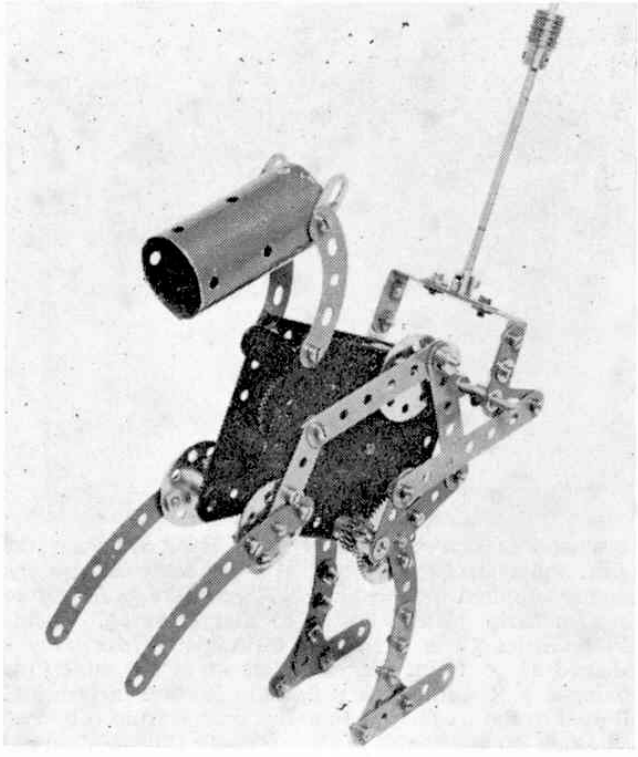
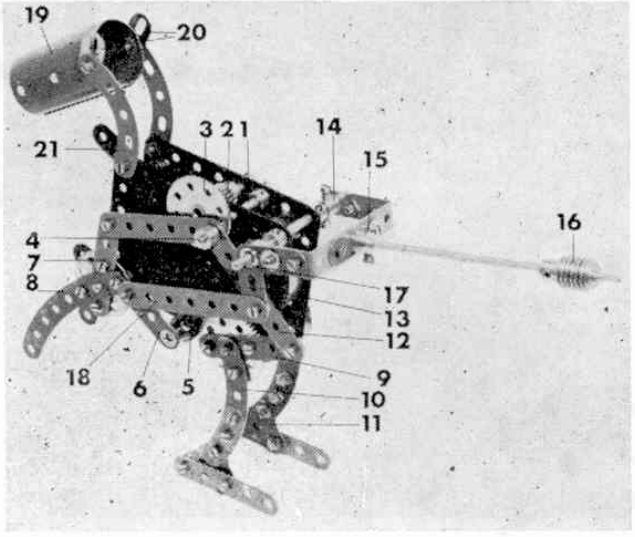


COME STEEPLECHASING

. . . with this fun-packed Meccano Model described as a "Steeplechaser" by its builder, D. J. Turnham of Old Marston, Oxford

Above, laughs galore can be had with this Meccano "Steeplechaser" designed and built by D. J. Turnham of Old Marston, Oxford ! Below, another view of the "Steeplechaser" showing almost its entire construction. This is an outstanding model considering its performance in relation to its simplicity.



GENERALLY SPEAKING Meccano is regarded as a fully-fledged miniature engineering system. This is as it should be, but it does not mean that Meccano must *only* be used for the reproduction of genuine engineering structures. On the contrary, the system can be, and often is, used to make more light-hearted models such as the steeplechaser featured in this article. (You will see from the accompanying photographs that the model does look something like a horse and, as it performs two movements—a "prance" followed by a "step"—the title "Steeplechaser" seemed particularly appropriate to me!—Spanner.)

So as to keep the quantity of parts used in the model as low as possible, the horse was built round a No. 1 Clockwork Motor, the Motor thus not only providing the power for the movements, but also serving as the major part of the horse's body. Before actual construction is begun, however, the drive pinion is removed from the Motor which is then wound. A 1½ in. Rod 1 is mounted in the Motor sideplates, six holes from the brake lever, where it is held in place by Collars positioned one each side of one of the plates. The inner Collar acts as a retainer to limit the expansion of the Motor mainspring thus preventing it from fouling a ½ in. Pinion 2 mounted on a 1½ in. Rod, held in the sideplates by a Collar and an 8-hole Bush Wheel 3. A Threaded Pin 4 is fixed to this Bush Wheel as shown, while the Pinion engages with the main drive gear wheel of the Motor. Held by a Collar in the opposite edges of the sideplates, in line with the above 1½ in. Rod, is a 2 in. Rod on which a ½ in. Pinion 5 and a Crank 6 are securely fixed.

Turning to the left foreleg, a 2½ in. Strip 7 is bolted across an 8-hole Bush Wheel, a spacing Washer being mounted on each securing Bolt. Fixed by ⅜ in. Bolts to this assembly, as illustrated, is a 4 in. Stepped Curved Strip 8, a Nut on each Bolt being used as a spacer, in this case. The right foreleg is similarly built, except that Strip 7 is omitted, then both legs are mounted tight on a 2 in. Rod journalled in the corner holes in the Motor sideplates. The Rod, of course, is passed through the bosses of the Bush Wheels. One end of a 3 in. Strip is lock-nutted to Strip 7, the other end being slipped onto Threaded Pin 4.

In the case of the left hindleg, a 2½ in. Strip 9 is bolted across a 57-teeth Gear as also is a 2½ in. Curved Strip 10, the latter, at right-angles to the former, running only to the centre of the Gear and being spaced from it by a Washer. Curved Strip 10 is extended three holes by a similar Curved Strip to which a 2½ in. Strip 11 is bolted, the joint being strengthened by a 1 in. Corner Bracket. In the right hindleg, Strip 8 is omitted and an 8-hole Bush Wheel is substituted for the 57-teeth Gear, but otherwise construction is similar. Both legs are mounted on a 2 in. Rod, journalled in the Motor sideplates, with the 57-teeth Gear engaging Pinion 5. A 3 in. Strip 12 is lock-nutted, at one end, to Strip 9, the other end being slipped onto Threaded Pin 4 where it is held in place by a Collar.

The tail unit acts as a counterbalance and is built up from a Bell Crank 13 connected to an ordinary Crank 14 by a 2½ × 1 in. Double Angle Strip. Bolted

PARTS REQUIRED

1—3	2—18a	5—38	4—90
2—4	1—19a	1—46	2—90a
4—5	4—24	7—59	2—111c
2—10	2—26	2—62	1—115
1—16	1—27a	1—62b	1—128
3—17	1—32	2—89b	2—133a
	No. 1 Clockwork Motor		1—216

to this Double Angle Strip is a Double Arm Crank 15, in the boss of which a 5 in. Rod is fixed. A Worm 16 is mounted on this Rod. Cranks 13 and 14 are now secured on a 3½ in. Rod 17 held by Collars in the upper rear corner holes of the Motor sideplates. To obtain balance, it is important that an equal length of surplus Rod should project through the bosses of the Cranks at each side. A 3½ in. Strip 18 is lock-nutted between Bell Crank 13 and Crank 6, as shown, the end of Rod 17 serving as a stop for the Strip.

Finally, the head is very easily built from a Cylinder 19 to which two Fishplates 20 and two 2½ in. Stepped Curved Strips 21 are bolted, the former to represent the ears and the latter, the neck, being fixed tight to the upper front corners of the Motor sideplates.

With the model completed it is " trimmed " by first ensuring that the forelegs are in alignment and that it stands firmly on its balancing feet in the " prance " position. Crank 6, the angle of the neck and the position of Worm 16 on its Rod are then adjusted until the model performs a " prance " successfully without falling over backwards. It is advisable to fit two Grub Screws in the boss of the Gear and each Bush Wheel used in the legs.

The movements of the horse are mainly dependent on the action of the tail counterbalance on Pinion 5. When the tail is horizontal, the Pinion climbs around the 57-teeth Gear simulating a prance, but when it is vertical, a step is made.

PARTS REQUIRED—A WORKSHOP IN ONE

2—2a	3—16	103—37b	1—111c
2—3	2—16a	36—38	1—115a
7—5	1—17	1—45	1—125
1—6	4—20b	3—53a	1—130a
2—8a	1—21	9—59	2—133a
5—8b	1—22	1—70	1—166
4—9a	3—23a	4—72	2—186
4—9b	1—26	2—89a	2—186a
2—9d	1—26c	1—94	5—188
2—10	1—27	1—96	1—190a
2—12a	1—27a	1—96a	1—191
1—15	1—27d	2—103f	2—195
1—15b	107—37a	1—109	2—235f

1 E15R Motor

" Good afternoon gentlemen, here is the shipping forecast for today Saturday the . . . "

Mechanical Engineer

Training in the Fleet Air Arm

Continued from page 425

Mechanical Engineering. The fourth year is spent on Front Line service at Naval Air Stations for field experience and the fifth back again at H.M.S. Condor. The fifth year being devoted almost entirely to technical training, and at the end of this course, Aircraft Artificers —as they then are—have a thorough training behind them in both the practical and theoretical skills needed, which is recognised by the T.U.C. as being equivalent to civilian apprenticeships. During the fourth and fifth years, entrants can sit for their Higher National Certificate, studying in their own time, but most Artificers prefer to leave this until they have reached the rank of Petty Officer.

The training given to Artificer Apprentices is to say the least, very expensive and because of this the Navy have to ensure that they do get a minimum of return on their investment. The minimum signing-on period is 12 years, man's time, running from the age of 18. At the age of 30, which is the first available time for leaving the service, a further 10 years can be signed on for to give release at the age of 40—after 22 years service—which is then pensionable.

When one considers the rate of pay, at first it would seem a little low, but on subsequent inspection bearing in mind that one is paid 7 days a week and accommodation and food, etc., are provided, they are comparable to civilian pay. First year Artificer Apprentices earn 9/- a day, fourth year Artificer Apprentices earn 22/3d. a day, Leading Hands earn 37/9d. a day, whilst Petty Officers earn 48/9d. a day.

Whilst at H.M.S. Condor the Editor was very impressed by the accent placed on leadership training. In addition to the parade ground work and leadership lectures, extensive facilities are conveniently available in the local area for venture training which includes camping, canoeing, hill walking and sailing. During an air trip in the Sea Prince aircraft, piloted by Lt. Cdr. S. C. Farquhar, which is held on the station for practical aerodynamic instruction and for giving trainees air experience, we spotted several groups on venture training in the snow covered Scottish hills. This flight really was something to be remembered, as your Ed. sat in the Navigator's seat at the side of the pilot, flying low over the snow covered Scottish hills, in brilliant sunlight, with the red Naval tents standing out vividly against the white background.

A real surprise was in store on landing, as Lt. Cdr. Farquhar decided to test the station's alertness. He landed short on the main runway, and called the tower up to say the aircraft had crashed, to test reactions of the fire, ambulance and rescue crews. Within seconds your Ed. was being dragged from his seat by an asbestos-clad, hatchet wielding, rescue crew member. Quite an experience, and reassuring to know that these chaps are on the ball, all the time.

Modellers in Scotland will be pleased to note that *H.M.S. Condor* has an Open Day on July 20th, which will feature both flying and static aircraft displays.

We would like to thank Captain J. W. Mott M.V.O., Commanding Officer of *H.M.S. Condor* and his fellow officers for their kind hospitality and co-operation which enabled this feature to be produced.

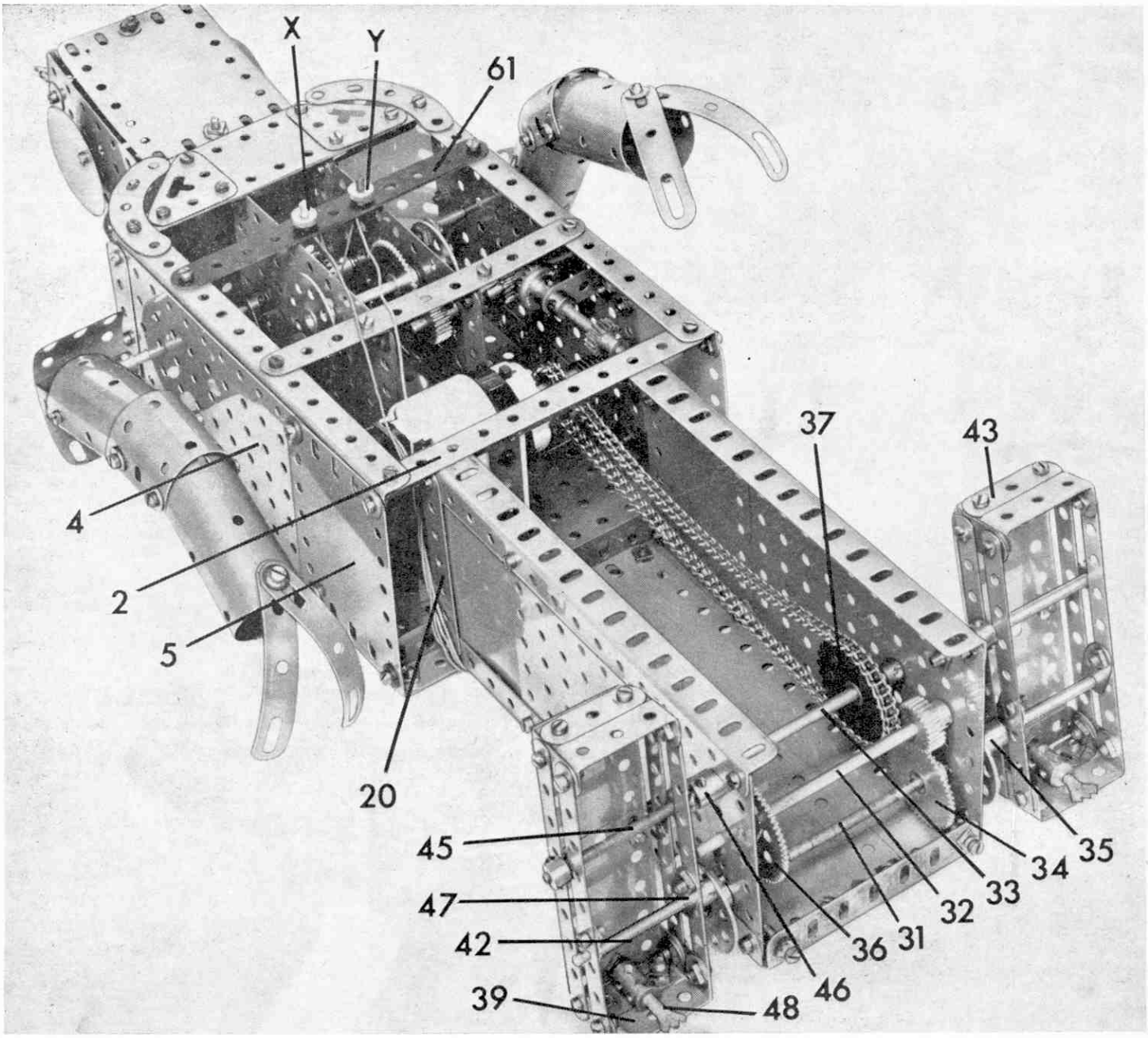
HERE'S HOPPY-THE ROBOT

Eyes aglow, Arms swinging, Head turning, 'Hoppy' perambulates in a most unusual manner. Build him with Spanner

SCIENCE fiction writers—those prophets of the mechanical age—have long foretold the existence of man-like machines, capable of movement and able to perform all sorts of physical tasks. In these days of automation the prophesies of science fiction are well on the way to realization. Already men in a wide variety of industries are being superseded by machines which are doing the job better, faster and at a greatly reduced cost, but as yet, none of these machines could, even by the widest stretch of the imagination, be described as 'human-looking'.

In spite of this, it is an easy matter to produce a man-like machine, or robot, as is proved by the fact that Meccano owners have been doing just that for close on half a century! It has been some considerable time, however, since we actually featured a robot in the 'M.M'., so I thought I would make up the deficiency this month with the typical example described below. Admittedly, it cannot do anybody's work for them, but it does walk, swing its arms and move its head, thanks to the Power Drive Unit it incorporates. The only thing to remember is that it does not walk like we do with two legs, but moves both feet forward together, while standing on its 'legs', then swings its body forward to repeat the movement. Construction should present no problem.

In this view of the model construction of the feet is clearly shown. Note that the back of the 'legs' has been removed to show the drive to the feet



BODY AND LEGS

To begin with, two rectangles are each built up from two 7½ in. Angle Girders 1 and two 5½ in. Angle Girders 2, then the rectangles are joined by two 5½ in. by 3½ in. Flat Plates 3 and 4, each extended by a 3½ in. by 2½ in. Flexible Plate 5. Note that the upper edges of Plates 3 and 4 are overlayed by a 3½ in. Strip 6. Bolted between Angle Girders 1 in each rectangle is a 5½ in. Strip 7 which is situated a distance of six holes from lower Girder 2.

The front of the body is now enclosed by another 5½ in. by 3½ in. Flat Plate 8, two 4½ in. Flat Girders 9 and a 4½ in. by 2½ in. Flexible Plate 10, this last edged by a 2½ in. and two 4½ in, Strips in addition to Strip 7. Bolted to top Girder 2, but projecting upwards, are a 2½ in. by 1½ in. Flexible Plate 11, two 1½ in. Corner Brackets 12 and two 2½ in. Stepped Curved Strips. A duplicate set of all these parts is bolted to upper Girder 2 at the back of the body, then a 3½ in by 2½ in. Flanged Plate 13 is fixed between Plates 11 and Corner Brackets 12 at each side, at the same time securing 2½ in. Strip 14 in position. A 2½ in. by 2½ in. and a 2½ in. by 1½ in. Plastic Plate 15 are bolted to each side of the Flanged Plate. These are curved to shape and are wedged behind corresponding Strip 6.

Two 7½ in. Angle Girders 16, connected by a 3½ in. Angle Girder 17 are bolted, along with two 7½ in. by 2½ in. Strip Plates and a 7½ in. Strip 18, to each lower Angle Girder 2, then Girders 16 at the sides are joined by a 3½ in. by 2½ in. Flexible Plate and a 5½ in. by 3½ in. Flat Plate 19. The upper edge of the Flexible Plate is overlayed by a 3½ in. Strip 20.

MOTOR AND DRIVE

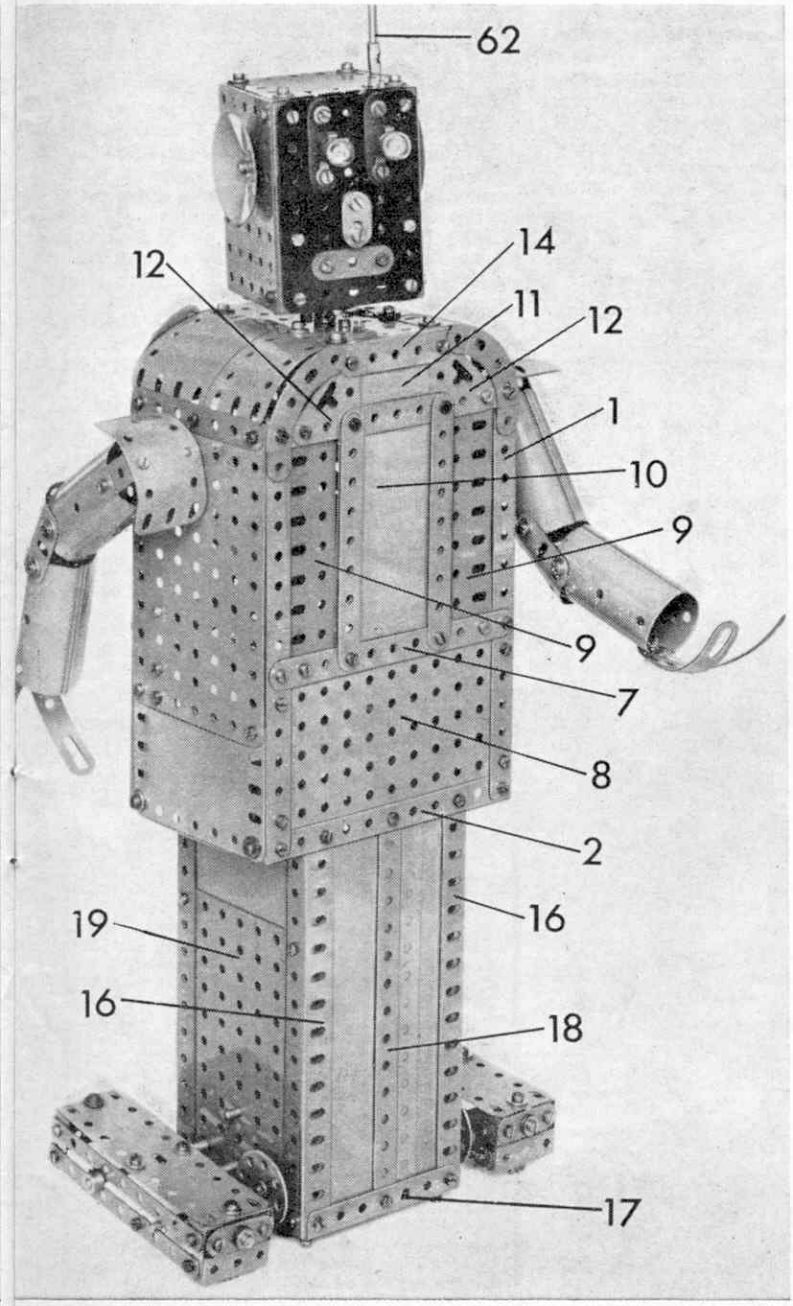
Fixed by Angle Brackets between upper Angle Girders 2 are two 3½ in. Strips, while another two similar Strips are fixed between Strips 7, also by Angle Brackets. Two 4½ in. by 2½ in. Flat Plates 21 and 22 are bolted to these Strips, as shown. A 3½ in. Rod 23 is journalled in Flat Plates 3 and 21, being held in place by a Crank at one side of Plate 21 and a ¾ in. Contrate Wheel 24, at the other side, the latter spaced from Plate 21 by a Washer. A 3 in. Rod is journalled in Flat Plates 4 and 22, this being held in position by a Collar and a Crank 25.

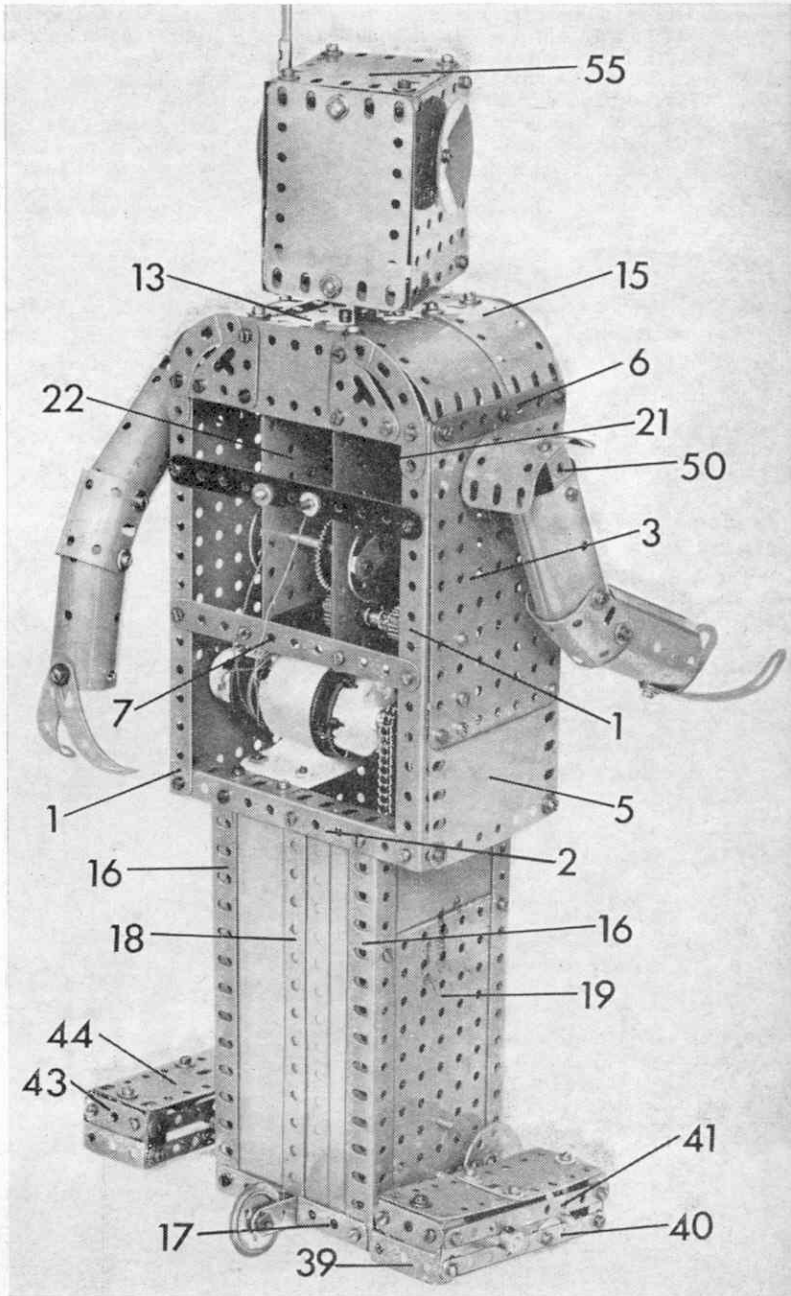
Lock-nutted to each Crank is a 2½ in. Strip 26, the other end of which is, in turn, lock-nutted to an 8-hole Bush Wheel 27, mounted on a 2 in. Rod journalled in Plates 21 and 22 and carrying a 50-teeth Gear Wheel 28. This Gear is in mesh with a ¾ in. Pinion on a 3 in. Rod, held by a Collar in Plates 3 and 21, and carrying a ½ in. Pinion 29. Engaging with Pinion 29 is a ¾ in. Contrate Wheel, fixed on the end of a 3½ in. Rod held by Collars in a 1 in. by 1 in. Angle Bracket bolted to Flat Plate 3 and in a ½ in. by ½ in. Angle Bracket bolted to Strip 20. Also fixed on this Rod is another ½ in. Pinion 30.

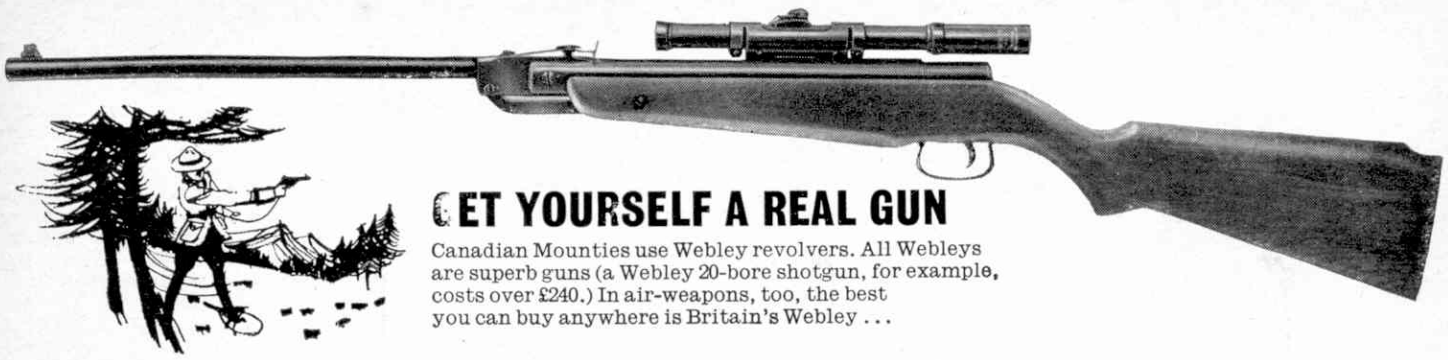
At this stage three 4½ in. Rods 31, 32, and 33 are journalled in Flat Plates 19 in the positions shown. Rod 31 carries a 50-teeth Gear 34 and is held in place by two 8-hole Bush Wheels to the face of each of which a Rod Socket 35 is fixed. Rod 32 carries a 60-teeth Gear 36 and is held in place by a Collar and a ¾ in. Pinion, the latter in mesh with Gear 34. Rod 33, on the other hand, carries a 1½ in. Sprocket Wheel 37 and is held in place by a Collar and a 7/16 in. Pinion, the latter in mesh with Gear Wheel 36.

Two 3½ in. Strips are bolted between lower Angle Girder 2 to provide the mounting for the Power Drive Unit on the output shaft of which a ¾ in. Sprocket Wheel and a Worm are secured. The Sprocket Wheel is connected to Sprocket Wheel 37 by Sprocket Chain, while the Worm engages with Pinion 30. At the top of the model, a Rod with Keyway is held by Collars in Flanged Plate 13, and in a Double Bent Strip bolted to the underside of

Meet the Mechanical Man—A self-propelled, walking robot driven by a Meccano Power Drive Unit. A rear view of the robot, showing the Motor mounting and construction of the 'legs'







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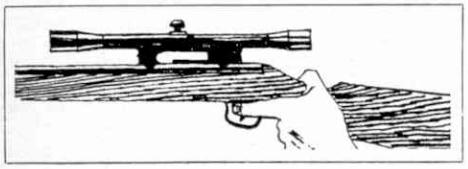

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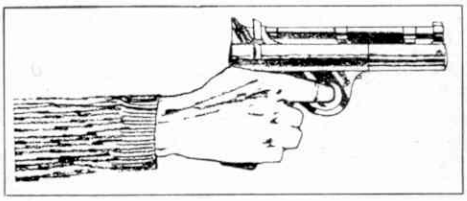

Shoot with safety Never point a gun, unloaded or not, at anyone. Never handle a gun before checking that it's unloaded. Always carry it so the muzzle is fully under your control. Never leave it where people younger or less responsible than you can meddle with it. Never leave a loaded gun unattended. Always make sure no-one is behind your target before opening fire.

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the Flanged Plate. A ½ in. Pinion 38, fixed on the lower end of this Rod, engages with Contrate Wheel 24.

FEET AND ARMS

Both feet are similarly built so only one need be described. Two 1½ in. by ½ in. Double Angle Strips 39 are joined by two 4½ in. Narrow Strips 40, bolted to their lugs, at the same time fixing four Fishplates in position. These Fishplates are, themselves, connected by a further two 4½ in. Narrow Strips 41, at the same time bolting another two 1½ in. by ½ in. Double Angle Strips 42 between the sides and also fixing four Angle Brackets in place. These Angle Brackets are joined by two 1½ in. Strips 43, one at each end of the foot. A 4½ in. by 1½ in. Compound Flexible Plate 44 is built up from two 2½ in. by 1½ in. Flexible Plates and is bolted to Double Angle Strips 42.

A 2½ in. Rod 45 is located in the gaps between Narrow Strips 40 and 41, being held in place by two Collars. This Rod must, however, be free to slide in the gaps. The inside end of the Rod is then fixed in a Rod Socket 46 attached to Flat Plate 19. Two Fishplates 47 are bolted to each Narrow Strip 40 and are angled so that their circular holes coincide with the gaps between Narrow Strips 40 and 41. Passed through these holes is a 2 in. Rod which is fixed in Rod Socket 35 attached to the Bush Wheel on the end of Rod 31. Attached to forward Strip 43 is a Short Coupling in the longitudinal bore of which a Centre Fork 48 is held. At the rear of the body, a Single Bent Strip is bolted to Angle Girders 17 and a ½ in. Bolt, carrying a 1 in. loose Pulley with Rubber Ring, is held by two Nuts in the lugs of this Single Bent Strip.

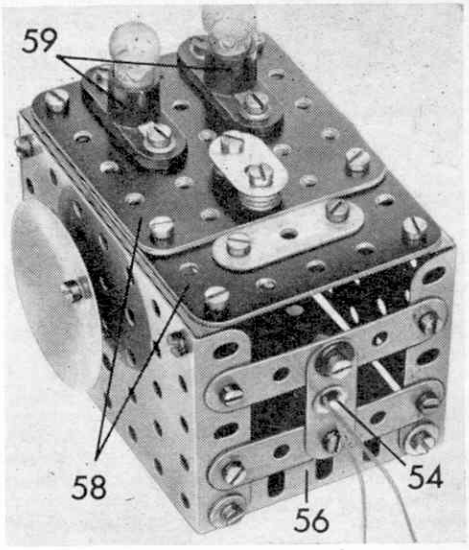
Two arms are each built up from two Cylinders 49 joined by a curved 2½ in. by 1½ in. Flexible Plate. A 1 in. by ½ in. Angle Bracket 50 and a Crank 51 are bolted to the upper Cylinder, while another curved 2½ in. by 1½ in. Flexible Plate is attached to Angle Bracket 50. Hands are provided by two Formed Slotted Strips 52, then the completed arm is attached to the body be securing Crank 51 on Rod 23, the other arm being mounted on the corresponding 3 in. Rod.

THE HEAD

Only the head remains to be built, and this is by no means difficult. Two 3½ in. by 2½ in. Flanged Plates 53 are joined at the bottom by two 2½ in. Strips, bolted between the centre holes of which is a Double Arm Crank 54, and at the top by a 2½ in. by 2½ in. Flexible Plate 55, the securing Bolts also holding a 2½ in. Angle Girder in Place. A corresponding 2½ in. Angle Girder 56 is bolted between the Flanged Plates at the bottom of the head, then a 3½ in. by 2½ in. Plastic Plate 57 is bolted to the vertical flanges of these Angle Brackets.

The face is provided by two 2½ in. by 2½ in. Insulating Flat Plates 58 overlapped three holes, which are bolted to two 3½ in. Angle Girders. Two Lamps in Lamp Holders 59 represent the eyes, while the nose is a Fishplate, attached to the Insulating Flat Plates by two ½ in. Bolts, but spaced from the Plates by four Washers on the shank of each Bolt. The mouth is simply a 1½ in. Strip, whereas the ears are each provided by a Conical Disc 60.

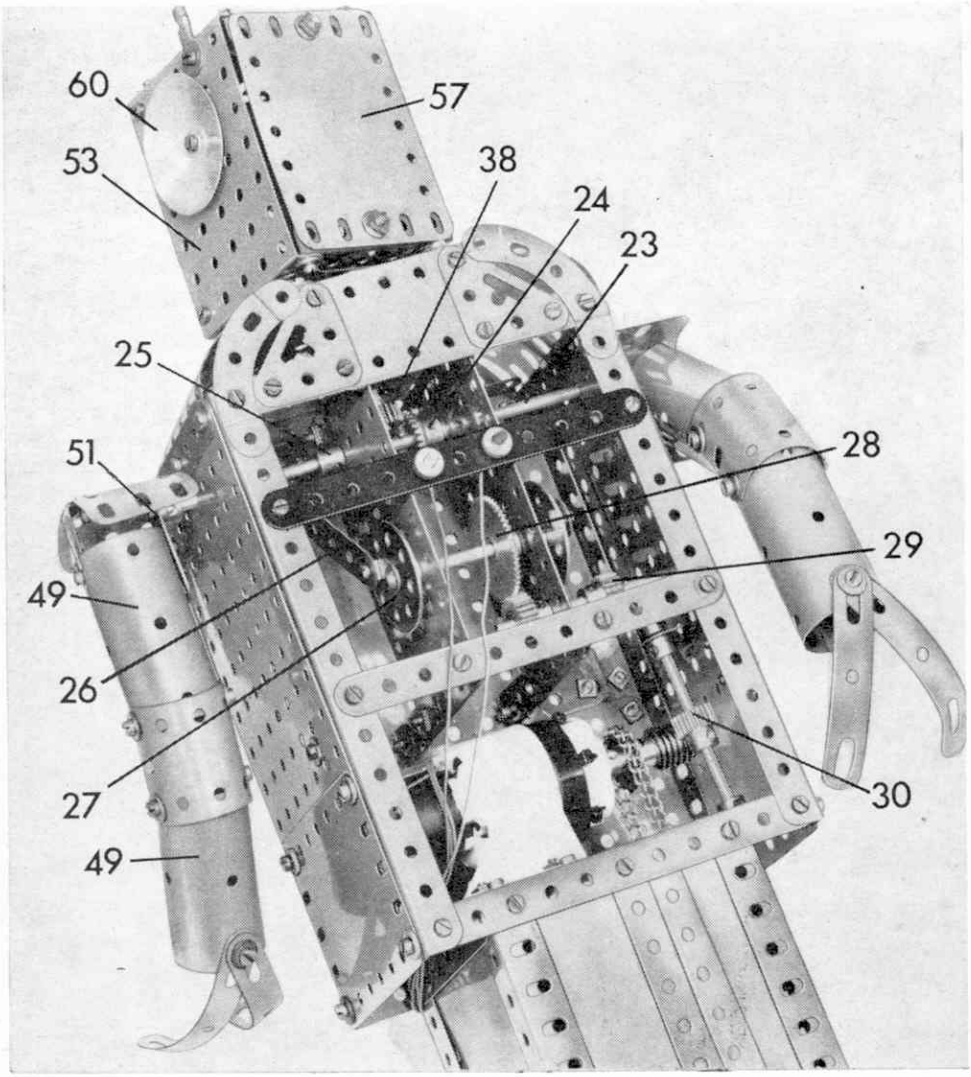
When completed, the face is fixed in position by bolting the 3½ in. Angle Girders to Flanged Plates 53, but before this is done the Lamp Holders should be wired in parallel. In other words, the upper terminals of the Lamp Holders are wired together,



A close-up view of the head

as also are the lower terminals, then two lengths of insulated wire are connected one to the upper terminal and one to the lower terminal of one of the Lamp Holders. These wires are passed through the boss of Double Arm Crank 54 and are threaded down the Keyway of the Rod with Keyway into the inside of the Robot, where they are connected to two terminals X and Y on a 5½ in. Insulating Strip 61, bolted to rear Angle Girders 1. Each terminal is obtained from a ½ in. Bolt, a Nut and a Terminal Nut. The head is then mounted in position by fixing Double Arm Crank 54 on the Rod with Keyway. An 'aerial' is provided by a 2 in. Rod 62 and is attached to the head by a Rod and Strip Connector bolted to left-hand Flanged Plate 53. Finally, the leads from the Power Drive Unit are taken to terminals X and Y, which also, of course, serve as the connecting points for the leads from the power source.

This view shows the mechanism transferring the drive to the arms and head



TIMING

Before the Robot can be operated the head, arms and feet movements must be synchronised. Cranks 24 and 26 and Bush Wheels 27 should be so positioned that when one arm is swinging forward, the other is swinging backwards. Also, when the right arm is in its forward position, the head should be turned to the right. It should be remembered that the feet do not move alternately but simultaneously in the same direction. Because of this, Rod Sockets 35 must be in identical positions in relation to the Bush Wheels. The exact timing for all movements, however, can best be obtained by experimenting.

PARTS REQUIRED

2 of No. 1b	1 of No. 27d	4 of No. 133
2 of No. 2	2 of No. 29	1 of No. 155
2 of No. 2a	1 of No. 32	4 of No. 179
12 of No. 3	202 of No. 37a	2 of No. 187a
6 of No. 5	180 of No. 37b	10 of No. 188
5 of No. 6a	48 of No. 38	1 of No. 190
8 of No. 8b	1 of No. 45	2 of No. 190a
4 of No. 9	8 of No. 48	1 of No. 191
4 of No. 9b	4 of No. 52a	2 of No. 194
2 of No. 9d	3 of No. 53	2 of No. 194a
13 of No. 10	2 of No. 53a	1 of No. 194b
17 of No. 12	12 of No. 59	4 of No. 195
1 of No. 12a	4 of No. 62	1 of No. 212
2 of No. 12b	1 of No. 62b	4 of No. 215
3 of No. 15a	2 of No. 63d	4 of No. 216
2 of No. 16	2 of No. 65	1 of No. 230
2 of No. 16a	1 of No. 70	8 of No. 235e
1 of No. 16b	4 of No. 90a	1 of No. 501
3 of No. 17	1 of No. 94	2 of No. 511
1 of No. 22a	1 of No. 95a	2 of No. 539
4 of No. 24	1 of No. 96a	2 of No. 540c
2 of No. 25	1 of No. 102	1 Power Drive Unit
3 of No. 26	2 of No. 103c	
1 of No. 26c	17 of No. 111a	
2 of No. 27	4 of No. 111c	