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Future of Pennsylvania's Mineral Industries

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A REQUEST by Secretary Livengood for a statement on the future of Pennsylvania's mineral industries gives me the opportunity to point out the imminent crisis with which this Commonwealth is confronted and the possible means for avoiding it.

The unplanned exploitation of Pennsylvania's rich heritage of mineral fuels, and metallic and non-metallic ores has brought us to the position where immediate and resolute action is essential if we are to avoid economic disaster. In a State where minerals provide most of the primary wealth and much of the revenue, the decline of the mineral extractive industries is bound to bring about a ruinous decay in the economic health of the Commonwealth. This situation is developing gradually, but can be as tragic as if precipitated overnight. Nevertheless, remedies are available and these I propose to describe in the following pages. They are, briefly, education and research: (1) education of the citizenry as to the importance of minerals in the economy of State and nation; (2) education as to the source and the means of procurement of minerals; (3) education and research in the field of human relations; (4) education and research in the origin, the constitution, and the occurrence of minerals so that search may be facilitated; (5) education and research in the economical, efficient and safe methods of mining, recovering and purifying the mineral fuels and ores; (6) education and research in the transformation of mineral fuels into energy and conversion of minerals of all classes into raw materials of industry or finished articles of commerce.

Organization, planning and execution are essential now.

Our Mineral Civilization

The crashing conclusion of the war—marked as it was by a new use of the rare mineral product uranium—has demonstrated as never before the overwhelming dependence of present-day civilization on mineral supplies. That atomic disintegration released energy on a scale hitherto undreamed of, but much time will elapse before the Herculean labors required in research and in engineering development can leash even a small part of that energy for industrial use. Certainly man's conquest of natural resources will ultimately include the mastery of atomic energy and this almost limitless power can be made an agent for the preservation of peace and the betterment of all mankind if we possess the wisdom

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properly to administer it. It must be remembered that gunpowder was developed and known for centuries before its employment in war and its initial military use was greeted with astonishment and horror comparable with that which was occasioned by the atomic bomb. Explosives now are man's invaluable servant without which much mining, harbor improvement, canal digging, irrigation, and major construction enterprises would be impossible. The development and use of atomic energy may follow the same pattern but we must be prepared to wait for many years and possibly generations before such a day arrives.

Target for Tomorrow

In the meantime it is essential as never before that we utilize our remaining mineral resources intelligently, efficiently, and to their utmost possibilities. The solution of problems associated with such a procedure will be most vital in Pennsylvania because of the pre-eminent place of the mineral extractive industries in the economy of the Commonwealth. Employment for all who desire it in productive work is the goal toward which we must work if we are to maintain American institutions, preserve and advance our standards of living, and pay off the debts of the war in which the American people through bond ownership now have such a large equity.

Since minerals dominate the economy of Pennsylvania, the target for tomorrow inevitably remains what it is for today: the fullest development of mineral resources consistent with the conservation demanded by national security. To this end education and research must be developed and applied to industry with intelligence and initiative, so that Pennsylvania can, in all literalness, be to her citizens a genuine commonwealth.

Our Mineral Economy

One hundred years ago Pennsylvania emerged from an agrarian economy into a mineral-industrial commonwealth. Minerals now furnish 67 per cent of the primary wealth and the mineral industries furnish nearly half of the revenue of the State. But the disturbing fact is that these minerals which furnish power, raw materials of industry, railroad tonnage, lubricants, markets for farmers, and the basis of real estate values are non-replaceable. Pennsylvania has not been keeping pace with the United States in value created by the mineral industries. From 1919 until the war the value created by the mineral industries in Pennsylvania declined about 5 per cent, whereas, the value created by this same group of industries in the United States as a whole increased about 26 per cent.

Principally because of her coal, Pennsylvania is also a leading mineral processing State. But part or all of the supplies of commercial minerals, ores, and metals that are processed within the State, with the possible exception of limestone, glass sand, fire clay, cement rock and coal, are imported from half of the states of the Union and at least 28 foreign countries. This ties our economy to political and economic fortunes beyond our complete control. Coal remains the principal source of energy. For the want of coal Pennsylvania would disintegrate as an industrial Commonwealth. Seriously depleted districts have become poor, unkempt,

forgotten, deserted. There is no way to turn back to an agrarian economy without State bankruptcy, "and when the loom shall cease to weave of itself human slavery will return." Minerals still offer the greatest hope for productive work in Pennsylvania and affect every county.

Fallacies in Our Thinking

Most of the material assets of Pennsylvania lie in her mineral resources and the problem of depletion is acute with respect to the mineral fuels, including low sulphur, low ash coking and steam coals. Anthracite in the upper basin, coking coal in the Connellsville region, certain coals and refractory clays in Central Pennsylvania, the bulk of our flush production of petroleum and natural gas, are slowly dwindling. Only the dregs remain of our known deposits of copper, lead, zinc, chromite, manganese, and certain of our iron ores. Our capital, as represented by mineral resources, is being exhausted rapidly without possibility of replacement. An unplanned, wasteful program became inescapable because of the lack of foresight on the part of earlier statesmen.

We must discourage the public from thinking: "Why worry about the bank balance while we still have plenty of blank checks." Instead of every man, woman, and child being the owner of a certain mineral capitalization, we are really the guardians of a reserve which, when once harvested, cannot be reproduced again. The proper use of this material is the basis of our standards of living and military power. It has been our privilege to have had a lion's share in the "war of production" because we are industrialized and can get at our raw materials. We paid a high price in mineral depletion for this privilege; we still must face economic competition and perhaps World War III. If he knows the facts, no good citizen will say that substitutes can be found by technology for our basic mineral raw materials.

Next to our fertile soils, bituminous coal is our greatest natural resource and the greatest source of stored-up energy. We must delve into the deepest secrets of Pennsylvania's minerals as thoroughly as we did into the uranium atom. For example, we do not know what coal is; we do not agree on its origin or constitution; we know that it is a complex material, the chief constituent of which is carbon. We know that as a whole it is burned with a recovery of about one-half its energy; that it is the basis of the iron and steel industry in Pennsylvania; and that, as a raw material of industry, it produces materials for a long line of by-products, such as fertilizers, road construction, explosives, dyes, drugs, and plastics. We know also that at times it has been sold too cheaply, sometimes has been a drug on the market, simply because it has been too abundant and there has been no national mineral policy. The irony of it all is that wishful thinkers tell us that our reserves in Pennsylvania are virtually limitless, but none of them speaks in terms of mineable, quality coal nor indicates that our production curve has been generally declining since the early '20's.

Human Resource Vital

The production, processing and manufacturing of mineral materials now supplies the principal source of employment in Pennsylvania. It seems clear that, first, we must maintain this position and, second, we must expand present facilities, attract new industries, and find uses for those materials we possess in abundance but are unable to use effectively. To do this we must face a major issue. We must train men in technical skills, leadership, and capacity for responsibility who can manage such industries and explore all their possibilities for efficient operation. This includes the producer and processor of raw materials, the research worker in the laboratory, the executive in economic management and skilled workers in the mine or mill. The gap in the training of technical leaders and skilled workers caused by Selective Service must be filled. Veterans from the mines and mills must be educated back into the mineral industries. The human element is the most important and without superior capacity and leadership no amount of natural resources will avail. Clearly this is the field of education. In this field we are faced with the complex problem of producing men trained in technical skills, management ability, and those qualities which in total produce what we are pleased to call good citizenship.

Human Relations Acute

Public consciousness has too long slumbered in complacency as to the seriousness of the social and economic problems of our mineral industries. In the more complex field of human relationships no solution has been found, and compromises based on immediate expediency do little more than to ease temporary troubles. The handling of labor is a science in itself. It is important that executive positions in the mineral industries and the unions associated with them be filled by well-trained men who have the best interests of the public, management, and labor at heart. Stability will be accomplished only by organizing, planning, and taking action in a resolute manner.

There are three major problems in industrial organization; problems of communication, social balance within the organization, and individual work effectiveness. The crux of the post-war period may hinge on the manner in which we handle and solve these problems which today are receiving a minimum of attention. It is going to be necessary to develop approaches to these problems that go beyond the present stage of superficial compromises based on expediency.

Research has come to be accepted as a fundamental necessity for planning in practically all of the fields but that of human relations in industry. Today, however, certain developments in such fields as economics, sociology, applied anthropology, and psychology have brought about an increasing interest in these problems. We have reached the stage where it is possible to bring to bear the latest developments in these disciplines upon the problems of industry.

There is, of course, nothing new in cooperation between technological institutions and industry. It is not even new today for academic institutions to turn their attention from machines and reagents to the men who perform the managerial and manual tasks of industry.

In order for the mineral industries of Pennsylvania to meet their human problems it is going to be necessary for the academic and technological institutions to develop research facilities that deal with them. Such research should avail itself of the ground work that has already been laid in related disciplines. It should also be so organized and staffed that the peculiarities of local human industrial problems may be attacked in a fundamental and realistic manner.

Such research facilities should develop research plans, conduct studies, serve as a consulting agency, provide facilities for students, and produce publications in the field. It should undertake comprehensive research in such problems as absenteeism, turnover, labor supply, fatigue, up-grading, down-grading, foremen, race relations, management, skills, tensions, output, rest periods, and others.

The human problems of industry, to be brought to a human solution, require data and human tools. The purpose of such a necessary undertaking, then, would be to conduct research on the problems of human collaboration in modern industry. It would demonstrate that collaboration is not only a subject for exhortation, but also a field for serious study and research.

Economic Studies Needed

There must be a comprehensive economic study of sources of supply, consumption data, and technologic trends affecting consumption. This will involve a compilation and interpretation of sources of mineral supply and quality, consumption data, reserves, availability and suitability, new products and improvements of existing products and uses, and a study of the mineral-consuming relationships involved in the maintaining of a helpful industrial economy. A research program covering the collection and analyzing of mineral consumption data and information pertaining thereto is imperative to the mineral-producing and the mineral-using industries of Pennsylvania. Where the mined product goes is known only in a general way for comparatively few minerals. Similarly, technologic changes affecting or likely to affect the use of a mineral or group of minerals are not generally known. This information needs to be incorporated in a study of mineral consumption in order that probable future consumption trends can be estimated. Such data are necessary for sound judgment in dealing with economic problems in the mineral industries, for wise planning for future operations, and for progress toward the important goal of establishing a reasonable stability of employment. It is believed that studies of mineral consumption and problems relating thereto would aid greatly in making a healthful industry with a high level of employment.

New Technologies Wanted

The creation of new knowledge which is a major field of research has become in itself a giant industry. It requires the services of every known skill and it has become classified as one of our greatest resources. The growth of interest in research has been increased by economic forces, which in turn have been created by the depletion of high grade and easily accessible material. The producer has been forced to go farther and farther for less and less. This condition is increasing in Pennsylvania

and costs of production inevitably progress with it. The only remedy which can be applied to prevent the eventful disappearance of industry is the discovery and application of new scientific facts by which we can use our own materials in more efficient ways.

Conditions which control research are such that success favors correct planning and adequate equipment centralized under one management. Isolated research in scattered fields adds much to the sum of knowledge but does not solve the problems with which our industries will be faced in aggravated form. We need a centralization of effort and equipment sponsored by the Commonwealth in cooperation with management and labor. And we need a long term plan of inquiry into the forces which control the production and consumption of the products of the mineral industries of Pennsylvania.

A comprehensive and effective program for the conservation of the mineral resources of any region must include the development and application of the most effective methods of mineral identification, determination of mineral properties, mining, purification, and mineral preparation, so that three goals may be reached: (1) the economic use of the leaner ores to replace the richer ores already depleted or exhausted; (2) methods of increasing the purity and adaptability of the ores to meet the increasingly rigid specifications required in modern industry; and (3) the preparation of new mineral products to use as substitutes for depleted minerals.

The history of the development, use, and consumption of the mineral resources of Pennsylvania is typical of that of any region originally rich in these materials, the development of which was begun in the days of early settlement and was carried out with primitive and wasteful methods. The most readily accessible and often the richest deposits have been completely exhausted or have been so improperly mined that they are no longer useful. Exploitation has moved on to more recently developed regions where the later improvement in extraction methods has permitted longer use of the deposits. Now, however, the end of the reserves in many of the more recently discovered districts is also in sight and consideration is again turning to the leaner ores. In most cases these cannot be exploited economically without the application of the most efficient methods of mining, purification, and ore-dressing. Indeed, in many instances, it will be necessary to develop entirely new methods. Development and economical use of these leaner deposits is conservation in the fullest sense of the word.

The geologic and topographic survey of the State should be completed. An inventory of the remaining mineral resources should start at once, involving both field and laboratory techniques. State-supported research on the production and utilization of our mineral fuels, both fuel and non-fuel uses, should be expanded. This holds also for the research on steel making, metals, glass, refractories, and slate waste. It is imperative that state-supported research should be started at once on the beneficiation of our iron ores, refractory clays, diaspore clays, white clays, ganister rock, fine grain mica, limestone, high alumina clay for the possible extraction of aluminum metal, dolomites for the possible extraction of magnesium metal, new sources of fuel for the glass industry, and various problems relating to mining, safety and health. The critical shortage of

lead and, to a lesser degree, of zinc in the United States lends emphasis to the necessity of a study of the possibilities of upgrading the remaining ores of these metals in Pennsylvania.

The mineral industries are involved tremendously in stream pollution abatement and strip mining problems. There must be technical aid on reclamation of stripped areas, recovering fine anthracite, neutralizing processes, by-products, and last, but by no means least, our underground water supply, a most precious mineral resource.

Conclusions

Material prosperity through the ages has depended on natural resources, together with the brains, skill, and energy required in their utilization. The records justify boundless faith in the future of the Keystone State. We need not fear a cycle of exhaustion if we keep first things first in our planning. Pennsylvania has lost many of her initial advantages in mineral resources and must fight now with human resources to hold her position as the leading mineral industrial Commonwealth. We are sorely in need of a down-to-earth mineral policy. We must insure a constant flow of mineral raw materials into the State to supply our mineral processing industries. We must find new industries to replace failing old ones. We must never allow another automobile industry to slip through our fingers for the want of far-sighted policies. We must understand the implications of the proposed St. Lawrence sea-way-hydroelectric power project. We must recirculate our metals wherever possible, again and again. We should seek the aid of the Federal Government in stockpiling every possible strategic and critical mineral required by our industries to insure us against need in case of another war. We should consider possible decentralization of the essential industries and facilities for some of them underground.

The frontiers of the earth sciences, of mineral engineering, and of mineral technology are still only partially explored. It will require the combined efforts of specialists in all of these fields to solve the mineral problems ahead of us. There must be more state-supported education and research on our remaining mineral resources. Curiosity and zest for discovery must pervade the atmosphere of the Commonwealth. The larger companies may be in a position to finance research laboratories; on the other hand, the smaller companies will find it difficult to prosper without the aid of State agencies. Nothing short of mutual give and take among State government, industry, and education can bring forth a solution.

Returns will be realized on primary mineral wealth, on value added by manufacture, and on productive work. If we slacken or fail, prosperity will not be insured for our children; let us hope we have adequate vision so that our children and their children may bless us for our foresight. Pennsylvania is faced with the greatest opportunities and greatest obligations of all time. The future lies not in the lap of fortune but in the hands of active, determined, resourceful, foresighted Pennsylvanians.