Meccano Electric Clock

A Realistic Model That Keeps Excellent Time

CLOCKS are among the most popular models with Meccano enthusiasts. The fine Grandfather Clock described in Super Model Leaflet No. 14A is a special favourite, not only on account of its interesting construction, but also because of its excellent timekeeping qualities. Another attractive model is the Mantel Clock No. 7.13, which keeps good time, but has to be wound up every four hours. In this article we describe another Mantel Clock that is not only a much finer model in design, construction, and general appearance, but, being electrically driven, does not require to be wound up at all.

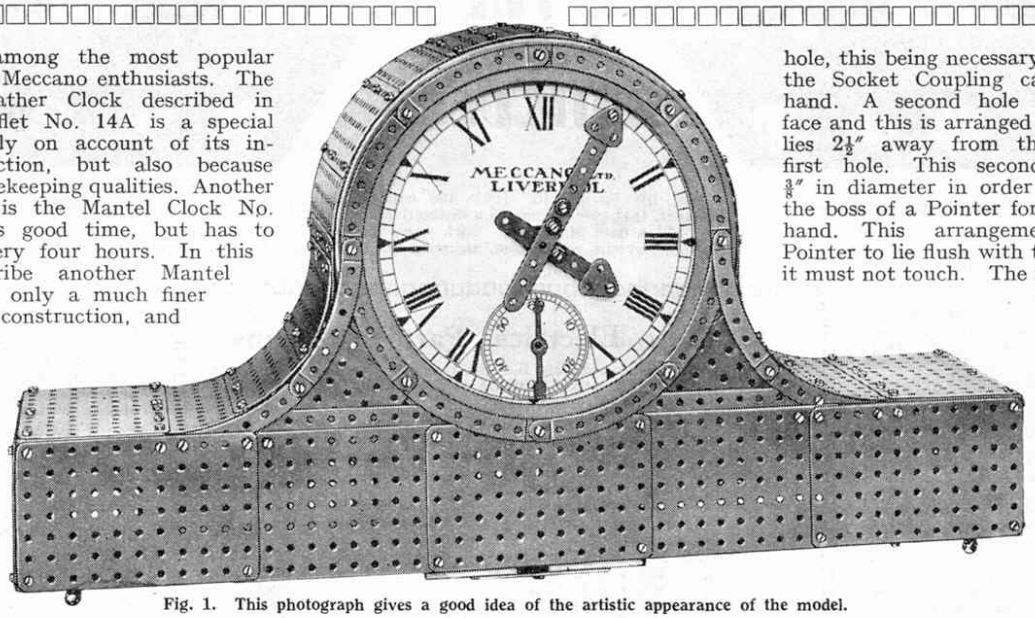

Fig. 1. This photograph gives a good idea of the artistic appearance of the model.

Construction of the Model

The base of the clock should first be constructed. The front and back each consists of a 24½″ Angle Girder, the front one of which carries five 5½″×3½″ Flat Plates and the rear one four similar Plates. The Plates at the rear are arranged as shown in Fig. 2. When the front and rear are complete they are connected together by 5½″×3½″ Flat Plates held in place by means of 3½″ Angle Girders and strengthened with the aid of 5½″ Angle Girders. The structure is made rigid by fitting four 5½″×3½″ Flat Plates, one being placed at each upper and lower end. At this stage the four Handrail Supports, forming the legs may also be fitted, these being shown clearly in Figs. 1 and 2.

The circular portion of the clock consists mainly of two Ring Frames (Part No. 167b), and these are fitted one to the front and one to the rear of the base. One Nut and Bolt is sufficient for the front Ring Frame, for the time being. The other Ring Frame must be secured temporarily in place by filling up the space at the rear of the base by means of a 5½″×3½″ Flat Plate. Each Ring Frame is now fitted with a circle of 4″ Curved Strips as shown in the illustrations, the Curved Strips on the front of the model being held in place by means of ⅜″ Bolts. These Bolts will be used later for securing the clock face in place. Two extra Curved Strips 1 are also fitted to each side of the Ring Frames, and the spaces so formed are filled in by means of 4½″×2½″ Flat Plates 2 and 4 and 2½″×2½″ Flat Plates 3.

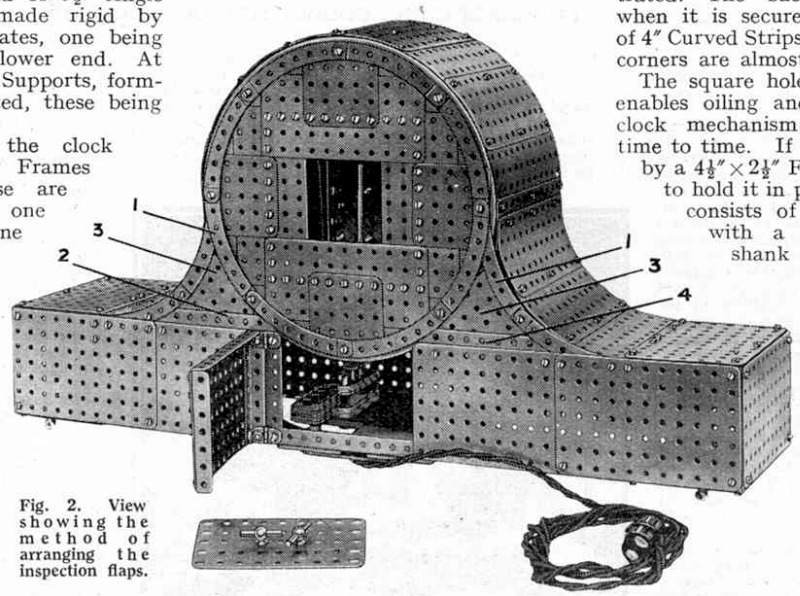

Fig. 2. View showing the method of arranging the inspection flaps.

Before proceeding any further, the clock face and also the back of the case must be fitted, for the securing Nuts and Bolts of these will be very difficult to manipulate at a later stage of the construction. The face consists of a stout piece of white cardboard 9¼″ in diameter, and round the periphery of this are punched eight 11/64″ diameter holes, so arranged that they are coincident with the eight holes in the wide flange of the Ring Frame. The centre of the face is pierced with a ¾″ diameter hole, this being necessary to accommodate the Socket Coupling carrying the hour hand. A second hole is drilled in the face and this is arranged so that its centre lies 2½″ away from the centre of the first hole. This second hole is made ⅜″ in diameter in order to accommodate the boss of a Pointer forming the seconds hand. This arrangement allows the Pointer to lie flush with the face, although it must not touch. The requisite numbers and minute spaces may now be drawn in on the board, a neat arrangement being shown in Fig. 1. The complete face is held in place, as already described, by means of eight ⅜″ Bolts arranged round the wide flange of the Ring Frame.

The back of the clock case is best constructed separately and then bolted in place. Four 5½″×2½″ Flat Plates are first arranged to form a square, each Plate overlapping its neighbour three holes. Fig. 2 makes the arrangement quite clear. Four 2½″×2½″ Flat Plates are then bolted in place as illustrated. The back is now completed and when it is secured in place, with the circle of 4″ Curved Strips round its edge, the unsightly corners are almost completely hidden.

The square hole in the centre of the back enables oiling and slight adjustment of the clock mechanism to be carried out from time to time. If necessary it may be covered by a 4½″×2½″ Flat Plate, fitted with catches to hold it in place. Each of these catches consists of a Handrail Support fitted with a 1″ Rod on the threaded shank of which a 1½″ Strip is locked by means of two Nuts. On turning the Handrail Supports the 1½″ Strips are made to grip behind the edges of the square hole in the back of the clock.

The 5½″×3½″ Flat Plate, mentioned earlier, that was fitted temporarily in order to support the rear Ring Frame, may now be removed and a hinged flap fitted in its place. This flap is built up from a 5½″×3½″ Flat Plate strengthened on three of its edges with suitable Angle Girders. Two Hinges form the connection between the flap and the clock case.

The space between the two Ring Frames may now be filled in. This is accomplished with the aid of 5½″×2½″ Flat Plates curved slightly in order to fit neatly in their allotted places. The plating, which is best started from the top, is not bolted securely in place until all the Plates are in position. By this means the forcing of Bolts into holes is avoided.

The frame is now complete and the construction of the mechanism may next be undertaken. For this, Figs. 4 and 6 will be found useful. Two 18½″ Angle Girders 6, connected together

by means of two $2\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates, form a platform on which the vertical structure, carrying the gear train is built. Each side of this structure consists of two $9\frac{1}{2}''$ Angle Girders 7 supporting two $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flat Plates overlapping each other three holes. The two sides, when complete, are joined together by two $3\frac{1}{2}''$ Strips, these being placed $2\frac{1}{2}''$ from the top of each side member. Four $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Brackets 21 are now bolted in place as shown in Fig. 6, and the purpose of these will be described later. Two $1\frac{1}{2}''$ Strips 24 are also fitted, as illustrated, these being bolted in place on what will be the rear half of the gear train support. The Threaded Pin 29 may also be secured in place at this stage. This is required for keeping one of the wires clear of the mechanism at a later stage of the construction.

The framework is also fitted with extra bearings, and these are built up in the following way. The first bearing consists of a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip that is supported at each end by a Simple Bell Crank, one of which is shown at 8. A third Simple Bell Crank 9 is also fitted, as shown in the illustration, and this carries a 2″ Strip 10 and a $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket 11. The 2″ Strip 10 overlaps its Bell Crank 9 by three holes.

The gear train may now be fitted. A Crank 12, carried on a 3″ Rod in the top centre holes of the framework, is fitted with a Pawl, loosely mounted on a Pivot Bolt. This Pawl engages with a Ratchet Wheel secured on a 3″ Rod together with a 1″ Sprocket Wheel 13 that is connected by a length of Sprocket Chain to a second 1″ Sprocket Wheel. This latter Sprocket is mounted on a Rod together with a $\frac{1}{2}''$ Pinion, and this rotates a 57-teeth Gear Wheel that drives the seconds hand of the clock.

A $\frac{1}{2}''$ Pinion on the same Rod as the 57-teeth Gear Wheel 14 drives a second similar Gear on the 3″ Rod 15, a $\frac{3}{4}''$ Pinion also being carried on this Rod. This latter Pinion is in mesh with a 50-teeth Gear that is mounted on a 3″ Rod, together with a second $\frac{3}{4}''$ Pinion 16. A 50-teeth Gear in mesh with the Pinion 16 rotates, through the medium of a $\frac{1}{2}''$ Pinion, a $2\frac{1}{2}''$ Gear Wheel 17 that is gripped on the $4\frac{1}{2}''$ Rod 18. This Rod forms the shaft on which the minute hand of the clock is fastened, a $\frac{3}{4}''$ Pinion being carried in addition to the large Gear. A 50-teeth Gear and second $\frac{3}{4}''$ Pinion 19 is driven from this latter $\frac{3}{4}''$ Pinion, and the Pinion 19 rotates a second 50-teeth Gear operating two 1″ Gears, the second one of which rotates a $\frac{1}{2}''$ Pinion 22. This $\frac{1}{2}''$ Pinion is in mesh with a 57-teeth Gear Wheel that is free to rotate, together with a Socket Coupling, on the $4\frac{1}{2}''$ Rod 18. The open end of this Socket Coupling will later support the hour hand. It should be noted that the three 2″ Rods, carrying the gearing from the minute hand to the hour hand, are journalled at their inner ends in the bearings supported by the Simple Bell Cranks 8 and 9. This arrangement is necessary because of the $2\frac{1}{2}''$ Gear Wheel 17 covering the required holes in the rear member of the vertical framework.

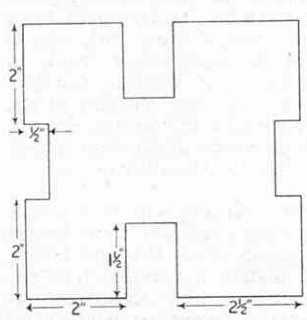

Fig. 3. Scale drawing of the board on which the horse-shoe magnet is mounted.

In order to prevent any mistakes occurring, the following gear ratio should exist between the various points. Between the 1″ Sprocket Wheel 13 and the seconds hand the ratio must be 3 : 1, and from this latter point to the Rod 18 it must be 60 : 1. From the Rod 18 to the Socket Coupling carrying the hour hand a ratio of 12 : 1 must exist.

The switch gear may now be fitted, and this is shown clearly in Fig. 4. The two $1\frac{1}{2}''$ Strips 24 mentioned earlier support a $3\frac{1}{2}''$ Rod in their lower holes. Two $\frac{1}{2}''$ fast Pulleys 26 are carried on this Rod and they may be secured temporarily in place, in the position shown in the illustration. They will be adjusted later when the pendulum is fitted. The Rod supporting these Pulleys also carries a Coupling, in the open end of which is gripped a Silver Tipped Contact Screw, the head having been removed previously. Two Grub Screws must be used for securing the Contact Screw in position.

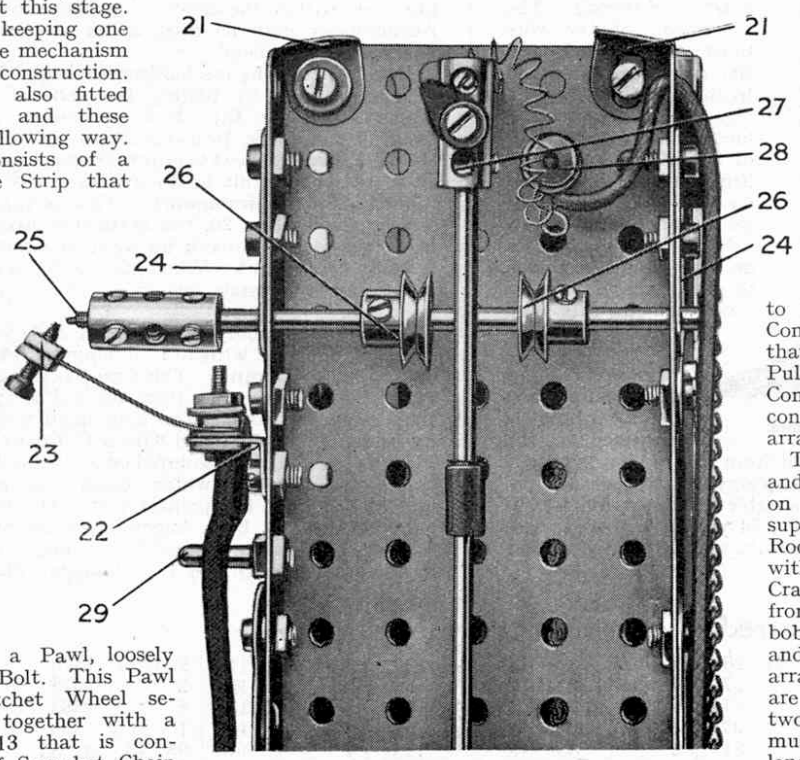

Fig. 4. The "brain" of the clock; view showing the automatic switchgear.

The $\frac{1}{2}'' \times \frac{1}{2}''$ Angle Bracket 22 may now be bolted in place, and this carries a 6 B.A. Bolt insulated by an Insulating Bush and Washer and supporting a Pendulum Connection. The Pendulum Connection has a second hole, drilled in the opposite end to that already having one, to enable a Silver Tipped Contact Screw 23 to be carried, two 6 B.A. Nuts being used to hold this in place. This second Contact Screw must be so arranged that when the Rod carrying the Pulleys 26 slides in its bearings the Contact Screw 25 makes light sliding contact with it. Fig. 4 makes the arrangement quite clear.

The pendulum may now be built and fitted. A Coupling 27, secured on the Rod carrying the Crank 12, supports the upper end of an $11\frac{1}{2}''$ Rod the lower end of which is fitted with a Double Arm Crank 30. This Crank is gripped on the Rod $1\frac{1}{4}''$ from the lower end. The pendulum bob is built up from sixteen $2\frac{1}{2}''$ Strips and fifteen $1\frac{1}{2}''$ Strips They are arranged as illustrated in Fig. 7 and are clamped together by means of two 2″ Threaded Rods, one of which must be cut down to the required length on account of the restricted space inside the clock case. The Threaded Rod 31 carries a Nut that is used for raising or lowering the bob for the purpose of regulating the mechanism. The winding of the bob should be left until the horse-shoe magnet, shown in Fig. 5, is constructed.

The horse-shoe magnet is built up from Flat Girders as follows. Nine $5\frac{1}{2}''$ Flat Girders and eight $3\frac{1}{2}''$ Flat Girders are clamped together by means of $\frac{3}{4}''$ Bolts, so that the long and short Flat Girders are alternate. $2\frac{1}{2}''$ Flat Girders are then placed in each space between the $5\frac{1}{2}''$ Flat Girders, so that they form a square horse-shoe. All necessary securing is carried out with the aid of $\frac{3}{4}''$ Bolts. The spaces remaining between the protruding ends of the $2\frac{1}{2}''$ Flat Girders, may be filled in with $1\frac{1}{2}''$ Flat Girders as shown in Fig. 5.

In order to prevent magnetic leakage between the two poles of the magnet when the clock is working, the horse-shoe is mounted on a thin wooden base cut as shown in Fig. 3 in order that it may be accommodated easily in the model. Two 2″ Threaded Rods 4 and two $\frac{3}{4}''$ Bolts are used for securing the magnet to the board, the board then being clamped to the underside of the clock frame by means of the Strips 5. This arrangement is adopted in order to allow the horse-shoe magnet to be adjusted.

The model is now complete except for the wiring, and great care is necessary at this stage as the success of the model depends upon accurate work.

The bob of the pendulum

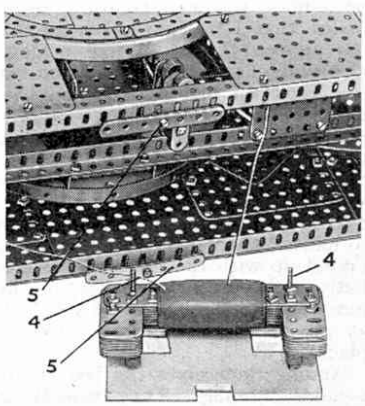

Fig. 5. The method of clamping the board carrying the magnet to the base of the model.

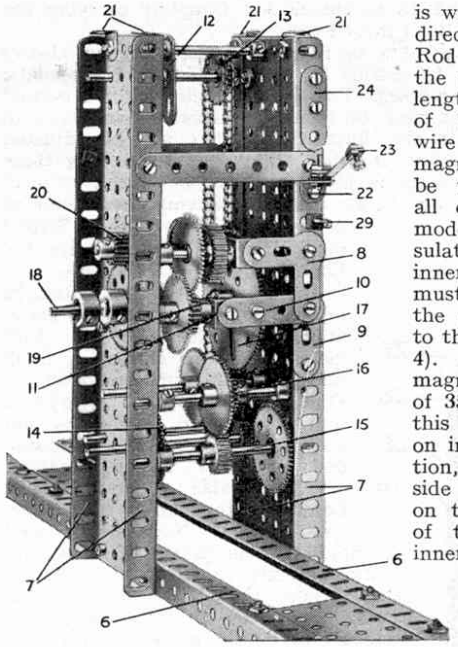

Fig. 6. The simple transmitting mechanism.

is wound in a clockwise direction when the 11½" Rod is held away from the person winding. A length of about 15 yd. of 35 S.W.G. S.C.C. wire is wound on this magnet, and care must be taken here, as in all other parts of the model, to use good insulating materials. The inner end of the wire must be earthed and the outer end attached to the Terminal 28 (Fig. 4). The horse-shoe magnet carries 80 yd. of 35 S.G.W. wire, and this must be wound on in a clockwise direction, when the open side of the magnet is on the right-hand side of the winder. The inner end of this wire is attached to one terminal of the transformer or accumulator, and the outer end is connected to the Terminal 28. The remaining terminal from the source of supply is connected to the insulated screw, carrying the contact 23.

The quantities of wire given are suitable for a current of 20V. If the only obtainable supply is of 6V., 24 yd. of 26 S.W.G. wire are required for the bob of the pendulum and 96 yd. of similar wire for the horse-shoe magnet.

The most suitable means of supplying current to this clock is the Meccano T20M Transformer, which may be incorporated in the base. Other types of Meccano 20V. Transformer also may be employed, but as they are larger, these will have to be placed outside the model. A Meccano T6M Transformer is suitable for the supply of current at 6V., and this may be incorporated in a similar manner to the T20M Transformer. Other Meccano 6V. Transformers may be used but cannot be accommodated within the model. A Meccano 6V. Accumulator may be used as an alternative to the Transformers.

Before fitting the mechanism in place, which is accomplished by bolting the ends of the Girders 6 inside the clock framework and securing the Angle Brackets 21 to the top of the clock case, it is best to adjust the mechanism, as it will be difficult to do so when it is surrounded by the framework. This is carried out by the Pulleys 26, the horse-shoe magnet being rigged up temporarily while adjustment is being carried out. When the mechanism is in position the hands (shown in Fig. 1) may be fitted.

The minute hand consists of a 5½" Strip, fitted at one end with a 1" Triangular Plate, and bolted to a Crank. This Crank is attached to the Strip three inches from the end carrying the Triangular Plate. The hour hand is built up from a 3½" Strip, fitted with a 1" Triangular Plate at one end, and mounted on a Double Arm Crank, the centre of which comes two and a half inches from the pointer end. The overhanging ends of both fingers may be fitted with small weights, formed from short Strips, in order to balance the 1" Triangular Plates.

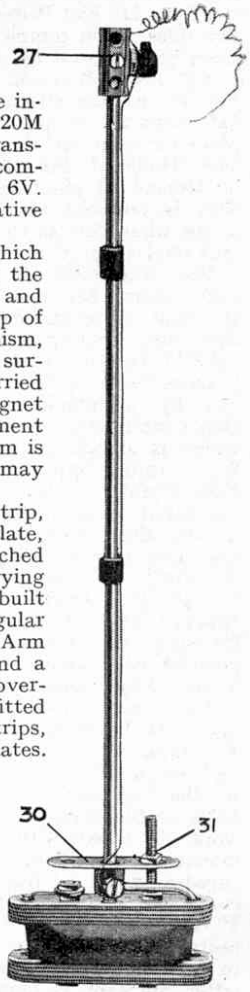

Fig. 7. The clock pendulum, showing how the "bob" is fitted.

The parts required to construct this model are:—

1	of No.	2	8	of No.	12	4	of No.	26	5	of No.	53a	16"	of No.	94	1	of No.	115	2	of No. 1570
7	" "	3	1	" "	13	4	" "	27	9	" "	59	2	" "	96	3	" "	127	2	" " 1575
16	" "	5	1	" "	15a	3	" "	27a	3	" "	62	9	" "	103	6	" "	136	5	" " 1583
1	" "	6	8	" "	16	1	" "	27c	1	" "	62b	8	" "	103d	1	" "	147	1	" " 1563
17	" "	6a	1	" "	16a	2	" "	31	2	" "	63	16	" "	103f	1	" "	148	95	yd. of 35
2	" "	7	1	" "	17	219	" "	37	24	" "	70	17	" "	103h	1	" "	156	S.W.G., S.C.C.	
2	" "	7a	1	" "	18a	40	" "	37a	10	" "	72	10	" "	111	2	" "	167b	Wire.	
4	" "	8a	2	" "	18b	57	" "	38	2	" "	77	2	" "	111a	1	" "	171	Piece of thin	
3	" "	9	2	" "	23a	1	" "	48a	4	" "	81	10	" "	111c	1	" "	172	wood 5½" × 5½"	
10	" "	9b	4	" "	25	16	" "	52a	24	" "	89b	2	" "	114	2	" "	182		

Grey Owl and His Friends—(*Cont. from page 931*)

gather that he seems to be subject to all the simpler emotions of which we as humans claim a monopoly, including to a marked degree those of gratitude and affection. And this is not mere "cupboard love" either, as with most domestic animals, as witness the case of the yearling beaver that I liberated from a trap and nursed his injured foot for nearly two weeks. Although he never before set eyes on a man, the poor creature, seeming to realise that I had saved his life, followed me around the camp like a dog, slept alongside of me at night, and on being set free took up his residence on the pond and is here yet, following my canoe up and down the lake and on occasion climbing into it. He shows his affection for me at times by climbing on to my knees and squeezing from his coat a pint or so of cold muddy water, mumbling contentedly to himself the while. A tame beaver that mated up with the newcomer will contest hotly with him for my attention, hustling him out into the lake if he should be first at my feet, and returning to take his place."

Among themselves the beaver are very sociable animals. They usually live in streams where, in order to render the water sufficiently deep, they build dams of mud and from the stems and boughs felled by their powerful jaws. In the neighbourhood of the dam they construct their lodges, which are roomy chambers, usually with two entrances from beneath the water. The mud that is used to cement the twigs together is plastered down by the front feet, and not, as sometimes supposed, by the tail, which is employed solely as a rudder.

In places that have been long frequented by beaver who have been left undisturbed, such as near Grey Owl's domain, their dams have become by frequent repairing a solid bank capable of resisting a great force of both ice and water. The materials used by the beaver in building the dams include driftwood, green willows, birch, poplars, and mud and stone. The stone and mud are mixed in such a manner as to contribute greatly to the strength of the dam. No particular engineering methods have ever been observed, however.

In building their houses the beaver use great care. These are formed of the same materials as the dam, and are constructed to house about eight to twelve animals. Some of the larger houses are built with partitions, forming apartments that have no communication with each other except under water. Beaver work very hard, are swift in their action, and always travel by water if able to do so.

In his effort to arouse public interest in the beaver Grey Owl discovered an unsuspected talent for writing. Already his articles, not only on the beaver, but on wild life in general, have been widely read, and his work is eagerly sought by magazines and journals. His work has awakened the interest of the Federal Government, and with his co-operation the Department of the Interior have been able to secure one of the most interesting moving pictures of beaver ever taken. These films depict the beaver at work in his natural surroundings, pictures his natural curiosity, and even show him eating out of hand. Recognising the value of his great knowledge of the wild, the Canadian Government have engaged the services of Grey Owl, who is now employed in conservation work in the National Parks in Western Canada.

We are indebted to the courtesy of the Canadian Department of the Interior for the information upon which this article is based and also for the illustrations.

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Readers who have enjoyed this article will be interested in a splendid contribution to our next issue, in which Mr. Jack Miner, the famous Canadian naturalist, tells the story of his great bird sanctuary at Kingsville, Ontario, the success of which has led to the provision by the Canadian Government of many similar bird sanctuaries.