tion, creativity and effort—can evolve the more important software, commercial, cultural and social.

Our modern cities have been shaped by inventions which occurred almost a century ago, such as the telephone in 1877, the skyscraper in 1880, the electric light in 1880, the electric trolley in 1885, the electric powered subway in 1886, the internal combustion engine in 1889, and the electric elevator, in 1889. Until contagious disease was brought under control, largely as a result of the invention of indoor plumbing, the development of high density population centres was out of the question; but it was the subsequent inventions of the 12 years, 1877-1889, that made the modern city a physical possibility. With the application of electricity, the ways of using a city and managing its intricate web of activities changed dramatically. The telephone made instant communication within the city possible, regardless of size. The electric light reduced fire hazards and provided greater safety on the city's streets at night. Developments of structural steel, large scale mechanical equipment to convert fuel to heat and the elevator, made high rise buildings possible. The streetcar and subway made possible rapid, cheap intra-urban transportation. Of all the inventions, however, the internal combustion engine and its application to the automobile has probably had the most profound effect of all on the city in the past quarter century. It is odd that even though the automobile was invented in the same dozen years as the other inventions that made the modern city physically possible, it is the automobile that is now largely responsible for rendering the modern city humanly impossible.

● (5:00 p.m.)

Perhaps we have arrived at a point where our cities must, in the physical sense, be founded upon something more contemporary than the concepts evolved from the inventive heyday of Alexander Graham Bell, Thomas Edison, Gottlieb Daimler and the Otis brothers. It is within the competence of the federal government, in the exercise of its spending power, to influence research, invention and development to achieve a more acceptable urban environment. I would like to enumerate areas where I think this might be undertaken. Some areas, I know, are already the subject of extensive activity, others less so, and others not at all; but I fear that whatever the intensity of activity, meeting the urban challenge is not now the subject of a co-ordinated approach and it must be if we are to succeed.

The four general areas I will enumerate require as much co-ordination among themselves as they do within themselves. In other words, that co-ordination is as important between the transportation and enclosure systems as it is between the various parts of each system. The initiation of an over-all, co-ordinated approach also seems to me to be much more amenable to success at the federal level than at the municipal level where the individual city will likely be so preoccupied with the priorities of existing problems that a global look at the urban fact, even in its own case, is almost impossible.

Finally, greater economy as well as objectivity can be achieved at the federal level in matters that concern all cities. The federal government can and should offer leadership. Most cities will welcome it. But the provinces must accept that leadership.

The first area for research, invention and development is the system by which a city ingests, each day, huge quantities of food, water, fuel and supplies and consequently produces huge quantities of waste in the form of sewage, garbage, trash and air pollutants. I suggest that it is futile to work on pollution alone while ignoring the input and processing that result in the pollution problem. A convenient and familiar example is presented by the non-returnable bottle. Is it really a pollution or a supply problem?

A second area is the transportation system, the means by which people and goods move in the city, both horizontally and vertically. The objects and the people along these paths of movement, highways, elevators and so on, are dynamic, but the paths themselves are too often static with little or no capacity to adapt to changing demands. A busy street necessarily blocked by a delivery truck awaiting an inadequate freight elevator is a commonplace example.

Then, there is the city's information communications network which makes it possible for the many parts of a great city to keep in touch with each other and which, in theory, should permit the city to operate as an entity and for signals to go out at the proper time to keep the other systems under control. Individual components of this network—telephone, electric distribution, traffic lights and so on—seem to work very well, but are they co-ordinated and do they serve the other systems? If they do not, should they not? For example, should it not be possible for a tele-