No. R 2

The Institution of Post Office Electrical Engineers.

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L. G. SEMPLE, B.Sc. (Eng.), A.M.I.E.E.

A Paper read before the North Midland Centre on the 4th April, 1938, and at other Centres during the Session.

This Paper was originally conceived in 1937, and was first presented at Local Centres early in 1938 in the form of notes intended to provoke discussion. It has been re-written for publication and now comprises a brief historical survey of the development of Control Working, a description of procedures now on trial and suggestions for the future which have not yet been given official consideration.

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The Control Centre as the Basic Executive Unit

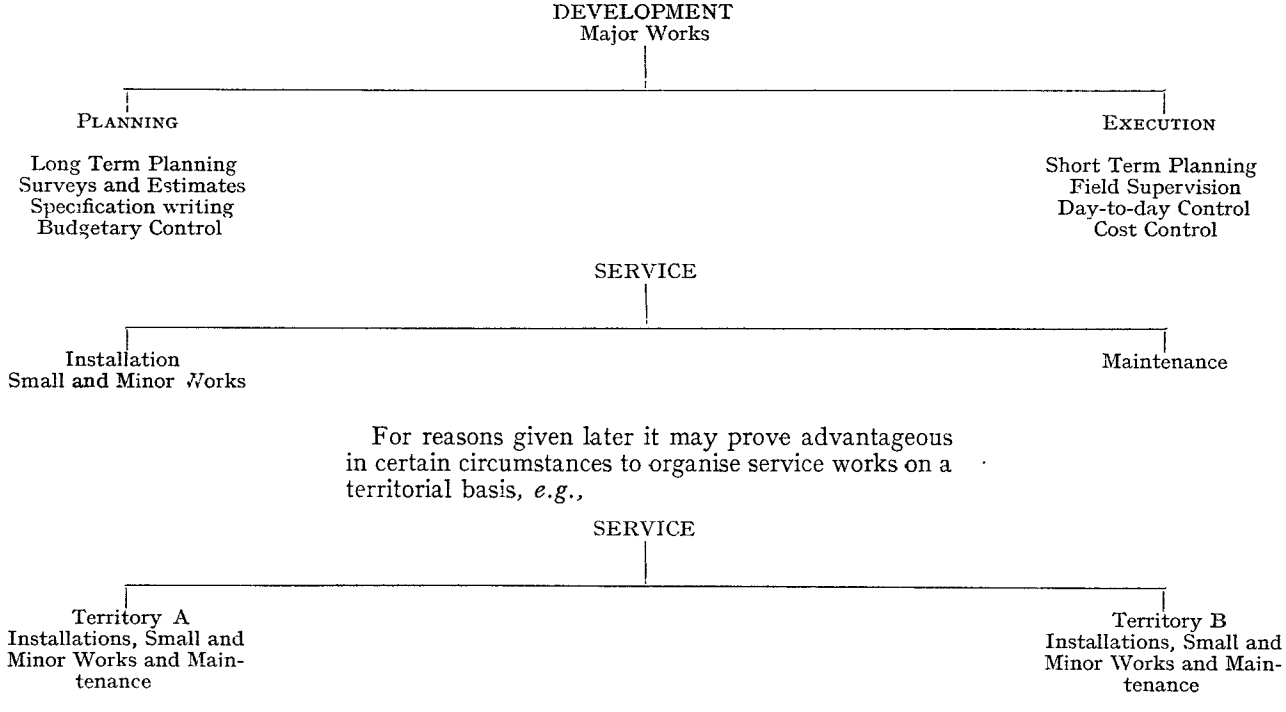
INTRODUCTION.

The paper traces the history of Control Centres from the Fault Control to the present experimental Major Works Control and includes suggestions for the further development of the Control Centre principle and its application to the Telephone Service under Telephone Area conditions. Throughout the paper frequent references will be made to Development Works and to Service Works and a few words of explanation at the outset as to the meaning attached to these titles may avoid confusion in the mind of the reader.

Development Work comprises the design, estimating, specification writing and execution of major works which, with few exceptions, provide plant to meet future growth. They are distinguishable from service works principally by their magnitude and by their superior claims to the services of specialists as distinct from engineering executives and by the fact that the need for them is, or should be, evident well in advance of the date for commencement so that they may be designed to conform with a fundamental development plan or policy and executed in accordance with a predetermined programme.

The title " Service " covers works of a day-to-day character such as the provision of subscribers' services, maintenance duties and the execution of small and minor works which are comparable in magnitude and scope with Advice Notes and Maintenance Works. It is in the handling of service responsibilities that the primary contacts with the public are made and it is largely by the nature of these contacts that the Department is judged in the public mind.

Each of these main groups is divisible into at least two components, viz.:—



Origin of Control Centres.

1. *Fault Controls.*

The origin of Control Centres is to be found in the establishment of Fault Controls for directing the movements of mobile workmen operating over a widespread territory with the object of securing prompt clearance of faults at reasonable cost. Such centres have long since established themselves as indispensable units in the Department's organisation with the exception of very sparsely telephoned territory where the detached linemen still hold the field. Even with the latter, however, linemen are grouped under Maintenance Recording Centres having functions similar to those of the Maintenance Controls in all except the hourly control of the linemen's movements.

2. *Advice Note Controls and Installation Centres.*

Following upon a visit to America in 1930, Messrs. Gomersall and Wilby reported that in order to achieve a better speed of completion of Advice Note Works " it should be a principle that installation work should be carried out to completion by an organised Installation Group . . . . . this Installation Group should deal with the installation of simple sets, extensions, subsidiary apparatus and small switchboards as well as with line work . . . . . and should also carry out all removals. Unified control should be obtained by:—

(*a*) concentrating both internal and external installation work under one Inspector ; or

(*b*) placing the Inspectors who are in charge of the external and internal Advice Note work under the control of one Chief Inspector."

3. We find, therefore, that the earlier Controls were set up primarily to speed up service, and statistics prove that much progress has been made towards the attainment of this objective.

4. The existence of Control Centres, even in an elementary form, provided facilities for experiments directed towards the solution of other problems of management. With the exception of the larger centres organised into internal and external functions, the predominant organisation of the country was on a territorial basis. This form of organisation served its purpose well during the early stages of telephone development, but the introduction of the automatic system and other technical innovations and complexities, together with a very appreciable growth and development of the service as a whole, confronted the Engineering Department with the following problems:

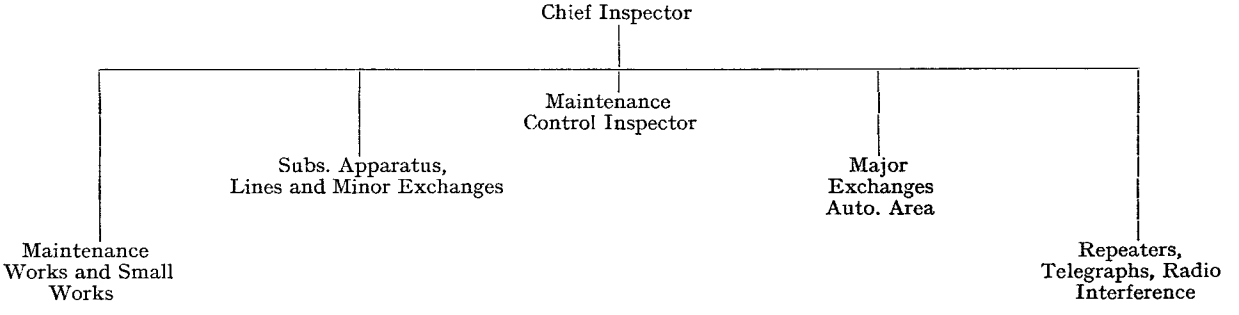
(*a*) the determination of the extent to which a functional organisation could be economically developed ; and

(*b*) the need for relieving Inspectors of routine duties in order that they might adequately fulfil their responsibilities as the supervising officers in immediate charge of the engineering forces in the field.

Probably the most important single fact emerging from the activities of Efficiency Engineers has been a recognition of the need for closer supervision of field operations, such supervision to be directed more to the education and training of workmen and the elimination of wasted effort, than to disciplinary control. It is not necessary to detail the many and varied duties of a territorial Inspector responsible for all types of work within his area or to re-state the case for assisting Inspectors and other supervising officers in the routine work and minor clerical duties inseparable from the effective administration of engineering responsibilities. Much has been done to simplify procedures and to eliminate formalities, but the many increasing demands placed upon the service have overtaken the simplification process, until the Inspector seems less and less able to get to grips with the working conditions and to fulfil his primary function as the supervising officer in immediate control of the field forces, a function requiring him to be thoroughly conversant with all the duties which his workmen have to perform and to be competent personally to train and guide them on those duties and so command their confidence and respect.

The arguments revolving around these problems suggested a need for a form of organisation in which an officer experienced in field conditions should take charge of the managerial functions whilst another should concentrate on the field supervision. An early attempt to organise maintenance responsibilities on these lines is illustrated below.

MAINTENANCE CONTROL



The Control Inspector was required to take charge of the officers employed at the Test Desk and Fault Control positions and to be responsible for the examination of returns and records relating to the maintenance of the area with a view to the detection of unsatisfactory conditions, for originating action to control such conditions, for handling written complaints and for directing linemen's movements in such a manner as to secure prompt and effective clearance of faults. The duties of the remaining Inspectors were to examine the condition of the plant, observe the output methods and workmanship of the maintenance workmen, personally to investigate the more serious repeat faults and to maintain close contact with the workmen.

Developments of this form of organisation have resulted in an acceptance in principle of a division of Inspectors' duties between the Control Function and the Works Function—a line of demarcation particularly useful in its application to Service Works. Although introduced originally to meet densely telephoned areas, it soon become apparent that by grouping several Inspectors' areas and instituting Joint Advice Note and Maintenance Controls, the same form of organisation could be adopted with advantage to meet most rural conditions. Such a scheme was advocated at the first conference of Efficiency Engineers in 1933. The most powerful argument against establishing Control Centres in areas of low telephone density is the cost of keeping an officer at a central point all day to cover a duty which cannot occupy his full time. The argument is applicable to both Advice Note and Maintenance Control Centres but may be met by amalgamation of the two duties under one Control, an arrangement which, in rural areas, possesses definite advantages over separate controls, for the following reasons:—

(i) Variations in the incidence of Fault Complaints and of Advice Note Works favour the employment of dual linemen and mixed duty gangs in rural territories because of:—

(*a*) the difficulty of maintaining an even flow of work for Advice Note gangs;

(*b*) there are savings in ineffective time if Advice Note gangs execute Maintenance Works during the progress of Advice Note work and vice versa;

(*c*) diverting staff from Advice Note work to fault clearance and maintenance and vice versa to meet day to day fluctuations in the incidence thereof;

(*d*) the inefficiency of sending a fitter or a gang a distance of several miles to fit (or recover) subscribers' apparatus to existing line plant at a point where a competent lineman is stationed;

(*e*) at small Maintenance Controls having a staff of no more than one Test Clerk, difficulty is frequently experienced in providing suitable reliefs for test desk duties due to lack of opportunity to afford economical training of other members of the staff. A combination of Advice Note and Maintenance Controls gives opportunities for the combined staffs to become familiar with all duties and thus make suitable reliefs available;

(*f*) under storm conditions when Advice Note Works must defer to fault clearance, there is great value in having the Control of Maintenance and Installation forces centralised at one point.

In addition to the advantages enumerated above in favour of common control of Installation and Maintenance forces in a sparsely telephoned area there is the over-riding consideration that to be of maximum benefit a Control should be located with the Inspectors operating in the Control area. Unless this is achieved much of the assistance which the Control should afford to the Field Inspectors will be lost and there will be an undesirable tendency for the Control to function as a "senior office" rather than as an "assisting office." For disciplinary purposes it may be desirable to outstation one or two Inspectors engaged on service works and such Inspectors probably stand in greater need of a local Control than any others. Usually, one Joint Control is the only type which can be economically justified.

Summary of Service Control Centres.

We see then that Control Centres, originally introduced to expedite the treatment of Service works, also provide convenient points at which to centralise the miscellaneous routine duties inseparable from the handling of Service works, such duties being performed by junior staff under the direction of an experienced engineering officer and on behalf of Inspectors who are freed to concentrate on the supervision of operations in the field. Having provided machinery to ensure uniform treatment of service matters within a given area and for directing them into the most appropriate channels, it is apparent that the field staff working to such a Control can be organised either territorially or as technical specialists according to the needs of the area. Moreover, the building of numerous small units into a few large units, which is the usual tendency when establishing Control Centres, provides greater flexibility, increases the possibilities of technical specialization and facilitates dilution of field forces with inexperienced labour in times of abnormal development.

On the other hand there has been, in the author's view, a tendency in some quarters to over-centralise as, for example, when one Advice Note Control is instituted to cover the whole of one Telephone Area. Over-centralisation tends to defeat one of the principal advantages of Control working, viz., to permit a reasonable degree of functionalisation without any loss of personal pride and interest in the performance of the team as a whole. The team should be of a size to permit a reasonable degree of functionalisation and at the same time to leave room for the expression of the individuality of each of the more responsible officers. If, as may happen in some places, there is only one natural Control Centre for a wide and densely telephoned area, then, although control of the whole territory may be in one building or even in one room, it is advisable to sub-divide the whole into two or more sub-Controls so that each team may preserve its individuality. This is of some importance also in the compilation of statistics on a Control basis—a subject dealt with later—since if the Control Unit is very large, the Control system of statistics may provide an insufficiently detailed analysis.

Development Works.

Engineering development work falls naturally into two divisions:—

(*a*) *Planning.*

The detailed engineering and preparation of estimates and specifications covering major new construction and rearrangement works.

(*b*) *Major Works Control.*

The execution of the works including preparation of short term programmes, allocation of staff and mechanical appliances, supply and disposal of stores, supervision of methods and results and supplying information for the compilation of accurate accounts and records.

The Planning Group should be aware of all major works, immediate or prospective, and should maintain a progress chart for this purpose (Fig. 1).

The Development Engineer must work in close co-operation with the Works Execution Engineer, to ensure that his proposals are practicable—but he must also keep in touch with technical improvements, economic factors and long term planning. He is therefore in the position of a liaison officer or intermediary between Headquarters Administration and technical experts on the one hand and the Works Executive on the other and must ensure that the Works Executive is advised through the medium of a specification for each work of the latest engineering practice. It follows that this specification should

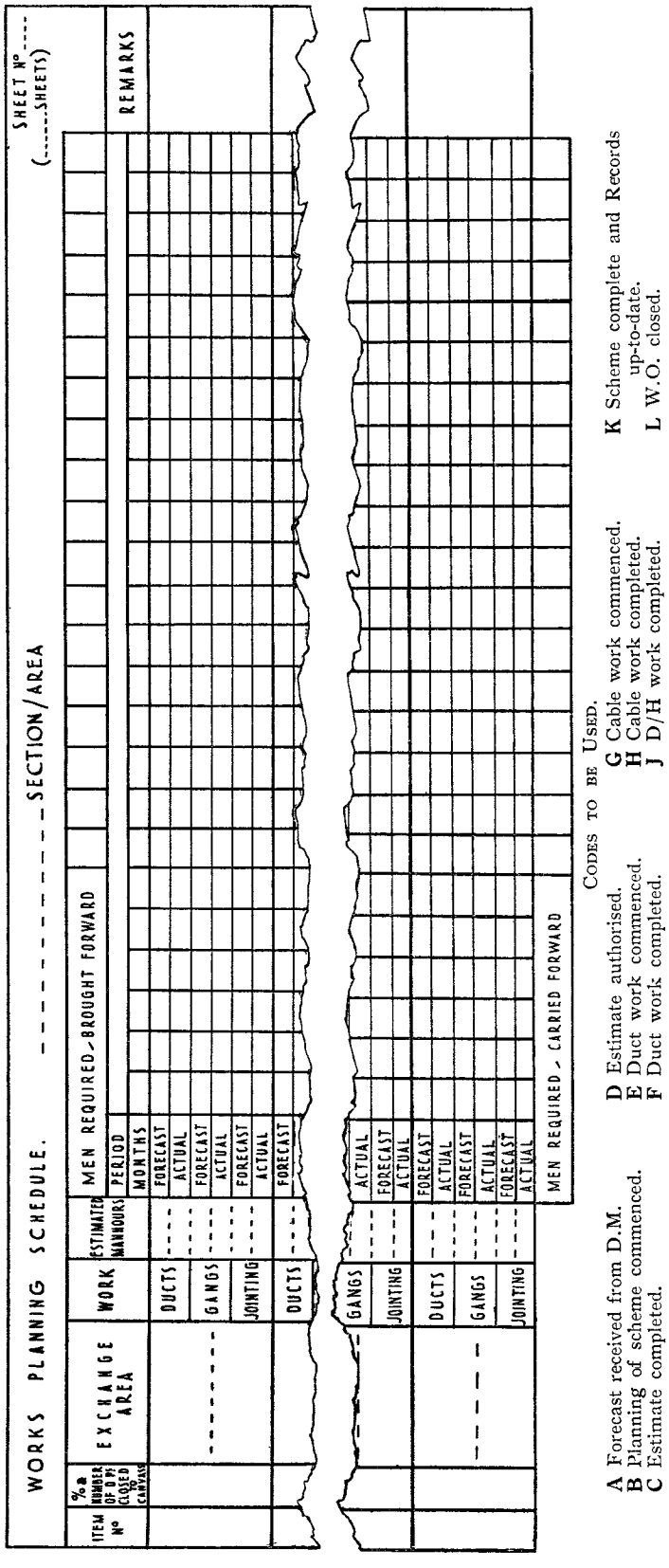


FIG. 1.

provide complete working plans for the field forces who are to execute the work. These plans must be based upon complete and definite knowledge of the actual conditions which will control the execution of the work—a knowledge to be gained by surveys in the field and a study of complete records of existing plant. In order to avoid duplication of effort in preparing the plans and subsequently in executing the work, the construction forces who are to do the work must be consulted to determine the best method of presenting for constructive purposes, a plan of the work to be done and the best constructive methods to be used in carrying out the work under the conditions which will prevail.

All preliminary work should be completed and the necessary information shown on prints or specifications before the plans are released to the field forces for execution. For example, wayleaves should be secured and details shown on the print—all jointing details should be shown, such as numbering of cable pairs to be brought out, stubs jointed through or terminated.

As far as possible each drawing should be complete in itself; all the information relative to any unit of work as, for example, a section of pole route or underground cable, should be shown on one print, but separate units of work, for example, conduit and cable should be shown on separate prints unless they are interdependent because of construction features.

In general the size of the print should be limited to that which a foreman or workman can handle conveniently in the field and only exceptionally should they exceed 22″ × 34″.

Construction or Works Control.

At a conference in 1933[1] attention was focussed on the " inability of the majority of Inspectors to free themselves from the entanglements of correspondence and to devote sufficient energy to the scientific planning and organisation of the works under control " and the setting-up of a Works Planning Group in each Engineering Section was advocated. The duties proposed for the group were " to receive all Works Orders as soon as they are authorised, to decide when and by what gang or working party they were to be erected, to see that all wayleaves were obtained, that stores were requisitioned for delivery at appropriate places and times, to arrange for the preparation of precise instructions and plans which are to be handed to the Foreman before the work is commenced, so that the work as proposed to be carried out in the estimate can be carried through without modification to the original plan and generally to ensure that before works are started every possible eventuality has been foreseen and all possible arrangements made to assist the Foreman to obtain a satisfactory Performance Rating. . ."

It was further proposed that " . . . . A Works Planning Inspector should have mounted on the wall of his room a Works Planning and Progress Indicator upon which would be recorded the constitution and qualification of all gangs and working parties; their previous Performance Ratings and their equipment.

[1] Conference of Efficiency Engineers, 1933. Report of proceedings, 14, 41 and 152.

Against each gang would be shown the Works upon which they are engaged and those allotted to them for execution as soon as present Works are completed. Means would also be provided on the Indicator for showing the manhours expended to date and the corresponding units completed. The Indicator should be so designed that the Works Planning Inspector and the Sectional Engineer can see at a glance how each work stands in regard to performance, when it is likely to be completed, what is the next work allocated to the gang and whether all necessary preliminary arrangements for the starting of that work have been made. . . . . The Works Planning Inspector will spend the greater part of his time at Section Headquarters, most of the travelling for survey and supervision purposes being carried out by the other Inspectors."

The procedure thus outlined had already been introduced in the Scotland East District with beneficial results and an organisation similar in principle, but differing in detail, developed independently at Leeds. Both organisations were studied and the best features of each were combined, with some improvements, in a draft scheme[2] issued by Headquarters in 1935 to all Superintending Engineers with the suggestion that it should be considered for local adoption. The draft scheme included the following remarks:—

" 1. The procedure outlined covers the control, allocation and costing on a performance rating basis of all works (external and internal) exceeding approximately 75 manhours.

. . . . . .

" 4. The procedure in respect of the larger works aims at concentrating Engineering clerical work and other matters at one or two Control Points within a Section with the purpose of securing:—

(*a*) Improved organisation and attention to preliminary detail.

(*b*) Improved supervision and therefore better quality workmanship.

(*c*) Up-to-date Performance Ratings, calculated daily in respect of each working party.

(*d*) Visual indication of the disposition of staff, allocation and progress of works and their respective cost performance.

" 5. A Works Control Officer, assisted as necessary by Wayleave Officers, Survey Officers and Writing Assistants, takes charge on behalf of a group of Inspectors of such matters as:—

(*a*) Keeping in touch with the position of all Works from the authorisation stage to the closing stage and, as far as readily possible, dealing with miscellaneous correspondence relating thereto.

(*b*) Requisitioning all Main and Subsidiary Stores items in advance—making arrangements for delivery and temporary storage—checking Delivery Notes against requisitions and generally supervising Stores and miscellaneous transactions.

(*c*) Controlling Motor Transport.

(*d*) Confirming Wayleave negotiations.

(*e*) Supervising the receipt and clerical check (but not certification) of all Progress Reports and Time Sheets of the group and, after certification by the Works Inspector (*i.e.*, the Inspector supervising the execution of the work), their correct disposal.

(*f*) Supervising the preparation of daily Performance Ratings and the upkeep of the Performance Indicator.

(*g*) Preliminary examination of TE 112 on behalf of Works Inspectors—drawing the latter's attention to danger points and obtaining adequate explanations on TE 112A."

It should be understood that the Control Inspector's duties are not intended to relieve Works Inspectors of their responsibilities in such matters as the certification of Progress Reports, critical examination of TE 112S, submission of Departures from Estimate applications, TE 155, nor is it the intention that Works Inspectors shall lose their sense of responsibility for the overall efficiency of the works under their control. The intention is that the majority of the duties outlined above shall be performed by Writing Assistants and/or workmen and that there shall be one Inspector to co-ordinate their efforts and be available constantly to give them guidance, thus releasing the Works Inspectors to spend the majority of their time observing and improving the organisation, quality and efficiency of the work in the field.

Many Works Control Centres have now been established throughout the country to function in accordance with the principles indicated above, although differences exist in the detailed application of these principles to meet local conditions and the views of local officers.

Practical experience of the operation of Major Works Control Centres and other factors have resulted in modification to the original draft and pointed to the need for emphasizing some features more than others. For example, the manhour limit has been raised to 100 manhours consequent upon the introduction of Minor Works Advice procedure, which procedure was itself introduced as a simplification made possible by the existence of Advice Note Controls. Too much attention has perhaps been given to the calculation and plotting of Performance Ratings and not enough to the careful study of works specifications with a view to determining in advance the most satisfactory apportionment of the several parts of a work to the various working units, the size of the economic working unit and the order and method by which the several units shall carry out the work with which they are entrusted.

In the author's view, Performance Ratings need be plotted but weekly and with a continued improvement in supervision and training the calculation of daily ratings could be dispensed with, an overall weekly rating per gang and a weekly cumulative rating per work being sufficient.

The Basic Executive Unit.

In the early days of the Service the staff of an Engineer's District was sufficiently small in numbers

[2] Rota 4800 Ed/35. Suggested procedure for Works Control and a Works Allocation and Performance Indicator.

and the class of work sufficiently simple to permit the Superintending Engineer to have a living experience of all its parts so that his control could bear a full and wise relationship to the purpose of the enterprise. Under these conditions and in the interests of clerical efficiency it was natural that clerical work should be centralised at the District Office. As the Service grew, certain clerical duties and an even greater proportion of technical responsibility was devolved upon the Sections. Of recent years the growth of the Service and the demands made upon it, have now so increased the responsibilities of Sectional Engineers that effective executive control can only be exercised at a lower level.

Effective executive control requires that the officers concerned shall have readily available full information relating to the progress and performance of works and workmen under their control. Since the preparation of such information is bound up with essential field accounting and statistical requirements, it follows that advantages should accrue from associating with the Control the clerical forces engaged on field accounting and statistical work.

The Major Works Control as an Executive Unit.

In 1937 an experimental procedure devised by a Headquarters' Committee was introduced in the Scottish Region which aimed at concentrating at the Works Control Centre many of the duties hitherto performed by Clerical Officers in the Superintending Engineers', Sectional Engineers' or Area Managers' Offices, together with simplifications in procedure which such devolution makes possible, viz.:—

(1) Receipt, clerical check of Progress Reports and Time Sheets; summarisation of units and manhours; and the calculation of Performance Ratings for individual working parties, for each major work and for the Control Centre as a whole.
(2) Preparation and upkeep of a weekly summary of expenditure (TE 112 revised), of a History Sheet (TE 112A revised), and a Stores Summary (TE 118).
(3) Requisitioning stores in accordance with estimate and/or supplementary instructions.
(4) Handling departures from estimate.
(5) Check of Contractors' accounts against Diary Pages.
(6) Upkeep of information on Control and Performance Indicator Panels.
(7) Preliminary closing of Works Orders.

All the information, including that referred to above, relating to any one major work is available for inspection at any time by any interested officer.

The opportunity was taken to introduce other modifications to existing procedure such as summarising manhours in bulk under—

(*a*) Providing, Recovery, Shifting and Ineffective in accordance with the standard practice for A.N. and Small Works—abandoning the allocation of manhours to individual works operations (Item numbers).
(*b*) Simplifying TE 155 (Labour excess) and TE 68 (Stores excess) procedure.

Each Field Inspector is required to submit a Daily Works Report describing briefly any item of interest observed during the course of his visit to the field forces and including information regarding actual or anticipated departures from the authorised plans and estimate.

A statement on the Daily Works Report of the causes, nature and extent of departures, either actual or anticipated, is all that is required from the Field Inspectors since the procedure provides that the Control Office shall arrange for the necessary authorities, credit the Works Order therewith and arrange for the supply of extra stores automatically. If the excess is for additional plant (stores), then it is not necessary for the Field Inspector to state the number of manhours since the Control Office will assume, unless the contrary be stated, that the additional plant can be erected at the estimated Performance Rating of the original estimate.

In addition to the foregoing simplification of D.F.E. procedure, the Daily Works Reports serve two other purposes.

(*a*) Information contained in them is transferred in precis form to the History Sheets (late TE 112A) for the Works concerned, and provides an up-to-date statement of the progress of the work and of all the factors affecting the execution of the work. Such information gives a valuable guide to the accuracy and soundness of the original proposals and provides adequate and immediate information regarding departures.
(*b*) The Daily Works Reports themselves are filed by Field Inspectors' Groups and scrutiny of these reports gives a fair indication of the interest and ability displayed by these Inspectors on field supervision. Lengthy and verbose reports are not required; the intention is that all really valuable information shall be given in as few words as possible.

The two most outstanding benefits so far derived from the scheme are a considerable increase in the amount of time available to Field Inspectors for field supervision and the ease and promptitude with which Works Orders are closed. The time increase is of the order of 15-20% over the former Major Works Control procedure and considerably more than 20% when compared with pre-control conditions. Inspectors and Clerical Officers engaged on the operation of the new procedure are unanimously in favour of it.

It should be noted that the strictly accounting functions as distinct from statistical and detailed costing functions remain as a separate unit of the Telephone Manager's Office.

The "Scottish experiment," as it has come to be called, has been examined by many officers and criticised from many angles and a number of amendments have been suggested and are receiving official consideration. There appears, however, to be unanimous approval of the underlying principle of co-ordinating all related functions at a lower level than the Sectional Engineer and in the direct association of clerical staff with Works Inspectors, and further experiments incorporating some of the amendments are to be made at Reading and Guildford.

Basic Executive Units.

To this point the paper has been an historical survey of the development of the Control Centre. The remainder of the paper is devoted to an expression of the author's personal views on the further development of these centres. None of these views has as yet received consideration in official circles and indeed the author is aware that they do not find favour in some quarters.

In the experimental Major Works Control organisation we see a step towards the co-ordination of related functions at lower levels than hitherto, that is, in the direct association of clerical duties with Control Centres and therefore with the Works Inspectors who constitute the eyes and ears of the Control. The next step is the application of the same principles to Advice Note and Maintenance Controls. The objective of the Post Office re-organisation has been interpreted as elasticity and efficiency in the Post Office organisation and responsiveness to public demands and needs. This objective it expects to attain in the first place by a substantially increased measure of decentralisation —a devolution carried to the lowest level compatible with efficiency and in this connection the first report of the Committee on Metropolitan and Regional Organisation says: " In approaching the subject of re-organisation we have thought it well to consider first the basic executive units of the system. It is at this level that the primary contacts with the public are made in respect of Service and the handling of enquiries and complaints and it is largely by the nature of these contacts that the Department is judged in the public mind."

It would be difficult to describe more aptly and in so few words the functions of Advice Note and/or Maintenance Control Centres in their relation to the Engineering Department's organisation. They *are* the basic executive units of the service side of our work providing the unit of organisation upon which the efficiency of the Service depends.

The Installation Control as an Executive Unit.

The four duties involved in the provision of a new installation are Sales Representative, Traffic Officer, Engineer and District Manager's Accounts Section. Without minimising in any way the importance of the functions of the other three the responsibilities of the Engineer are of the first importance. Briefly, it is the responsibility of the Engineer to provide the service as quickly as possible, in the most economical manner having regard for local amenities and in such a manner as to give lasting satisfaction to the subscriber. The means by which this responsibility is fulfilled involves the allocation and availability of spare plant, a close control over the movements of the staff, a quick appreciation of what is involved in the provision of any given service, a system of quality inspection, and the maintenance of friendly relations with the local authorities, to mention only the most obvious duties.

In most centres there is already an Advice Note Control Centre which exercises these responsibilities on behalf of the Sectional Engineer and these centres constitute the real basic executive units for the provision of subscribers' services. The desired unification of duties in the public interest can best be achieved by locating Sales representatives and Advice Note issuing and closing clerks at these Control Centres. In addition to more complete information regarding the requirements of a new installation, the regulation of canvassing, closing of areas, etc., would more easily be achieved.

In the author's view the unification would be even more complete if it were made a matter of future policy that a not inconsiderable proportion of sales representatives should be recruited from the ranks of the Engineering Department—preferably those entering the Service as Youths-in-Training after a secondary school education. If necessary, youths could be especially recruited with this object in mind and the benefits and economies which would result from sales representatives having an intimate knowledge of what is involved in the provision of a subscriber's service would be far reaching.

The author does not suggest that the sales representative should necessarily be under the control of the Engineering Officer in charge of the Control Centre or vice versa, but rather that the public should be able to look to one Centre for information on all matters appertaining to the provision, alteration or removal of telephone service and that the Sales and Engineering Officers for a given area should work as a team, each member of which has a particular responsibility to his own superior officer. In the ultimate, each Advice Note Control Centre would be self-contained, maintaining its own records and compiling its own returns for which it would have the assistance of such clerical staff as the work justified.

With the extension of automatic working the functions of the Traffic Officers have become more closely allied with those of Engineering Officers and investigation would probably shew that much of the detail of the Advice Note responsibilities could equally well be performed by staff at Installation Controls.

The Maintenance Control as an Executive Unit.

Telephone Areas' boundaries have been determined as far as possible to conform with the natural development of the telephone network, *i.e.*, to be co-terminus with group centre boundaries so that the territory controlled for traffic purposes from one group centre should be wholly contained within only one telephone area. Maintenance Controls should therefore normally be located at a group centre or auto-manual switching centre (but not necessarily at every group centre) which, under fully automatic conditions, will be the only centre at which assistance traffic will be handled.

The staff of a large Engineering Maintenance Control Centre already comprises a team of more or less specialist officers and there appears to be no good reason why there should not be added to it one or more officers well versed in the service duties at present performed by the District Manager's Traffic Staff only. As in the case of the proposed Installation Office, the unit would at the outset comprise a staff working as a team in the interest of the subscribers, although guidance and instructions on general policy would be determined by the Telephone Manager with

the assistance of his expert advisers, each of whom would also function in an inspectorial capacity in his own particular sphere.

Joint Installation and Maintenance Controls as Executive Units.

The existence of a Joint Control will generally imply that the territory controlled is sparsely telephoned and the volume of work is not great. The Control Staff will, therefore, be few in number and some difficulty may be experienced in devolving commercial and traffic responsibilities. Nevertheless, it should be possible to effect some degree of devolution in such matters as the acceptance of straightforward orders and handling complaints in order to maintain at all centres a policy of maintaining close personal contact between subscribers and the officers of the telephone service who possess an intimate knowledge of the subscribers' requirements and of the service rendered to him.

Development and Planning Unit.

The design of a fundamental plan for the provision of plant to meet future growth involves Traffic studies, Sales studies and Engineering design, and a combination of these duties into one central unit for each Telephone Area should be the most effective way of co-ordinating the various activities.

Instructions on the preparation of maps by the Engineering Staff, for the purposes of Block Surveys by the Sales Staff, emphasize the need for the closest collaboration between the two staffs so that the

EASTHAMPTON SECTION. MAINTENANCE CONTROL LOCATED AT ROKING

N. F. CHEAM. CHIEF INSPECTOR.

CODES ½ = NUMBER OF QUALIFIED MEN NECESSARY TO EFFICIENT MAINTENANCE OF LOAD.

= UNSUITABLE FOR TRAINING.

* { LEFT HAND COLUMN = SCHOOL TRAINING / RIGHT HAND COLUMN = FIELD TRAINING AND EXPERIENCE. } UPPER SQUARES = HIGHLY QUALIFIED. LOWER SQUARES = QUALIFIED.

ø = FOR U S W^S ——— QUOTE DATE OF FIRST SKILLED CERTIFICATE

LOAD Nº	INSPECTOR	RELIEF INSPECTOR	S W. I.	DUTY Nº	RELIEF S.W.I.	WORKMEN	RANK	ø SENIORITY	TRAINEES	RANK	HEADQUARTERS	DATE OF RETIREMENT	INSPECTORS COURSE	INSTRUCTOR	CERTIFICATES Nºs & GRADE	PANEL	LINES	SUBS APPARATUS	HOUSE TELEPHONES	PHONOGRAMS
1P																				
1F																				
	A. JONES										RG	60	■	■	3/1		■	■		
2P																				
2F																				
		P. SMITH.	P. SMITH.	A6.			S.W.I.	47			RG	68	■	■	3/1	✓	■	■		
			(Control		S MORRIS	S MORRIS	U.S.W.	6/36			RG	73			2/1	✓	■	■		
			Group)				S.W 2	135			RG	60					■	■		
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3P																				
3F																				
			T HARDING.	A1.			S W1	63			RG	60		■	2/2	✓		■		
			(Main		R. JACKSON.	R JACKSON.	S W2	230			RG	70				✓		■		
			Auto			G WELLS.	S.W.2	291			RG	70			2/2		■	■		
			Group)			S. HUDSON.	S W.2	299			RG	72					■	■		
								7/38	J WILSON	Y.IN.T	RG	79			1/1			■		
6P																	✓	✓		
6F																	✓	✓		
	S. VEALE										RG	50	■				■	■		
7P																	4	4		
7F																	4	4		
			V. CHURCHILL.	A12a			S W1	39			RG	65			2/1 1/2	✓	■	■		
			(Roking Subs and			N HAMILTON.	S.W.2	121			RG	58					■	■		
			InnerArea)		P. SHARPE	P. SHARPE	S.W.2	207			RG	71			3/1	✓	■	■		
						J. WHITE	S W.2.	304			RG	72						■		
8P																	4	4		
8F																	4	4		
		T MITCHELL	T. MITCHELL.	A12a			S.W.1	57			AY	62			3/1	✓	■	■		
			(Ayrton Area)		A. HARRISON	A. HARRISON	S W2	241			AY	63			2/1 1/2	✓	■	■		
						B ANDERSON	S W2	170			PK	56					■	■		
						W LITTLE.	S W2	257			SM	66					■	■		

TWO LOADS SHOULD BE SHEWN FOR EACH GROUP OF WORKMEN (a) PRESENT LOAD (b) ANTICIPATED LOAD REQUIREMENTS 2 YEARS HENCE.

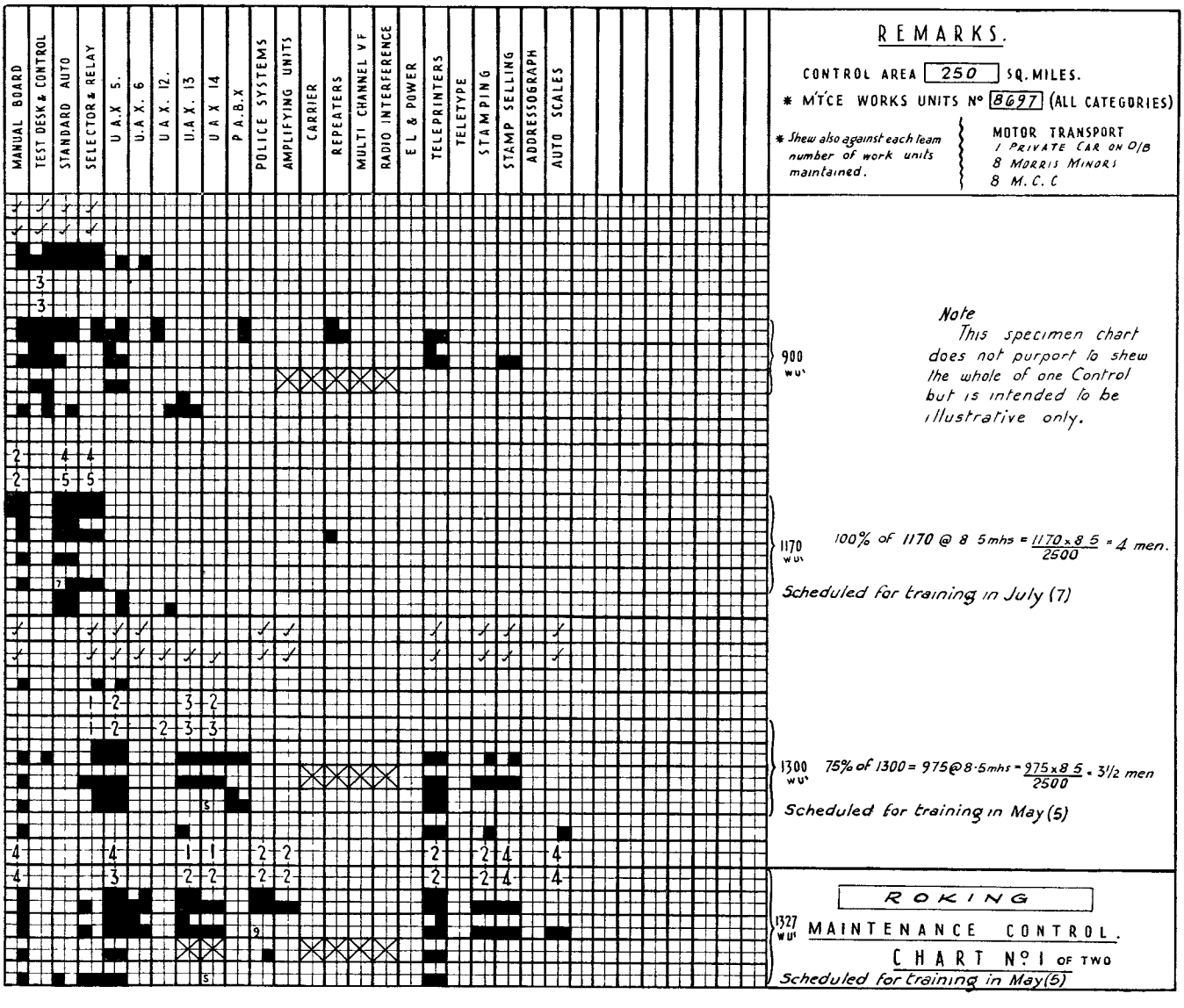
FIG

large expenditure on underground plant is properly regulated. In the author's view a Development and Planning Group might, at the outset, comprise both Engineering and Sales development officers working as a team, and future recruitment and training should aim at a body of men versed in both duties and competent to carry a scheme through in its entirety. If the Sales development officers were more intimately aware of the problems involved in the lay-out of line

combining the Traffic Officers engaged in Traffic design with the Engineering Officers engaged in converting that Traffic design into an equipment specification.

Control Statistics.

If the Control Centre is to be treated as the basic executive unit, then clearly performance statistics of



plant and if Engineering development officers were more in touch with the factors which influenced the development forecasts for a given area, the resultant scheme should more nearly approach its purpose, viz., the provision of adequate, but not excessive, plant to meet future development.

Similarly, there is much to be said in favour of both quality and quantity must be available on a control basis.

Such statistics have been available for a number of years in respect of the maintenance performance of at least one Engineering District and recently the whole of the Engineering Department's maintenance statistics were revised to put them on a control basis.

For the measurement of local performance and for the purposes of local supervision, control statistics provide a better analysis than Section figures for each maintenance sub-division. The adoption of control costing has helped to make possible the bulking of maintenance manhours hitherto kept in separate groups such as the six groups for Subscribers' Apparatus on different types and sizes of exchange.

The one criticism to which any new form of organisation exposes itself is the cost of implementing it as compared with the savings it is designed to secure. The absence of costs of Engineering Supervising Officers, Control Officers, Clerical Officers and of Motor Transport engaged on specific duties has made it difficult in the past to obtain a true picture of the overall costs of any one form of organisation or of any one team.

A system of comprehensive costs per Control has been devised and is being tried experimentally in several areas. By this means it is possible to determine the overall costs, inclusive of direct labour, supervisors, associated control (including clerical) staff, motor transport and subsistence for each Control team which will permit of true cost comparisons, not only between comparable Controls but also between one form of organisation and another.

The value of comprehensive costs, in principle, is indisputable, but it is perhaps not too much to say that an analysis on a Control Centre basis is the only practicable method of compiling such costs. To prepare and make use of such statistics on an Area or Section basis is almost impossible since they would comprise a summary of the expenditure incurred under the control of numerous supervising officers, working independently and the performances of individuals would not be readily obtainable. Variations in types of work add still further to the difficulties. Control Centre statistics, however, represent the performance of a team and are therefore a measure of the efficiency of local organisation and supervision as well as of labour and transport expenditure.

Personnel.

A team of workmen working to a Control Centre constitute a convenient unit on which to determine staff requirements. The numbers and qualifications of the workmen must be related to the immediate and prospective works load and such loads divide naturally between Controls, each type of Control representing a type of work and requiring qualifications dissimilar from those of other Controls. This statement should not, however, be interpreted as preventing or prohibiting interchange of staff between Controls, but rather as drawing attention to the fact that such changes should be kept at a minimum.

Fig. **2** is a Staff Control Chart for a Maintenance Control which has the undermentioned objects in view:—

1. To provide a means whereby maintenance loads may be scheduled in such a manner as to indicate the qualifications necessary for the efficient management of the load.
2. To provide a means of scheduling the staff *vis-à-vis* the load requirements and thus to determine—
   - (*a*) the extent to which the staff possess the qualifications necessary to the management of the load;
   - (*b*) the need for additional training of existing staff to remedy deficiencies revealed by (*a*);
   - (*c*) to guard against over-training of any one officer to the detriment of others and to effect economies in training expenditure;
   - (*d*) the need for additional trainees, *i.e.*, reserve staff, to meet future developments such as may arise from growth of or changes in type of plant, promotions, retirements, etc.

The workmen comprising the Maintenance team are divided into convenient Maintenance load groups and in each of the columns is entered a figure to represent the number of workmen who should be qualified in the subject concerned in order that the load may be efficiently covered. Two figures are quoted, the first (P) to indicate present requirements and the second (F) to indicate requirements two years hence.

Opposite each man's name and in the appropriate columns code markings are made to indicate the qualifications of each man.

Accommodation

Maintenance Controls.

In what follows the term " Control " includes the control staff, the control inspector and the field inspectors associated with the control.

For obvious reasons, *e.g.*, fault reporting and testing, maintenance controls are best located at the group centre exchange or switching centre of the control area and adjacent to the main frame. Since, however, it is undesirable that a control room should form part of an apparatus room it follows that the main frame and the maintenance control should occupy a room separate from, but close to, the apparatus room.

Provision should be made for the accommodation of traffic staff within the same building although it may be difficult to locate them with, or even adjacent to, the control room.

Installation Controls.

An installation control in the same town as the Area Manager's Office is probably best located in that Office together with the Sales Staff. Subsidiary installation controls at outstations should occupy rooms in the same premises as the local maintenance control even although they may be operated as separate and distinct controls.

Development (Planning) Units.

Generally, there will be only one planning unit within an area, although such unit may be sub-divided into internal and external functions. This unit should be closely associated with the Traffic Design and Sales Development Staffs, with the Accommodation Duty, also with the Drawing Office and Plant Records Duty.

In some areas depending upon the qualifications of the existing staff and the volume of internal and external work, respectively, it may be advantageous to group the development and execution work as follows:—

Major Works Control.

Sufficient accommodaton should be provided within the major works control to meet the requirements of the clerical forces intimately associated with such work and the remaining engineering clerical staff should be housed in an adjacent room. When planning the layout of a major works control it should be borne in mind that a part of the time of some of the clerical staff should be devoted to giving direct assistance to inspectors or groups of inspectors in such

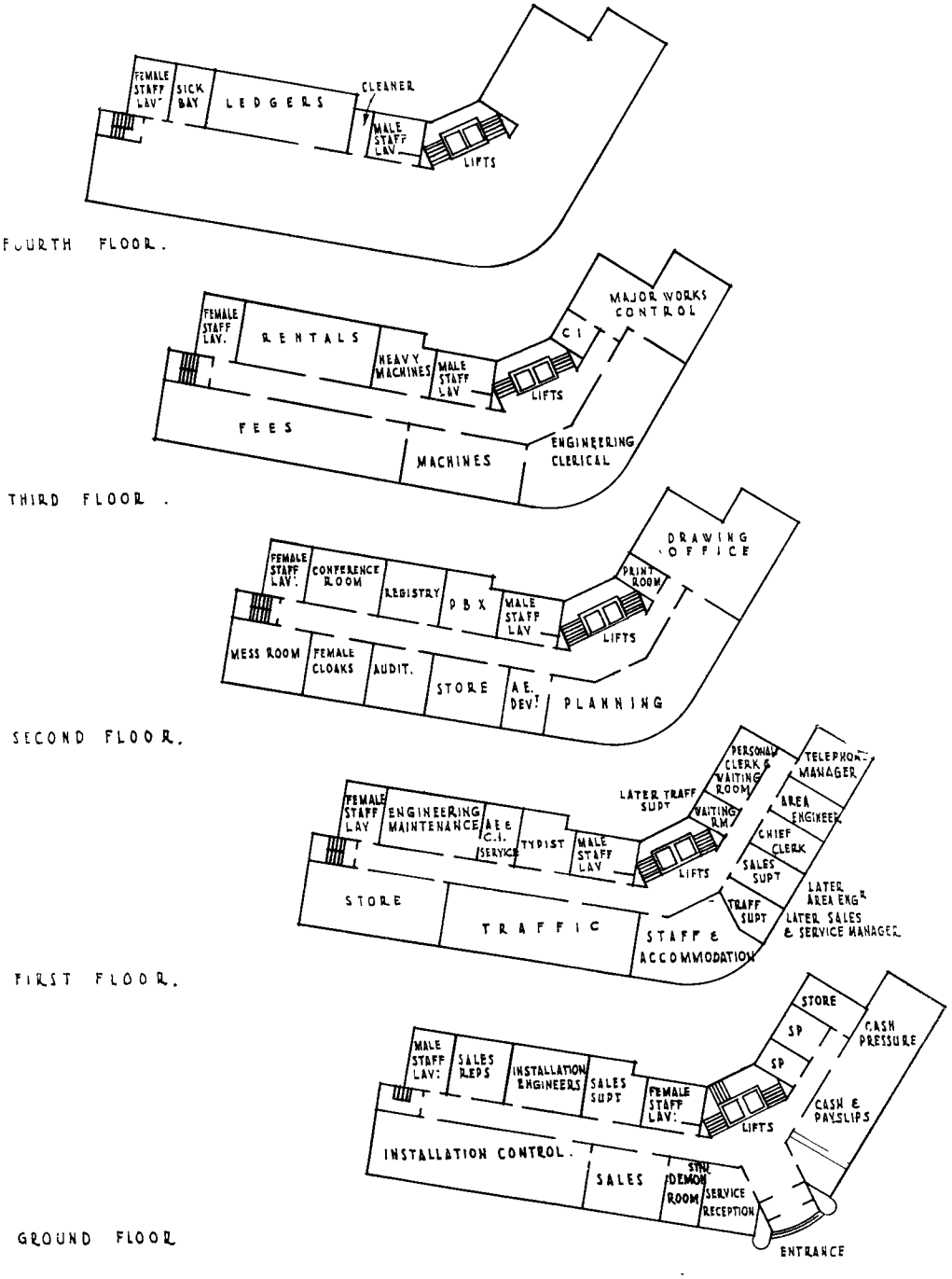


FIG. 3.

matters as the handling of the daily correspondence, answering telephone calls, filing, etc., as well as the indirect assistance afforded by the clerical group as a whole. It is desirable, therefore, that at least one clerical assistant should be allotted to each group of three or four field inspectors for this direct assistance and should be seated at their group of tables. This direct personal assistance, however, will not normally be a full-time job and the remainder of her time can be occupied with a routine job associated with the main clerical staff within the control.

The layout of accommodation in Area Managers' Offices has been determined in the main, and as far as circumstances would permit, on the lines indicated, and Fig. **3** is given as an example.

Conclusion.

No organisation can be satisfactory which does not make provision for variations between one place and another, in the qualities and capabilities of existing staff, telephone density, etc. It is the author's view that the principles of control working leave ample scope for ingenuity in their application to particular circumstances without departing from the fundamental principles which may be re-stated as follows:—

1. Service Duties should be separated from Development Duties.
2. Service Controls may be divided into—
   - (*a*) Installation Controls,
   - (*b*) Maintenance Controls, or
   - (*c*) Joint Installation and Maintenance Controls.
3. Development Control may be divided into—
   - (*a*) (i) Planning and Development (internal and external),
     (ii) Major Works Control (internal and external),
   - or (*b*) (i) Planning and Development (internal only),
     (ii) Major Works Control (internal only),
     (iii) Planning and Development (external only),
     (iv) Major Works Control (external only),
   - or (*c*) (i) Planning and Major Works Control (internal only),
     (ii) Planning and Development (external only),
     (iii) Major Works Control (external only).
4. Each control should be a self-contained unit comprising all the technical and clerical forces necessary to the fulfilment of its functions and equipped with statistical and other data necessary to the measurement of its performance.
5. Within each control the organisation should be such as to ensure that sufficient time is available for adequate supervision of the field forces and that such supervision is directed as much towards the guidance and encouragement of staff as towards inspection of quality and output.
6. No control should be so large that the supervising officers completely lose their individuality.

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