The same principle is followed in the heliograph. This instru­ment, invented by Sir Henry C. Mance, receives on a mirror, and thence casts upon the distant station, the rays of the sun; the working of a small key controls the flashes by throwing the mirror slightly off its alignment and thus obscuring the light from the party reading signals. The fact that the heliograph requires sunlight, as mentioned above, militates against its employment in Great Britain, but where it is possible to use it it is by far the best means of signalling. Secrecy and rapidity are its chief advantages. An observer 6 m. distant would see none of its light if he were more than 50 yds. on one side of the exact align­ment, whereas a flag signal could be read from almost every hill within range. None of the physical exertion required for fast signalling with the flag is required to manipulate the instru­ment at a high rate of speed. The whole apparatus is packed in a light and portable form. An alternative method of using the heliograph is to keep the rays permanently on the distant point, a shutter of some kind being used in front of it to produce obscurations.

When in use the heliograph is fixed upon a tripod. A tangent screw (E) which moves the whole instrument (except the jointed arm L) turns the mirror in any direction. Metal U-shaped arms (C) carry the mirror (B), which is controlled by the vertical rod (J) and its clamping screw (K). The signalling mirror itself (usually having a surface of 5 in. diameter) is of glass, an un­silvered spot (R) being left in the centre. This spot retains its position through all movements in any plane. The instrument is aligned by means of the sighting vane (P) fixed in the jointed arm L, and the rays of the sun are then brought on to the distant station by turning the horizontal and vertical adjustments until the “ shadow spot ” cast by the unsilvered centre of the mirror appears on the vane. The heliograph is thus ready, and signals are made by the depression and release of the “ collar ” (I) which, with the pivoted arm (U, V), acts as a telegraph key. When the sun makes an angle of more than 120 degrees with the mirror and the distant station, a “ duplex mirror ” is used in place of the sighting vane. The process of alignment is in this case a little more complicated. Various other means of making dots and dashes are referred to in the official work, ranging from the “ collapsible drum" hung on a mast to the rough but effec­tive improvisation of a heliograph out of a shaving-glass. The employment of the beams of the search-light to make flashes on clouds is also a method of signalling which has been in practice very effective.

The Morse code employed in army signalling is as follows:—

A ■— J S ∙∙∙ 2

B K T - 3

C L U 4

D M V 5 ·

E · N — · W 6 -

G P ~ γ~'.l∑^- l-~"'

H∙... Q Z 9 —

I . . R 1 0 —

The semaphore code used in the armyjs shown below:— ’

In using this code the signaller invariably faces hîs reader, as unless this were enforced each letter might be read as its opposite. In the above diagram the appearance oi the signals to the reader is shown, thus the sender’s right side only is used for the letter A.

In sending a message accuracy is ensured by various checks. The number of words in a message is the most valuable of these, as the receiving station’s number must agree before the message is taken as correct. Each word or “group” sent by the Morse code must be “ answered ” before the sender passes on to another. All figures are checked by the "clock check ” in which 1 is repre­sented by A, 2 by B and so on. All cipher "groups ” are repeated back *en bloc.* There is an elaborate system of signals relating to the working of the line. The "message form ” in use differs but slightly from the ordinary form of the Post Office telegraphs. Signal stations in the field are classed as *(a) "*fixed ” and "mov­ing,” the former connecting points of importance, or on a line of communications, the latter moving with the troops; *(b)* “ter­minal,” “transmitting” and “central”; the first two require no definition, the last is intended to send and receive messages in many directions. The “ transmitting station ” receives and sends on messages, and consists in theory of two full “ ter­minals,” one to receive and one to send on. It is rarely possible in the field to work rapidly with less than five men at a trans­mitting and three at a terminal station. “ Central ” stations