called organic: London, Liverpool or Manchester. They too have a network of streets and however much the grid is distorted, it is there. At a certain scale and under certain pressures the grid combined with floor space limits and daylight controls is just as likely to force tall building solutions. And it is just as likely to congeal. It lends itself just as readily to regenerative action. The theoretical understanding of the interaction between the grid and the built form is therefore fundamental in considering either existing towns or the developing metropolitan regions.

The process of understanding this theoretical basis rests in measurement and relationships and it goes back certainly to Ebenezer Howard. Lionel March has recently pointed out a number of interesting things about Howard's book *Tomorrow: a peaceful path to real reform* first published in 1898. It is a book about how people might live in towns and how these might be distributed. But the important thing is that there is no image of what a town might look like. We know the type of housing, the size of plot, the sizes of avenues. We know that shopping, schools and places of work are all within walking distance of the residential areas. On the basis of these measurements we know the size of a town and the size of Howard's cluster of towns which he calls a city Federation. We know the choice that is offered and we know the measurements that relate to these. If we disagree with the choice we can change the measurements. Lionel March (1967) took Howard's open centred city pattern linked by railways and showed that it could be reversed into a linear pattern linked by roads and that such patterns could be tested against the land occupied by our present stock of building and our future needs.

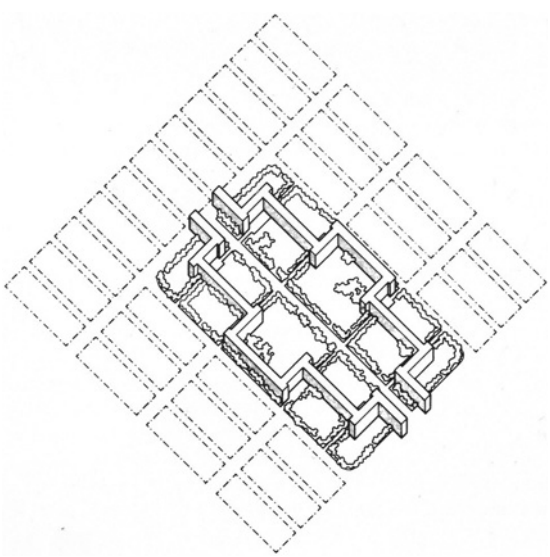

FIGURE 8.4
Change in the scale of the grid. Le Corbusier's proposals for dwellings with setbacks (from his proposals for a city for 3 million people) are superimposed on the Manhattan grid and open up new possibilities in the building form.

Now that is theory. It contains a body of ideas which are set down in measurable terms. It is open to rational argument. And as we challenge it successfully we develop its power. The results are frequently surprising and sometimes astonishingly simple. Ebenezer Howard's direct successor in this field was Raymond Unwin. The strength of his argument always rests in a simple demonstration of a mathematical fact. In an essay 'Nothing gained by overcrowding' (Unwin 1912), he presents two diagrams of development on ten acres of land. One is typical development of parallel rows of dwellings: the other places dwellings round the perimeter. The second places fewer houses on the land but when all the variables are taken into account (including the savings on road costs) total development costs can be cut. From the point of view of theory, the important aspect of this study is the recognition of related factors: the land available, the built form placed on this, and the roads necessary to serve these. He demonstrated this in a simple diagram.

Unwin began a lecture on tall building by a reference to a controversy that had profoundly moved the theological world of its day, namely, how many angels could stand on a needle point. His method of confounding the urban theologians by whom he was surrounded was to measure out the space required in the streets and sidewalks by the people and cars generated by 5-, 10- and 20-storey buildings on an identical site. The interrelationship of measurable factors is again clearly demonstrated. But one of Unwin's most forceful contributions to theory is his recognition of the fact that 'the area of a circle is increased not in the direct proportion to the distance to be travelled from the centre to the circumference, but in proportion to the square of that distance'. Unwin used this geometrical principle to make a neat point about commuting time: as the population increases round the perimeter of a town, the commuting time is not increased in direct proportion to this.

The importance of this geometrical principle is profound. Unwin did not pursue its implications. He was too concerned to make his limited point about low density. But suppose this proposition is subjected to close examination. The principle is demonstrated