THE ECONOMICS OF EXHAUSTIBLE RESOURCES*

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1. The Peculiar Problems of Mineral Wealth. Contemplation of the world's disappearing supplies of minerals, forests, and other exhaustible assets has led to demands for regulation of their exploitation. The feeling that these products are now too cheap for the good of future generations, that they are being selfishly exploited at too rapid a rate, and that in consequence of their excessive cheapness they are being produced and consumed wastefully has given rise to the conservation movement. The method ordinarily proposed to stop the wholesale devastation of irreplaceable natural resources, or of natural resources replaceable only with difficulty and long delay, is to forbid production at certain times and in certain regions or to hamper production by insisting that obsolete and inefficient methods be continued. The prohibitions against oil and mineral development and cutting timber on certain government lands have this justification, as have also closed seasons for fish and game and statutes forbidding certain highly efficient means of catching fish. Taxation would be a more economic method than publicly ordained inefficiency in the case of purely commercial activities such as mining and fishing for profit, if not also for sport fishing. However, the opposition of those who are making the profits, with the apathy of everyone else, is usually sufficient to prevent the diversion into the public treasury of any considerable part of the proceeds of the exploitation of natural resources.

In contrast to the conservationist belief that a too rapid exploitation of natural resources is taking place, we have the retarding influence of monopolies and combinations, whose growth in industries directly concerned with the exploitation of irreplaceable resources has been striking. If "combinations in restraint of trade" extort high prices from consumers and restrict production, can it be said that their products are too cheap and are being sold too rapidly?

It may seem that the exploitation of an exhaustible natural resource can never be too slow for the public good. For every proposed rate of production

there will doubtless be some to point to the ultimate exhaustion which that rate will entail, and to urge more delay. But if it is agreed that the total supply is not to be reserved for our remote descendants and that there is an optimum rate of present production, then the tendency of monopoly and partial monopoly is to keep production below the optimum rate and to exact excessive prices from consumers. The conservation movement, in so far as it aims at absolute prohibitions rather than taxation or regulation in the interest of efficiency, may be accused of playing into the hands of those who are interested in maintaining high prices for the sake of their own pockets rather than of posterity. On the other hand, certain technical conditions most pronounced in the oil industry lead to great wastes of material and to expensive competitive drilling, losses which may be reduced by systems of control which involve delay in production. The government of the United States under the present administration has withdrawn oil lands from entry in order to conserve this asset, and has also taken steps toward prosecuting a group of California oil companies for conspiring to maintain unduly high prices, thus restricting production. Though these moves may at first sight appear contradictory in intent, they are really aimed at two distinct evils, a Scylla and Charybdis between which public policy must be steered.

In addition to these public questions, the economics of exhaustible assets presents a whole forest of intriguing problems. The static-equilibrium type of economic theory which is now so well developed is plainly inadequate for an industry in which the indefinite maintenance of a steady rate of production is a physical impossibility, and which is therefore bound to decline. How much of the proceeds of a mine should be reckoned as income, and how much as return of capital? What is the value of a mine when its contents are supposedly fully known, and what is the effect of uncertainty of estimate? If a mine-owner produces too rapidly, he will depress the price, perhaps to zero. If he produces too slowly, his profits, though larger, may be postponed farther into the future than the rate of interest warrants. Where is his golden mean? And how does this most profitable rate of production vary as exhaustion approaches? Is it more profitable to complete the extraction within a finite time, to extend it indefinitely in such a way that the amount remaining in the mine approaches zero as a limit, or to exploit so slowly that mining operations will not only continue at a diminishing rate forever but leave an amount in the ground which does not approach zero? Suppose the mine is publicly owned. How should exploitation take place for the greatest general good, and how does a course having such an objective compare with that of the profit-seeking entrepreneur? What of the plight of laborers and of subsidiary industries when a mine is exhausted? How can the state, by regulation or taxation, induce the mine-owner to adopt a schedule of production more in harmony with the public good? What about import duties on coal and oil? And for these dynamical