

Discussion.

The Author, in introducing his Paper, exhibited a number of lantern slides. He observed that the subject could not be reduced to exact scientific formulas, but he had tried to show the trend of modern thought, in order that the Paper might present the atmosphere and the organization within which reconstruction after the war would possibly—he would like to think probably—be carried out.

The subject of town and country planning and the reconstruction at which it aimed was so large a subject and so fundamental that it was probably basic to the work of every member of The Institution, and of most men connected professionally with building in Great Britain and elsewhere.

He thought that the framework within which planning and reconstruction were likely to be carried out, was very important, particularly to the younger members of The Institution, whose lifetime's work was involved, because some knowledge of the conditions under which they were likely to work was very important, and there was no doubt that a larger conception of the relative importance of individual projects would be one of the underlying principles of post-war work.

The Council had recently interested itself in a remarkable manner in some of the larger conceptions to which he had referred. The lectures which had been instituted at Cambridge and throughout the country and the Papers which had been presented to The Institution on such matters as aesthetics, general business management, and educational subjects, were directly related to the subjects of town and country planning and eventual reconstruction.

Much of the organization about which experts had been talking for the past 20 or 30 years had, by a system which he might call democratic progression, been embodied in legislation, and there was now a national recognition of the necessity for national planning.

In his Paper he had steered a course between the ideas of what might be called extreme conservatism and its opposite, which he had heard very aptly described as "long hair and sandals", that was, the experiments and theories of the faddist. Probably much in the Paper would seem advanced, but it contained nothing so far advanced as many of the ideas which were being urged at the present time. There was, he thought, a foundation which was workable and which was likely to be productive of results, and he had ventured to put it forward not only as a possibility but also to some extent as a probability. He had mentioned four fundamentals of planning and reconstruction after the war, the first

two of which should precede the formulation of a complete and orderly plan for the country, whilst the other two should govern the reconstruction. It mattered not under what financial conditions or under what conditions of land tenure the work was done ; they should not affect the plan itself, because that should be formulated to an ideal, but they would affect the progress of reconstruction. If the two great problems of finance and land tenure could be solved, the programme of reconstruction might mean something within the lifetime of, at all events, the younger members of The Institution ; but, if they were not solved, the danger might arise of a programme being entered upon which would take so long to carry out that great changes might take place in the meantime.

The President thought that all would recognize that the Paper was a work of high distinction. The Author was a high authority on the subject, and that was abundantly evident in the Paper. Under war conditions, and owing to censorship restrictions, Papers discussed at The Institution were necessarily fewer, but he was sure it would be agreed that, particularly as exemplified by the present Paper, they had certainly not been reduced in quality.

Mr. T. Peirson Frank hoped that the Paper and the discussion on it would tend to show the great part which should be played in planning, both local and national, by members of The Institution, and particularly by the younger ones who were specializing in town planning.

On p. 235 the Author had said, referring to the replanning by the Italians of their larger towns some years ago : " It is difficult to trace the actual cause of these activities." In 1929 an International Congress was held in Rome, and Mr. Frank had acted as honorary reporter of one of the meetings, at which Professor Chiodi, who represented the Italian views, said that the trouble in Italy was practically identical with that experienced in Great Britain ; during the past century the towns in Italy had developed like " stains of oil", but an effort was being made to change that monocentric development to self-contained units separated by very considerable open spaces. The subject of the space between a large town and its satellite town had also arisen in cross-examination when the Chamber of Trade of Welwyn Garden City had attended a meeting in London. The question was asked as to the distance they thought they ought to be from their larger town (in that case, London), and the reply was that Welwyn was too far away from the town to which it was supposed to be a satellite.

Those who had had in the past to deal with regional planning rather than town planning had doubtless felt the absolute necessity for some sort of foundation upon which the lay-out of a regional plan could be based. That need had been expressed on other occasions, but up to the present no national structure on which a regional plan could be founded had become evident.

Mr. Frank would like regional planning to be rather more closely defined, for the following reason. Ten years ago, when the topic was

under consideration, nearly all of the regions contemplated were about 20, or perhaps 30, miles around some of the larger towns. But those regions were not regions in the same sense as the present civil defence areas, which were regionally controlled. Which of those two views had the Author had in mind ?

In dealing with planning organization the Author had expressed the view (p. 242) that : " the plans themselves should be a matter for local preparation ; they should be prepared by local persons having an intimate knowledge of local factors—preferably by persons whose life and circumstances are parts of the plan itself." Mr. Frank thought that the men who had that most intimate knowledge were the engineers to the local authorities. Hitherto probably about 80 per cent. of the town planning schemes had been prepared by them, and they could therefore assist considerably in the larger national planning and reconstruction.

In dealing with detail planning units the Author had given (p. 243) two solutions for the problems encountered. The first was : " the revision of local authorities' boundaries on a regional basis." Mr. Frank was not quite sure what the Author meant by " regional " in that connexion, but that solution would be quite useful ; it was the one which the Italians and others had adopted ; but those who had taken part in any of the very keen fights for an extension of a borough boundary would know that it was not a very happy solution in Great Britain. One could not imagine two virile towns such as Leeds and Bradford being merged with each other. The problem was not one for engineers, but had to be dealt with by those who were concerned with the formation of the local government structure. The second solution suggested by the Author seemed more likely to meet with acceptance, but Mr. Frank thought that it would be necessary to add " with powers to implement the decisions." Some of the most successful work had been carried out by regions which had had sub-committees of the borough engineers and surveyors working under a joint committee of the local authorities.

A difficulty arose in the creation of a satellite town, which had been noticed by Lord Marley's Committee on Garden Cities and Satellite Towns. Usually the large town wanted to be able to expand, and therefore wished its satellite town to be some little distance away. Little difficulty had been experienced in the days when money could be borrowed from the Government free of interest for the purpose of financing the satellite town, as in the case of Welwyn, but such facilities were not available to-day. The County Council concerned would, if it were rich enough, assist in financing the satellite town—provided that that town was not planned to be so large as to become a county borough !

He agreed with the Author's remarks on ring roads. When Mr. Pybus was Minister of Transport he took quite a bold step and decided that part of Marylebone Road was to be a ring road and that all through omnibuses, Green Line coaches, and so on, should be kept out of the

centre of London. Mr. Frank considered that passengers travelling in public conveyances, such as omnibuses, should have the right of free transfer to omnibuses, etc., running within the inner circle. By that means the pressure within the inner circle could be relieved and only as many vehicles used as were necessary to convey passengers within that area.

With regard to heating and ventilation, the Author and he (with others) had recommended an impartial investigation, because they believed that probably one of the greatest national economies could be effected by adopting a system of district heating.

The Author had mentioned the "multiplicity of sewerage schemes in congested districts." Mr. Frank knew of no more congested district in Britain than the area within 25 miles from Charing Cross. In 1931-32 that area contained about 200 sewage-disposal works, two of which—operated by the London County Council—served more than $5\frac{1}{2}$ million people, whilst the remainder served about $3\frac{1}{2}$ million people. Those works had not been constructed at the dictates of engineers: the local government structure had caused that multiplicity of unnecessary, unsightly, and sometimes unsavoury works. The cost per head per annum for the two large works was 1s. $9\frac{1}{2}$ d., whereas, for the other works, in the sixty-four districts that furnished returns the cost per head per annum ranged from 2s. 2d. to 3s. 4d.

Sir Frederick Cook said that whilst he agreed with nearly all that the Author had said on the engineering aspects of the subject, he was inclined to dissent from the view that no urgent need for town planning had been apparent in Great Britain prior to 1918. The narrow and tortuous streets of our old cities had left us with a heritage which only the recent visitations that everyone deplored had provided an opportunity for improving in the comprehensive manner that was generally desired. Again, there were the conditions which arose as a result of the industrial revolution—the development of towns with mean streets and appalling buildings—which, as had been aptly said, gave rise to conditions in which people had to live, "divorced from nature, and unrelieved by art."

The Author had referred with an enviable freedom to the effect upon the development of the country of our system of land tenure; and he might well have added the building development which the country had suffered for so long—much earlier than from 1918—whereby the arterial roads were regarded not as main traffic routes but rather as furnishing desirable building plots upon which dwelling-houses could be subsequently erected. In that connexion it would be unfair not to mention the extraordinarily good work which had been done by certain large landowners on their estates, particularly in residential towns.

The Author had suggested four basic principles as essential to the organization for reconstruction, and Sir Frederick wished to suggest another, namely, transport. He thought that the means of communi-

cation should be regarded as an essential part, and indeed as the framework, of a plan. He was considering transport not from any one point of view, but as a whole. The spirit of co-operation had been singularly lacking. The development of canals had been hindered, if not stopped, by a form of control which was inimical to co-operation, whilst even in recent years the controversy—at times almost bitter—between road and rail had been unfortunate, and had led people away from the real crux of the matter, namely, that all forms of transport—road, rail, water, and now air—were essential, each in its own way and by its own means, to the industrial and social development of the country. Each should be regarded not separately, but rather as complementary to the others and forming an essential part of the whole system.

The Author had referred to the necessity, in the interests of trade and industry, of providing a balance which would not be subject to periodic depression or boom, and he cited Birmingham as a fortunate instance in that respect. Perhaps that condition in Birmingham was largely fortuitous. Geological as well as geographical conditions had to be considered, and those were conditions which could not be altered. The Author had suggested, presumably as a solution of the problem, that existing industries and centres of population should be supplemented or decentralized without regard to the effect upon purely local rates and property values. That was indeed a bold suggestion, but psychological, as well as material, conditions had to be taken into account. Those who had had experience in 1929 and a year or two afterwards, of moving people from one town to another, in order to find employment for them, realized the enormous but easily understandable objections which men raised to being taken away from an occupation which they had learned from their fathers and in which their families had been engaged for generations, and to removal from a neighbourhood in which they had been born and bred. It was obviously right that in such cases the people should receive the most sympathetic and kindly consideration. That was a matter perhaps for the politician, and not for the engineer, but it was indeed essential that the considerations which he had mentioned should be kept in view. He need only refer to such matters as the working out of minerals and the transference of trade from one district to another by reason of economic or other considerations, over which the people concerned, and the workers in particular, had no manner of control.

Mr. Frank had referred to the question of the machinery by which planning should be prepared and carried out, and the Author was evidently of the opinion that the best method to adopt was that of regional organization. Possibly that was the best machinery for preparing plans, but he doubted whether it could be left to the local authorities. It should be remembered that many variables operated amongst the constituent members of a region—variations in area, in population, in ratable value, and so forth—and, whilst some might find it comparatively easy to

carry out the recommendations of the regional organization, many others might find it beyond their means. The fundamental difficulties, to which Mr. Frank had alluded, were dependent upon and had arisen from the structure of local government. Such factors had led to the passing of the Trunk Roads Act in 1936, whereby certain roads became the responsibility of the Government instead of that of the numerous highway authorities through whose areas the roads passed. As the Author had implied, it was very unfortunate that the outbreak of war had put a stop to the work which was already in hand in that connexion.

In giving effect to regional planning, the spread of expenditure was not the only desideratum to be remembered. The burden should be equalized over the region as a whole on the basis of capacity to pay. The problem was perhaps beyond the scope of the engineer, but the Author had wisely remarked that in all such matters the engineer should undertake to educate the public. They would have to be dealt with before planning could be made really effective; otherwise those responsible would fall into the not uncommon error of trying to develop tactics in advance of strategy.

"Planning for future wars" was a prospect which few people could contemplate, and which none could contemplate with equanimity. If Great Britain were to be planned on the supposition that at any moment it might be attacked from the air, or that an enemy might land on its shores, surely that was a negation of all for which the people were now fighting; and nothing that they could do, no money that they could spend, no personal sacrifice that they could make, would be too great if it would save the country from that calamity.

The Author had discussed the part which the engineer should play in post-war planning and the qualities which he should possess. Of all those qualities none was more imperative than that of willingness to take advice. Planning was not the function of the engineer alone. By reason of his training and experience, no technical man was better qualified than the engineer to perform that task, although some matters had to be borne in mind with which perhaps he was not best qualified to deal. The Author had shown that in the matter of planning the engineer was capable of covering a wide field, and engineers should look forward to the time when they would accomplish the end they had in view, that of making Great Britain a better country in which to live.

Mr. D. H. Brown observed that in the section of the Paper dealing with a national skeleton plan, the Author had suggested that it would be desirable to divide the country into a number of regions to deal with the skeleton plan for communications. Surely that point was already met by the Divisional Department of the Ministry of War Transport? The headquarters of the Ministry dealt with all systems of transport and should therefore be the body to deal with the skeleton plan for communications, and Mr. Brown did not think that there was any need for further regionalization.

With regard to the approval of detail plans, if national control was too rigid or detailed there was a danger of standardization becoming a fetish which had little regard for local feelings and traditions. Whatever else might be said of the past development in Great Britain, it had to be admitted that in many areas the local building tradition had influenced the trend of development to the advantage of the country as a whole. With an increasing tendency for standardization throughout the whole country, the expression of local character and tradition might be submerged in a uniform standard of design devoid of any expression other than regularity.

The Author had referred to the possibility of the distribution of water-supply on a national scale. Quite apart from the economic and technical considerations, which were extremely complicated, a very important question of principle would also be involved, namely, the allocation of the costs of such a scheme. It would be appreciated that Mr. Brown was speaking as a county council official and not as a borough official or a water engineer. There was little comparison between the generation and distribution of electricity on a national scale and water-supply on similar lines, because, whilst everyone in the country would probably take advantage of the electrical scheme, in many rural areas large numbers of people were able to provide themselves with a sufficient and wholesome water-supply merely at the cost of sinking a well on their own ground. It could not reasonably be expected that such people would be prepared to contribute to the cost of a national water-supply scheme, even if that was found to be a practical possibility.

He was not quite clear as to the exact impression which the Author wished to convey in the fourth paragraph of the section on "Detail Planning Units" (p. 243, *ante*). A number of county boroughs in the country had large areas of rural land within their own boundaries, and in those cases there would appear to be no lack of balance between urban and rural considerations within the same county borough. If the Author meant that those areas were insufficient and that a much larger area was necessary to give a proper balance to detailed planning units, could he give some idea of the area of land which, in his opinion, should be included within a county borough planning unit for the purpose of effecting a balance in the planning outlook?

The Author had suggested that the county, although a much better planning unit as regards size, lacked the advantage of intensive urban development, with its consequent ratable value. Mr. Brown doubted whether that statement would find general agreement, for, so far as Warwickshire was concerned, a considerable intensive urban development in the county planning area had arisen from the proximity of Birmingham and Coventry. The type of development which had taken place had admittedly brought ratable value to the county; but the expenditure on the provision of such services as roads, sewers, schools, and so forth, had

frequently outweighed the income which was derived from the urban development, which was, therefore, not altogether a blessing since it carried heavy responsibilities with it. He would expect a similar position to exist in the home counties adjoining London, and also in the industrial areas of the north-west of the country. If, however, the Author meant that lack of ratable value in a county necessarily tended to cripple the preparation or carrying out of planning schemes, Mr. Brown would be glad to know the Author's reasons for that view.

In Warwickshire planning was being carried out on a county basis, by agreement with the local authorities working under four Executive Committees, which (with the exception of three municipal boroughs, that were preparing their own schemes) covered the whole administrative county. The County Council and the local authorities had representatives upon the Executive Committees, and Mr. Brown acted as Honorary Surveyor to the Committees. The schemes were prepared by a planning staff in his department, and the whole cost of the work was met by the County Council. By that arrangement local knowledge and interest were retained, and on the whole the system had worked fairly satisfactorily. Naturally in such cases local difficulties would arise. In Warwickshire one large urban area desired to avoid any industrial development in the way of factories, and in such a case there seemed to be a tendency on the part of the other authorities not to wish to argue with the authority in question as to whether the line it took up was right or wrong. He believed, however, that the bulk of the members of the Committee—certainly the technical members—thought that it would have been better for the locality in question to accept a certain measure of industrial development rather than hope to increase its population to 70,000 or 80,000 without having any industry within its boundaries. Before the scheme had been completed the war had started and had forced a good deal of industry into the area, so that the problem had solved itself.

He would be interested if the Author would amplify his views on regional collaboration, particularly as to when it could be stated with assurance that existing towns had grown too large for the provision of adequate amenities for the inhabitants, and also how it was suggested that the process of thinning out would be effected.

Whilst the establishment of new towns was very desirable in theory, considerable difficulty was involved in reconciling the various industrial, social, and domestic interests involved. Moreover, the tendency of the population of Great Britain to remain stable, with an increasing proportion of older people, would seem to confine the establishment of new towns within very definite limits, despite the drift of the younger people to the south and to the midland industrial areas, during the past few years, which constituted a rather different problem.

The dispersal of industry was a closely allied subject. The authorities in Warwickshire had been in direct contact with the problem during the

past 18 months and had been able to assist many industrial concerns in their search for existing buildings for use as factories, stores, and so forth, and with advice upon new sites for factories. In most cases where new factories had been erected the sites had been within a mile or two of existing industrial towns, or on the fringe of smaller towns, as the chief necessity had been adequate supplies of gas, water, and electricity, in addition to transport facilities for the workpeople. Alternatively, in a few cases quite small buildings had been taken in or near villages, and machines installed to employ twenty to thirty people, most of whom were drawn from the locality. In one or two cases fairly large new factories had been erected in country districts where public services were available ; but large numbers of workpeople had had to travel long distances to and from their work, and it would seem doubtful whether they would be prepared to continue to do that in peace time, or whether their wives and families would be willing to live in quiet country districts once the dangers and worries of air raids had passed, even if houses were provided. Possibly the dispersal of industry could be more successfully carried out by setting up new industries, as extensions of existing smaller towns, in parts of the country which were at present subject to depressions owing to their having only one type of industrial activity. That would avoid the necessity of moving people away from their existing homes and associations. Alternatively, if the trade was one which for commercial reasons could be conducted most economically and efficiently in a certain limited area of the country, that could most conveniently be done by dispersal to smaller towns within that area.

The more or less compulsory removal of people from one part of the country to another was a difficult, delicate, and expensive matter, which would need very careful consideration if a contented community and successful industries were to be established.

Mr. Brown agreed that planning authorities should have power to require private building or rebuilding to proceed according to a time programme, and should exercise control over initial building construction. One of the greatest drawbacks of the existing planning system was the lack of official encouragement to the practice of time-setting, which would allow the fullest advantage to be derived from existing services and the extension of them before development could be proceeded with in other localities, thereby reducing the cost to local authorities of the provision of uneconomic services.

Mr. E. H. Ford observed that the following quotation from a recent speech by a Cabinet Minister indicated the growing recognition of the part which the engineer had to play in the development and planning of modern cities : " The population of a large modern city could not exist without the many services performed by the engineer, and the growth and importance of his work is indicated by the large amount of money annually expended on these services. There are, in fact, few matters in municipal administra-

tion that do not directly or indirectly concern the engineer." He thought that that was borne out in the Paper.

The Author had asserted that "Great disasters and major wars frequently have resulted in considerable improvement in the physical standards of the people whose homes and properties have suffered damage." Mr. Ford would prefer the use of the word "material" rather than "physical"; but, even with that emendation, he did not agree with the statement. Many people considered that during the past 25 years they had seen a great retrogression of real values in Great Britain. He concurred that the peace-time programme of slum clearance and reconstruction did not exercise the popular imagination, but he thought that people would want to see the devastated towns and villages brought to life again as quickly as possible. He therefore regarded it as very important that practical and workable schemes should be prepared, so that reconstruction would not be delayed by the formulation of more ideal plans which would take much longer to put into operation. The danger was that people would become impatient and the country would drift into inferior redevelopment schemes.

The Author had been very bold in his suggestions as to land nationalization. Mr. Ford could not regard the purchase by the Government of mineral rights as a similar matter to the nationalization of the surface of the land. He considered that it would be unfortunate if replanning were taken into the political arena to such an extent as was suggested in some quarters. He agreed that it might be *easier* perhaps for a civil or municipal service to plan land which belonged either to the Government or to the municipality, but he doubted whether planning by such bodies always led to the best results. There was a danger of entering into a phase of national life where freedom and individuality would be enmeshed and bound by fresh legislation, the object of which would doubtless be, in the opinion of the present generation, the uplifting of the people; but, unless a very long vision were applied and great caution exercised, the result might be the exact opposite.

The British people could not let themselves drift away from their national characteristics. They were a cheerful people, humorous, self-reliant, perhaps reticent sometimes; they loved sport, and they loved animals and gardens and allotments. Another problem was that of the "hiker"; his path should be made easy—but not too easy. The roads were used by many unpleasant people, such as the "road hog" and those who spread litter on the countryside, and they had to be considered in any question of planning. Again, if the countryside were not to be spoiled, restrictions might have to be imposed upon speculators and others. The Author had referred to the education of the people; but what was meant by education? There would be black sheep, rogues, and Calibans for a very long time. At a conference which Mr. Ford had attended, a remark had been made which had struck him very forcibly, namely, that

the country would still have to have "localized hells." In planning provision would have to be made for all types of mind and for the enjoyment of all kinds of people. It might not be possible to do away with all the black country and other "localized hells," but efforts should be made to make them purgatories rather than hells.

Referring to the Author's remarks on Russia, Mr. Ford thought the best thing that could be done was to observe and learn from the failures in other countries. He could not think that English people would ever go in for the orgies of flat building which had taken place in Italy, Germany, and France, and it was certainly not desirable that they should turn to the Nazi type of architecture. The President of the Royal Institute of British Architects had said that he could not understand how architects in Italy, living as they did among the glorious buildings of the past, could construct such atrocities. There was a danger of that being done in Great Britain also, and it was necessary to guard against it.

He considered that too great a use of the drawing board, the T-square, and the pencil should be avoided. He was always very suspicious of a plan which looked pleasant and pretty on paper, and he felt instinctively that something was wrong with it. Diagrammatic plans and geometrical designs for housing estates were prepared without any relation to the engineering problems involved.

The Author had expressed the view that industrial expansion, agricultural policy, land tenure and finance were subjects "not within the scope of town and country planning"; but Mr. Ford thought that they should be.

He did not think that more new towns were needed. Many of the younger generation employed their draughtsmanship enthusiastically in designing new towns, but the question should be asked whether those new towns were wanted and whether people would be happy in them if they were built. Those who lived in the "desirable residential suburb" or the "desirable residential estate" were not always the happiest people.

The Author had raised a very interesting point by his statement that "the road constitutes a construction member or backbone of the redevelopment plan." As Sir Frederick Cook was present, Mr. Ford would plead that the Government should define trunk roads and motor roads as soon as possible, because, until that was done, planners could not make any progress with their redevelopment plans, even in central areas, since the road scheme formed the backbone of the whole plan.

Mr. Hilaire Belloc had truly said that imagination was the greatest gift that God had given to men, for by it alone was religion conceivable. Imagination, in which Mr. Ford included not only the features to which he had already alluded but also the human values and everything which the people of Britain held dear, should lie at the base of all planning.

The varying characteristics of the English, Welsh, Scottish, and Irish peoples, and the outlook of each of them and of the country and town

dwellers, should be exemplified in the physical planning and building of town, house, farm, and workshop.

Mr. S. B. Donkin observed that he appreciated the Author's proposal not to bury service pipes, cables, etc., in the roadways or footways in new model towns or villages, but to provide subways; or, if that were too expensive, to provide tunnels where crossing roads, and otherwise reserve strips of land on each side of each road so that buried service pipes and cables could be exposed for repairs or extensions without interference with traffic. The facilities offered by subways and tunnels made district heating and the supply of hot water considerably more economic and simple to install.

The Author considered that telephone, low-tension, and high-tension electricity cables should be underground. That was the correct ideal, but in practice it meant that the distribution system might cost from three to ten times as much as for overhead distribution (depending upon the voltage of transmission) and would affect the cost of electricity unless the local urban or county authority responsible for the new plan would provide the subways or tunnels without rental to the public utility undertakings.

Mr. Donkin wished to emphasize the desirability of district heating combined with the supply of electricity for a new town whenever a generating station was reasonably available, or its erection was permissible. It should be borne in mind that such district heating could be effective only if there were a reasonable density of housing to provide economy in distribution.

A supply of hot water should be made available, as well as provision of space heating, and both of those supplies should be given from the same source by means of hot water and through one service. Mr. A. E. Margolis had written a number of articles on that subject, and in view of his pre-war experience in Hamburg his figures were worthy of very careful consideration and attention.

For a model township such as that referred to by the Author, with 100,000 inhabitants and with some industry and municipal buildings, there could be, with the combination of the supply of electricity with heat, a saving in coal amounting to 100,000 tons per annum, in comparison with the separate and independent supply of electricity at the lowest possible present-day costs, together with the supply of coal for heating all the domestic and other premises in the town by open grates and by independent enclosed boilers for hot water. That saving of coal would represent about 1 ton per head of population per annum.

The Author had asserted that the cost of a service to the consumer for heating might be 3s. 6d. per week as an on-charge to the cost of the heat for a three-roomed house. Mr. Margolis had had some experience with such services, and with his design of a one-pipe system for both space heating and hot water, which he advocated, the price would be very much lower

than that, and he had told Mr. Donkin that it might even represent the total cost per week for heat, hot water, and the service.

In 1936¹ Mr. Donkin had demonstrated that a model township of 100,000 inhabitants could be provided with cheap electricity and heat for industrial and domestic purposes at a low and attractive cost and was a remunerative proposition. It was all the more economic, as he had said in his Presidential Address², if the ratio of the heat quantity to the quantity of electricity required was high. That ratio for the model town of 100,000 inhabitants referred to by the Author would be about $4\frac{1}{2}$ to 1 (heat to electricity) in heat units.

The following data had been used in giving the figures mentioned above: For a model township of 100,000 inhabitants with industry, hospitals, schools, and public buildings there should be a consumption of 800 kilowatt-hours of electricity per person per annum for power, light, and heat. (The load factor of the system might be 33.3 per cent. giving a peak load for electricity of 28,000 kilowatts.) 800 kilowatt-hours per person per annum covered sufficient electricity to provide for additional electric heating in cold weather and other special cases.

The space heating and heat required to provide hot water as at present, with coal fires and enclosed boilers, had been taken at $4\frac{1}{2}$ tons of coal per annum for a house to accommodate three persons. That figure had been given by Mr. Donald V. H. Smith in a recent Paper presented to the Institution of Engineers and Shipbuilders in Scotland³: it represented, for the Author's model township, about $1\frac{1}{2}$ ton per head of population per annum, and corresponded reasonably well with the consumption of coal for domestic purposes given in the Mines Department's Annual Reports.

The efficiency for open fires and enclosed hot-water boilers was taken as 30 per cent. The efficiency of the distribution of heat was taken as 80 per cent.

The saving was so large that the cost of providing the district heating and hot water service system could very easily be covered, and anyhow it would be covered by the charges made to the consumer for heat and electricity, so that there was a net gain to the country in the saving of coal.

Mr. Donkin admitted that the system could not be applied immediately throughout the country; but wherever a new township was to be built or reconstructed; wherever an electricity works was available, or could be built; and wherever subways or other special provisions were made for public utility services, a satisfactory case could be made out for the combination of the supplies of electricity, space heating, and hot water.

Mr. R. H. Buckley inquired whether Birmingham had been in an

¹ "Industrial, Agricultural, and Domestic Heating, with Electricity as a By-Product." *Journal Inst. C.E.*, vol. 1 (1935-36), p. 378 (Jan. 1936).

² *Journal Inst. C.E.*, vol. 7 (1937-38), p. 2 (Nov. 1937).

³ "District Heating and its Relation to Housing and Town Planning", *Trans. Inst. Engrs. & Shipbuilders in Scotland*, vol. 84 (1940-41), p. 163.

advanced stage of town planning before the war, whether any scheme had been actually in operation, and whether industry had been allowed to be restarted in its original position.

Restrictions on land permitted by legislation carried with them a liability for compensation, which usually terrified councils. When they were told that certain restrictions should be imposed, they nearly always said: "What is it going to cost?" And that fear prevented the benefits of the legislation being secured.

He did not consider that Great Britain had done well at town planning, especially with regard to the provision of great trunk roads.

He reviewed briefly the history of town planning in Essex. Between 1920 and 1930 the south-eastern part of the county was shockingly developed: there were no by-laws in the rural districts and no control.

Under the Local Government Act of 1929 the County Council obtained control of all the roads in the rural districts and inquiries were held with regard to the alteration of boundaries, with the result that large rural and large urban districts were created. That Act contained some very useful provisions and enabled the County Council to set up Regional Executive Committees. Three Regions were formed, comprising in all twenty-eight local authorities, and those who had had experience of the difficulty of persuading small units to forgo their own powers and to combine with others, would realize that it was a great achievement to get twenty-eight local authorities to combine in the work of the Executive Regional Town-Planning Committees. He stressed the word "Executive", because the Committees must be executive if they were to be useful. An important point was that the county council paid half the cost. Between 1925 and 1935 it spent an average of £1,000,000 per year on roads, and in 1935 it spent £16,000 on town planning.

In July 1933 the Essex County Council Act came into operation, under which the county council obtained valuable powers for land acquisition for green belt and open spaces, the clearing of waterways, and the prevention of ribbon development. It also provided that on the deposit of a plan with the local authority, a notice could be served on the owner of the property, requiring him to provide reasonable means of access before a house was sold, let, or occupied. That went a long way to stop sporadic development.

He was interested to read of the numbers of professional men engaged in town planning in Russia. Town planning was already slow enough in Great Britain, but if so many people had to be consulted it would be difficult to get anything done at all.

He agreed with Mr. Ford that the Author's four basic principles came within the scope of town planning. Industry grew up owing to physical conditions, and doubtless the Author would agree that atmospheric conditions should not be lost sight of. The town-planning schemes in Essex included many reservations of suitable land for agriculture. One

rather unfortunate thing was that the rural district councils, financially assisted, had laid many miles of water-supply pipes, and were disappointed that the land could not be sold for building purposes, so that they could recoup themselves for the expense of the water-mains.

Local authorities would not risk imposing restrictions on land tenure, because of the risk of compensation claims, unless they were assisted by the State, and would not cause large improvements to be carried out unless they were suitably financed.

The Author had suggested that a Ministry of Planning should be set up, and that one of its duties should be the preparation of a national skeleton plan. Whilst Mr. Buckley agreed that one Ministry, such as a Ministry of Works and Planning, should have control, he considered that it should possess executive powers backed by the Treasury, and it was very important that it should be composed of men who thoroughly understood local government. The Author had also referred to the determination of standards and research as being subjects to be dealt with by a Ministry of Planning, and had instanced building by-laws as codes of standards already in existence. Mr. Buckley wondered whether anything could be embodied in the by-laws to prevent the agony of the housewife during frosty weather. Some towns in Essex were frozen up every winter. The supply-pipes to the houses were encased in outside walls and the cisterns and heating cupboards were in the wrong places. Such matters could easily be put right, and it was very important that they should be.

He agreed that detail plans should be prepared by the local authority ; and surely national plans could be decided upon and embodied in the local schemes. He also agreed that a special Planning Ministry should approve the detail plans. The Ministry of Health was completely overwhelmed with town planning schemes. For Essex alone twenty-four schemes were in the hands of the Ministry when the war broke out, so that it could easily be realized what an immense number would have to be dealt with from all over the country. He would like to know what had happened to the valuable Report brought out by Sir Charles Bressey. If it was shown to local authorities they were frightened of it, and it was impossible for any local authority to put the very valuable proposals contained in it on a town-planning map unless the Government would undertake to meet all of the liabilities.

He hoped that too many controlling bodies would not be set up. Surely a large county or urban authority, having performed its functions of local government for many decades, had been "duly tried and tested" and should be given greater powers of control, untrammelled by the burden of overriding and unnecessary departments.

He thought that the Trunk Roads Act had been a great success. It had enabled very valuable work to be done in making double carriageways and cycle-tracks, and it was a pity that the war had stopped that work. Local authorities should be exhorted to have schemes in readiness for after

the war. He was pleased to say that Essex had schemes ready which would involve £600,000, and that £350,000 worth of further work could be put in hand in three months.

Whilst congratulating the Author on his interesting and idealistic hopes for the future, he was sure that in Birmingham the Author would be asked this question: "Where's brass coming from?" It was necessary to get down to practical politics. If the Government would say what it wanted, the local authorities would place the restrictions on their maps, subject to 100 per cent. liability being paid by the Government.

* * **Mr. G. L. Groves** considered that by his clear and comprehensive study of some of the reconstruction problems with which engineers would be called upon to deal, the Author had paved the way for other Papers on the same important subject. He hoped that further studies would be forthcoming, because the matter was urgent, the field was wide, and the potential resources of engineering to make the world a better place were almost unlimited. But the value of such Papers would be enhanced considerably by giving them wider publicity than inclusion in the Institution Journal. That suggested the vital question: what could the engineering profession do, in advance of its active participation in reconstruction schemes, to help solve some of the innumerable practical difficulties of the post-war period?

It was significant that the most far-reaching schemes of reconstruction yet achieved had been in "dictator" countries—Russia, Germany, and, to a smaller extent, Italy. Great as might be the needs in the matter of reconstruction on equally broad lines, Mr. Groves feared that the process would not, under the British democratic regime, gather sufficient momentum to drive it through with that thoroughness and dispatch which its great importance merited. But the measure of success which reconstruction eventually achieved would be proportioned in some degree to the extent to which the nation became reconstruction-minded. By that he meant something more than making reconstruction a popular catch-word; nothing less, in fact, than that all responsible citizens should have brought home to them a realization of the necessity for reconstruction, what reconstruction properly applied could do, what it entailed, and how it could be brought about.

A considerable part of the community was ready and anxious to improve its knowledge of things that mattered—health, economics, housing, forms of government, and so forth. Evidence of that was provided by such pointers as the reports of public libraries, the character of many broadcast talks, and the ready sale of popular editions on subjects of the type just mentioned. That being so, it was only reasonable to believe that thinking men and women would welcome more information, if suitably presented, than was readily available on engineering topics—

* * This and the following contributions were submitted in writing.

problems, methods, projects, and achievements. Knowledge of that kind would do much to foster an understanding of, and support for, those items of the reconstruction programme in which engineering was destined to play a leading part. If, therefore, the engineering profession could, through its Institutions, take a lead in spreading that knowledge, it would be doing far more to oil the wheels of the reconstruction machine than by keeping the knowledge and experience and suggestions of its members to itself and waiting passively for its services to be called upon when the machine was put in motion. Not only could it do so; in the national interest it ought to do so. The help that engineering was in a position to render, in large part, to a State disordered by faulty planning and by war, could be likened to what a skilled physician could do for a disordered body. In both cases it was only fair to the patient that he be told what was wrong with him, how much could be done for him, and the form his treatment should take: and who should tell him but the doctor? Accordingly, with those considerations in view, Mr. Groves submitted that the engineering profession should take the initiative in stimulating public interest in those features of post-war reconstruction which came within its province. He offered the following suggestions:

Publications.—Why not an issue of engineering “Penguins”? Not, of course, under that name, nor in association with the commercial undertaking which had made such a success of the “Penguin” series; the description was used merely to indicate the type of publication which had proved itself acceptable to the man in the street.

No difficulty should be experienced in preparing a number of concise, easily-read, and informative booklets on the engineering aspects of reconstruction. Two or three recent contributions to the Journal, after revision suited to the requirements of the lay reader, might well be included in the series. The Author's Paper was one, whilst another was Professor Inglis' Presidential Address¹, which, although it did not deal with reconstruction schemes, was of great importance to those who would be playing their part in reconstruction during the next twenty or thirty years; there was no question but that numbers of prospective engineering students, and their parents, would read and re-read that Address with interest and profit, not only at the present time but for many years to come. In order to maintain the supply of such publications, a list of suitable titles should be prepared and a scheme of awards for accepted contributions devised.

Broadcasts.—Many broadcast talks were given by doctors, economists, physicists, and other professional men: but how few by engineers, whose work was, to quote the President's words, “now shaping the destiny of civilization.” What an anomaly! Most laymen were interested in the work of engineers, and it was certain that suitable talks on the subject

¹ Journal Inst. C.E., vol. 17 (1941-42), p. 1 (Nov. 1941).

could be made a popular and instructive feature of broadcast programmes. Scope existed for useful pioneer work in that direction.

Meetings.—The Institution came into possession, from time to time, of material (such as the Paper) which was of interest and value to a circle far larger than its own membership. It would surely be fitting and desirable that such material, even if discussed at an Institution meeting in the first instance, should also be presented to much wider audiences, with, perhaps, speakers interested in the subject (but not necessarily engineers) invited to take part in the proceedings.

An extension of that suggestion was that a convention should be held to study the engineering aspects of reconstruction. That could hardly fail to be of value, even allowing for the fact that existing circumstances would limit its scope and activities in some degree. Attendance should be invited not only from engineering institutions but also from other societies—for example, The Scapa Society and The National Playing Fields Association—whose members' views would help in a clearer perception of the intricate framework of reconstruction into which the engineer's contribution would require to fit. The proceedings of such a convention would provide the basis of subject-matter for at least one interesting and valuable "Penguin."

Dr. C. S. Myers had asserted in his James Forrest Lecture¹ that engineers were introversive. Perhaps they were; certainly they were as a corporate body. Mr. Groves considered that The Institution, as the parent society of engineers in Great Britain, had a responsibility not only to its members and to the profession as a whole, but also, if only because of the war, to the State. It should surely review its methods and procedure, broaden its contacts, and do all in its power to further the prospects of that new and better social order of which the nation stood in such great need.

Mr. T. H. Longstaff considered that the Author, in applying his vast knowledge and experience to the major problems which would arise in relation to post-war planning and reconstruction, had done a real service not only to The Institution but also to his profession generally. In fact, the subject was so ably dealt with that The Institution might do well to consider passing the Paper on to the appropriate Government Department charged with the duty of formulating post-war development plans.

Next to winning the war, the major problem with which the British nation had to deal was the immediate establishment of a sound, practicable, and economical scheme of post-war reconstruction and development, for its future life and well-being were necessarily dependent thereon. The Author had indicated a basis upon which to build the perfect scheme, although admittedly the actual conditions might not permit the "ideal"

¹ "Psychology as applied to Engineering", Journal Inst. C.E., vol. 18 (1941-42), p. 295 (Feb. 1942).

to be completely fulfilled. The League of Nations had possessed the most commendable ideals, but owing to the lack of practical facilities with which to establish them its efforts had not prevented a world catastrophe.

It seemed necessary that no time should be lost in taking major decisions on the four items enumerated on p. 237, *ante*. Foresight and sound judgement would be needed in the endeavour to envisage the basic conditions.

For all practical purposes Great Britain might well be considered as one huge industrial concern, which, in the past few years, had been almost entirely transformed for the production of war weapons and materials. During that period it had been subjected to both damage and considerable wear and tear. Meanwhile, other nations with whom a large percentage of its pre-war trade had been carried on, had become highly industrialized and serious inroads had been made into the nation's capital and foreign assets. It would appear that immediately after the cessation of hostilities it would be necessary, without loss of time :—

- (1) to adapt, repair, and improve the nation's industrial undertaking to produce 100 per cent. efficiency ;
- (2) to provide productive work for every able-bodied man : the national finances would not permit of " carrying passengers " ;
- (3) to encourage the personal qualities of thrift, perseverance, and determination to succeed. The members of the community should not be allowed to drift into nothing more than " human machines."
- (4) to provide such amenities as business could afford.

A well conceived and carefully prepared scheme was essential and the nation could not afford to lose time in establishing the foundations ; but above all the scheme should be thoroughly practicable, economical, and capable of fulfilment.

Mr. Longstaff feared that failure to adopt that as the post-war outlook would entail grave risk of heading for national bankruptcy.

He considered that the need for a national skeleton plan had been all too obvious for many years past. The organization indicated by the Author would appear to meet the position, and such a Central Department would be able to co-operate with other Government Departments concerned in the establishment of such a plan.

Obviously the invaluable local and practical knowledge possessed by local authorities and their officers, a large number of whom were members of The Institution, was of vital necessity in the preparation and administration of any planning and reconstruction scheme.

It would certainly seem that a case existed for the establishment of a system of regional collaboration. Had the Author considered the possibility of existing county authorities undertaking that duty ? They were already experienced in collaborating with local authorities and in many

instances the staffs of county councils had for some time been engaged in the preparation of planning schemes. An economic advantage was that practically all county councils already had on their staffs officers who possessed the necessary experience together with technical qualifications of high order in engineering, architecture, finance, law, and education.

The Author had stated that secondary communications were regional matters. Presumably county and county borough councils, as the existing leading highway authorities (in consultation with the Ministry of Transport), would be the appropriate bodies to deal therewith. As the planning of road communications would, of necessity, be a subject of major importance in any planning scheme, that might be considered as a further reason why county and county borough councils should become the regional authorities.

Mr. Longstaff suggested for the Author's consideration the provision of a "Supplement" to his very valuable Paper, containing more detailed information in regard to regional and local control.

Mr. A. W. Ward observed that the task foreshadowed in the Paper would be so colossal as almost to overwhelm a nation just emerged from a world war, and it was questionable whether Parliament or people would or could grapple with it, except by stages. Much had been heard about "five-year plans" and it might be that more would be accomplished by proceeding by instalments "on a fixed-time basis"—an expression used several times in the Paper—than would otherwise be the case. The necessity for reorganizing agricultural, industrial, and transport policy and for clearing the land of slum dwellings and building new homes was recognized; one could gauge what was required to make good the damage already caused (but could conjecture only as to what might yet be done) by enemy action; and the mere statement of the case was quite sufficient to indicate that the guiding principles governing the general plan of reconstruction would have to be made with courage, celerity, and vision.

Recently it had been said, in an interesting broadcast, that "democracy must use persuasion in its dealings concerning land." That was a thorny subject, which, because of the traditional British conception of private ownership, had to be approached with some trepidation; but there could be no doubt whatever that it was the rock upon which the whole scheme would be wrecked unless that fundamental subject were dealt with courageously. "Courageously" was not intended to mean outrageously. A clear-sighted policy on the part of landowners generally (including their advisers) would serve the legitimate interests of all concerned infinitely better than would obstruction "to the last ditch." The Author had laid down four "basic principles" (p. 237), and he appeared to have been labouring under a sense of frustration when he wrote the first sentence of the paragraph on "Land Tenure" (p. 239). Something could be gleaned from his change of mood as that paragraph developed, and everyone familiar with the difficulties and almost insuperable delays which were encountered

when the interests of landowners were concerned—and one could imagine how those difficulties would be aggravated when the whole country constituted the sphere of operations—would heartily endorse his statement that “. . . the control of land must be definite and not subject to argument and litigation.”

A skeleton plan, clearly indicating the broad principles upon which the future development and reconstruction of the country was to be based, would clarify the situation immeasurably, stimulate the active interest and support of every section of public opinion, and avoid hasty and wasteful improvisation. The Ministry of Works and Buildings had collected, and was still collecting, a mass of valuable information and advice from leaders of thought in every profession and business concerned, and it should be possible so to marshal and co-ordinate such information and advice that a skeleton plan and basic principles could be agreed upon. No sane person would wish to divert one ounce of effort required for winning the war, but with failure to make physical (as well as political) plans for peace, absolute chaos would await the demobilization of vast numbers of men and women.

The Author had made frequent use of such expressions as “local initiative”, “local interests”, “local authorities”, and had strongly deprecated too rigid a control over Local Planning. Mr. Ward thought that few, however, would wish to quarrel with the statement made recently in Parliament:—“We shall encourage planning authorities to group in areas suitable as units. . . . Too many too small units were being separately planned. In any new or further groupings, local authorities will be consulted; I ought not to need to say that.”

The number of local authorities might have to be reduced, for it was doubtless correct to say that there were “too many too small units.” That matter might safely be left to Parliament. The task of technical men would be to dovetail local planning and reconstruction into the regional and national schemes, and it was that task which would concern the large body of corporate members of The Institution engaged in local government service. What had already been accomplished in regional and town planning had been mainly the work of those officials. Co-ordination of effort on the part of some planning authorities had, unfortunately, been lacking; but, in extenuation, it should be said that there had been no national plan to stir the imagination.

The Government had adopted a five-year plan since hostilities had commenced, in the form of the War Damage Act, which answered the question as to how the funds would be provided for repairing damage to property due to enemy action. The power to raise in 5 years a sum equal to half the Schedule A assessments of property would produce a colossal amount for post-war reconstruction—not less than £150,000,000 on a conservative estimate. In justice to property owners, building operatives, manufacturers, engineers, architects, and others, plans should be made in

readiness for the time when men could return to their peace-time occupations and reconstruction could begin.

The public conscience had been aroused for action in regard to post-war problems, and had perhaps never been so well informed and expectant. The air was full of educative propaganda, and great satisfaction would be felt if the Council of The Institution were to regard that day's proceedings as inaugurating a new phase in its history, for the part which the engineer should play in that great work (in conjunction, of course, with other professions concerned) had been amply demonstrated.

The Author, in reply, observed that the discussion undoubtedly indicated the wide interest which members of The Institution were taking in the important subject of post-war planning and reconstruction, and it was most encouraging to find that many of the points referred to in the Paper had already provided subjects for considerable thought.

Perhaps the problem which recurred most consistently throughout the discussion was that concerning the constitution and the area of control of detail Planning Authorities; that point had been mentioned by four contributors, who, whilst not disagreeing that some revision of the present position was necessary, had asked for elucidation, whilst Mr. Longstaff had gone so far as to suggest a supplement to the Paper.

The subject was admittedly difficult, but it appeared that unanimity would be found in the suggestion that detail Planning Authorities should operate in an area which was capable of being planned and eventually dealt with, so far as new construction and reconstruction were concerned, as a balanced unit, the chief difficulties being the constitution of the Authority and the area of the unit. It was difficult to define either of those factors in precise terms, but in the Author's opinion the constitution should be democratic and should be local; moreover powers should be more complete than at present, and should embrace not only a complete planning control, but also a much more complete financial control by local authorities.

The area of control was extremely difficult to define in general terms, and in practice would be difficult to define by specific boundaries. There were many factors with which it would be desirable to comply, some of which had been mentioned in the Paper—for example, areas of water-supply and areas bounded by major physical features; but an examination of those desiderata indicated that individually they would require widely varying boundaries. Drainage-areas, for example, might be extended for hundreds of miles—much too far, in fact, for any local cohesion. In dealing with balanced planning, certain areas would be highly urbanized, and others reserved for rural use; whilst the intermediate requirements of agricultural villages, market gardening, and agricultural industries had also to be planned. Each had a bearing upon the others in regard to both human well-being and financial support. A measure of industrial balance between a number of towns would be much

easier if the towns concerned were under a unified control : in some parts of Great Britain county areas would hardly be sufficiently large or correctly drawn to achieve that object.

Areas such as the Lake district or the Yorkshire moors need present no difficulty ; they would fall into the category of national reservations and would be subject to special restrictions and control.

The land of Great Britain could never become completely self-supporting for its present population—there was not sufficient of it ; it had been estimated that approximately 2 acres were required for the complete agricultural needs of one person, and since the area of Great Britain allowed only a little more than 1 acre per person of population, it was useless to attempt to define self-supporting units on a population basis.

The excellent planning carried out within county areas in the past, would tend to indicate that similar areas would be useful as planning units in the future ; but in the Author's opinion it would be absolutely necessary that the planning control over a county area should include control also over the area of any contained urban development, including boroughs and county boroughs. It was probable that such areas would constitute a very good commencement, although when the plans were under consideration adjustments would undoubtedly be found to be necessary. There seemed to be no reason why provincial authorities reconstituted on such a basis should not retain their local interest, which would be enhanced by a still further localized control by district committees composed of members resident in particular parts of the areas.

The reform of local government was a very complicated subject, involving many matters outside the scope of the engineer ; but it was not difficult to lay down definite factors to which a formula could be fitted, and the factors could be decided most readily from the defects existing in the present system, all of which—financial, physical, and social—arose from lack of balance.

The psychological aspect of transference of population, mentioned by Sir Frederick Cook, was very important : attachment to " the old home " was very complex and was made up, among other things, of friendship as well as familiarity with material things. It would be less upsetting to move a complete community than a single family, and some scheme on those lines might be feasible by transferring a complete industry with all its workers. If, at the same time, the new conditions of living formed a vast improvement on the old, the operation would be facilitated. The important point, however, was that the present generation of people might have to make certain sacrifices for the well-being of generations to follow, who would not be affected by the same psychological inhibitions. In any case, compulsion was undesirable—persuasion based upon real improvement was the only sound course.

Sir Frederick's remarks concerning transport could not be over-stressed.

Communications should form the basis of any national plan, and the formulation of an adequate scheme should be the first task of a Ministry of Planning. The four basic problems referred to, however (despite Mr. Ford's and Mr. Buckley's opinions to the contrary) did not lie within the scope of physical planning; they were matters of major national policy which would govern the formulation of the whole national plan, including communications, and the carrying out of the work; but there was a very clear distinction, for example, between national and international allocation of trade, or the financial economy of a nation, and the planning of the physical use of national space. The planning was governed by the policy decided for the first-named consideration; but unless the term "town and country planning" was to include everything within the scope of human life, physical, social, political, economic—and even spiritual—a distinction must be allowed.

In reply to Mr. Brown, it was intended that a distinction should be drawn between national communications and secondary or local main roads; the latter class of highways was important chiefly to the local or regional traffic, and could well be dealt with locally.

Large towns with a considerable ratable value were undoubtedly able to provide more efficient services of a luxury type—libraries, museums, etc., and such features as a university and an opera house. Moreover the economy of certain large industrial plants required mass labour which could be found only in large towns; but it was probable that all of those advantages could be provided to the ultimate in a community of 250,000 persons, who could live and work under excellent conditions in an area of about 25 square miles. No person in such a town need live at a distance of more than 3 miles from his work or from the open country, provided the surrounding area were properly controlled; any population in excess of that number was unnecessary, and the defects in that respect of the half-dozen largest towns in Great Britain were too well known to need stating. Population tendencies could not be dealt with in the Author's reply; the subject was vitally important and the present tendency was likely to result in a situation of a very dangerous character. Remedies existed, but they were of such a nature that they would be more likely to impose themselves than be voluntarily adopted.

An interesting point had been raised by Mr. Donkin in regard to the cost of burying service mains underground. Under the past and present system of land tenure in Great Britain the owners were in a position to require payment for an easement in respect of any pipes or cables laid under their land—in effect, to make a levy on services to the public; the Author hoped that such anomalies would disappear with a revised system of control.

Mr. Buckley had asked specific questions concerning Birmingham, and a reply might be of general interest. Birmingham had an area of more than 50,000 acres (82 square miles). The whole area was planned for

zoning and communications, but the older central parts of the city, about 12,000 acres, were not covered by resolution. Eight individual schemes covered the remainder of the area, five of which were operative schemes, including the first scheme ever approved in Great Britain (1913). About three-quarters of the city had been developed under town planning control, and industry had not been allowed to restart in positions zoned for other purposes, with the important and unfortunate exception of Government-owned industry. Despite that bad example, zoning had operated very effectively.

The Author wished to thank the contributors for their many interesting and instructive comments.

There could be no doubt of the responsibilities and opportunities of engineers in the all-important task of reconstruction.
