SCIENCE

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THE STATE GEOLOGIST AND CONSERVATION[1]

BY conservation now-a-days is meant the best use of our natural resources, without waste. Probably the responsibility of conservation rests more upon the state geologist than any other state official, because he is the one, more than any other, whose duty it is to study and inform the public upon the occurrence, quality, quantity and uses of the natural resources of the state he serves.

INEXHAUSTIBLE RESOURCES

Natural resources may be divided into two kinds: Those that are inexhaustible and those that are exhaustible. Of the former are such as sand, clay, road materials, building stone and water power. But while these and others are inexhaustible in quantity, they do not occur universally, so may become, and in most places do become, products upon which it is vitally important that the public be informed.

Here it might be well to call attention to the fact that geologists somewhat, and the public to a large extent, lose sight of the common things, in their anxiety to discover and develop the rare ones. Often a bed of shale for brick making, sand for building, gravel for concrete, or limestone for cement, fertilizer, or other purposes, is of more local importance than a bed of coal, iron ore, or some other of the less common products. A bluff of stone may stand unused for years, before some one will see its value, perhaps for railroad ballast or con-

[1] Read before the American Mining Congress, Chicago, November 16, 1916.

crete work, and not only realize from it a fortune himself, but supply a needed commodity to industry. In studying these inexhaustible materials, as well as the exhaustible ones, the state geologist must consider their quantity and quality, and the possible uses to which they can be put.

This involves such things as the conditions of supply and demand; mining or quarrying; transportation facilities for getting out the raw material, and those of converting it into the manufactured product; and such other things as bear upon its profitable utilization. The state geologist must carefully determine whether on the whole these conditions are favorable or unfavorable, for his conclusion may decide whether or not a deposit that can be worked with profit will be used at once or left unused for many years to come. It is sometimes tempting for the geologist, whether acting as an official for the public or an expert for a company, in those cases where he is doubtful as to the value of a deposit, to take the easiest way out and report unfavorably. May it not be that good property is often thus condemned? Should we not, when placed where we must pass judgment upon deposits of doubtful value, intensify our investigations to the limit of time and means and make sure of our ground, if possible? If the value can not be determined with certainty, then the favorable and unfavorable features should be fully presented.

EXHAUSTIBLE RESOURCES

In studying the exhaustible materials, the state geologist has a double duty. In the first place, it is a part of his work to make known the areas in which such actually, probably or possibly occur, to indicate their quality and character, and to make suggestions as to their development. This part of the state geologist's work has been heretofore and is yet considered his main duty. But with the probability of some of our most important products becoming exhausted in the not distant future, the geologist's duty in conserving known material is next in importance to discovering what is unknown. To this end, he should exercise the powers of his office to prevent waste of exhaustible raw material of all kinds. For example, if there is no other bureau whose duty it is to see that the least amount of coal consistent with good mining is left in the ground as pillars, etc., it plainly is the duty of the state geologist to exert himself toward bringing about mining methods by which the largest possible amount can be recovered. The same line of action will apply to oil, natural gas, the metalliferous ores, and all other exhaustible material.

Again, the state geologist should, at least to a reasonable degree, be alive to the use of by-products. This, to be sure, will take him into the field of metallurgy and chemistry, but most geologists are informed on the elements of these subjects, if they are not experts in them. We can hardly remain unconcerned and permit by-products to be wasted, on the assumption that those operating the mines should employ experts to get the most out of the raw material. If the experts are not employed, the duty of the geologist becomes all the more incumbent, for the loss, while one to the operating company, may be primarily one to the public. It may mean the waste of valuable material the public can ill afford to spare.

Recently there has been impressed upon me the lesson that it is a duty of the state geologist to look carefully into developed mines, not only to ascertain if there is not a waste of the ore for which the mine is worked, or of some possible by-product, but of material that is too important to be classed as a by-product. In the case of the

Embreeville iron mines of Tennessee, mines that have been operated intermittently for something like seventy years, it appears that there have been wasted during all that time, large quantities of zinc ore, the presence of which was only recently discovered by an employee of the mining company now owning the property. This has, during all these years, been mined with the iron, dumped with it into the furnace, and driven off as volatile matter into the air. It is not at all improbable that the value of the zinc thus wasted is greater than that of the iron recovered. For this mine has proved to contain large deposits of zinc, and is now worked for zinc, with iron as a by-product. The mines at Leadville, Colorado, have had a similar history. It is as necessary to keep our eyes open in a developed mine as on unprospected ground.

SOIL AND TIMBER CONSERVATION

While this congress does not immediately concern itself with soil conservation, the title of this paper requires me to say that in those states that are subject to rapid erosion, there is no more important duty of the state geologist than to reduce the waste from soil wash to the minimum. No one knows so well as he, the slow process of soil formation, and the rapid rate at which the hillside accumulations of many thousands of years are removed by uncontrolled running water. The education of those who till the soil to the great importance of preserving it from wash is an overwhelmingly discouraging undertaking, but notwithstanding one which we can not shirk.

In the conservation of our resources, the state geologist, possibly above all others, should look into the future and be controlled by its prospective demands. Our rapidly increasing population; the near occupancy of all our farming and pastoral lands; the possible, even probable, depletion of the soils, natural fuels and useful minerals; all these should have his most serious attention. In those states where forestry legally comes within the duties of the state geologist, an additional responsibility of the greatest importance and one that often requires much diplomacy, is placed upon him.

LEGISLATION AND CONSERVATION

The comprehensive efforts of the state geologist for conservation ultimately require him to do what he can for constructive statesmanship. It is best to attempt conservation through the education of those who earn their livelihood from our natural resources, but at times it becomes necessary to supplement this by legislative enactment. This does not of necessity mean that those engaged in placing natural products on the market are vandals, or even that they are indifferent to waste of material. Among our most ardent and practical conservationists at present are men engaged in farming, mining and lumbering. The necessity for legislation may, and often does, mean that the complete and economic utilization of a natural resource requires conformation to a broad and well-worked-out plan that must be put in operation in statewide, or it may be inter-state, proportions. In such cases, it becomes incumbent upon the state or the nation to impose such restrictions as are consistent with the most complete utilization of such product, the rights of the public, and fairness to capital.

Of such nature is the problem of water-power development in the states that possess it in large amount. This is a natural resource, the future importance of which probably the most sanguine do not realize. There are two ways of having it developed. One is the haphazard way, by which any power site can be occupied without regard to whether the available power is all util-

ized or not, without regard to whether or not it can advantageously be linked up with other sites on the same or neighboring streams, or without regard to where transmission lines go. This means the future non-utilization of a great deal of energy that will be sorely needed. The other is the systematic plan, by which all these things are worked out in detail. This means the ultimate utilization of most of the available water power, and this can be secured only by the assistance of the state through legislative enactment. As all with experience know, this is so difficult that it is well-nigh hopeless. Likewise, conservation of forests, fuel supply and possibly the soil, need to be encouraged by legislative enactment. In part or all of these, depending upon the scope of his duties as defined by statute, the state geologist is expected to take the initiative, by deliberately calling the attention of those charged with administrative and legislative affairs to those resources which the state can aid in conserving.

THE SCIENTIFIC SPIRIT

The object of most legislators in supporting geological surveys is to develop the natural resources; that is, to increase the wealth of the state. We have no fault to find with this attitude, and we willingly exert our energies to that end; but geological work, whether for economic or scientific purposes, requires the strictly scientific spirit as its impelling force, without which no results can be relied upon. For this reason we must ask the public to indulge us if, occasionally, a bulletin appears that does not seem to have economic importance. Such may in the end prove to be of the greatest economic value. The state geologist should be a man who can make his work practical, but he should at the same time be a scientist with irresistible inclinations toward the purely scientific problems that confront him. Only such a geologist can effectually serve a state.

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STANFORD MEETING OF THE PACIFIC DIVISION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The second annual meeting of the Pacific Division of the American Association for the Advancement of Science will be held at Leland Stanford Junior University during the period, April 4 to 7.

General Sessions.—Among the general sessions of the division on this occasion will be the address of the retiring president of the division, Dr. J. C. Branner, president emeritus of Leland Stanford Junior University, on the evening of Thursday, April 5. Dr. F. J. E. Woodbridge, professor of philosophy at Columbia University and lecturer in philosophy on the Mills Foundation at the University of California this spring, will present an address on Friday evening, April 6, on the subject, "History and Evolution." This address will be followed by a general reception on the part of the university to the visiting members of the American Association and of affiliated societies.

On Thursday afternoon, April 5, a symposium will be held upon the general subject, "Coordination and Cooperation in Research and in Applications of Science," under the direction of Dr. D. T. MacDougal, director of the Desert Laboratory of the Carnegie Institution of Washington, at Tucson. Among the speakers at this symposium will be Dr. William E. Ritter, director of the Scripps Institution for Biological Research, at La Jolla, who will present a paper on "Closer Organization of Scientific Men of the World."

Meetings of Societies.—The following announcements are made concerning the meetings of societies participating in this occasion.

On Saturday evening, April 7, a dinner will