

## The Development of Remote Control Systems.

The object of remote control systems is to give an operator at a certain point, control over apparatus at one or more remote points and to provide indication of the functioning of that apparatus, over a comparatively small number of wires. The scope of application of these systems is considerable and includes the control of electric sub-stations and generating stations, the indication of water levels, pressures, meter readings and the control of hydraulic valves, sluice gates, etc.

Up to the present the chief field has been the control of electric sub-stations and for this purpose the General Electric Co. Ltd. have developed two systems which also would be equally suitable for any of the uses mentioned above. The systems can be described briefly (a) for use where back indication only of the functioning of apparatus is required and (b) for the control and back indication of apparatus such as circuit breakers, where the total number of circuit breakers does not exceed twenty-four.

### System (a).

This equipment gives a cheap and simple method of obtaining indication of the functioning of switchgear at an unattended sub-station. No control of the switchgear is provided. It was designed specifically for use in unattended static transformer sub-stations on A.C. lighting distribution systems. The opening of any circuit breaker is immediately signalled to a central station where an alarm is given and thus, immediate notice of a failure of supply in an outlying district is given, without waiting for complaints from consumers.

The simplicity of the scheme is such that two pilot wires only of small gauge are required between each sub-station and the control station. A 50-volt battery of small capacity is used at each point and the equipment at each station is contained in a small cabinet having approximate dimensions of  $2' \times 1' 6" \times 1'$ . Compactness is a valuable feature, thus rendering the scheme suitable for use in very congested sub-stations or kiosks.

### System (b).

This was designed primarily for use in connection with automatic converter sub-stations of normal size to give control and indication of the functioning of switchgear, 24 circuit breakers being the maximum. Fig. 1 shows a typical apparatus cabinet for either control or sub-station and Fig. 2 a



Fig. 1—Apparatus Cabinet.

typical panel for the control of a rotary converter sub-station.

Each circuit breaker is operated by means of a two-position key on the control panel and to close any circuit, the associated key is moved to the "close" position, where it locks. The correct circuit breaker is thereupon automatically selected and operated. For each circuit breaker two lamps—red and green—are mounted on the control panel and the lamp which is glowing represents the condition of the associated breaker (red, closed—green, open). When a change in condition is made, automatically or by local operation at the sub-station, the indicating lamps change and a common alarm is sounded to attract the operator's attention.

In addition to the above features the system is capable of giving control of motor driven voltage regulators, etc., and of the facility commonly known as "D.C. firing," that is, the simultaneous connection of several converters to the D.C. bars after they have been

separately run up and synchronised. It can also be used to switch metering pilots to one of a number of instrument transformers, etc., under the control of a distant operator.

As in the case of system (a) two pilot wires are required between the control station and each sub-station and a 50-volt battery at each place.

A further system which is capable of extension considerably beyond 24 points and which also gives several additional facilities, has been developed and details of this will appear later

The equipment in these systems consists solely of relays and step-by-step rotary selectors as used in automatic telephone exchanges. To ensure the absence of contact troubles, all relays are equipped with springs having twin platinum contacts and for absolute reliability heavy duty type selectors

are used. Each relay is further fitted with an individual dust proof cover and special dust proof cabinets of wood or metal are provided to accommodate the whole of the apparatus.

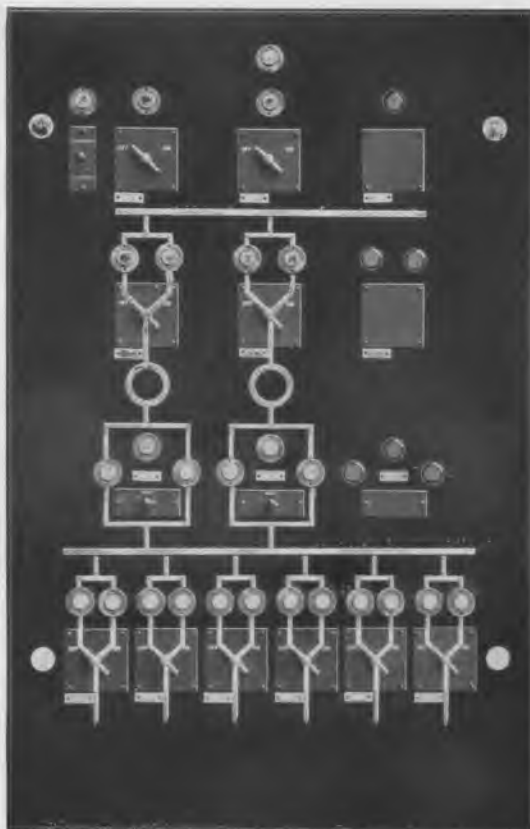


Fig. 2—Control Panel.