Mr. DADDARIO. Mr. Vivian.

Mr. VIVIAN. I have several questions regarding mine drainage. Does mine drainage last more or less indefinitely? After mines open, how long will the drainage continue to run? For a hundred years?

Dr. HIBBARD. As long as water is flowing through the area, yes. Our problem is not with the mines operating today, but with the mines that have been abandoned and water has been flowing through them for 40 to 50 or more years.

Chairman MILLER. In the old times, this water found itself into other systems. What the mines have done is to break the pipe and tap it. The water is coming out now and there is no way of stopping it.

Dr. HIBBARD. And, this is why the first approach was to seal the mine. Hopefully the seal would prevent the water from getting into or out of the mine, but in many cases the situation is such that it is impossible with currently known means to do this.

Mr. VIVIAN. Every surface of a hill in a sense, is an open mine. So, presumably nature has been absorbing mine drainage for thousands of years, hundreds of thousands of years, and I presume what happens is that you have an accentuated rate of chemical contaminations in deep mines. Is that the problem?

Mr. PERRY. The mines that give you problems are those above drainage. If a deep mine below drainage gets filled with water, then the problem disappears. There are three elements that are required to make acid mine drainage. Ore is the pyrite, one is water, and one is air. If any one of these is eliminated then acid mine drainage stops so, over a long term, exposed sulfur compounds have been washed away and it is only by mining where you open fresh surfaces containing sulfur compounds that can come in contact with air and water that you have acid forming again.

Mr. VIVIAN. Is it particularly prevalent in the open strip mines which I see so often in the Alleghany area?

Mr. PERRY. It occurs there, too, but better methods of control have been developed for strip mines than for underground mines.

Dr. HIBBARD. In fact, with existing mine operations and anticipating the problem, you can frequently handle it as you go.

Mr. VIVIAN. I would like to ask about the subject of auto fuels again. What actual improvements has the Bureau of Mines been able to make in the treatment of auto exhaust?

Mr. PERRY. The Bureau's research has been financed principally by Public Health Service. Our work has been to identify the variables that affect the kind of products that come out. The product from an auto exhaust is a product of unburned hydrocarbons, stuff that comes through unchanged, partially burned hydrocarbons; and mixtures of these. The Bureau's role has been to actually try to identify the individual compounds and their relationship to fuel composition because this is variable depending upon the way you process it and the crude you made it from.

When an engine is accelerating, decelerating, or idling, the condition of the engine, type of engine, all of these things affect the nature of the waste product. Our role has been generally to identify the facts related to this so that abatement devices could be devised.