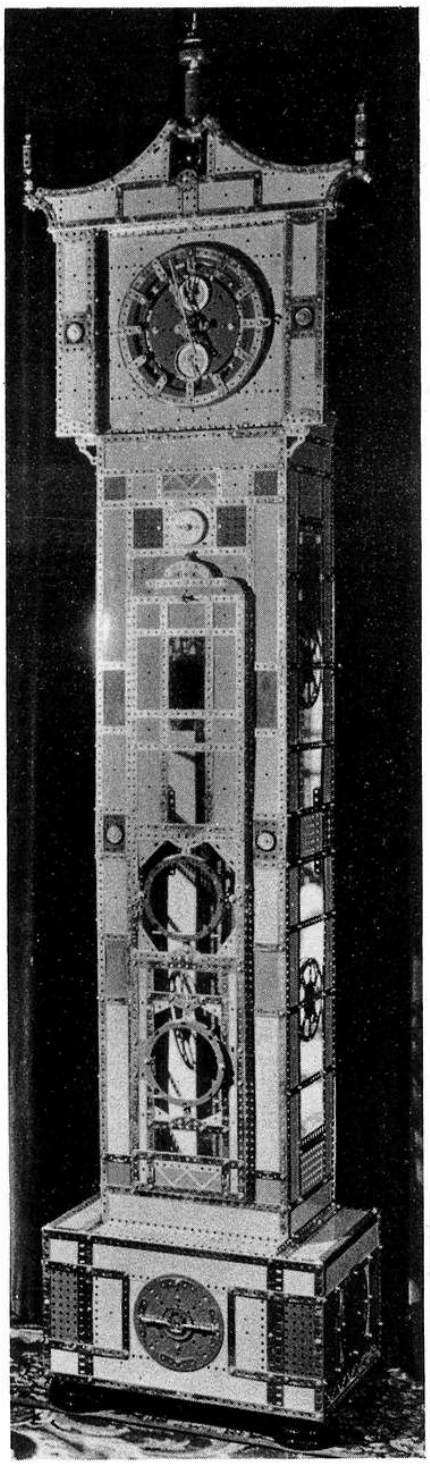
SET 10 MODEL ··· SET 10 MODEL ··· SET 10 MODEL

GRANDFATHER CLOCK



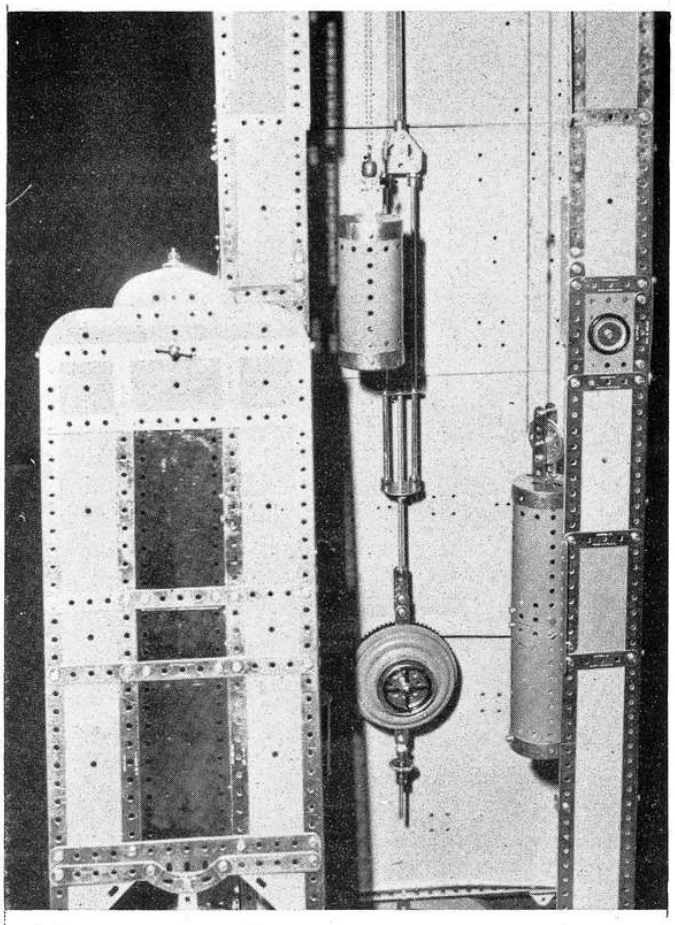
A new giant timepiece built from the entire contents of a No. 10 Meccano Set by B. N. Love

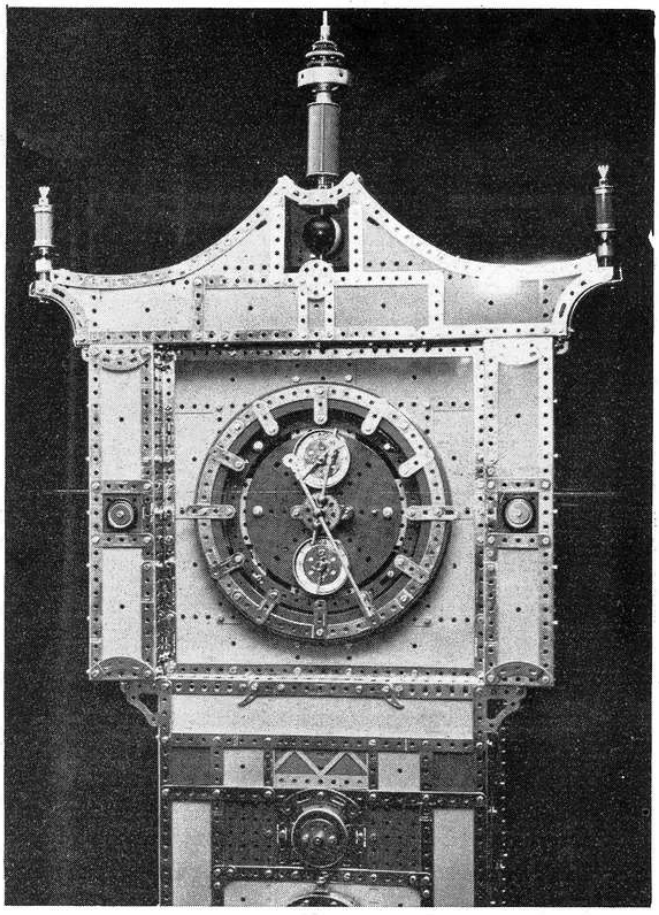
When Bert Love settled down to design and build the outstanding Grandfather Clock pictured here and on page 64, he determined right from the start to limit himself exclusively to a current standard No. 10 Meccano Set. No matter what problems might arise, he had no intention of moving outside of the set; no extra parts were to be used – even Nuts or Bolts – and yet the clock had to be a true working model.

Considering Bert was literally starting from scratch, i.e. he was not following any previously-published plans but was designing afresh, he had set himself a pretty formidable task. A model such as he planned would of necessity have to be a large and complex structure and, despite the size of the No. 10 set, the need for an odd "extra" part was likely to be pressing. In the final event, however, Bert succeeded in his original intention – but he used *every single part* in the set to do it! This must be a record in itself as we at Binns Road doubt if there has ever before been an outfit model published which uses every part in the chosen set. (We would certainly like to hear about it if any reader knows of one).

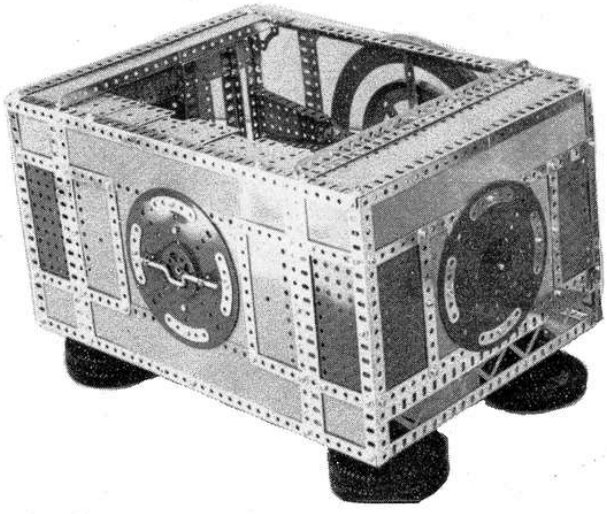
The Clock, itself is a real giant. It stands 7ft. 4in. tall from base to apex, keeps very accurate time and runs for 26 hours on one winding. It includes a fully-maintaining winding drum and, in addition to the normal clock hands, it features extra dials for seconds hand and moon motion. The size and complexity of the Clock, in fact, has caused something of a problem: Mr. Love has supplied us with the accompanying photographs and a full description of his model, but, because so much is involved, we don't have the space to do them both justice!

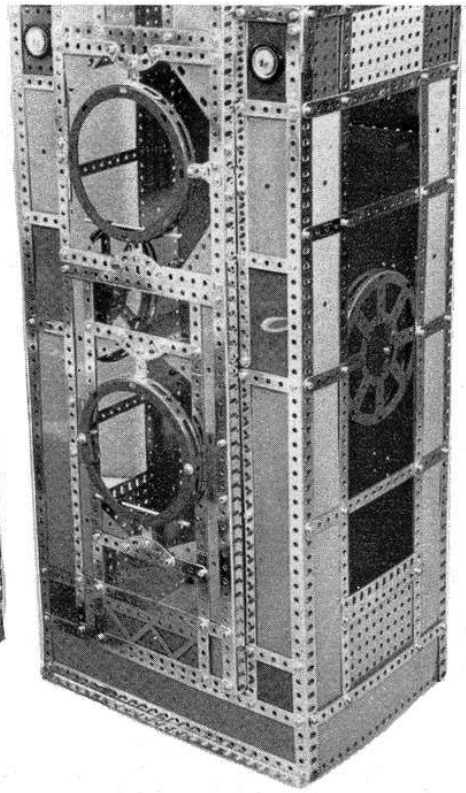
Space in any magazine is limited – and in our's more than most (although, as you may have noticed, we have been able to include an extra four pages in this issue). To have printed the full description would have required considerably more space then we have available, even if the photographs were reduced to postage stamp size, and so we have been forced to compromise. Reproduced here, therefore, are the photographs, but the constructional description has been printed separately for those readers interested in building the model. We will be pleased to supply copies of the description upon request. Send a stamped (3½p. U.K., two International Reply Coupons overseas) self-addressed envelope to: Meccano Magazine Quarterly, P.O. Box No. 4, Binns Road, Liverpool, L13 1DA.



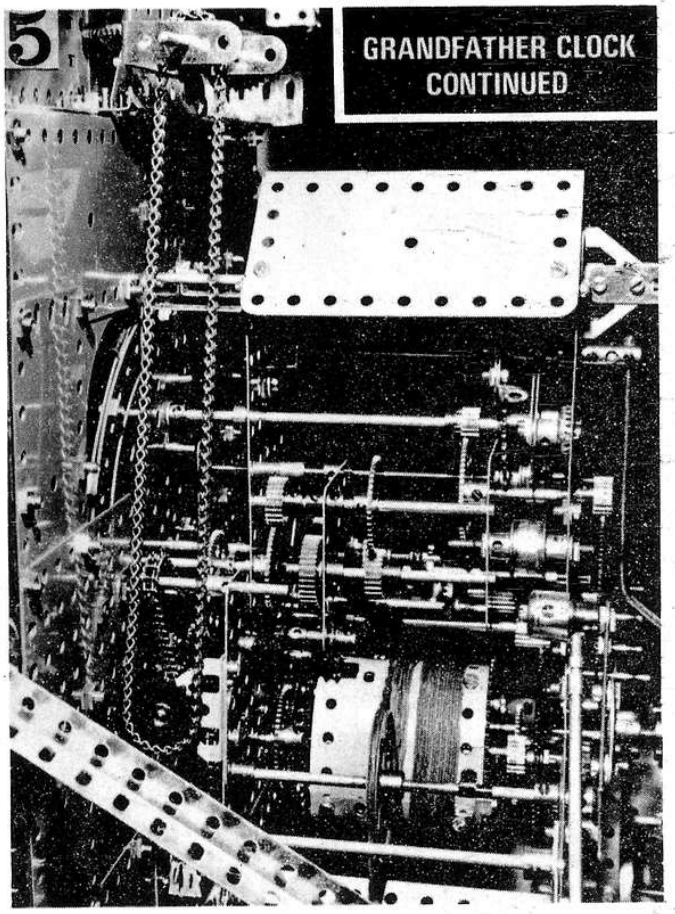


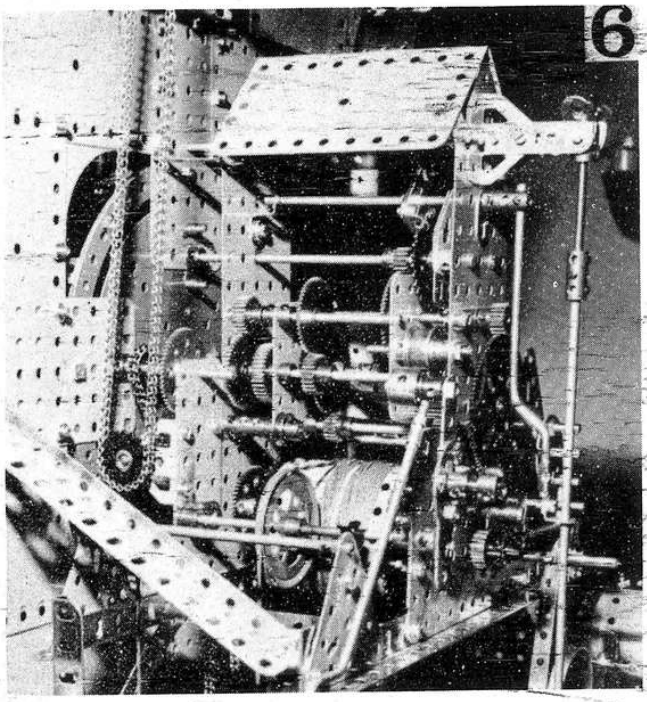
Opposite page: Fig. 1. General view of the No. 10 Set Grandfather Clock. The model stands 7ft. 4in. tall and runs for 26 hours on one winding. Above: Fig. 3. Front panel removed from clock-case to show pendulum and main driving weight. The pendulum has coarse and fine length adjustment. Fig. 4. View of ornamental top showing main and auxiliary dials with moon movement above. Upper small dial shows 24 hour motion. Right: Fig. 2. The clock base unit with lower end of the main clock-case showing general construction. Blue Plastic Plates are combined with yellow Flexible and Strip Plates for symmetrical and contrasting design.

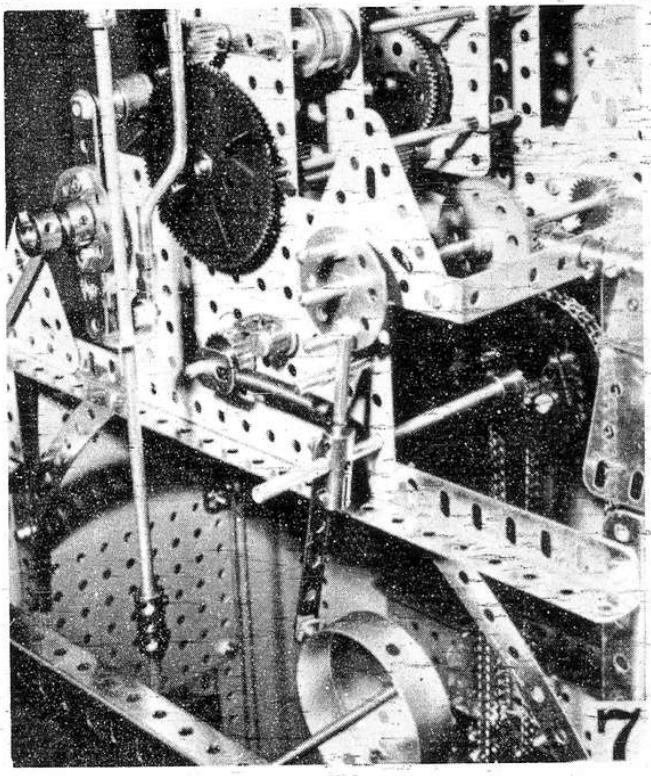


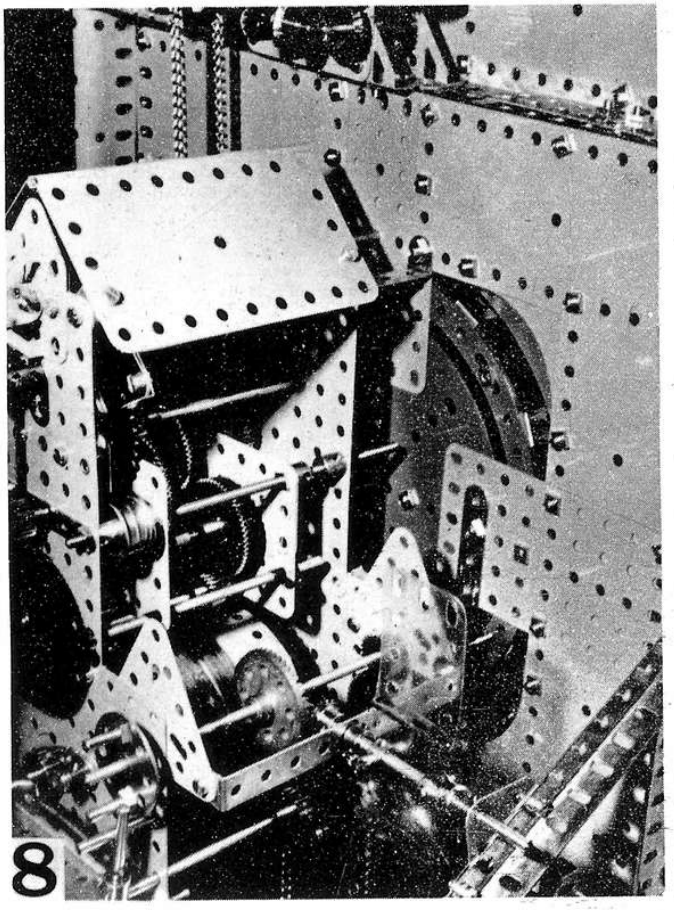


A full description of this model has been written by Mr. Bert Love (pictured on opposite page), but shortage of space prevents us from printing it here. The description has therefore been printed separately and a copy may be obtained direct from our editorial office at Binns Road.









Four more detail views of the Meccano Grandfather Clock by B. N. Love. Fig. 5. Side view of main clock motion showing simple displacement of driving cord by 2" Pulley to put fall of weight clear of the pendulum. Note two strands of Cord twisted together for strength. Fig. 6. Rear view of clock plates showing pendulum crotch, suspension by Flexible Coupling Unit and winding crank in stowed position to the left of the 2½" reduction Gear Wheel. Fig. 7. Chain drive and ratchet wheel strike mechanism for single bell strike on the hour and half-hour. Fig. 8. Bevel drive to air-brake checking speed of simple strike shaft. Note chain and bevel drive above to moon motion.

MECCANO Magazine

Supplement to the October 1973 issue

GRANDFATHER CLOCK

by B.N. Love

A Meccano No.10 Set Model

This building description is intended for use in conjunction with the photographs of the Grandfather Clock appearing in the October 1973 issue of Meccano Magazine Quarterly.

IT IS nearly twenty years since a Supermodel Leaflet was published for a No. 10 Set Model and over forty years since the original "New" Meccano Grandfather Clock appeared on the scene, so it is with very great pleasure that I present this fine model. Its origin lies in the self-imposed challenge of building a reliable long-case clock of attractive appearance using nothing but the contents of a No. 10 Set, yet exploiting as many parts in the outfit as could reasonably be employed in the model. No additional Nuts and Bolts were to be used and, to all intents and purposes, the clock was to be of a "Robinson Crusoe" nature where the builder had no other tools, equipment or spares other than a new No. 10 Set.

One of the greatest difficulties in the original design was to allocate the limited number of parts to the various clock sections which are as follows: (1) base unit, (2) trunk or main clock-case, (3) ornamental clock top, (4) various dials and hands, (5) epicyclic maintaining winding drum, (6) main clock motion, (7) escape and pendulum and (8) chain-driven and half-hour strike. An immediate choice for the eight 24½" Angle Girders was that of forming the four compound uprights of the corners of the clock-case giving a little over four feet in height to this section. Next in line were the eight 18½" Angle Girders, four of which were allocated for the base unit and four for the removable front panel of the clock-case, essential for pendulum bob and other adjustments. These were the easy choices, but, with a very limited number of 9½" and 7½" Angle Girders – only six of each – allocations became quite a poser. Taking the plunge, all six 9½" Girders were designated for the base unit, a general description of which now follows:

BASE UNIT

Fig. 1 shows the general form of the base which has a framework of Angle Girders, 18½" wide, 9½" deep and 12½" from front to back, four of each size Girder being required. Additional bracing is supplied on the top of the base unit by two more 12½" Girders set-in six holes from each side to support and form the base anchorage for the main clock-case above, while a further two 12½" Girders run across from front to back inside the base unit at the bottom, immediately below the upper pair just mentioned. Four 9½" Flat Girders are also in the No. 10 Set and these are used at the front and rear of the base unit to give vertical support and to act as anchoring points for the Flexible Plate covers.

With some twenty 12½" Strip Plates and thirty 5½" x 2½" Flexible Plates in the Set, temptation was to fill in the base unit all round, but the game of robbing Peter to pay Paul featured extensively throughout the design and construction of the clock and strict economy became the most limiting factor. However, only six 12½" Strip Plates and four 5½" Flexible Plates could be spared for covering, but, by pressing two Flanged Plates, three 6" Circular Plates and four 5½" Blue Plastic Plates into service, most of the front and sides of the base were reasonably clad and, by using the two 12½" Braced Girders and a few Flexible Triangular Plates, the remaining 'holes' were largely plugged.

At the rear of the base unit, Sector Plates and a large Flanged Ring support the framework, even the 6" Pulley adding its weight in the centre of the Flanged Ring. The two remaining 9½" Girders give additional vertical bracing inside the base, being bolted to the flanges of the inside 12½" Girders and running up to the top pair of similar Girders at the trunk base where they are secured to the slotted flanges of these Girders by the sturdy 3½" x 1½" Double Angle Strips employed as rather large Angle Brackets. Four 2½" Angle Girders, each carrying one Double Bent Strip, are bolted under the base at each corner, five holes in, to form bearings for 3½" Rods which carry the clock feet.

One might ask, "How are 3" Pulleys and Motor Tyres used in a Grandfather Clock?". And the answer is "By letting them serve as wide support feet!". This is exactly what is done here, four of the six Tyres and Pulleys serving at the front and one more at the two rear corners. To balance height and to give good clearance of the base unit above carpet level, each of the Rods mentioned is padded out below the 2½" support Angle Girders by 1½" Pulleys with Tyres; while extra 2½" Pulleys are added to the rear feet to make up the necessary height for level-standing of the base unit.

CLOCK-CASE

The trunk section of the clock-case is made from 24½" Angle Girders, Strips of various lengths and a variety of Flexible and Flat Plates. Compound Girders for the front edges are made by joining pairs of 24½" Angle Girders by means of a pair of 3½" Flanged Plates set at right angles, their flanges just lapping each other top and bottom. A gap of one hole is left between the Girder ends which is then overlaid with a 2½" Strip. Rear corners of the clock-case are again 24½" compound girders, but this time they are supported at their join by a 5½" x 2½" Flanged Plate which offers rigidity to an otherwise weak joint. Fig. 3 shows the clock-case opened up so that the plating can be seen.

Fourteen 12½" Strip Plates remain in the outfit and these are used at the upper and lower ends of all four compound girders, but two of them are reserved to act as horizontal panels to the top and bottom front of the clock-case. This gives a 12½" width to the case, the front-to-back dimension being 9½". All Girders of this length having been used up in the base unit, the four 9½" Strip Plates are used horizontally on each side of

the clock-case for top and bottom panels and two of the six 9½" Strips are used halfway up the sides as fore and aft spacers.

Of the 12½" Strips available in the No. 10 Set, two are used for the base unit – one on each side to hold the side plating – two are used for vertical overlays on the front panel and two are used as spacers/overlays on the 12½" Strip Plates forming the top and bottom of the front of the main clock-case. This leaves eighteen 12½" Strips which are soon swallowed up as vertical overlays to the Flexible Plates covering the front and rear corners of the clock-case.

Horizontal spacing of the case sides is maintained by compound strips formed from a pair of 2½" Strips joined by a 5½" Strip. These are fixed at regular intervals up the case side. Blue Plastic Plates are interlaced over the front vertical Flexible Plates to augment covering facilities and to produce a pleasing contrast in a symmetrical design. Liberal horizontal overlay by 2½" Strips features extensively, but, all the time, consideration is given to making one Bolt and Nut secure as many items as possible as economy here is vital. Transparent Plastic Plates form central 'windows' in the detachable front.

FRONT PANEL

This is made from pairs of 18½" Angle Girders at each side which are joined by 2" Angle Girders with no gap and then overlaid at the middle of the join with 1" Triangular Plates. These in turn hold ½" Angle Brackets to support the central 5½" Circular Girder to give correct spacing of the middle of the panel. One 7½" Angle Girder is used to space and brace the panel at its bottom edge and its outer fixing Bolts trap Reversed Angle Brackets inside which clip over the open edge of the clock-case front to keep the bottom edge of the panel in place. At the top, the panel is braced by two 7½" Strips, five holes apart, the upper Strip carrying a 5½" x 1½" Flexible Plate and two Semi-circular Plates. Two more Semi-circular Plates are mounted above and the general curved form obtained is edged with Formed Slotted Strips bolted to the side Angle Girders and attached to the top 5½" Strip by Double Brackets.

Flexible Plates, 5½" x 2½" and 2½" x 2½", are used for the front plating at the top end of the panel. These are overlaid by compound strips made from 5½", 3½" and 2½" Strips. Panel bracing above and below the central Circular Girder is by two 7½" Flat Girders overlaid with 3" Strips and fitted with 2½" Stepped Curved Strips with 1" x ½" Angle Brackets to hold the top and bottom holes of the Circular Girder. Similar construction is used in the lower section of the panel, but Flexible Plates 1½" wide are used and are overlaid by a pair of 12½" Strips. Five holes below the top centre, a 1½" Rod is fitted with a Handrail Coupling and passed through the centre of the upper 7½" Strip where it is fitted with a Compression Spring and then a Pawl with Boss, boss inwards, to act as a turn-catch for securing the panel to the upper edge of the case opening. Triangular Flexible Plates add ornamentation to the two Circular Girders, as shown, and the bottom of the panel has a 5½" Braced Girder backed by a 5½" x 1½" Blue Plastic Plate. Transparent Plastic Plates are fitted down the centre of the top section of the panel and two more across the lower portion above and below the second Circular Girder. This lower Circular Girder frames the pendulum bob nicely and gives a pleasing visual effect as the pendulum swings.

ORNAMENTAL TOP AND DIALS

Built as a single unit, the clock top is made from Girders and Plates and can be clearly seen in Fig. 4. Economy in the use of Angle Girders makes it necessary to do a fair amount of joining-up in this area as eight 12½" Girders have been used on the base unit, two on the main clock-case and two more are required for supporting the clock motion and weights. This leaves only four available for the clock dial framework. However, a compound 12½" girder is made from the remaining two 12½" Flat Girders (two having been used at the sides of the base) and four 5½" Girders to make up two units immediately to the left and right of the clock dial. Two standard 12½" Girders are joined with the compound pair above and below the dial to form the edges of a square which is filled in with Flexible Plates. Each side of the square supports a 4½" x 2½" Flat Plate behind the Flexible Plates and mounted centrally on the 12½" Girder units, giving rigidity and anchoring points for the 6" Circular Plate forming the main dial centre. The second large Flanged Ring forms the numeral background while the numerals themselves, which are 1½" Strips, are bolted to Double Brackets at their inside ends, the Double Brackets being sandwiched between the pair of 7½" Circular Strips bolted to the four Flat Plates mentioned. By this arrangement it is possible to slide the numerals into the correct 12 divisions of the dial. Positions at 12, 3, 6 and 9 o'clock are bolted directly to the Flat Plates by long Bolts passing through the Flanged Rings and held in place by lock-nuts. This type of construction gives a recessed design to the clock dial centre allowing the hands to be positioned nicely against the numeral positions.

Wing panels are provided for the ornamental top by using the last two 12½" Angle Girders on the outside edges and two more 12½" units, compounded from one 3½" and two 4½" Angle Girders, on the inside. These are spaced by the last four 2½" Angle Girders, overlaid with 2½" Stepped Curved Strips top and bottom, panel filling being provided by a pair of 5½" x 2½" Flexible Plates with the two 2½" x 1½" Flanged Plates contained in the No. 10 Set. Each of these Plates carries a 1" loose Pulley with Rubber Ring and ¾" Washer as ornamentation. Further compound girders extend over the top of the dial frame to secure the wing panels at their top ends. A pair of 5½" and one 7½" Angle Girder make up this compound length and they are attached to the dial frame at the top by the remaining two 7½" Flat Girders which lie on top of the 12½" standard Girder and the 18½" compound girder.

Ornamentation at the top of the clock is carried out in what Flexible Plates and Triangular Plates remain. These are overlaid with four 5½" Curved Strips at the very top and are fitted with a roof of 5½" x 1½" Flexible Plates supported at the rear by four more 5½" Curved Strips. Formed Slotted Strips, in threes, give the finishing curvature at the extreme sides of the ornamental top and these are held in place by 1½" Angle Girders attached at each side of the clock to the wing panels by the two available Corner Angle Brackets, one left-hand and one right-hand.

Three finnials complete the decoration above the ornamental top, being made from Sleeve Pieces and small Flanged Wheels at left and right and from a 3" Cylinder, Boiler End, etc., in the centre top. This is held in place by a 6" Screwed Rod passing through two large Flanged Wheels at either end of the 3" Cylinder and is capped with spare Gear Wheels and a Screwed Rod Adaptor at the peak. All of the 2½" x 2½" 'U' Section Curved Plates are used as a scroll edge to the wing panels mentioned. These need deft fingers, or preferably a pair of long-nosed tweezers for putting the Bolts and Nuts in place. (Robinson Crusoe would have to use a twig, split at one end!).

Observant readers will have noticed a ping-pong ball at the top of the clock doing duty as the moon on the moon-motion Axle Rod. This obviously floated ashore as a natural buoyant piece of flotsam! Purists may use one of the six or eight-holed Wheel Discs, used elsewhere on the clock as pure ornamentation, in place of the ping-pong ball. If used thus, the Wheel Disc should be attached to the moon shaft by a Bolt through its centre into a Collar-robbed, of course, from some other part of the clock where a Spring Clip is substituted?

Hour and minute hands are made from Axle Rods. A 6" Rod, fitted with a Rod and Strip Connector, forms the minute hand and is carried by a Handrail Coupling on a 5" Rod running through the loose 57-teeth Gear Wheel and into the main clock movement. A 3" Rod forms one part of the hour hand and is carried in a Handrail Support, fixed in one hole of the Gear Wheel. A second Handrail Support holds a 1" stub axle in the opposite hole to form the tail of the hour hand and this permits the Handrail Coupling holding the minute hand to recess neatly through this gap in the hour hand. The seconds hand shaft protrudes through a 6-hole Wheel Disc which traps a Wheel Flange in place by two Pivot Bolts secured by Cord Anchoring Springs at the rear of the dials. A Collar on the end of the shaft holds a 1" Screwed Rod and a counter-balancing ¾" Bolt. Construction of the small 24-hour dial below is similar.

EPICYCLIC MAINTAINING WINDING DRUM

Figs. 5 and 6 give general views of the motion from the right-hand side of the clock. Front and back plates are identical and are made by bolting two 5½" x 2½" Flat Plates centrally on the top row of holes in two 5½" x 3½" Flat Plates. These latter Plates are carried lengthways by two 12½" Angle Girders spaced by a pair of 4½" Double Angle Brackets at each end of the Plates at the bottom, the same Bolts also holding four 5½" Curved Strips, forming arch supports, to the Angle Girders. Four 5½" Angle Girders are bolted to the ends of the 12½" Angle Girders and then to the clock case side by their slotted holes. The four 5½" Curved Strips are then bolted to the bottom ends of the 5½" Angle Girders. Fig. 5 shows a pair of 2½" Triangular Plates mounted on the pair of 12½" Girders. These carry a 5" Rod in Cranks to make a Pulley bar for extending the weight run if required.

A maintaining winding drum is the heart of the clock and is made from two 3" Sprocket Wheels joined by three 2½" Double Angle Strips and one 2½" Rod, these four last-mentioned items being located at 90° in the outside ring of holes in the Sprocket Wheels. Four curved 2½" x 2½" Flexible Plates are bolted to the Double Angle Strips to form overlapping sections of a smooth winding drum, the final joint being made by passing Bolts through the last lapped pair of Plates and into a pair of Collars underneath the Plates, held on the 2½" Axle Rod. One of these Bolts is 3/8" long and is locked in place with a Nut to leave a short projection to which the twisted-up Meccano Cord is attached for the weight drive.

Choosing the straightest 6" Rod in the outfit, this is fitted with a 1" Sprocket Wheel at one end and passed through the clock plates three holes up and in the centre of the 5½" x 3½" Flat Plates, the winding drum being slipped on in the process for a trial spin. This must be as free running as possible – any binding at any stage of the clock motion will prevent the clock working. The Nuts and Bolts should be adjusted round the drum as necessary for smooth rotation. Now the winding drum is fitted with two 3" Rods, 180° apart, through two of the remaining outside ring of holes in the Sprocket Wheels. Each Rod carries a 19t Pinion at one end and a 57t Gear Wheel at the other. A loose 57t Gear Wheel is then bolted centrally to a 3½" Gear Wheel by two Pivot Bolts and this is tested separately for free spin without binding. The whole drum may now be assembled for a trial wind.

The 6" Rod should be checked again for straightness and the 1" Sprocket Wheel fixed to the front end, boss to rear. The Rod is then inserted through the clock plate from the front and fitted with a 19t Pinion (boss to front) with double Grub Screws, followed by a ½" Plastic Pulley as a spacing washer. The Drum, with the two 57t Gears facing to the front (their own bosses to rear) is worked onto the Rod, pushing the Rod right through the drum. The 3½" Gear, which will be the main driving Wheel for the clock, must have its 57t Gear attached to it by the Pivot Bolts mentioned, but a Collar is placed on each Pivot Bolt to space the two Gear Wheels apart. The boss of the 57t Gear faces front and that of the 3½" Gear to the rear. This latter component is placed on to the 6" Rod last thing before thrusting the Rod through the back plate of the clock where it is fitted with a Ratchet Wheel. No set screws are used on the bolted pair of Gears just mentioned and they must be free on the winding shaft. The drum should now revolve freely round its shaft, all fixed Gears meshing and running in planetary motion.

The winding train is completed by locating a 2½" Rod eighteen holes below the 6" Rod, in the front of the clock-case (see Fig. 4), carried in a 3½" Strip at the front, bolted to two vertical 3½" Flat Girders as shown and supported behind the panel by two Girder Brackets carrying two 3½" Double Angle Strips reinforced by a 3½" Flat Girder. This gives a sturdy rear bearing for the key shaft which is fitted at the rear with a second 1" Sprocket Wheel and at the front with a Collar secured by a short Grub Screw and a Set Screw. This engages with the slot of a Socket Coupling bolted to a Bush Wheel and a pair of 3½" Strips which form the winding key. This can be seen in Fig. 5. where it is stowed in a Slide Piece at the back of the clock for easy access. The key has a handle made from a Worm Gear covered by a Chimney Adaptor, both mounted on a long Bolt and lock-nutted to the two 3½" Perforated Strips. A dummy cover for the key shaft is made from a 6-hole Bush Wheel fixed by long Bolts to a Wheel Flange which give enough friction grip to hold the cover in place without further Nuts, simply by pushing the plate over the end of the key shaft and allowing the long shanks of the Bolts to pass through the horizontal 3½" Strip. Some 38" of Sprocket Chain then completes the winding mechanism. The epicyclic design maintains the clock motion during a full rewind.

MAIN CLOCK MOTION

Fig. 7 gives a clear view of the escape train from the "Great Wheel" (3½" Gear Wheel) upwards. One 2½" x 2½" Flat Plate is fixed by long Bolts with Coupling and Collar spacing to the front clock plate at the level shown in Figs. 5 to 8 and a second plate is attached by 2" Screwed Rods to the back plate with paired ¾" Flanged Wheels as spacers – see the same Figs. A 4½" Rod is mounted immediately above the Great Wheel and carries a ½" face, 19t Pinion at the inside rear and a normal 19t Pinion further along the Rod which passes through the middle bottom hole of the front 2½" Plate. The rear 19t Pinion meshes with the Great Wheel, while the other meshes with a loose 57t Gear Wheel on the minute hand shaft.

Continuing up the rear of the

clock, a 2" Rod carries a ¾" face, 19t Pinion (to give a necessary reversal of motion for the seconds hand) and a 2½" Gear Wheel at the rear of the clock. Another 2" shaft directly above carries a 19t Pinion outside and a 60t Gear Wheel inside the clock as is shown in Fig. 7. Selecting the best remaining 6" Rod, this becomes the seconds hand shaft and is pushed through from the front of the clock dial. The larger half of a Dog Clutch is fitted with a 1" Screwed Rod and a counter-weighting ½" Bolt in its opposite screwed holes to form the seconds hand which is firmly attached to the extreme end of the 6" Rod. This then passes through the front clock plate and into a rear bearing made from two Flat Trunnions and a 1½" Flat Girder mounted on two ¾" Bolts spaced by ¾" Contrate Gears – See Figs. 6 & 7. A Collar and a ½" Plastic Pulley, serving as a thrust washer, and a second Collar behind the front clock plate hold the 6" Rod in lateral position and a 15t Pinion completes the seconds hand shaft.

At this stage a moderate weight should be tried just to get the escape train running to make absolutely sure that there is no binding anywhere. The upper 6" Rod is critical and the rear Trunnion bearing must be adjusted carefully to make sure that there is absolutely no drag on this shaft. It pays to spend time on this.

The escape anchor is made from two 1½" Corner Brackets sandwiching ½" Angle Brackets to form pallets, while the short slot in the paired Corner Brackets matches with the slot in a Double Arm Crank for vertical adjustment of the escapement. A "spider" from a Universal Coupling forms a finger nut for on-the-spot adjustment at the top of the anchor. A Rod carries the escape anchor and is journalled through the rear clock plate and into a Reversed Angle Bracket on the front clock plate – see Fig. 5. An inside Collar and an outside Coupling keeps the escape shaft in place while the Coupling holds a 5" Crank Handle fitted with a Rod and Strip Connector and ½" Angle Bracket to form the pendulum crutch.

The going train of the clock also starts from the Great Wheel with the 19t Pinion and loose 57t Gear Wheel already mentioned. Starting with a Handrail Coupling holding the minute hand on the extreme end of a 5" Rod, this Rod carries first a Washer and then the loose 57t Gear Wheel shown at the front of the clock dial. Another Washer follows and then the Rod goes through a 2½" Strip attached to the main dial with one Nut and Bolt only and then straight through the front clock plate where it receives a 1" Gear Wheel, boss forward, before going through the 2½" Flat Plate. Immediately behind this Plate, the minute hand shaft is fitted with a 1" Pulley with Tyre, boss forward and fixed tightly to the shaft with double Grub Screws. The loose 57t Gear Wheel is pressed against the Tyre by a Compression Spring held in place by the second half of the earlier mentioned Dog Clutch serving as a Collar almost at the inside end of the minute hand shaft. This arrangement allows the hands to be set without undoing Grub Screws, etc.

Drive to the hour hand comes from the 1" Gear Wheel on the minute shaft to a second 1" Gear Wheel to its right, boss forward, on a 3" Rod running to the rear and carrying a Collar and a 25t Pinion. This meshes with a 50t Gear Wheel just above it on a 3½" Rod running between the two 2½" Flat Plates. A second 25t Pinion passes on the drive to a 50t Gear Wheel below it on a 2½" Rod passing through the clock face and fitted outside with a 19t Pinion giving the final drive to the hourhand via the loose 57t Gear Wheel which revolves freely on the minute hand shaft at the front of the clock.

The last-mentioned 2½" Rod also carries a second 19t Pinion just inside the clock to repeat the hour rotation by another 57t Gear Wheel on a 2½" Rod to its right carried in a 3" x 1½" Flat Plate bolted with a Trunnion inside the front lower clock plate. This rotation is then halved by a ¾" Sprocket Wheel driving a 1½" Sprocket Wheel on a 2" Rod acting as the 24-hour movement shaft which is journalled through the front of the clock at the position of the lower dial. Its rear end runs in the front clock plate. The same shaft also carries a Worm for subsequent moon phase drive.

PENDULUM AND WEIGHT

Essentially, the bob weight is a 4" Ball Thrust Race with the Flange section trapping a ring of loose Steel Balls and sandwiching two 4" dia. Circular Plates and a 5½" Strip between itself and the other portions of the Thrust Race at the rear. A 2" Rod, capped by a Steering Wheel, runs through an 8-hole Wheel Disc, then a Wheel Flange, then through all the other parts mentioned and into a 1½" Pulley Wheel at the back which secures the whole lot together. Two 1½" Rods also pass through the top and bottom holes of the Wheel Disc and through the bob to help keep all parts in register and they are prevented from dropping out by internal Spring Clips.

Fine adjustment is by a pair of Bevel Gears on a 3" Screwed Rod held by two Nuts in an End Bearing at the top of the 5½" Strip, a Threaded Boss providing the final adjustment. An 8" Rod is attached to the bob by a Rod and Strip Connector and is backed by double 2" Strips to form a rigid connection. A really firm joint is made by ½" Bolts spaced by Spring Clips, with a final reinforcement by means of a Collar. Coarse adjustment is provided by allowing the 8" Rod to slide between a pair of 11½" Rods connected to a Bush Wheel at the lower end via Rod Sockets and to a pair of Flat Trunnions screwed to a vertical Coupling by means of Small Fork Pieces and spacing Collars at their upper ends. A set screw in the Bush Wheel gives adjustment while a Double Arm Crank prevents rotation of the pendulum bob.

The Coupling sandwiched by the Trunnions takes the shank of a Screwed Rod Adaptor which carries an 11½" Screwed Rod as the next stage of the pendulum. This is connected by a Threaded Coupling to an 8" Rod and a second 8" Rod completes the pendulum, being joined on by a Coupling. Fig. 5 shows the final attachment via a Flexible Coupling Unit to the bored end of a Slotted Coupling held in a firm bracket at the rear of the clock. This is reinforced by a Coupling, between the 2" Strips shown, which carries an 8" Rod horizontally right through to the front of the clock. The driving weight is two Boiler sections bolted together by four 2" Strips. The upper cap, as the lower, is secured by a 2½" Rod passing through Boilers and Ends. A 1½" Pulley, with ½" loose Pulley spacing runs on a 1" Rod between two 2" Strips bolted to a 1" x ½" Double Bracket on the upper cap. Washers are added as weights until the clock runs comfortably. Three strands of Meccano Cord are twisted up to hold the weight and details are shown clearly in Fig. 3.

A second weight is also shown in Fig. 3, but this is an optional device providing a half-hour strike. Details of this, together with the motion for the moon drive, will be covered in a future issue of the MMQ.

PARTS REQUIRED

As this model is built with the entire contents of the Meccano No. 10 Set please refer to the current Contents of Outfits list in the No. 2 Manual.

MOON-DRIVE MECH.

as fitted to Bert Love's No.10 Set Grandfather Clock (Oct.'73 MMQ)

SINCE THE GRANDFATHER Clock was first featured in M.M.Q. No. 3 (writes Mr. Love) some slight alterations to the moon mechanism have been incorporated to give yet another dial to the Clock, although still keeping within the No. 10 Set limitations. In following this description, readers are advised to consult the original article in issue No. 3 as several references to previous illustrations are important.

Referring to Fig. 4 on page 63 of MMQ No. 3, showing the main clock dial, the lower small dial is the 24 hour dial (not the seconds hand dial as was mistakenly indicated in the original article) and it is from this 24 hour dial, which turns on what is known as the "diurnal" shaft, that we take off the moon drive in stages. A 2½" Rod forms the diurnal shaft which runs through to the front clock plate behind the dial and is located so that it does not foul the external gears of the main winding drum revolving behind the clock plate. This diurnal shaft carries a 1½" Sprocket Wheel (which receives a 2:1 step-down motion from an hour shaft via a ¾" Sprocket Wheel) and behind the 1½" Sprocket, a Worm takes up most of the remaining portion of the 2½" Rod.

Now referring to Figs, 5 & 6 on page 64 of MMQ No. 3 we can see the ¾" Sprocket Wheel just mentioned, plus two more Sprocket Wheels which carry the moon drive in its second stage up to the top of the clock. The lower Sprocket Wheel is 1" diameter and has 18 teeth. It is fixed to a 4½" Rod carried in Trunnions at either end of the lower front clock plate. Towards the inner end of this Rod, a ½" Pinion is secured to engage with the Worm on the diurnal shaft. This means that, in 19 days, the 1" Sprocket will revolve once.

As the upper Sprocket Wheel is ¾" diameter and has 14 teeth, it speeds up the motion of the lower Sprocket and is fixed to another 4½" Rod carried in a 2½" x 1½" Double Angle Strip attached to a 3" x 1½" Flat Plate as shown in Fig 1 on this page. Both ends of this Plate are attached to the inside ledge of the ornamental clock top by Trunnions, the middle Trunnion carrying a 5½" Strip running to the top rear of the clock and holding a 5½" x 2½" blue Plastic Plate which forms an excellent curved background 'sky' for the moon globe.

To accommodate the new dial shown in Fig. 2 here, a slight change in gear positioning is required, the two Bevel Gears going inside, while the large Contrate and 50t Gear are mounted outboard as shown in

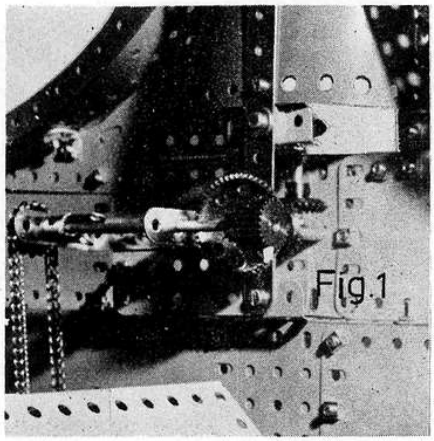


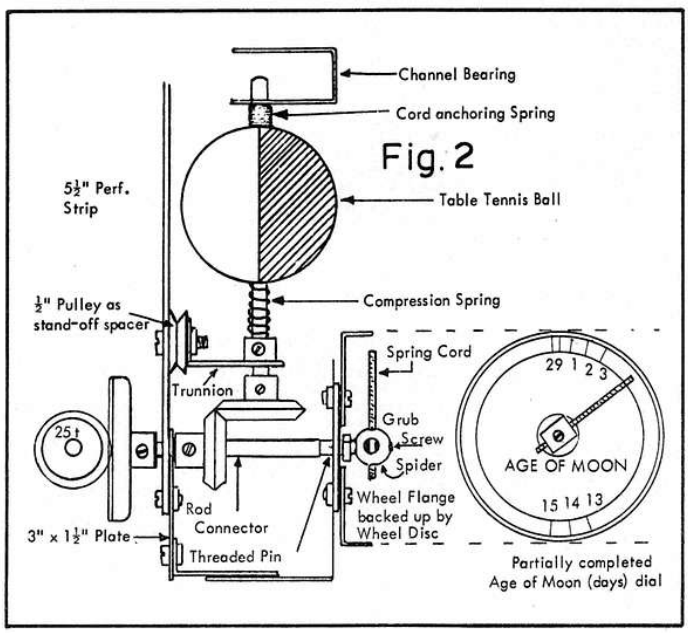
Fig. 1. It is necessary to have the 50t Gear running on the far side of the Contrate as shown to give correct rotional direction to the 'Age of Moon' indicator. The dial requires 29½ divisions.

Fig. 2 should make all of the final stage moon drive clear. Two sections of the Age of Moon shaft are provided, linked with a Rod Connector as shown to give a 'slip' drive to the indicator hand for re-setting the Age of Moon without back-winding the whole clock mechanism. So far, the gear train gives us the following ratio:

$$\frac{\text{Worm}}{19t} \times \frac{18t}{14t} \times \frac{25t}{50t} = 29.555$$

Thus the moon globe will rotate once in 29.555 days which is more accurate than most domestic grandfather clocks with simple moon motion. Credit for the moon train gear used goes to Pat Briggs – well known in Meccano clock-building circles.

Perhaps a word on making the moon globe will be welcome. A standard table tennis ball is used, but this should be pierced with care, using a darning needle to probe for a central axis. If the ball spins eccentrically, correct with a fresh hole at the tip of the needle until rotation is reasonably concentric. Open up the holes with a fine rat-tail file until they are a free-running fit on a Meccano Axle Rod. The Compression Spring shown in Fig. 2 gives a positive grip on the ball, but allows re-setting as required. Indian ink, brushed on with a small sable brush, should be used for shading one half of the table tennis ball. When faced squarely, the ball will present the correct moon phase to the observer. N.B. If any of our friends in the antipodes build this clock they will need to reverse the lower level of Fig. 2 for correct moon phase!



Alterations to moon-drive in No. 10 Set Grandfather Clock to add 'Age of Moon' dial with existing parts in Set. With Age of Moon pointer rotating clockwise, moon phase appearance of half-black table tennis ball is correct for observer in Northern Hemisphere. For Southern Hemisphere observers, lower Bevel Gear would have to be changed over from left to right to reverse moon globe direction.