Electricity Applied to Meccano

V.—A Meccano Shocking Coil, Electro-magnet, and Signal

These articles are intended to draw every Meccano boy's attention to the numerous fascinating uses to which the Meccano electrical parts may be put. The first two articles of the series dealt with the elementary principles of electricity, and the second and third articles described various Meccano switches, a coil-winding machine, and a Meccano electric telegraph system. Below we describe an electro-magnet of the type that can be used in model cranes, etc., a shocking coil, and an electrically-operated semaphore railway signal. All these models are constructed from a few ordinary Meccano parts used in conjunction with the special electrical accessories.

THE importance of the electro-magnet in nearly all electrical appliances was remarked upon in the article in this series which appeared in the December, 1927, "*M.M.*," and in the course of the article it was shown how its magnetic field was similar to that of an ordinary bar-magnet of the permanent type. Hence the former type of magnet may be substituted with advantage for the latter. A permanent magnet is liable to become de-magnetised through rough usage and its power is extremely limited, whereas the effect of an electro-magnet may be very powerful indeed. Moreover, the magnetic force of the latter type may be turned on or off at will.

An electro-magnet depends for its lifting power upon two factors, namely, the number of turns of wire constituting the magnet winding, and the number of amperes—that is, the amount of current—in the turns. A current of ten amps. flowing through ten turns of wire will produce a weak magnetic effect, but if we increase the number of turns to one hundred, a magnet ten times more powerful will be obtained. In technical terms the power of a magnet is gauged by the number of "ampere turns," which measurement is obtained by multiplying the number of amperes flowing along the wire by the number of turns in the magnet.

The above will become more clear if we recall that a straight conductor is surrounded by a magnetic field, as explained in a previous article. If the conductor is wound into a close spiral the magnetic field of each adjacent turn will be augmented, thus producing a greatly enhanced effect.

Having briefly sketched the elementary principles of the electro magnet we may describe the construction of a working model in Meccano. Nearly all the models described in this article, and the majority of those that will appear in subsequent issues, will embody a magnetic coil in some form or other, but the model about to be described is a simple electro-magnet of the type that in actual practice is sometimes attached to the hoisting hook of a crane and used for lifting masses of iron and steel, etc.

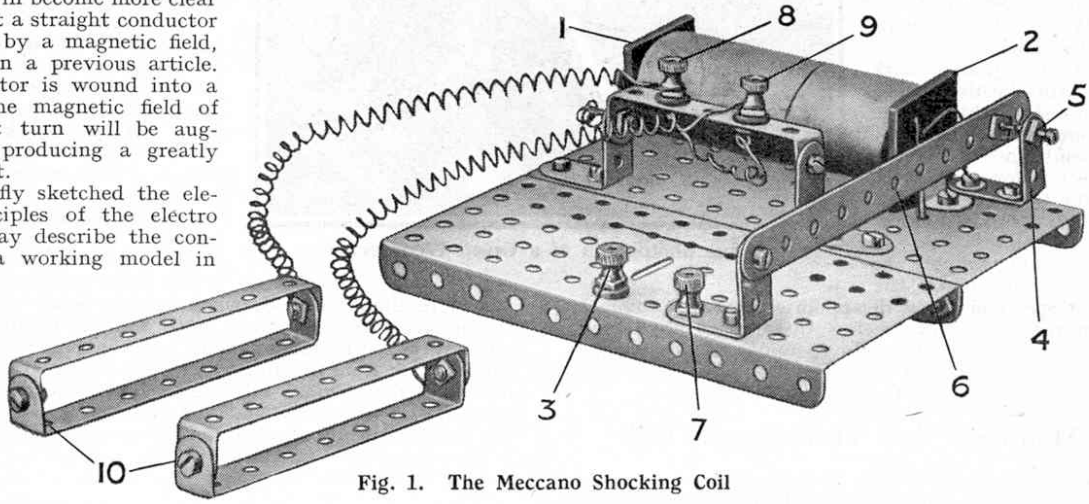


Fig. 1. The Meccano Shocking Coil

The Meccano Electro-magnet

To construct the Meccano electro-magnet (Fig. 2) first wind two Bobbins to full capacity with either 23 or 26 SWG wire. A magnet wound with 23 gauge wire will be more powerful than one wound with 26 gauge wire. This is due to the fact that the "23" wire has a lower resistance per unit of length than the "26"; therefore, a larger flow of current will be carried by the former, and a more powerful magnetic effect will be produced from a given voltage.

Some interesting results may be tabulated to show the relative weights that can be lifted by magnets wound with 26 and 23 SWG copper wire, the same voltage being used in each case, of course. In the Meccano models it will be found that magnets wound with 23 SWG wire have a fewer number of turns than those wound with the other wire. This, of course, is due to the fact that the slightly larger diameter of the wire prevents the same number of turns being accommodated on the Meccano Bobbin. A magnet wound with 26 gauge wire has a higher resistance than one wound with 23 wire, so we must increase the applied voltage if we wish to maintain the current at the same value as in the lower resistance coil assuming, of course, that both magnets have equal lengths of wire used in each case. This is in accordance with the ampere-turns law quoted above.

The Bobbins of the Meccano magnet are attached to the yoke 1, which is composed of three 1½" Strips, by the Pole Pieces 2. A wire protruding from one of the magnet coils should be connected to one wire of the second coil, and in order to select the proper wires for connection, it should be imagined that the current, starting from the input end (represented by the wire attached to the accumulator) of the first coil, flows round that coil in a clockwise direction. It then passes to the second coil and flows round it in an anti-clockwise direction. By connecting the two magnets in this way, one is given a North and the other a South polarity.

The two leads to the coils should be of sufficient length to permit the magnet being raised and lowered by the crane. The hoisting cord may be rove round the 1" Pulley 3, which turns upon a 1" Axle Rod journalled in a Cranked Bent Strip 4 bolted to the yoke 1.

The magnet may be fitted to almost any Meccano Crane, and much fun and interest can be gained by using it in place of the hoisting hook. The load is dropped whenever required by switching off the current.

Induction or Shocking Coil

In the article on "The Dynamo and the Electric Motor" in the "*M.M.*" for December, 1927, reference was made to the great discovery by Faraday of electrical induction. As there stated (page 1083) the first step in the discovery was the demonstration that a current of electricity could be induced in a coil of wire either by moving the coil towards or away from a magnet. This discovery led to the construction of the dynamo.

The induction of a current is due to the cutting across of the lines of force of the magnet by the coil. Instead of the magnet a solenoid or spiral coil of wire carrying a current may be used to produce the lines of force and Faraday actually used a solenoid in this manner. A further step was taken when the relative positions of the coils were left unaltered and the current in one of them was started and stopped alternately. This led to the invention of the induction coil.

In its usual form this instrument consists of two coils, one wound outside the other. The inner coil is called the primary coil, as it carries the current used to produce the lines of magnetic force, while the outer coil is the one in which the current is induced, and is called the secondary coil.

When the current is switched on in the primary coil the latter becomes an electro-magnet and lines of force come into existence. These are cut across by the secondary coil, so that the effect is exactly the same as if a coil carrying a current were moved towards the secondary. If the current is now switched off an induced current in the opposite direction is produced in exactly the same manner. By switching on and off with great rapidity by means

of a current interrupter, an alternating current is induced in the secondary coil.

The great value of the principle of induction is that the voltage of the induced current may be increased by using more turns of wire in the secondary coil, the voltage set up being nearly proportionate to the relative number of turns in the two coils. If the primary coil has 100 turns and the secondary coil 2,500 turns, then the voltage in the secondary circuit will be nearly 25 times as great as that in the primary circuit. In the model to be described the primary circuit consists of about 200 turns and the secondary of about 1,500. This gives a voltage ratio of about seven, and thus the use of a four-volt accumulator will produce an alternating current in the secondary of approximately 28 volts.

The instrument is made more efficient by inserting a core of soft iron within the primary, as this causes the lines of force to be crowded into a smaller area. The core also plays an important part in the type of interrupter used in the present model. At one portion of the circuit the primary current is made to pass from the point of a screw to a vibrating strip, the latter being close to one end of the core. Immediately the current is switched on the core becomes an electro-magnet and attracts the strip towards it, thus breaking the connection with the point of the screw. The primary current is thereby cut off and as the core loses its magnetism the vibrating strip swings back and makes contact once more with the screw. The current is thus restarted, only to be interrupted again immediately, so that the device switches the primary current on and off automatically in the manner required.

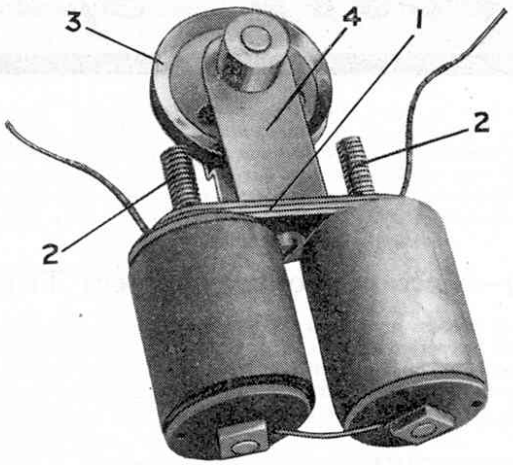


Fig. 2. The Meccano Electro-magnet

Construction of the Model

Let us now turn our attention to the construction of the Meccano model. The core of the primary consists of four 4½″ Strips laid one upon the other, on which are pressed two Coil Cheeks 1 and 2. These Strips are carefully covered with insulating tape or stout brown paper to prevent their sharp edges cutting the insulation of the winding.

The primary winding, which is wound on the core, consists of two layers containing approximately 200 turns of No. 23 SWG copper wire, the two ends of the wire being led through the two small holes in the Cheek 2. Care should be taken to wind the turns on evenly. When completed, the primary winding must be covered with insulating tape, etc., to insulate it from the secondary winding. This must be done carefully as the whole coil will have to be dismantled if a breakdown in the insulation occurs.

The secondary winding consists of ten to twelve layers of 26 SWG wire, or approximately 1,500 turns. It is advisable to cover this also with insulating tape or paper, etc., to add to the appearance of the completed coil.

The coil is bolted to the Flanged Plate forming the base of the model by two Double Brackets secured at each end of the core. One end of the primary winding is brought below the base plate to the insulated terminal 3, and the other end is connected to the 1″×1″ Angle Bracket 4, which is insulated from the Flanged Plate.

This Angle Bracket carries a special Meccano silver-tipped Contact Screw 5, a similar screw being carried on the vibrating 5½″ Strip 6. This forms the interrupter. The 1″×1″ Angle Bracket to which the 5½″ Strip 6 is bolted, has a Terminal 7 in metallic contact with it. The Accumulator is joined across the terminals 3 and 7, thus completing the primary circuit. The two ends of the secondary winding are brought out to the insulated terminals 8 and 9, to which the leads to the handles 10 are attached.

The strength of the shock imparted through the handles 10 may easily be regulated by adjusting the gap between the Contact Screws. This causes the "make-and-break" to become faster or slower as the case may be, thereby varying the speed at which the primary magnetic field cuts the secondary turns.

The amusement which may be obtained from the model is almost inexhaustible and many ways of using it will occur to our readers.

Electric Semaphore Signal

As most "*M.M.*" readers are aware, power signalling is rapidly superseding manual operation on all our great railway lines. The former method is divided chiefly into the electric and pneumatic systems of operation. Electricity has been chosen as the means of operating our model, and when completed it will form a very useful addition to any miniature railway. The semaphore is pulled down by the action of a plunger, which is drawn into a solenoid coil when the current is switched on, and is returned to the "danger" position immediately the current ceases.

The general construction of the model should be quite clear from the illustration, and it is only necessary to describe the operation of the solenoid and its attendant mechanism.

The solenoid 1 is a Meccano Bobbin wound to capacity with 26 SWG insulated wire. When winding the bobbin a few inches of each end of the wire are left free so that they can be used later to connect the coil windings to the terminals 2 and 3. One of these terminals must be insulated from the Flanged Plate forming the base of the signal. The 1½″ Rod 4, termed the plunger, slides freely in the centre of the bobbin, and when the current is flowing it is drawn into the core of the solenoid. This action is explained by the well-known principle that a solenoid will draw all magnetisable objects into its core, with a force depending directly upon the number of turns of wire on the bobbin and the current flowing.

The plunger 3 is attached by an End Bearing to the freely pivoting 2½″ Strip 5, and when drawn down, it causes this Strip to move, so pushing the semaphore arm down through the medium of the connecting Rod 6. The top of this Rod 6 is attached by another End Bearing to a double-arm Crank 8 (part No. 62b) secured to the short Rod carrying the Signal Arm (part No. 158a or 158b). Immediately the current is shut off the signal returns to the "danger" position, owing to the weight of a 1″ loose Pulley and the Rod 6 acting on the longer arm of the lever 5.

The solenoid is held in position on the base Plate by two 1½″ Angle Girders 7 clamped together by 1″ Threaded Rods. The Angle Bracket 9 forms a stop to support the Strip 5 when the signal is at "danger." Care should be taken to see that the plunger is perfectly free to move in the core of the bobbin, otherwise the model will fail to work satisfactorily.

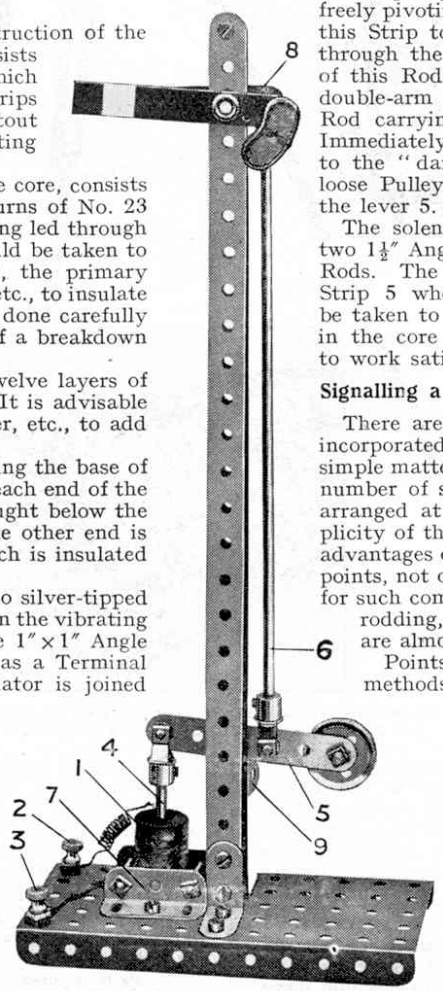


Fig. 3. Electric Semaphore Signal

Signalling a Model Railway Electrically

There are many ways in which electric signals may be incorporated in miniature railway layouts. It is quite a simple matter, for example, to equip a signal cabin with a number of switches operating an equal number of signals arranged at various points along the track. In the simplicity of the control arrangements lies one of the greatest advantages of the electrical method of operating signals and points, not only in model railways but also in real railways, for such complications as levers, wires, pulleys, bell cranks, rodding, etc., necessary in the ordinary manual methods are almost entirely eliminated.

Points can also be operated electrically, of course. The methods of operation most commonly employed in model railway layouts use either solenoids or electric motors. In the latter method the motor is connected to the points operating lever by suitable gearing and, usually, a rack and pinion movement. The solenoid method is the simplest and will no doubt appeal more readily to the majority of model railway enthusiasts for economical reasons, although both methods may be carried out entirely with Meccano parts.

Actually, two solenoids should be used, the plunger of each being connected to the tongue of the points so that the latter may be pulled one way or the other, merely by directing the current first to one solenoid and then the other.

(114)—A Useful Pen Rack

(S. T. Temple, Streatham, S.W., and K. Freeman, Coventry)

A Meccano device that may be put to really practical uses is shown in Fig. 114. It should prove invaluable not only in the home but in the office as well. Many Meccano boys, while constructing purely mechanical models such as motors, steam engines, cranes, etc., are apt to overlook the simple but practical purposes to which Meccano may be turned almost every day. These boys will be interested to know that Meccano book racks, magazine stands, pen racks, blotters, and numerous other similar devices are in everyday use in the Meccano offices at Liverpool.

The Meccano pen rack is of very neat construction and if built with enamelled parts, it will form quite an ornamental addition to any Meccano boy's "den."

The base of the rack is constructed from two 7½" Angle Girders and a 7½" Flat Girder. The latter is bolted directly to the Angle Girder 1, and is connected to the other Angle Girder 2 by a pair of Flat Brackets. These Flat Brackets are bent slightly so that the whole model can be set at an angle as indicated in the illustration.

To the fourth hole from each end of the 7½" Angle Girder 2 a Coupling is attached by means of a bolt passed through the hole and screwed tightly into the end threaded bore of the Coupling. A 4½" Rod 3 is then inserted in the other end of the Coupling, and four Cranks are mounted upon the Rod at equal distances apart. The outer ends of the Cranks should be bent slightly so that there is less likelihood of the pens or pencils rolling off.

Two further Couplings are secured to the upper ends of the Rods 3 and a 6½" Axle Rod 4 is fastened in their transverse holes. A Coupling secured to the centre of this Rod 4 carries another 4½" Rod, to the lower end of which is secured a Flanged Wheel. The angle of this Rod should be adjusted until the Flanged Wheel rests firmly on the table when the under-sides of the Angle Girders are also in contact with it.

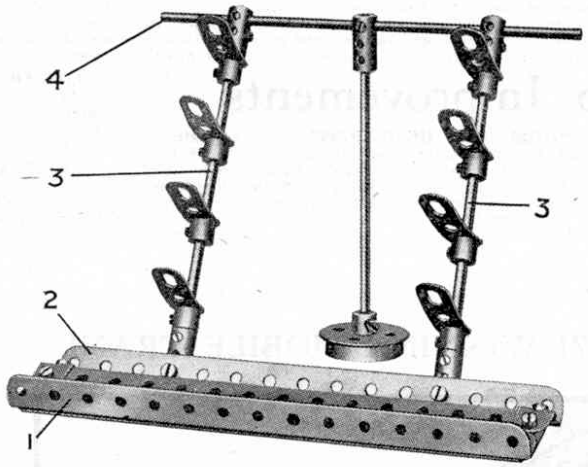


Fig. 114

(115)—Combined Match-Box Holder and Ash-Tray

(W. Kuonen, Battle, Sussex)

The combined match-holder and ash-tray illustrated in Fig. 115 is a particularly neat device that should prove popular with all members of the household. A good way by which a Meccano boy may display his ingenuity to his immediate circle of relatives and friends—and, incidentally, build up "good-will," the value of which may sometimes be realised on such occasions as birthday anniversaries, etc.!—is to construct several useful little articles of this kind and place them in different parts of the house.

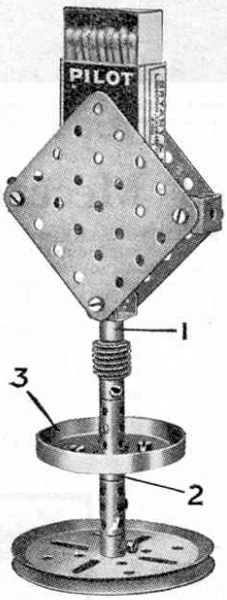


Fig. 115

The match-box holder is designed to take the standard size box of matches, and consists of two 2½" × 2½" Flat Plates joined by two Double Brackets and a Fork Piece 1. Six Washers should be placed one on each side of the Double Brackets and Fork Piece, in order to space the Plates at the correct distance apart to receive the match-box.

The stand is built up from a 3½" Axle Rod secured to a 3" Pulley Wheel forming the base. The Couplings and a Worm Wheel are fastened to the 3½" Rod to increase the weight of the stand and to add to its solid appearance, and a Bush Wheel 2 mounted in the position shown carries the Wheel Flange 3, which forms the ash-tray.

If desired a strip of sand paper or the roughened portion of a match-box cover may be pasted on each of the Flat Plates to facilitate the striking of the matches.

To complete the model a piece of felt or similar material should be gummed to the underside of the 3" Pulley Wheel, so that the stand may be placed upon polished tables, etc., without fear of scratching their surfaces.

Parts required:

2 of No. 11	1 of No. 32	2 of No. 72
1 „ „ 19B	10 „ „ 37	1 „ „ 116
1 „ „ 24	2 „ „ 63	1 „ „ 137

(116)—Meccano Hand Punch

(W. de L. M. Messenger, Rochester)

The model shown in Fig. 116 is an extremely practical one and affords an interesting illustration of a form of parallel motion used not only in hand punches but in numerous other important mechanical devices. Although only an ordinary 1" Axle Rod is used for the punch itself, the Meccano model will easily perforate thick paper with clean-cut holes.

The punch 1 is carried in a Coupling on the end of the 5" Rod 2, and is placed so that when the handles are pressed together, its end enters the Coupling 3, which is secured to a second 5" Rod 4. The Rods 2 and 4 are free to slide in the centre transverse bores of Couplings 5 and are secured in the corresponding holes of Couplings 6.

Both pairs of Couplings 5 and 6 are mounted pivotally in the 5½" Strips, which form the operating levers of the punch, by means of ⅜" Bolts, which are passed through the Strips and secured in the ends of the Couplings. As will be seen from the illustration, a Washer is placed under the head of each bolt to obtain the proper spacing.

The Strips 4 are pivoted together by bolt and lock-nuts (see Standard Mechanism No. 263), and are extended by 2½" large radius Curved Strips, forming the handles. The ends of each pair of Curved Strips are connected by a Coupling.

The sliding Rod 2 carrying the punch is provided with a Collar 7 and the screw holding the latter in position is passed through the end of a tension Spring, the other end of which is attached to the 1½" Rod 8. This Spring normally holds the punch jaws in the open position. When the handles are pressed together, however, the spring is extended while the Rods 2 and 4 slide in the Couplings 5. The Rods always remain strictly parallel to each other.

It is probable that Meccano boys will find a number of interesting and important uses for this parallel movement in other Meccano models.

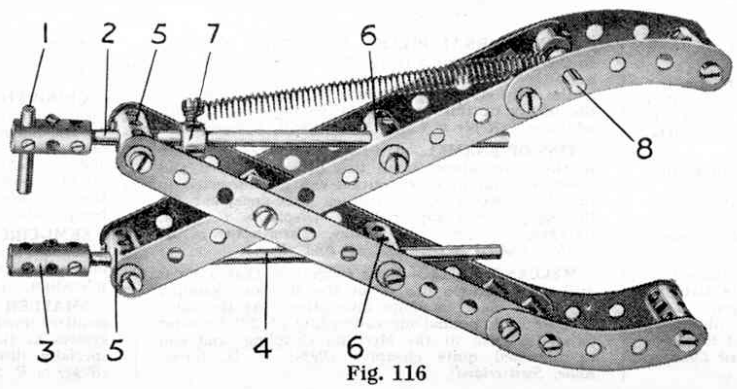
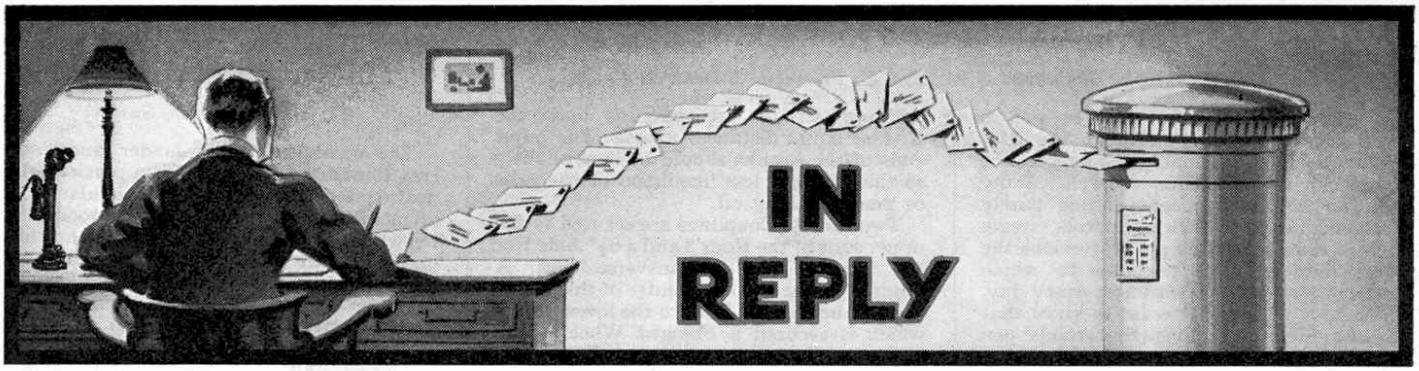


Fig. 116

(M.14). Securing Wheels to Screwed Rods.—G. R. S. Agnew, of Belfast, points out that when a wheel, etc., is secured to a Screwed Rod in the usual manner, the set screw is liable to damage the thread of the Rod. He suggests that this could be avoided by placing a nut on the Rod on each side of the Wheel and screwing up tightly, thus locking the wheel in position. In securing a Threaded Boss, etc., to a Screwed Rod, only one nut is necessary.



In these columns we reply to suggestions regarding improvements or additions to the Meccano and Hornby Train systems. We receive many hundreds of such suggestions every week, and consequently we are able to publish only ideas that show particular interest or ingenuity. Suggestions submitted for consideration in this section must be written on separate sheets of paper and the name and address of the sender must appear on each sheet used. Envelopes should be addressed to "Suggestions," Meccano Ltd., Binns Road, Liverpool.

Suggested Meccano Improvements

COMBINED BELL AND REFLECTOR.—We note your suggestion that a steel dome polished on its inner surface should be manufactured so that it could be used either as a bell or a reflector. We agree that when fitted with a Meccano lamp holder it would form a very efficient searchlight. We will give your idea careful consideration. (*Reply to J. Smith, London, N.*)

8″×3″ FLAT PLATE.—We do not consider that an 8″×3″ Flat Plate would be a suitable addition to the Meccano system as such a Plate would be liable to bend and could only be used in very few models. (*Reply to D. V. Magrass, Ferndale*).

NEW GEAR WHEEL.—We note your suggestion that a gear Wheel should be manufactured having only ¼ of its periphery occupied by teeth. Such a part is unnecessary as its functions are already covered by the Rack Segment (part No. 129). (*Reply to A. C. Coomber, Kirton*).

IMPROVED ARTILLERY WHEELS.—We were interested in your suggestion regarding the fitting of a groove in the 3″ artillery Wheels, part No. 19a. This would certainly allow 3″ rubber tyres to be fitted to them, and we will keep your idea before us. (*Reply to J. McLarin, Plymouth*).

IMPROVED RACK SEGMENT.—Your suggestion that a boss should be fitted to the rack Segment is quite interesting. It would be advisable to point out, however, that a Crank bolted to the existing Rack Segment forms a good substitute for your proposed part. (*Reply to D. Deighton, Mangaweka, New Zealand*).

CONICAL PIVOT.—We were interested in your suggestion regarding the introduction to the Meccano system of pointed rods and conical bearings. These would be useful in the construction of scientific models, etc., and we will give your idea careful consideration. (*Reply to G. and M. Cavallini, Rome*).

IMPROVED ANGLE GIRDERS.—We note your suggestion that the ends of the angle Girders should be cranked in a similar manner to the Curved Strips (part No. 89a and 90a). This is quite a good idea and we will bear it in mind. (*Reply to S. Whenm, London, S.E.*15).

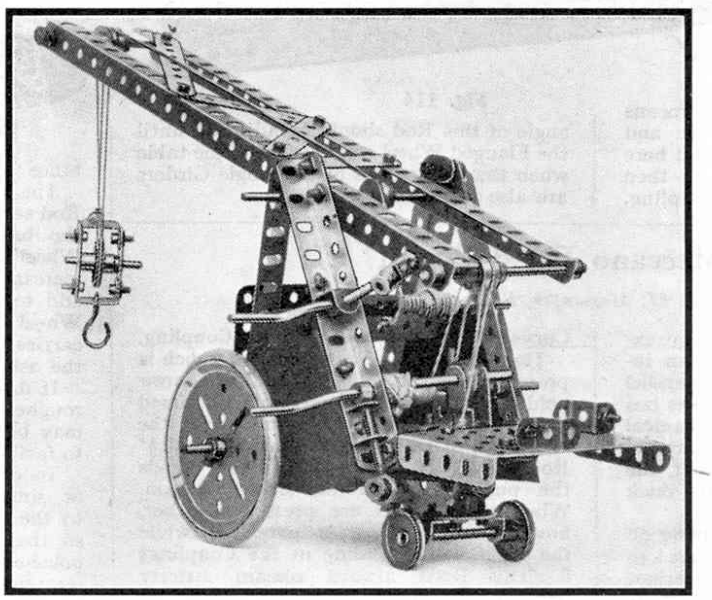
DOUBLE CRANKSHAFT.—We do not consider that a Double Crankshaft is a necessary addition to the Meccano system as where this accessary is required it can easily be built up from existing parts. (*Reply to H. V. Parking, Sultan*).

PETROL TINS.—We are afraid that your suggestion regarding the manufacture of Petrol Tins of such a size that the Meccano 8 amp. accumulator might be fitted into them is impracticable, as the acid from the accumulator would soon corrode the metal casing. (*Reply to B. Skinner, York*).

IMPROVED AXLE ROD.—We note your suggestion that all Meccano Axle Rods should be slightly flattened so that set screws may obtain a firmer grip. True running would, however, be difficult to obtain if this were done and your suggestion cannot therefore be adopted. (*Reply to W. L. Holcroft, East London, S. Africa*).

MOTOR CAR HEAD-LIGHTS.—We are afraid that Meccano motor head lamps would be of too ornamental a nature to warrant their introduction to the Meccano system. We are sure that ingenious Meccano boys will be able to construct head lamps of their own from existing parts. The Meccano bulb holder and electric bulb should prove useful in this respect. (*Reply to E. Gray, Southall*).

A PRIZE-WINNING MOBILE CRANE



The model mobile crane illustrated above gained a prize for E. H. Richards, aged 9 years, in Section B of the "November" Competition, the results of which appear on another page. As can be seen from the illustration the model is particularly well designed and constructed, and well deserves the prize allocated to it

NEW JOURNAL PIECE.—The addition of a boss to the Double Bent Strip (part No. 45) so as to give more bearing surface is, we consider, unnecessary as the Strip gives ample support by itself. Moreover, the utility of this part would be impaired by this addition. (*Reply to C. E. Bosch, Delft, Holland*).

TINS OF ENAMEL.—We hope to be able to supply in the near future, small tins of enamel (red and green) so that nickelled outfits can be converted to the New Meccano. A further announcement on this subject will appear later. (*Reply to P. Scott, Chipping Norton; J. Hedley, Birmingham; A. Godfrey Eldorel, Kenya Colony, and others*).

MECCANO DRILL.—Your suggestion that a twist drill of a suitable size to fit the Meccano coupling should be made, is quite interesting. At the same time we would remind our readers that a 5/32″ diameter twist drill will fit the Meccano Coupling, and can be obtained quite cheaply. (*Reply to D. Game, Rolle, Switzerland*).

LONGER COUPLINGS.—There does not appear to be any great demand for a longer coupling. Any alteration to the existing one would materially affect the adaptability of this part. (*Reply to Edward Jones, Buckhurst Hill*).

RIGHT ANGLE STRIPS.—Your suggestion re a right angle Strip similar to the architrave (part No. 108) but without the framework, is quite interesting. We do not see however that it offers any great advantage over part No. 108 and we cannot therefore consi ler its manufacture. (*Reply to A. W. Godder, Canterbury*).

CAST FLANGED WHEELS.—We are afraid that we cannot consider your suggestion regarding the casting of the flanged Wheels in one piece, as the change of method would result in an increase in cost. (*Reply to J. G. Munro, Aberdeen*).

1″ STRIPS.—We are afraid that little use could be found for a 1″ perforated Strip, as the flat bracket (part No. 10) can be used in every case where your suggested part is required. (*Reply to A. Feutrell, Erith, Kent*).

PETROL TANKS.—As these accessories would be purely ornamental and would serve no useful purpose their manufacture is, we fear, out of the question. (*Reply to Sydney Swanson, Burnley*).

SLOTTED STRIPS.—We agree that a Strip having a slot instead of perforations would be extremely useful in the construction of certain models. Such a Strip, however, would be very weak mechanically and for this reason could only be manufactured in short lengths. Nevertheless, we will keep your idea before us. (*Reply to J. Quich, Letchworth*).

EYE PIECE WITH BOSS.—In reply to your query we are pleased to say that the Eye Piece fitted with boss (part No. 50a) is now available. (*Reply to G. Baillie, Glasgow*).

TYRES FOR 6″ PULLEY WHEELS.—We are afraid that tyres to fit 6″ Pulley Wheels could not be introduced into the Meccano system as little use could be found for such articles. (*Reply to E. N. Nineham, Swansea*).

RUBBER WASHERS.—We do not consider that the addition of rubber washers to the Meccano system is necessary as for all general purposes the existing fibre washers are quite efficient and, unless damp, insulate perfectly. (*Reply to Colin Lomas, Sheffield, and H. V. Parkin, Sutton, Surrey*).

GROOVED RODS.—We note your suggestion regarding the cutting of a groove in Meccano Rods. As you remark an equivalent of keyed rods would be obtained by screwing the set-screws of the Pinions and gear wheels into the groove in the Rod. We are afraid however, that the diameter of the existing Meccano Rods is too small to allow such a scheme being carried out. (*Reply to P. Fortescue, Southsea*).

SEMI-CIRCULAR STRIP.—Your suggestion that we should manufacture a Semi-Circular Strip is quite interesting and we will give your idea careful consideration. (*Reply to J. Stevenson, Teddingworth*).

SMALLER FUNNELS.—We do not consider that smaller funnels are a necessary addition to the Meccano system as the Chimney Adaptor (Part No. 164) is specially designed for fitting to locomotives, etc. (*Reply to R. Stevens, Portslade-by-Sea*).

Results of Meccano Model-Building Contests

By Frank Hornby

"November" Competition, Home Sections

A GLANCE at the photographs reproduced on this and the accompanying page will show at once that the entries in the "November" competition reached a very high standard. Moreover, the number of entries creates a fresh record, for the total exceeds by far that of any previous contest. The following is a list of the prize-winners in the Home Sections :—

Section A (Competitors over 14 years of age).

FIRST PRIZE (Cheque to the value of £3-3s.): Eric Campbell, Castledermot, Co. Kildare. SECOND PRIZE (Tie; each competitor will receive a cheque to the value of £2-2s.): J. Wilks, Station Road, Ashford, Kent, and A. Thomas Locke, Shottery, Stratford-on-Avon. THIRD PRIZE (Cheque to the value of £1-1s.): H. T. Bates, Hayes Street, West Bromwich.

SIX PRIZES, each of Meccano products to the value of 10/6: J. C. Pearse, Kingston-on-Thames; W. R. Hastings, Gravelly Hill, Birmingham; R. Mitchell, Keighley, Yorks.; G. N. Keightley, Ipswich; Stanley Brockett, London, S.E.11; C. H. Harrison, Blackpool.

TWELVE PRIZES, each of Meccano products to the value of 5/-: R. Kirkham, Elworth, near Sandbach; E. Ray, Stotfold, Herts.; C. Johnson, Tunbridge Wells; L. Hollyoak, Coventry; C. Randolph Weller, Moseley, Birmingham; R. Coombes, Witney, Oxon; T. A. C. Moorhouse, North Acton, London, W.3; A. C. Rogers, Hawkhurst, Kent; F. Lord, Bacup, Lancs.; P. Woodman, Exeter; C. Hulme, Marple; A. T. Wilkinson, Abercarn.

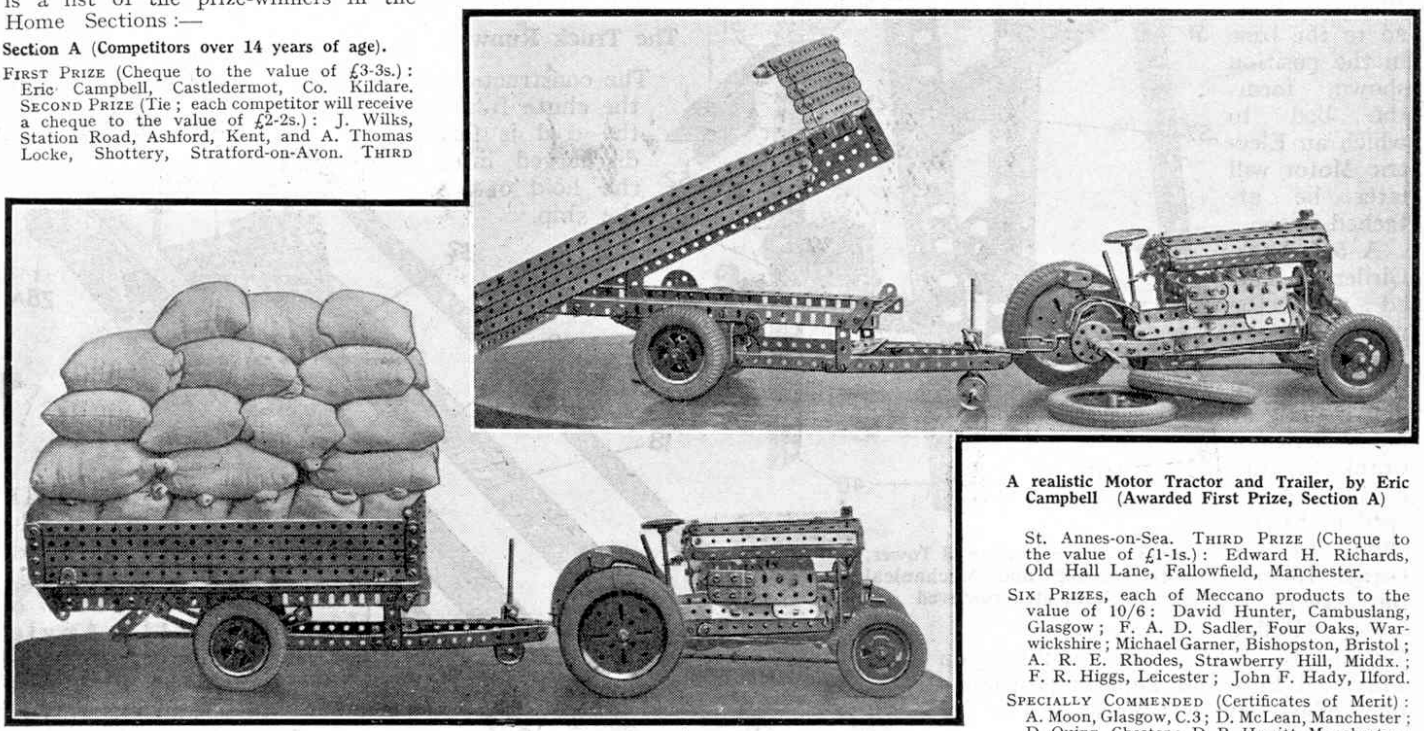
SPECIALLY COMMENDED (Certificate of Merit): Hector Telford, Lower Largo, Fife; S. Budge, St. Sampsons, Guernsey; L. Doughty, Croydon; W. V. Whitbread, London, N.W.10; G. Harcourt, Evesham; W. Purnell, Andover; R. H. Mann, Mytholmroyd, Yorks.; J. Redfern, Salford; W. Green, Burnley; E. Bates, London, S.E.17; F. Bosomworth, Macclesfield; J. B. Holt, Manchester; Alfred Brunner, Upminster; D. P. Plummer, Guernsey; H. A. Davies, Abergele; K. Lister Kilner, Huddersfield; William Great-Rex, Liverpool; Jack Wardle, Burton-on-Trent; P. Lyth, Newcastle.

Section B (Competitors under 14 years of age).

FIRST PRIZE (Cheque to the value of £3-3s.): Alan B. Horn, Thirlmere Road, London, N.10. SECOND PRIZE (Cheque to the value of £2-2s.): Alan Hill, Clarendon Road, St. Annes-on-Sea. THIRD PRIZE (Cheque to the value of £1-1s.): Edward H. Richards, Old Hall Lane, Fallowfield, Manchester.

SIX PRIZES, each of Meccano products to the value of 10/6: David Hunter, Cambuslang, Glasgow; F. A. D. Sadler, Four Oaks, Warwickshire; Michael Garner, Bishopston, Bristol; A. R. E. Rhodes, Strawberry Hill, Middx.; F. R. Higgs, Leicester; John F. Hady, Ilford.

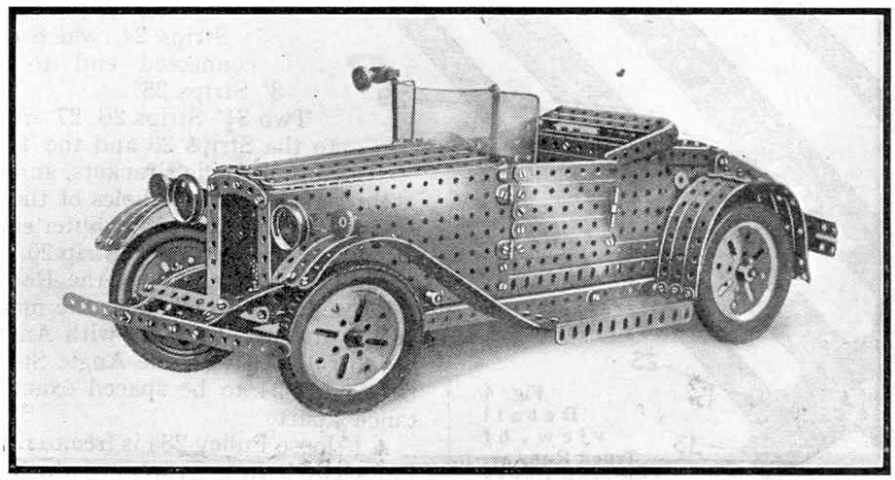
SPECIALLY COMMENDED (Certificates of Merit): A. Moon, Glasgow, C.3; D. McLean, Manchester; D. Quinn, Chester; D. B. Hewitt, Manchester; Ronald S. Comfort, Bury, Lancs.; Arthur Wendt, Barry Dock, S. Wales; B. Hartley, Earby; J. Burdon, Whitby; H. Holden, Chatburn, near Clitheroe; Rex J. Booker, Rustington; R. Viney, Manchester; C. Busby, Sharpenhoe, near Ampthill; Neil Monie, Leigh-on-Sea; L. D. Carter, Corsham, Wilts.; Bernard E. Whitby, Waltham Cross, Herts.; A. E. Matthews, Teddington, Middx.



A realistic Motor Tractor and Trailer, by Eric Campbell (Awarded First Prize, Section A)

The First Prize-winner in Section A, Eric Campbell, submitted a model of a "Fordson" tractor and trailer, two views of which are shown on this page. It is an exceedingly well-made model, and the tractor itself has a very realistic appearance. The engine in the tractor is cleverly represented by Flat Girders, etc., and a radiator fan is fitted at the front. The rear road wheels are duplicated, as can be seen in the upper illustration, in order to obtain a firmer grip on the road.

The trailer is fitted with springs of the semi-elliptic type, and the sides and back



This well proportioned two-seater Motor Car secured Second Prize for J. Wilks in Section A

The New Meccano Ship-Coaler

An Old Favourite in a New Form

A mechanical ship-coaling apparatus forms an ideal subject for Meccano model-building. The model described below incorporates many entirely new features and constitutes a big improvement upon earlier Meccano structures of a similar nature.

FOR a long period the coaling of steamships was carried out entirely by hand labour, and even to-day this is the case in many eastern ports. Coaling by hand cannot be otherwise than a dirty operation, causing intense discomfort to all on board. The late Sir Frederick Treves, in his interesting book "*The Other Side of the Lantern*," gives a graphic description of the miseries of coaling at Port Said. "Clouds of coal-dust envelop the poor vessel," he says, "and penetrate into every part of it. The deck becomes an ash drift. Whatever the hand finds to touch, it finds to be black. Coal-dust becomes the breath of the nostrils, coal-dust settles upon the face, powders the neck, and creeps among the hair. Moreover, in no part of the ship is there any escape from the husky din which accompanies the ritual of coaling."

On this particular occasion the coaling took place at night from great coal-carrying rafts containing gangs of hundreds of coolies. Each raft carries high aloft cressets or iron baskets blazing with fire. "The rafts are made fast to the great vessel, planks are run up to the coal bunkers, and then there begins an unceasing procession of gaunt folk carrying yellow baskets full of coal up one plank and returning with them empty along another. As they pass up and down, their rags dance in the wind, clouds of coal-dust and smoke circle round them, while the light from the cressets flashes fitfully upon the file, making their sweating limbs glow as with a fervent heat. The stream of basket carriers might be coming out from the crater of a volcano, and it is a matter of wonder that they are neither charred nor smothered . . .

"Hour after hour the dry tramp of feet along the plank continues, hour after hour the same hoarse dirge is screamed forth from a hundred creaking throats, hour after hour the spades are at work and the baskets come and go. Then the scuffle of feet ceases, the scrape of the shovels dies away, the fire in the cressets flutters out, the barges are empty, and to the same weird chant they glide away and are lost in the gloom." Such methods are picturesque but unscientific.

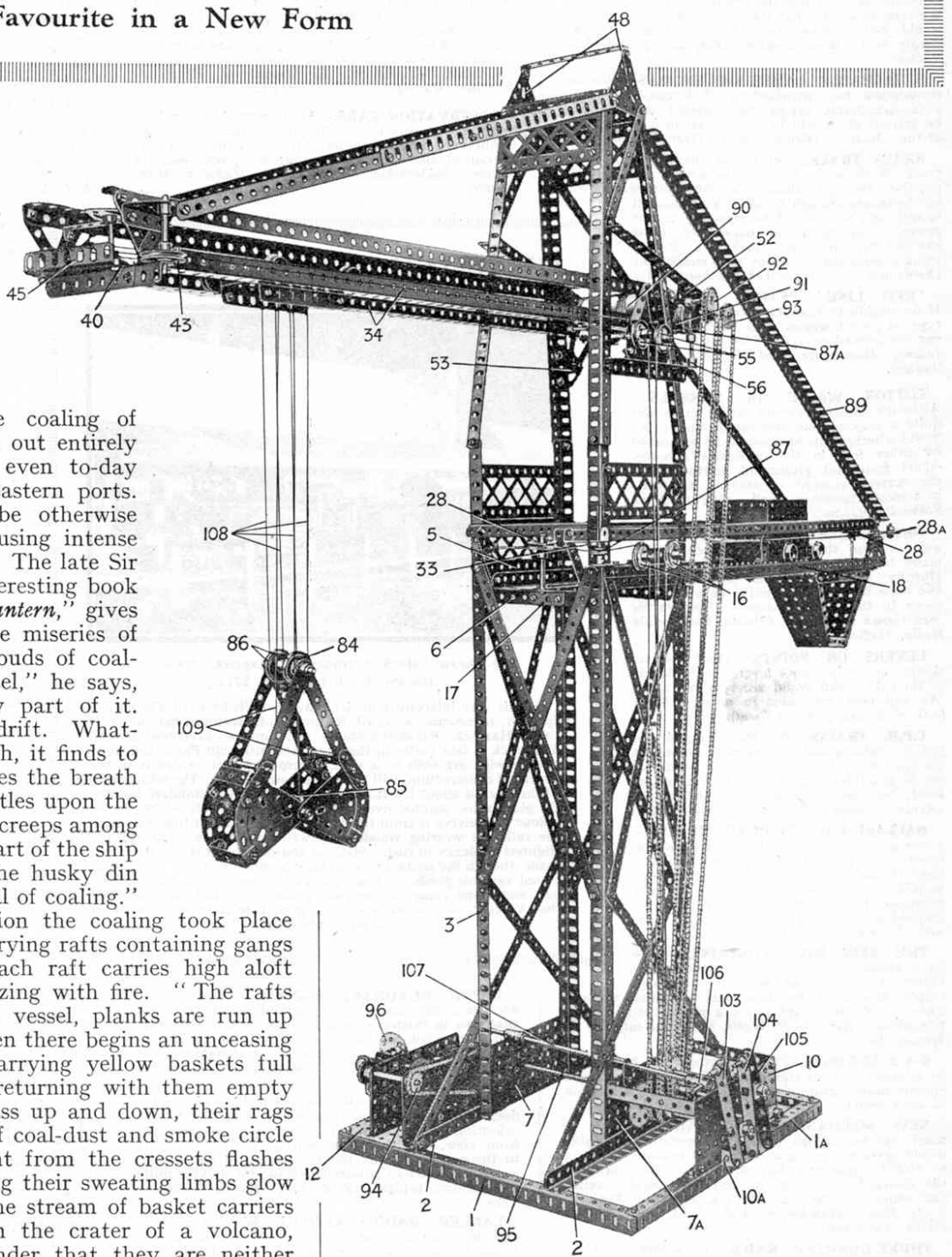


Fig. 1. General view of the Model

Coaling by Machinery

Coaling by hand on these lines is only possible in parts of the world where ample and cheap native labour is available. Elsewhere machinery must be called into play to carry out operations at a sufficient speed, and yet economically. The method employed for transferring the coal from the quayside to the ship's bunkers varies considerably in different ports, according to local

conditions and circumstances. The coaling facilities of the larger ports are naturally on a more elaborate and more interesting scale than those at the smaller ports. At Liverpool, for instance, one well-known firm has a whole fleet of floating coaling machines operated by grab in conjunction with belt conveyor, and also by bucket elevator and chutes. These machines correspond very closely in their working principles to the Meccano model about to be described.

The grab machines do not themselves carry any coal, but are moored alongside the vessel to be coaled, and barges containing the coal are brought alongside the grab machines. The grab is lowered into the barge, from which it takes up in its great steel jaws a mouthful of coal weighing something over a ton. This coal is raised to whatever height may be required and is then released on to a travelling belt conveyor, by which it is carried across the deck of the vessel to the hatchways. In the Meccano model, the automatic discharging truck corresponds to the belt conveyor.

While the coal is on its journey along the conveyor the grab descends again and takes up another load, and so the process goes on, the loading proceeding at the rate of over 100 tons per hour. As soon as one barge is emptied, another one takes its place, so that the loading continues without interruption until the necessary amount of coal has been taken on board.

The machines operated by bucket elevator and chutes differ from the grab machines in that they themselves carry the coal. They are capable of holding from 1,000 to 1,100 tons. The coal is made to fall in regulated quantities through a false bottom on to a travelling chain of buckets, which lift it to the top of the machine and discharge it down chutes directed either over the decks into hatchways, or into side ports. By means of elevator machines coaling can be carried out at the rate of some 300 tons per hour. In addition, the coal can be delivered overall to a height of more than 50 ft., thus ensuring the speedy coaling of a large liner without any necessity for the vessel to move from her loading or discharging berth.

The Meccano High-speed Ship-coaler has been designed specially to illustrate the possibilities of mechanical coaling. It is one of the most interesting of all Meccano models, and if carefully constructed it operates with wonderful precision and in a most realistic manner. The whole of the movements necessary for coaling a miniature ship are controlled from a central gear box situated in the base of the model, and are carried out with perfect accuracy. The model is one that makes a particular appeal to Meccano enthusiasts because, in addition to the enjoyment of building it, it affords endless fun when completed. Moreover, a considerable amount of dexterity is required for its successful manipulation. There are so many movements that the operator has to use his intelligence all the time, and must be quick with his fingers in order to carry out the various stages without a hitch. In other words, it is just as exciting to operate as it is to build—an ideal model for all really enthusiastic Meccano Boys. It is particularly suited for use in loading Hornby Wagons from a miniature coal-dump.

The Main Tower

The construction of the model should be commenced by building the main tower. Fig. 2 shows the tower in detail, with superstructure, gearing, etc., removed. The base of the tower consists of four $12\frac{1}{2}$" Angle Girders 1 bolted in the form of a square and spanned by two similar Girders 2. Four $24\frac{1}{2}$" Angle Girders 3, forming the chief supports of the tower, are braced at the top by the $5\frac{1}{2}$" Angle Girders 6, 6a and the $5\frac{1}{2}$" Braced Girders 4, 5, whilst their lower ends are joined by two $5\frac{1}{2}" \times 2\frac{1}{2}$" Flat Plates 7, 7a. The rigidity of the structure is increased by crossed $12\frac{1}{2}$" Strips 8, 9.

The framework of the gear box is formed by erecting a $5\frac{1}{2}" \times 2\frac{1}{2}$" Flat Plate 10 edgewise on one of the base Girders

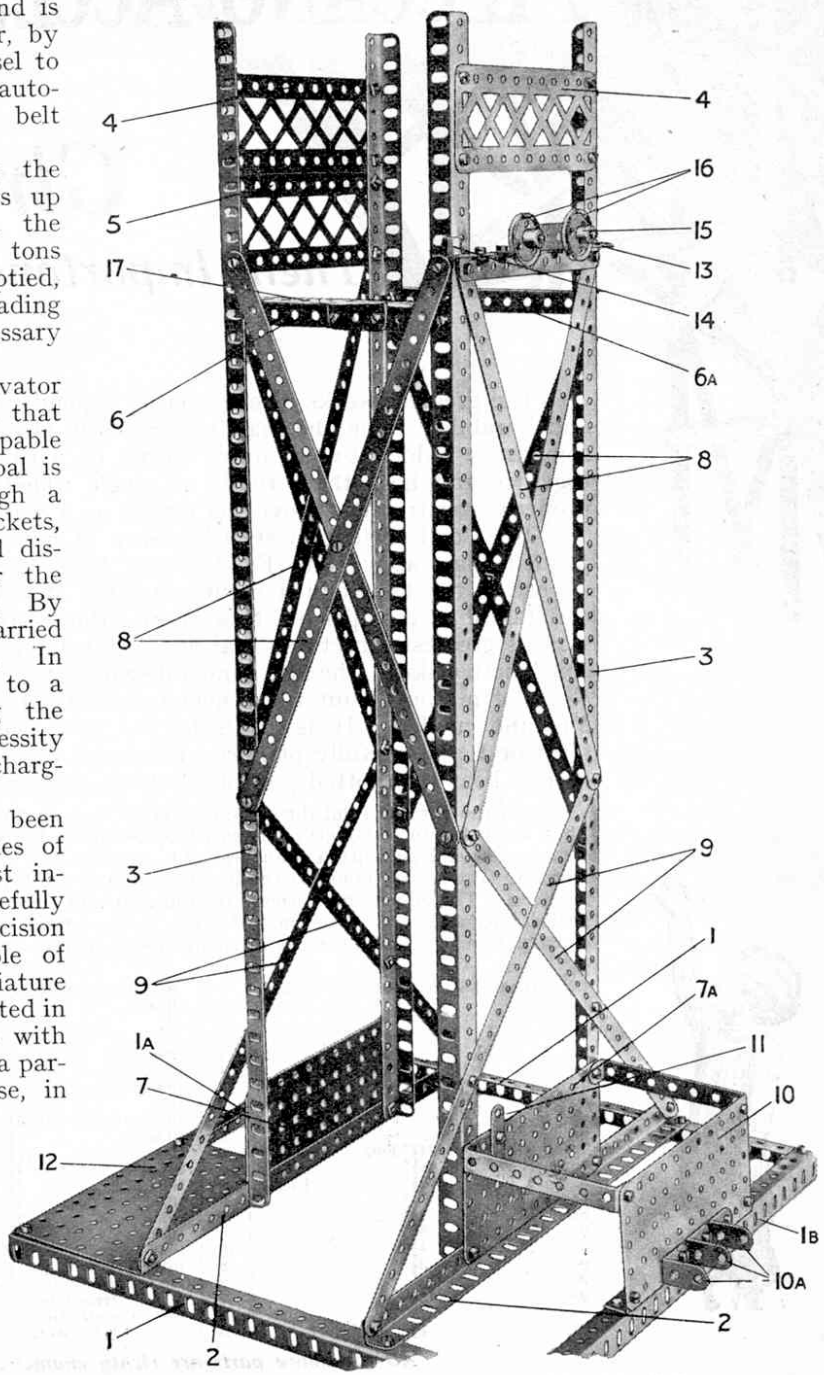


Fig. 2. Detail view of Main Tower

1 and joining it to the Plate 7a by means of two $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips. Three $1'' \times 1''$ Angle Brackets 10a are secured to the outer side of the Plate 10, and a $1\frac{1}{2}''$ Strip 11 is attached in a vertical position to the Plate 7a. A $5\frac{1}{2}'' \times 3\frac{1}{2}''$ Flat Plate 12, bolted to the base in the position shown, forms the bed to which an Electric Motor will later be attached.

A $5\frac{1}{2}''$ Angle Girder 13 bolted near the upper ends of two of the Girders 3, above the gear box, carries a Crank 14, and a 2" Angle Girder 15 secured to the Girder 13 carries two 1" loose Pulley Wheels 16, which are mounted on Threaded Pins and kept in position by Collars and set-screws. The addition of a Trunnion 17 to the Girder 6 completes the construction of the main tower unit. Care should be taken that all parts are situated correctly, as each will have a definite use in the completed model.

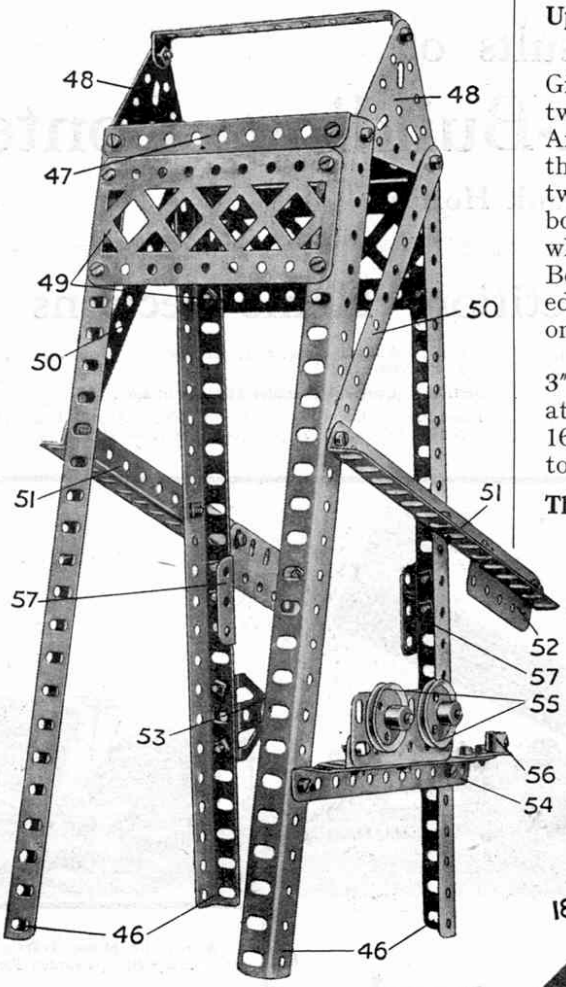


Fig. 3. Upper Portion of Tower, with Gearing and Mechanical Details, etc., removed

Upper Portion of Tower

The upper tower (Fig. 3) is built of four $12\frac{1}{2}''$ Angle Girders 46 surmounted by two $4\frac{1}{2}''$ Angle Girders 47 and two $2\frac{1}{2}''$ Triangular Plates 48 joined by a $4\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip. The wider sides of the tower are strengthened by $4\frac{1}{2}''$ Braced Girders 49, and the narrow sides by two $5\frac{1}{2}''$ Strips 50. To the ends of these Strips 50 are bolted the $7\frac{1}{2}''$ Angle Girders 51, the projecting ends of which slope downward and carry $2\frac{1}{2}''$ Flat Girders 52. Below the Girders 51, two $1\frac{1}{2}''$ Angle Girders 57 are attached to the upright 46 as shown, and further down, on one side only, is a Trunnion 53.

The $5\frac{1}{2}''$ Angle Girder 54 carries a 3" Angle Girder and a 3" Flat Girder, to which the 1" loose Pulleys 55 are attached by Threaded Pins in the same way as the Pulleys 16 (Fig. 2). A Crank 56 is bolted as shown (Fig. 3) to the short projecting end of the Girder 54.

The Truck Runway

The construction of the truck runway, together with the chute from which the coal is finally discharged into the hold of the ship, will be followed from Fig. 4. Two $24\frac{1}{2}''$ Angle Girders 18 separated by $3\frac{1}{2}''$ Strips 19, 20 and a pair of $3\frac{1}{2}''$ Flat Girders 21, are the rails on which the truck (Fig. 6) runs. At the outer ends of the rails are the $2\frac{1}{2}''$ Triangular Plates 22, and at the inner ends are the $2\frac{1}{2}''$ Strips 23. The latter are joined to the Plates 22 by the Strips 24, which consists of $12\frac{1}{2}''$ Strips connected end to end by overlapping 3" Strips 25.

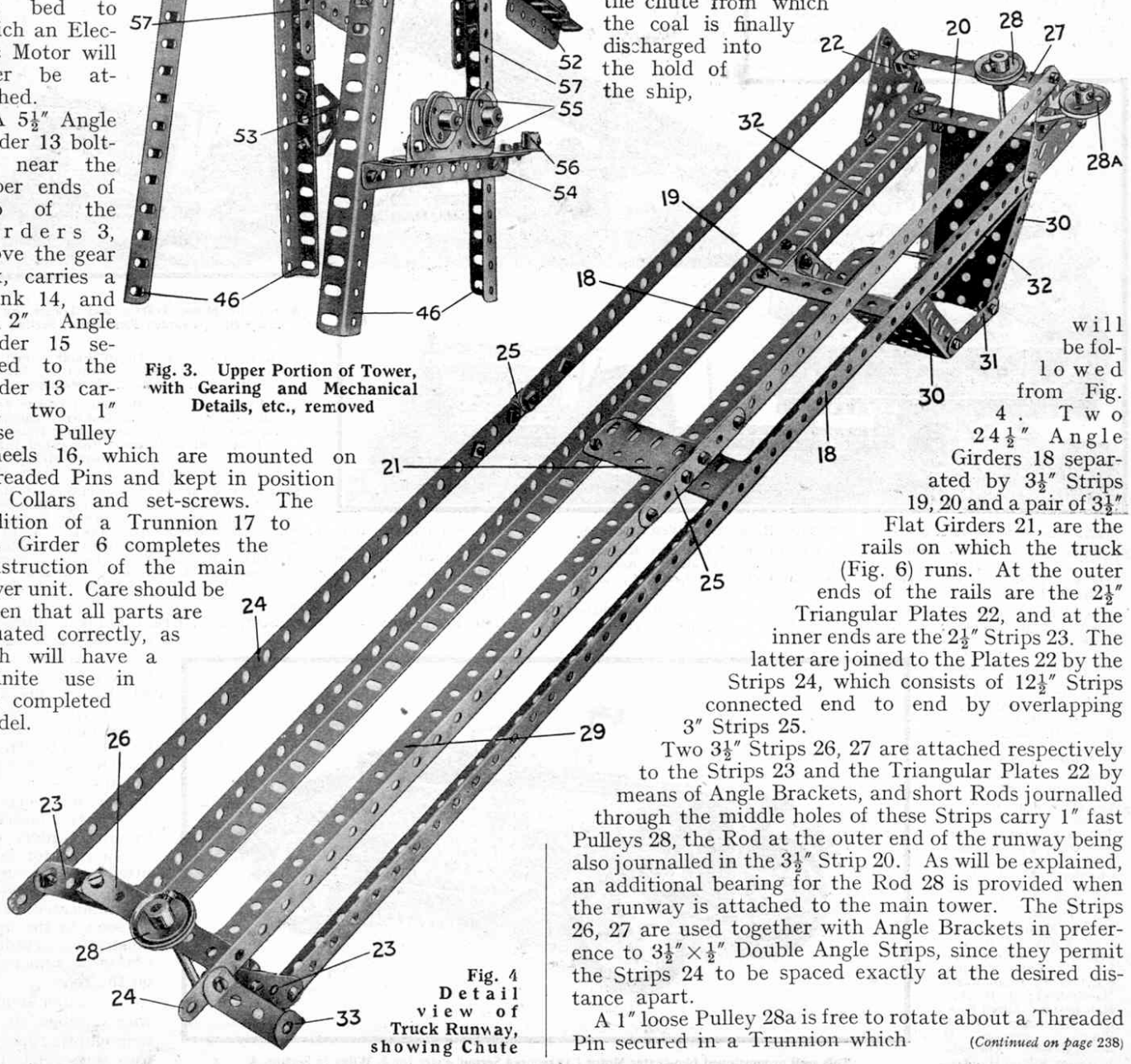


Fig. 4 Detail view of Truck Runway, showing Chute

Two $3\frac{1}{2}''$ Strips 26, 27 are attached respectively to the Strips 23 and the Triangular Plates 22 by means of Angle Brackets, and short Rods journalled through the middle holes of these Strips carry 1" fast Pulleys 28, the Rod at the outer end of the runway being also journalled in the $3\frac{1}{2}''$ Strip 20. As will be explained, an additional bearing for the Rod 28 is provided when the runway is attached to the main tower. The Strips 26, 27 are used together with Angle Brackets in preference to $3\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips, since they permit the Strips 24 to be spaced exactly at the desired distance apart.

A 1" loose Pulley 28a is free to rotate about a Threaded Pin secured in a Trunnion which

(Continued on page 238)

Famous Trains—(*continued from page 217*)

carries the breathless traveller up no less than 2,145 ft. with a maximum gradient of 87.8 per cent., which is rather steeper than 1 in 1¼! It claims, and not without reason, to be the steepest railway in the world, and, like most lines of a steeper inclination than 1 in 2, is worked by a steel cable.

Below Piotta, on our journey, comes some even more striking engineering than that of Gurtnellen and Wassen. From Rodi Fiesso to Faido, as the crow flies, is only 2½ miles, but the difference in level between the two places is 613 ft., and in order to overcome it the railway has circuitously to travel five miles, with a maximum gradient of 1 in 38, threading on the way two tunnels that are completely spiral. Then, as the river rushes down the Biaschina Ravine, and we approach Giornico, just before we enter Piano Tondo Tunnel, we notice a second stretch of the line below us, and a further stretch below that, the latter making its exit from the mountain-side some 300 ft. below our entrance. Here there are two corkscrew tunnels—Piano Tondo and Travi, both just under a mile in length—side by side, in order that the railway may keep pace with the sudden fall in the level of the valley-floor. A downward run of 41 miles from Airolo brings us to Bellinzona, where we have fallen to a level of 760 ft., or just over 3,000 below the level of the St. Gotthard Tunnel. The time is now 11.35 a.m. and the stop lasts but two minutes.

Bellinzona is the junction for the historic town of Locarno, which we see, some miles off, on the shores of Lake Maggiore, as we ascend to the mile-long Monte Ceceri Tunnel that carries us under the watershed separating the Ticino Valley from that of the Lake of Lugano. This has necessitated a fresh ascent of 800 ft. in 8¾ miles, once again on single line, to Rivera (1,560 ft.), after which we drop a corresponding distance, down the fertile Vedeggio Valley, to lovely Lugano, where the station is high above the lake and 1,010 ft. above the sea. The time of the halt here is from 12.7 to 12.10 midday.

Skirting the shore of the lake, by means of tunnels and bold viaducts, we descend to the lakeside at Melide, and then cut clean across the lake by a remarkable causeway to Bissone. Here we are down to 900 ft., but another rise of 280 ft. ensues in the next six miles, ere we can drop to the frontier station at Chiasso, reached at 12.34 p.m.

Within Swiss territory the "*St. Gotthard Pullman*" has now travelled for 198 miles, of which 140 miles have been over the marvellous St. Gotthard route. In the course of this latter distance it has passed through 80 tunnels whose aggregate length is 28½ miles, and over no less than 324 bridges of more than 32 ft. span, many of them viaducts of no inconsiderable size. Small wonder is it that the total cost of the St. Gotthard line was nearly three hundred million francs, which represents about twelve million pounds.

At Chiasso the Swiss Federal authorities hand us over to the care of the Italian State Railways, after the Customs authorities have taken 18 minutes in which to examine our baggage, and a run of 32 miles, through Como, where a 2-minute stop is made, and across the Plain of Lombardy, brings us 63 minutes later to the great city of Milan. It is 1.55 p.m. and our journey of 230 miles, over these terrific gradients, has taken us 6 hrs. 43 min., whereas the very quickest journey possible between Basel and Milan in pre-war days was 8 hrs. 5 min. This shows how remarkable are the advantages derived by the passenger from the electrification.

The "*St. Gotthard Pullman*" has not yet finished its day's work, however. At 4.5 p.m. the same afternoon, it will be starting northward again out of Milan. Six o'clock in the evening will find it at Lugano and 9.15 at Lucerne; while the tired rolling stock, after 460 miles of travelling, will find its way into the great Central Station at Basel at 10.44 p.m. at night, there to disgorge its passengers into the night expresses leaving for all parts of Central and Western Europe.

Clearing the Railways of Snow

Courtesy] [*Southern Railway*

A Scene on the Alton and Winchester Line during the January snowstorms. Workmen are clearing a cutting in which a train was buried

Conquest of the Air—(*continued from page 207*)

one of whom was a lady, who were clinging to a slender screen of osier, for whom every second seemed counted, no one had fear. All tongues were mute, all faces were calm. Nadar held his wife, covering her with his body. Poor woman! Every shock seemed to break her to pieces.

"Jules Godard then tried and accomplished an act of sublime heroism. He clambered up into the netting, the shocks of which were so terrible that three times he fell on my head. At length he reached the cord of the valve, opened it, and the gas having a way of escape the monster ceased to rise, but it still shot along in a horizontal line with prodigious rapidity. There were we squatting down upon the frail osier car. 'Take care!' we cried, when a tree was in the way. We turned from it and the tree was broken; but the balloon was discharging its gas, and if the immense plain we were crossing had yet a few leagues, we were saved. But suddenly a forest appeared on the horizon; we must leap out at whatever risk, for the car would be dashed to pieces at the first collision with those trees. I got down into the car, and raising myself, I know not how, for I suffered from a wound in my knees, I jumped, and made I know not how many revolutions, and fell upon my head. After a minute's dizziness I rose. The car was then far off. . ."

The publicity that Nadar gave to his idea of a huge aerial screw had the effect of leading other inventive aeronauts, who did not wholly accept his views, to endeavour to apply the screw principle to lighter-than-air balloons. Next month we shall deal with these pioneer efforts to construct a practical mechanically propelled airship. (*To be continued*)

The New Meccano Ship-Coaler—

(*Continued from page 253*)

in turn, is bolted to one of the Triangular Plates 22. A Collar with set-screw keeps the Pulley in position. A 1½" × ½" Double Angle Strip 33 is bolted to the second hole at the inner end of one of the Strips 24.

The guide rail 29 consists of two 12½" Strips, one end of each Strip being clamped between two Flat Girders 21; this rail also passes between two 3½" Strips 19, and its end is curved downward to overhang the chute. The latter consists of two Sector Plates 30 joined by 2" Strips 31 and bolted to 5½" Angle Girders 32 on the underside of the rails 18.