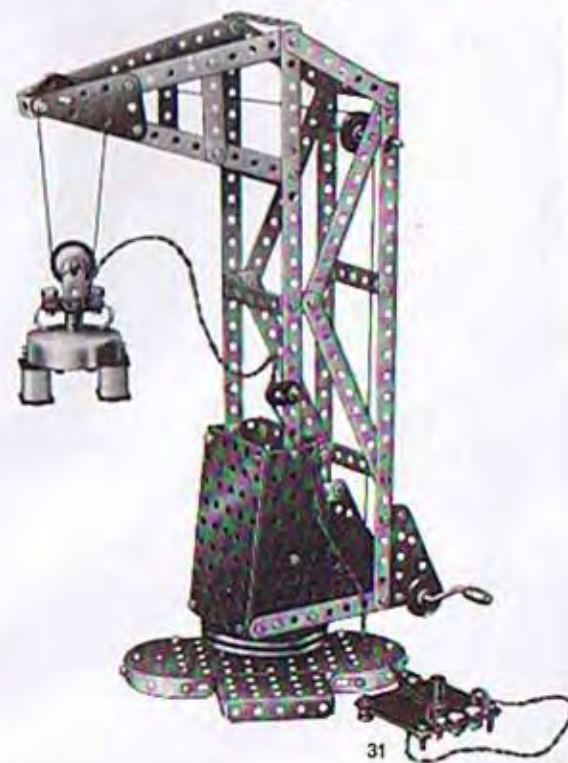
This model shows how effectively Meccano standard parts and Meccano Elektrikit electrical parts can be combined to make more interesting and exciting models.

To build this model a Meccano Outfit No. 4 is required in addition to the Elektrikit. Building instructions for the Crane itself will be found under 4.12 in the 4/5/6 Meccano Book of Models. The electromagnet and switch are models E5 and E1 in this book.

4-5v battery.

6-15v AC or DC

4-1	2-54
8-2	1-59
2-3	4-111a
8-5	5-111c
6-10	1-111d
2-11	2-125
1-11a	2-126
9-12	1-147b
2-12b	1-176
1-16	1-186
1-17	1-191
1-18a	2-214
1-18b	4-215
2-19b	4-221
1-19g	1-502
1-20a	1-511
3-22	2-513
2-22a	1-514
6-35	2-520
103-37a	2-525
83-37b	2-526
29-38	1-529
2-38d	1-533
1-40	4-542
1-48	3-544
6-48a	4-561
1-52	1-562
2-53a	1-564





## E37 Electrically Driven Big Wheel with Lights

This model incorporates motor E21 with a slight alteration to the vertical members of the frame.

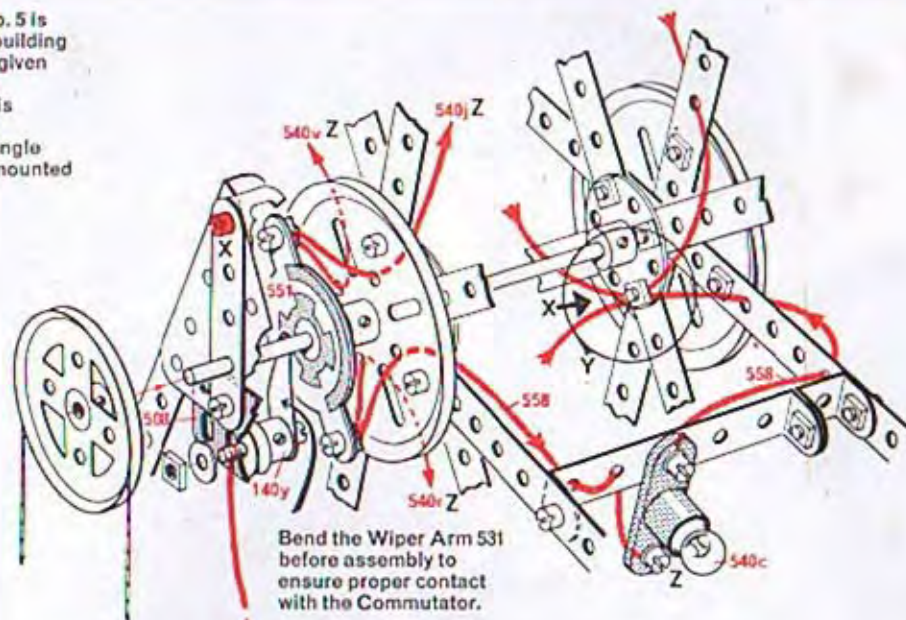
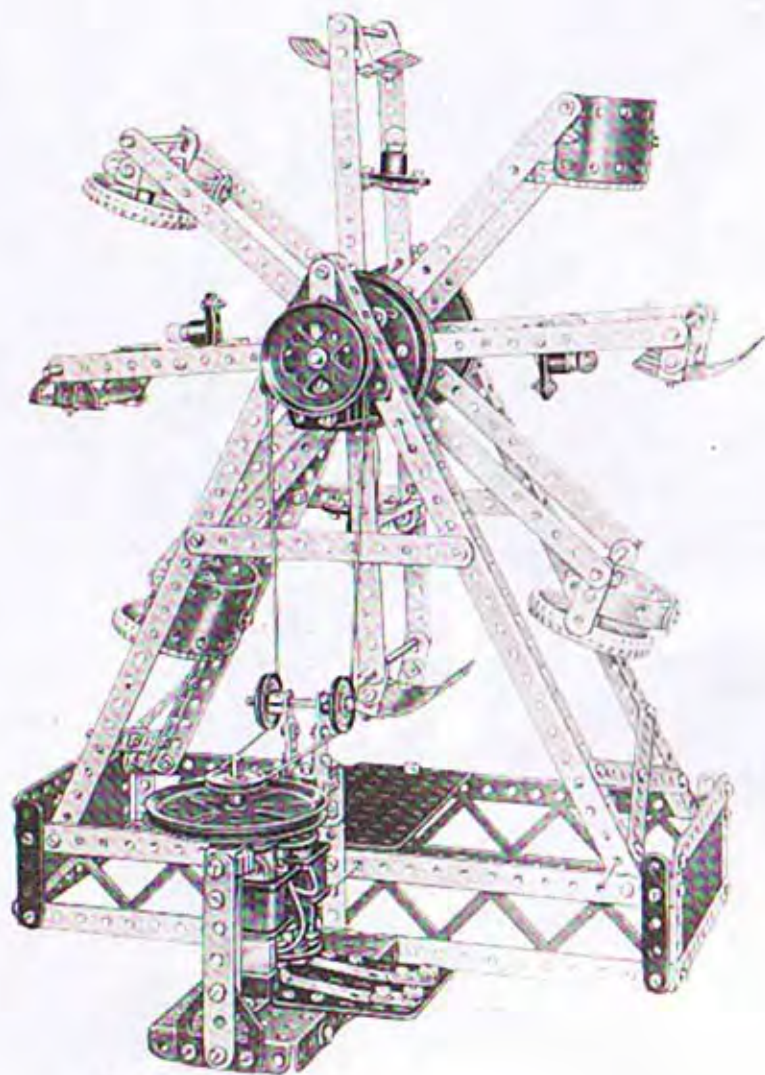
**X** These nuts and bolts should be screwed up tight and it may even be necessary to scrape a little paint from the parts to ensure proper contact.

**Y** Wires leading from the frame side of the holders back to Bolt X.

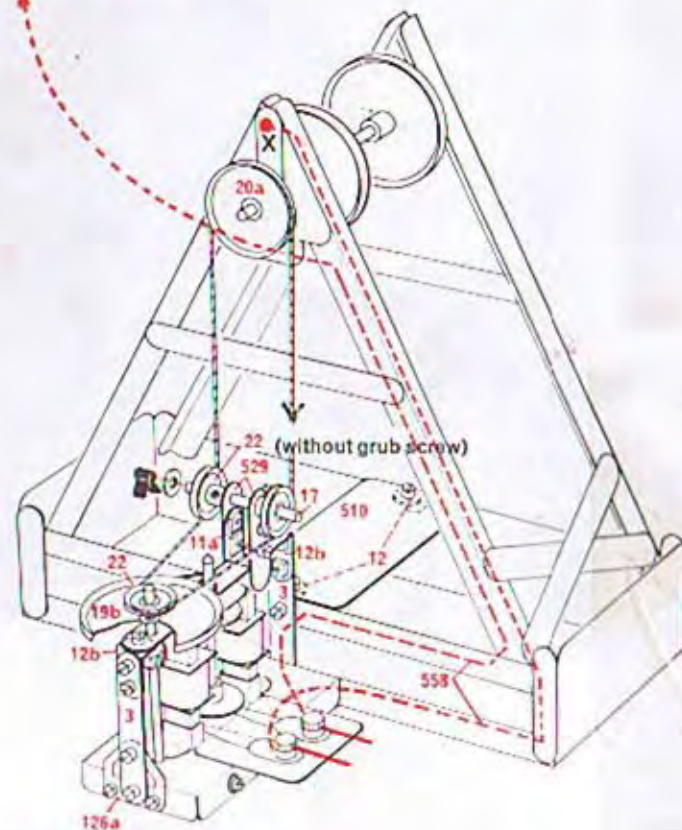
**Z** Wires leading from the Commutator to the holes in the lamp holders *not* connected to the frame.

To build this model a Meccano Outfit No. 5 is required in addition to an Elektrikit and building instructions for the Big Wheel itself are given under 5.15 in the 4/5/6 Meccano Book of Models. The entire hand-driving device is dispensed with and the baseplate 52 is replaced by part 510 supported by two Angle Brackets 12. Also the large Pulley 20a is mounted outside rather than inside the frame.

12 volts — DC only.



10 - 1	1 - 111
14 - 2	2 - 111a
2 - 3	2 - 126
12 - 5	1 - 126a
2 - 6a	4 - 187
4 - 8	4 - 188
5 - 10	2 - 190
4 - 11	2 - 192
1 - 11a	1 - 199
14 - 12	1 - 200
2 - 12a	4 - 215
1 - 15	4 - 221
1 - 15a	2 - 501
2 - 15b	2 - 502
4 - 16	1 - 508
2 - 17	1 - 510
3 - 19b	1 - 511
1 - 20a	1 - 514
3 - 22	2 - 520
1 - 23	2 - 525
2 - 24	2 - 526
1 - 26	2 - 529
14 - 35	1 - 531
173 - 37a	2 - 533
143 - 37b	2 - 537
29 - 38	2 - 538
2 - 38d	4 - 539
1 - 40	4 - 540
1 - 45	2 - 542
1 - 46	8 - 544
8 - 48a	1 - 545
1 - 52	1 - 548
2 - 80c	1 - 551
2 - 99	2 - 561



# Principal Meccano standard parts used in the models in this book



5

Perforated Strip  
2 1/2"



10

Fishplate



11

Double  
Bracket



12

Angle  
Bracket



12c

Obtuse Angle  
Bracket



17

Axle Rod  
2"



19b

Pulley 3" diam.  
with boss



19g

Crank Handle  
3 1/2" shaft  
with grip



22

Pulley 1" diam.  
with boss



22a

Pulley 1" diam.  
without boss



23

Pulley 1/2" diam.  
without boss



24

Bush Wheel  
1 1/2" diam.  
8 holes



24a

Wheel Disc  
1 1/2" diam.  
8 holes  
without boss



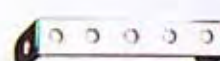
35

Spring  
Clip



38d

Washer  
Washer 3/4"



48a

Double Angle  
Strip 2 1/2" x 1/2"



52

Flanged Plate  
5 1/2" x 2 1/2"



59

Collar  
with screw



50a

Stepped Curved  
Strip 2 1/2" (1 1/8" radius)



115

Threaded  
Pin



120b

Compression  
Spring 1 1/2" long



125

Reversed  
Angle  
Bracket  
1/2"



126

Trunnion



126a

Flat  
Trunnion



140y

Collar  
4 holes



147b

Pivot Bolt  
with 2 nuts



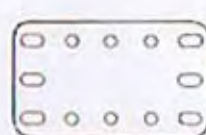
155

Collar or Ring  
for 1" pulley



176

Anchoring  
Spring  
for cord



188

Flexible  
Plate 2 1/2" x 1 1/2"



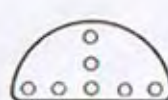
212

Rod and  
Strip  
Connector



213

Rod  
Connector



214

Semi Circular  
Plate 2 1/2"



215

Formed  
Slotted  
Strip 3"



221

Triangular  
Flexible  
Plate 2 1/2" x 1 1/2"

# Meccano Electrical Parts



**503**  
Insulating Strip  
501 - 5 1/2"  
502 - 2 1/2"  
503 - 1 1/2"



**508**  
Insulating Flat Girder  
507 - 2 1/2"  
508 - 1 1/2"



**511**  
Insulating Plate  
510 - 5 1/2" x 2 1/2"  
511 - 2 1/2" x 2 1/2"



**513**  
Insulating Fish-plate



**514**  
Insulating Bush Wheel  
8 holes



**516**  
Insulating Bush Wheel  
6 holes



**518**  
Bush Wheel  
1" diam.



**520**  
Rectangular Coil with base



**522**  
Cylindrical Coil



**525**  
Core Holder for Rectangular Coil



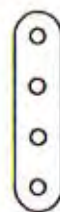
**526**  
Core for Rectangular Coil



**527**  
Core for Cylindrical Coil - slotted



**528**  
Core for Cylindrical Coil 1"



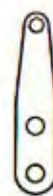
**529**  
Strip 2"



**530**  
Flexible Strip 2"



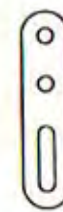
**531**  
Wiper Arm  
1" radius flexible



**532**  
Wiper Arm  
1 1/2" radius flexible



**533**  
Wiper Arm  
2" radius Bent



**534**  
Slotted Strip 2"



**537**  
Permanent Magnet



**538**  
Magnet Holder



**539**  
Lamp Holder



**540c**  
Lamp 12v. 60 mA  
540c (Clear)  
540r (Red)  
540j (Yellow)  
540v (Green)



**542**  
Terminal Nut



**543**  
Contact Screw



**544**  
Contact Stud



**545**  
Pivot Bolt 1/2"



**548**



**549**

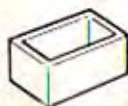


**550**

548 Pivot Rod 3 1/2"  
549 Pivot Rod 2" 550 Short Pivot



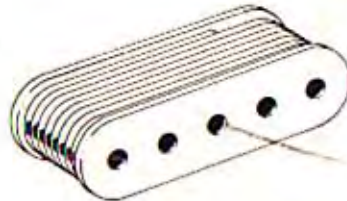
**551**  
Flat Commutator



**554**  
Short Circuit Piece



**555**  
Rod with square end 4"



**556**  
Reel of P.V.C. Sleeving  
557 Reel of Bare Copper Wire



**558**  
Coil of Connecting Wire



**559**  
Coil of Paper



**561**  
Washer Thin



**562**  
Bell



**563**  
Screwed Rod 2"



**564**  
Insulating Spacer