NATIONAL SCHOOL
SAILING ASSOCIATION

NIGHT TIME

Curriculum Development Paper No 9

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NIGHT TIME

A "Nocturnal Dial" is not difficult to make and has the great advantage that it is almost as portable as a pocket watch. Understanding why it works may be more troublesome; thinking is always a painful business.

The principle is simple enough: stars travel across the sky like the sun; those near the pole never get close enough to the horizon to set; they just go round and round like a wheel with the pole star motionless at the centre. Since the stars above the pole travel from East to West like the sun, the "wheel" will seem to turn "against the clock". Fig. 1 shows a part of the northern sky early in December at about 6 in the evening. Fig. 2 shows the same bit of sky a couple of hours later. Though the positions of the stars will be different, the motion is the same throughout the year and can be checked on any clear night . If you know where to start, the "pointers" of the Great Bear can be used as the hour hand of an enormous 24 hour clock.

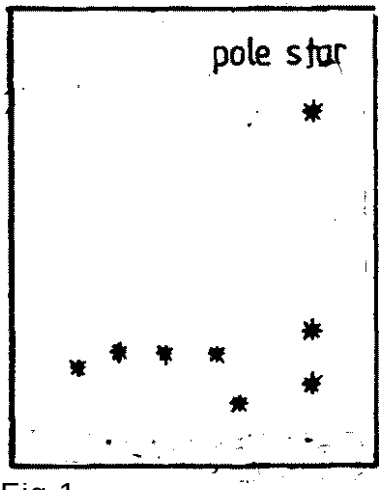


Fig 1

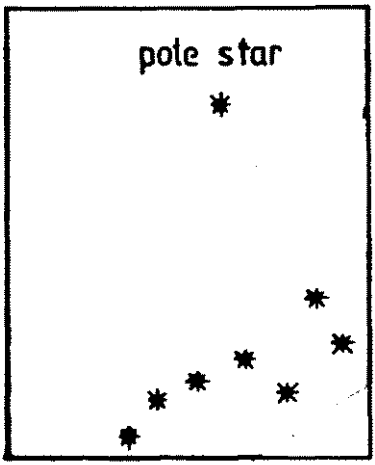


Fig 2

The trouble is that in the ordinary way we tell time by the sun. Because the Earth moves round the sun once every year, sun time and star time get out of phase with each other. In Fig. 3, when the-Earth is at A and the sun says "12 noon", the star would be overhead at midnight. By the time the Earth had got round to B the sun would still be saying "midday" when the star said "6 in the evening". Three months later, when the Earth is at C the star would be in line with the sun and both would say "Midday". At D, the star would be overhead at 6 am, when the sun said "Noon"; at A again all would be as it started. During the course of the year, however, star time will have gained a whole day on the sun. A star or "sidereal" day is ' about 4 minutes shorter than a sun or "solar" day . Obviously allowances must be made for this and each day's star clock must start at a different place according to the time of year.

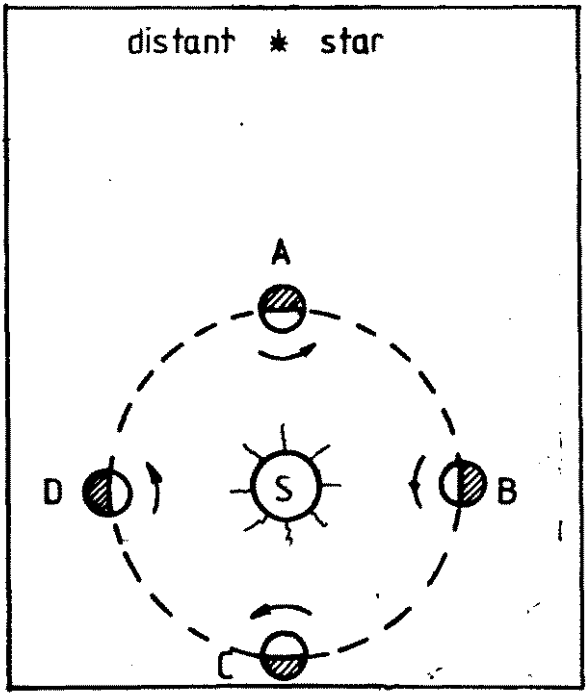


Fig 3

On 7 September of each year, the sun and the "pointers" of the Great Bear have the same "Right Ascension", i.e. they are in line with one another and tell the same time. If you could see the "pointers" in the day time they would be overhead at noon, level with the Pole Star and to the Westward at about 6 in the evening and immediately below the Pole Star at midnight. A month later, sidereal time will have gained a couple of hours (30days x 4 minutes = 120 minutes = 2 hours) . With the Great Bear in the same positions as before the times would be 10 am, 4 pm, and 10 pm. All we have to do is make a clock face that can be turned round by 2 hours each month to match the date and we can tell the time by using the pointers as an hour hand.

Fig. 4 shows the "bits and pieces", all, except the tube of the axle, to be made of thick. stiff card. The body is simple with a handle, a date line and a 5/8" hole in the middle. The dial, a little smaller than the body, has a calender round the edge - a 24 hour clock face. The pointer has a long arm to match up with the pointers of the Great Bear and the axle is made of a tube of gummed strip wound round a pencil. There are two thick cardboard washers to hold it all together.

The clock face has 12 o'clock exactly in line with September 7. From there onwards each hour is 15 from the last and each month 30^{o} . This last is not exactl' correct as real months vary in length from 28 to 31 days; 30 assumes them all to be about 301 days each. However as you can't measure time accurately enough for this small difference to be noticeable, it doesn't matter very much.

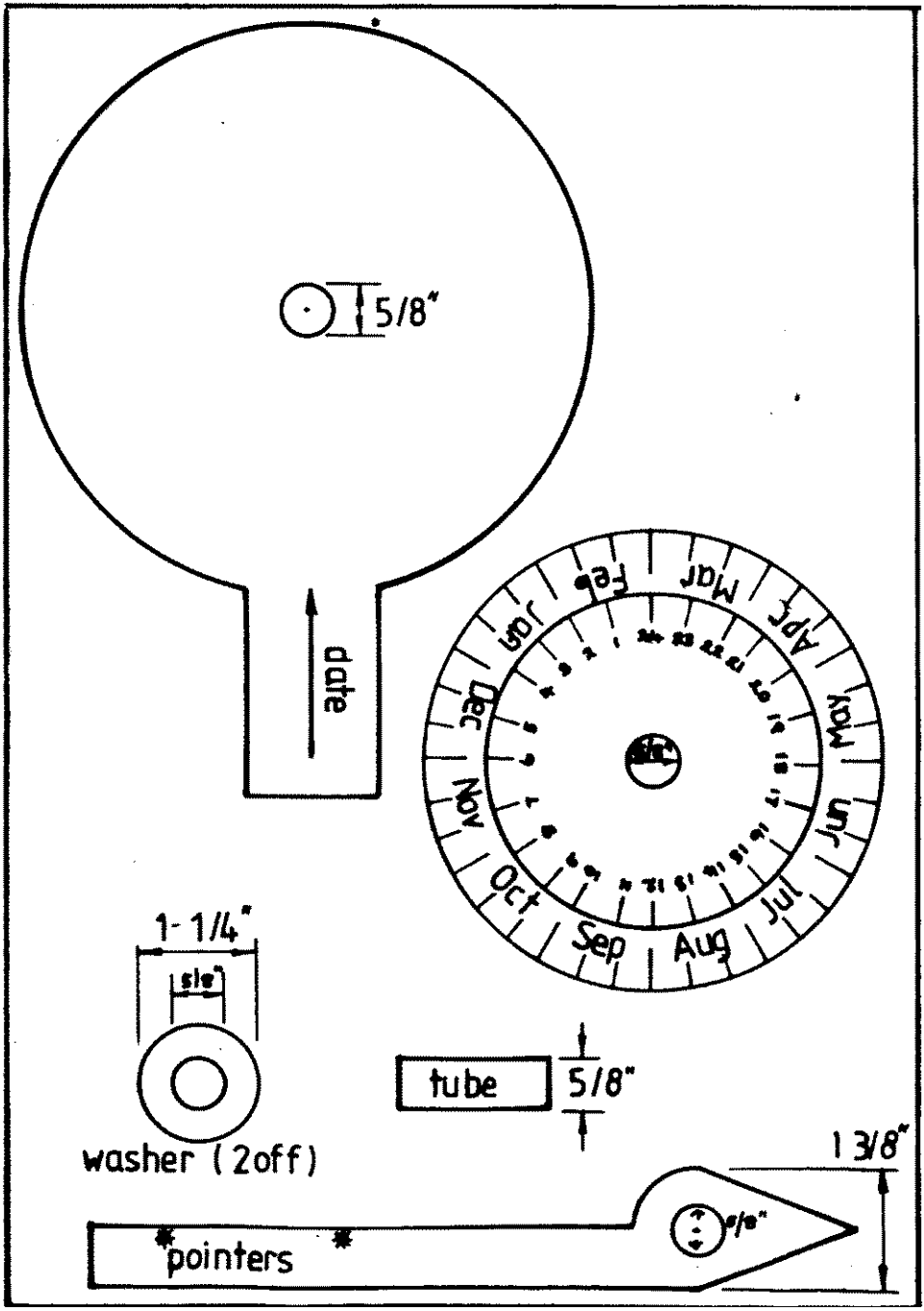

5/8"
date
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
1-1/4"
5/8"
washer (2off)
tube
5/8"
1 3/8"
pointers

Fig 4

Figure 6 shows the dial assembled and ready for use. The two cardboard washers have been glued to the hollow axle and just enough slack has been left to allow the pointer and clock face to turn smoothly.

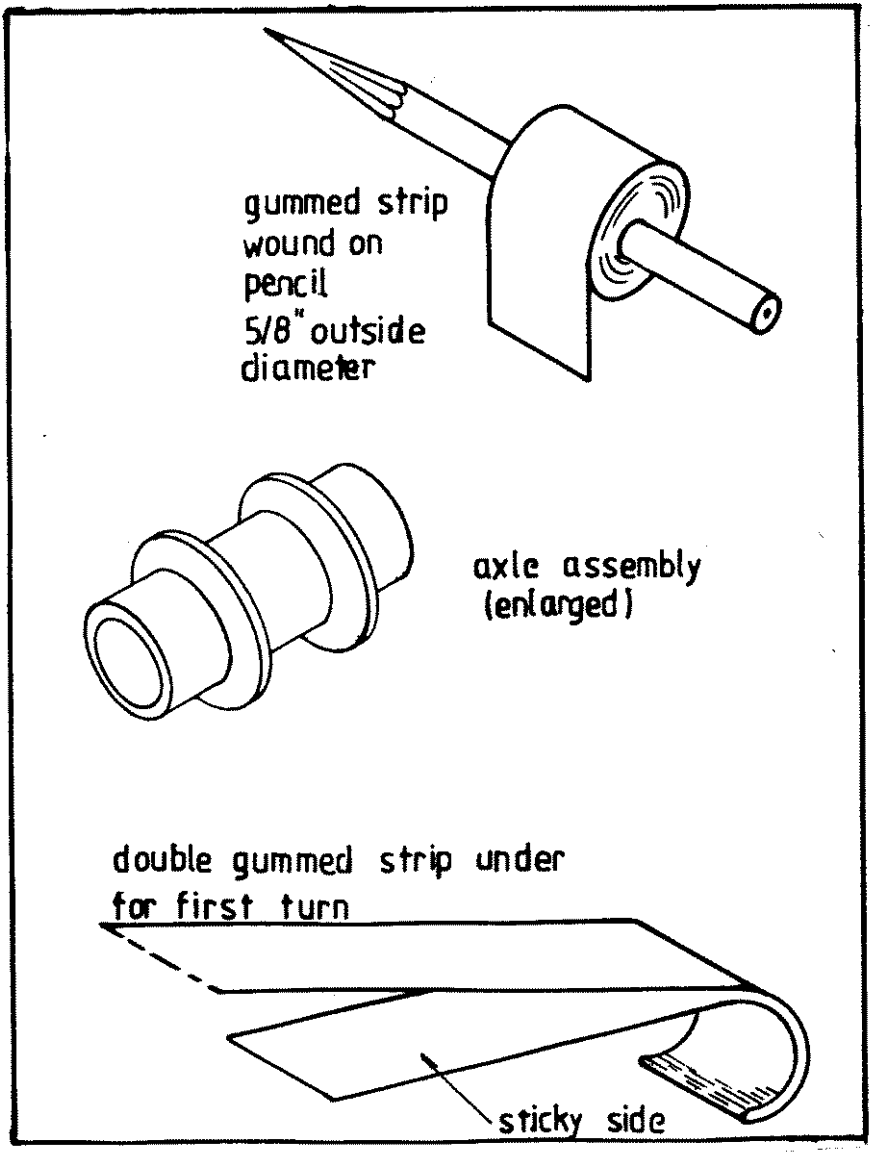
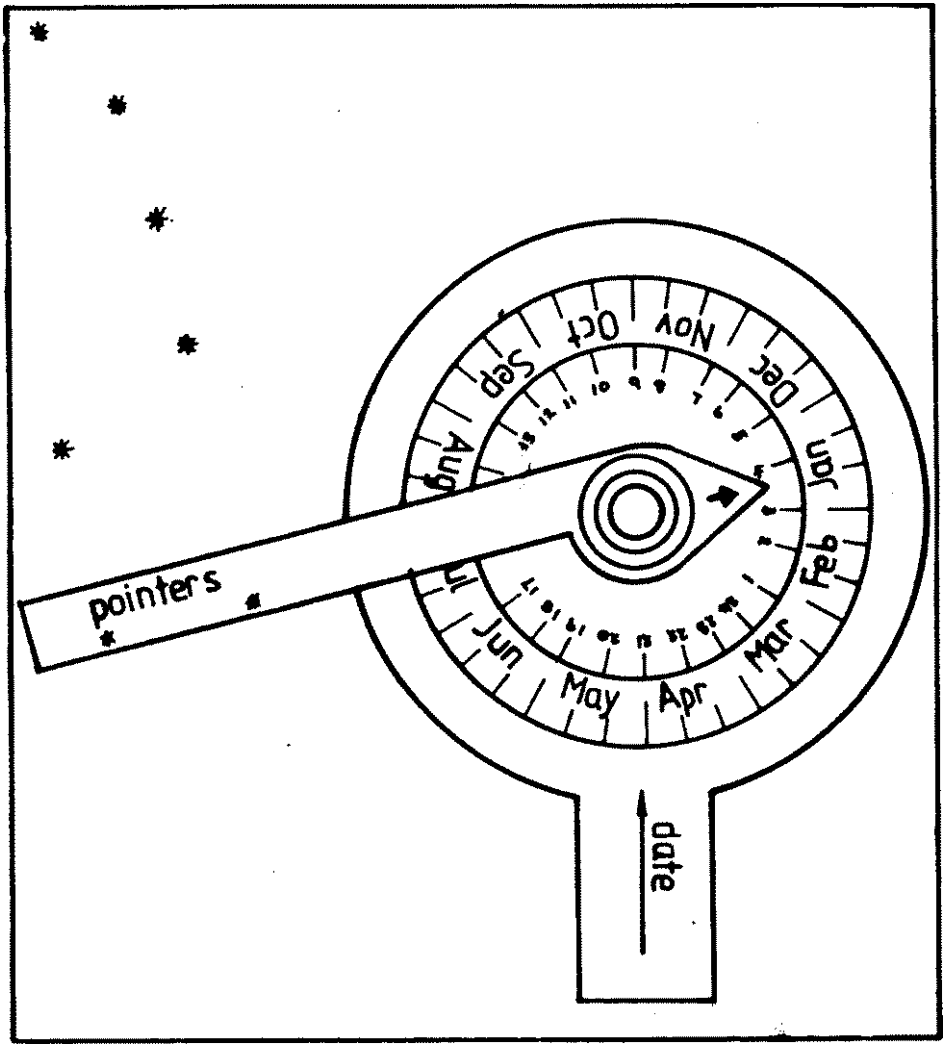


Fig. 5

To tell the time, set the clock face to the date and hold the dial with the handle downwards. Look through the hollow axle at the pole star and match the stem of the pointer with the pointers of the Great Bear. The arrow head on the pointer will tell the correct local time. In Fig. 6 the date is May 1 and the time is 03.00 hours.



SOME PRACTICAL TIPS

You could use an eyelet and punch to make the axle, but unless this is a heavy sailmaker's tool the hole is really too small to look through and it is difficult to fit the eyelet just tight enough for the parts to turn freely. Also, if the card you use is thick enough to be strong, only a really large eyelet will close up properly; and you do need really good stiff card.

If you are up to the task of engraving, then sheet metal is the ideal material as our ancestors found out. Perhaps in these days plastics would serve as well, but not all respond smoothly to the graver.

The best way of making a 5/8" round hole in thin material like card, is to clamp it between two pieces of wood and drill right through the lot with a brace and bit. The centre holes are best made before marking out the clock face and dial-body . A scrap of sticky paper stuck under the hole and some careful work with a ruler will soon find the centre to work from.

It is useful to cut a few notches in the edge of the clock face so that a finger nail can get a grip to turn the dial to the proper date.

When making the hollow axle, fold the sticky paper under for the first turn round the pencil so that it is double, sticky side in. If you don't do this you may not be able to slide the tube off the pencil when all is stuck up.

B.W. Lucke.