

right frame spacer nut. It will be necessary to rotate the shaft in the frame as the latter is withdrawn and the weight of the reel should be supported on the wooden wedge provided for this purpose when withdrawing the frame.

In assembling, the automatic brake should be in the release position so that it can slide on over the brake drum. The frame holding down studs should be set up tight before the frame spacer nuts are tightened. The machine should never be operated with the spacer nuts loose as the spacer bolts must take the thrust of the clutch and hand brake. This is considerable, due to the high leverage of the worm screw, and the machine may be damaged if operated with the spacer nuts loose.

The bolt holding the end of the band brake to its bracket should be kept tight as there is a strong tension on the band when the brake acts to stop the reel. As the band lining wears, it should be compensated for by adjustment in order to keep the brake spring effective and for proper operation of the interlock.

When heaving in, it will be necessary to lay the wire evenly on the drum by drawing the bight of the wire from side to side as with other machines. The tension pulley shaft and other working parts should be kept well lubricated but care should be taken not to use too much oil in the shaft alemite oiler, for it may find its way to the cone brake and clutch friction linings. Grease should not be used.

If desired, the machine can be operated without the automatic brake by not reeving the wire over the tension pulley, or by removing the band brake.

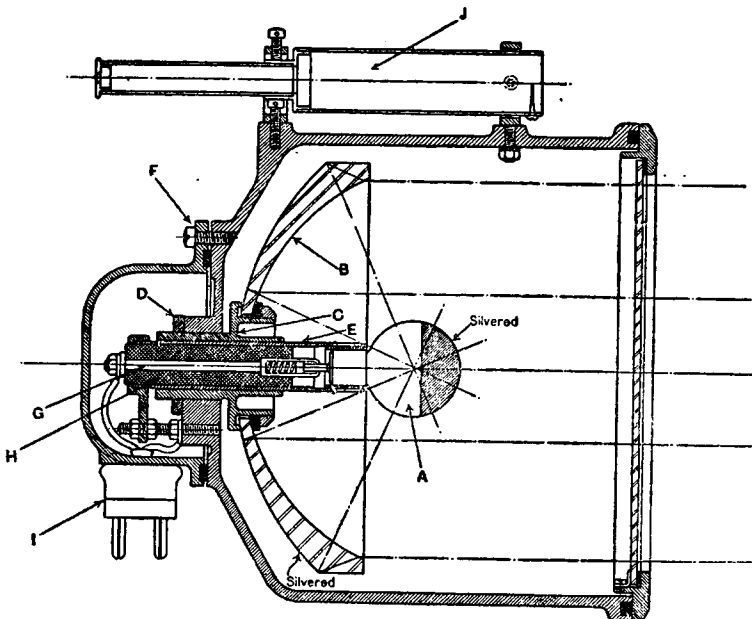
When the machine is not in use, the automatic brake should be tripped so as not to weaken the brake spring by keeping it fully extended.

## TRIANGULATION BEACON LAMPS : TYPE COOKE, TROUGHTON AND SIMMS

(Extract from article : *The Re-Triangulation of Great Britain*  
by Major M. HOTINE, R. E. - *Empire Survey Review*, No 29, Vol. IV, London, July 1938).

### BEACON LAMPS.

The design of electric directional projector used has been altered slightly as the triangulation



*Standard Electric Beacon.*

has progressed, but for the sake of simplicity it is proposed to describe in detail only the final form, which is now a standard article manufactured by Messrs COOKE, TROUGHTON & SIMMS.

The precision bulbs provided with the lamp (*A* in the accompanying sectional drawing) are interchangeable to within 0.02 inch of mean filament position, and are partially silvered in order to concentrate light on the six-inch back-silvered double spherical reflector *B*. The radii of curvature of the reflector are such as to give a theoretically parallel beam, by reflection and refraction, from a "point" filament. In practice the spread of the beam is about 5 degrees, which implies that the beam need not be very accurately directed on short rays, although for long rays in bad visibility it is advisable to orient the beam as accurately as possible.

The reflector *B* is mounted centrally on a brass sleeve *C* screwed into the back of the lamp body. This sleeve is adjustable and is provided with a lock nut *D*, although as a user's adjustment this is only required in order to replace a broken reflector.

The lamp holder consists of a long brass tube *E* which is a sliding fit in the sleeve *C*. The tube *E* is adjustable longitudinally to locate the mean position of the filament at the focus of the reflector and so to provide the least dispersion of the beam; but since the bulbs are precision made and are interchangeable within narrow limits, it is seldom necessary to use this adjustment in the field. A removable watertight aluminium cover at the back of the lamp, secured by three screws *F*, gives access to these adjustments and to the internal electrical connexions when required. The "live" connexion to the centre base contact of the lamp is made through the brass rod *G* and spring plunger contained in the bakelite insulating bush *H*. Connexion to the battery is through the plug *I* attached to the lamp, and through a 10-foot length of twin cab-tyre cable provided with a socket, and spring-jaw crocodile clips for attachment to the terminal lugs of the battery.

A plane glass watertight front window is provided, hinged to the body of the lamp and secured by means of a swing bolt and milled head.

An adjustable open sight *J* is fitted on top of the lamp body. This may be adjusted on a specially ordered or improvised white target, carrying a cross and a six-inch circle, and set up level at a convenient distance. The sight is in adjustment when the beam lies symmetrically over the target circle, and the cross (which is arranged at the correct distance above the centre of the circle) is bisected by the sight. The sight will only remain in perfect adjustment for one particular bulb, since even with these precision bulbs a very slight movement of the filament is liable to have a considerable effect on the direction of the beam. For primary rays, particularly where the observer's station is not visible to the naked eye, a semaphore board is set up instrumentally on line and the beam is directed symmetrically through the five-inch hole in the semaphore board.

The lamp body, which is an aluminium alloy casting, is fitted with gunmetal trunnions, through each of which a small hole is drilled for checking the position of the filament. To avoid station-centring errors, the filament should be located on the lamp axes and it is advisable to check occasionally that this is so by sighting through the holes in the trunnions. No centring error need, however, be feared so long as a concentrated beam is obtained, *unless* the reflector has been jarred out of adjustment through the lock nut *D* working loose. This is very unlikely. The lamp can be elevated or depressed 20°. The trunnions are carried on a gunmetal fork, which has removable caps to the trunnion bearings. One of the bearings is provided with a clamp. The fork can rotate in azimuth on a vertical spindle and may be clamped. This spindle terminates in a female thread which will fit the small central plug in the brass spider inset on the top of concrete station pillars; or alternatively will fit the thread of a standard heliograph tripod. If the lamp is to be set on a tripod, at stations where no concrete pillar has been constructed or where an eccentric beacon is required, it must be levelled with reasonable care to avoid centring error. For this purpose a few lamps are supplied to special order with three-foot-screw levelling tribrachs which can be screwed to any small TAVISTOCK theodolite tripod or to special metal telescopic tripods. Station centring is in that case effected by plumb-line.

The complete lamp, together with its accessories and spare bulbs, is fitted in a wooden box equipped with web shoulder straps.

Alternative bulbs of 1, 3, 6, 12, and 24 watts are supplied to meet varying visibility conditions; the one-watt bulb at night being roughly the equivalent of a 5-inch helio in duplex just before sunset. The intensity of the beam does not, however, go up in direct proportion to the power of the bulb, although there is a sufficient increase to warrant the use of higher-power

bulbs in moderate or bad visibility. The intensity of illumination in different parts of the beam at a distance of 30 feet from the lamp has been determined experimentally as follows:—

<i>Power of Bulb.</i> Watts	<i>Intensity of illumination.</i> Foot-candles.
1	1.3 — 2.1
6	1 — 6
12	10 — 17
24	12 — 26
36	9 — 17

It may be assumed that the higher figure for intensity of illumination would be available if, but only if, the lamp is accurately aligned. Owing to the greater spread of the filament, the 36-watt bulb under test actually gave no more illumination than a 12-watt bulb and has accordingly been excluded from the series.

The lamps have been run throughout off 6-volt accumulators, since replacement batteries of a suitable weight and capacity in this voltage were more likely to be available in motor garages than 12-volt batteries. They could, of course, be run off inert dry cells in conditions where periodic recharging of accumulators would be impossible, but in that case it would be inadvisable to use the higher-power bulbs. For work in the Highlands of Scotland a charging van was equipped with an L.32 "Pioneer" petrol-electric charging unit, and located in a mobile central pool for the supply of re-charged batteries. In the more thickly populated parts of the country, however, the light-keepers themselves arrange for supply of fresh batteries from motor garages, or battery service stations, by hiring a replacement until their own accumulator has been re-charged.

In order to provide a still more intense light in very bad visibility it has sometimes been found desirable to "boost" the light by applying as much as 12 volts to it. This involves, of course, a very short life for the bulb, but on occasions this may be much more economical than a protracted delay to observe a difficult ray. The life of the bulb may be prolonged by first warming up for 5-10 minutes on the normal voltage and then stepping-up two volts at a time without allowing the lamp to go out as the voltage is increased. This is done by using a split lead, one arm of which is connected to the higher voltage before disconnecting the other arm. The latter must, however, be disconnected almost immediately in order to avoid short-circuiting the extra cell.

## RENQVIST-WITTING TIDE GAUGE

(as installed at the Port of Gdynia).

(Reproduced from the Polish H.O. Publication entitled *Stacja Mareograficzna*).

The following description of the tide gauge as installed at the Port of Gdynia has been extracted from a summary description published in a pamphlet issued by the Polish Hydrographic Service entitled *Stacja Mareograficzna*, Warsaw, 1932.

The tide gauge installed at the station (Fig. 1 and 2) — of the RENQVIST-WITTING type — is composed of the following parts mounted on a cement pedestal (1.00 m. × 0.50 m. × 0.50 m.) located at the edge of the well:—

1) Float: (a cylindrical glass bell of the following dimensions: height 25 cm., diameter 50 cm.).

2) Recording Apparatus, comprising:—

a) Two horizontal wheels on a common axis; the upper wheel having a helicoidal groove of one metre circumference to contain the wire supporting the float and containing another groove in which is wound the wire attached to the float counter-poise. The lower wheel is fitted with ten pencils spaced equidistantly (at 10 cm.) and numbered from one to ten to trace the curves (\*) resulting from the movements of the float to the natural scale.

(\*) The reading of the curves on the mareograph is accomplished by means of a glass plate on which are engraved two systems of lines; the horizontal lines spaced 2 mm (heights) and the parabolic lines spaced at 12 mm (time).