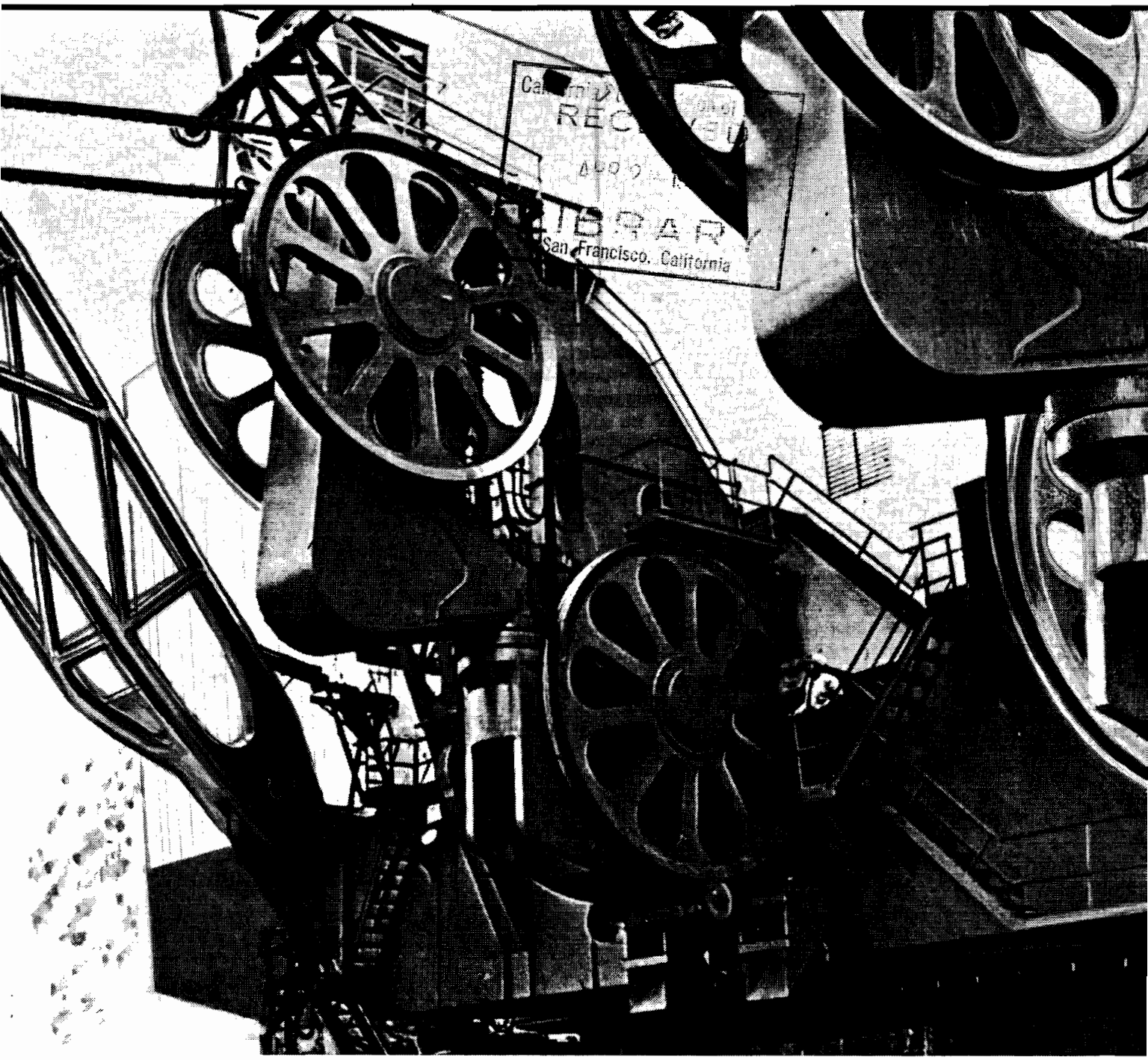
THE DEVELOPMENT OF SURFACE COAL MINING IN INDIANA

Special Report 35



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COVER: The era of colossal midwestern excavating machinery culminated in the construction of Big Muskie, a 220-cubic-yard dragline used in Ohio. (See the discussion on p. 25.) The photograph was published in 1969 (Coal Age, v. 74, no. 12, p. 51) and has been retouched and artistically enhanced by Wilbur E. Stalions.

The Development of Surface Coal Mining in Indiana

By DENVER HARPER

DEPARTMENT OF NATURAL RESOURCES
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Foreword

Reserves of surface-minable coal in Indiana are a great store of wealth whose exploitation since 1915 has transformed the physical and economic landscape of Indiana's southwestern counties. In studying the coal resources of Indiana, the Indiana Geological Survey has compiled much engineering, economic, historical, and geologic information on the surface-mining industry. This report is a chronicle of surface mining in Indiana that is based primarily on two sources: publications of the U.S. Bureau of Mines and Coal Age magazine. It is a compilation of more than 110 articles—most dealing with mining practices at specific surface mines in Indiana—spanning 63 years. In this report emphasis is placed on technologic advances that opened new reserves and permitted growth of coal production in the state. Recent events that have affected Indiana's coal industry, such as the development of unit trains, changes in the structure of the coal industry, and the opening of midwestern markets to western coal, are briefly discussed.

Introduction

Men have quarried stone and mined ores from open pits for millenia, but surface mining of coal on a large scale is a recent development. Much of the history of large-scale surface mining was made since World War I in the midwestern states of Ohio, Illinois, and Indiana, where geography makes available large markets for coal, and where geology and topography make possible the use of widespread, area-type surface mining.

Thickness of the coal seam is an important geologic factor affecting underground mining. The dimensions of underground workings bear a relation to human stature, and problems arise when the seam is too thin or too thick to accommodate workers and the tasks they must perform. But underground mining has the advantage that under ideal conditions only the coal itself is removed, and the costly removal of valueless rock strata above and below the coal is minimized. For most of the history of coal mining in most areas, underground mining prevailed. In Indiana underground mining dominated coal production until the 1930's, but it has accounted for less than 3 percent of the state's output in recent years.

In surface mining miners remove the rock overlying the coal (called overburden) first, and then they remove the coal in a separate operation. When this method is used, the thickness of the coal seam is less important than it is in underground mining. Rather, it is the ratio of the overburden thickness to the seam thickness that is critical. Very thin seams may be removed if the overburden is thin, and no special problems are created by mining thick coal. Because coal must lie near the surface to be extracted by this method, reserves of surface-minable coal in most major coal-producing areas are small when compared with reserves of underground coal. At present the official estimate of surface-minable coal in Indiana is about 1.8 billion tons, or about 11 percent of total reserves.

Successful area-type surface mining requires nearly level terrain and nearly flat lying coal seams so that the thickness of overburden is almost constant across wide areas. In the important surface-mining districts of Indiana (fig. 1) the land has relatively little relief, and some coal seams of the state are extensive and dip westward at only about 30 feet per mile. Large surface mines are possible under such conditions. For each of the past

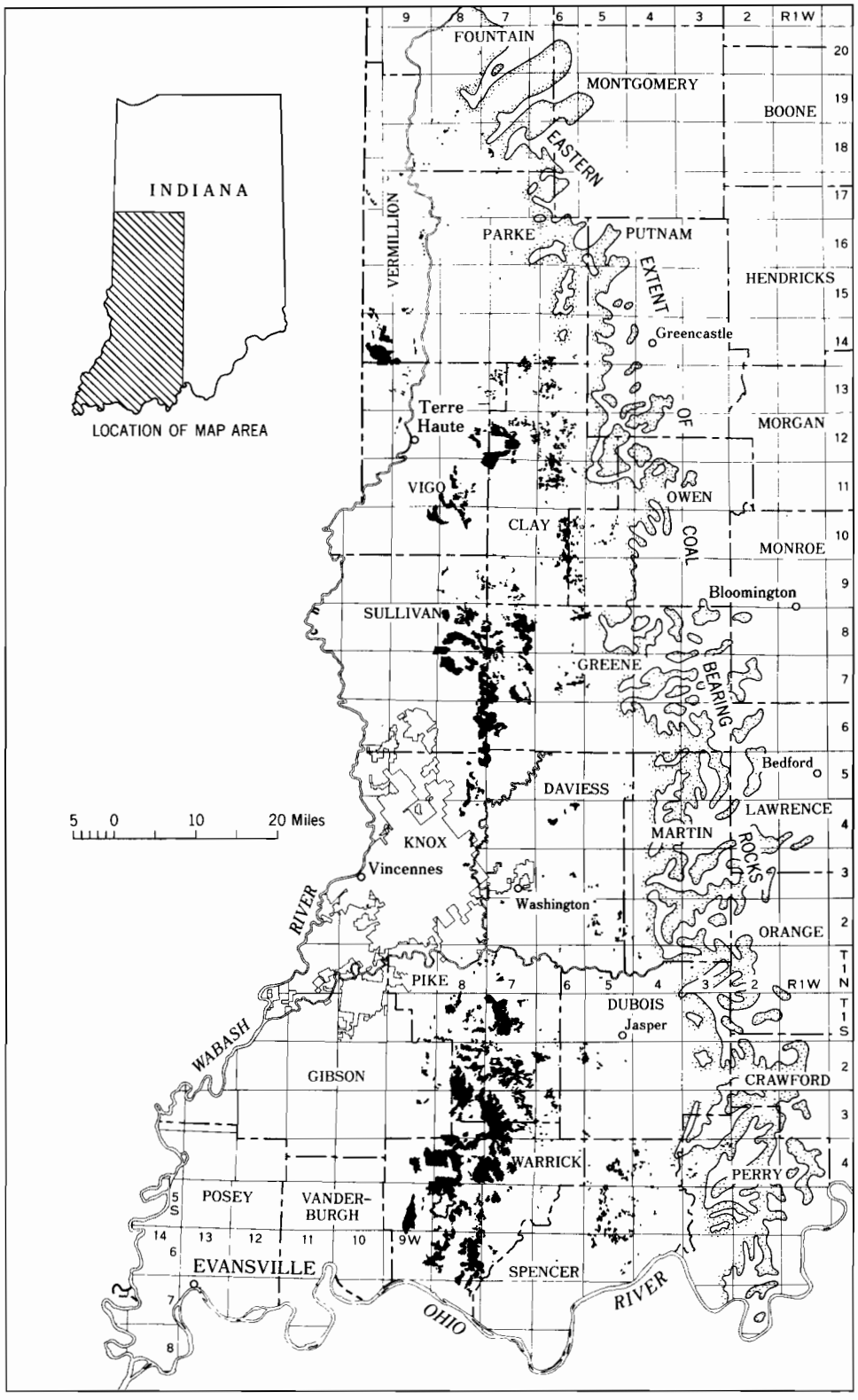

Figure 1. Map showing areas surface mined for coal in Indiana.

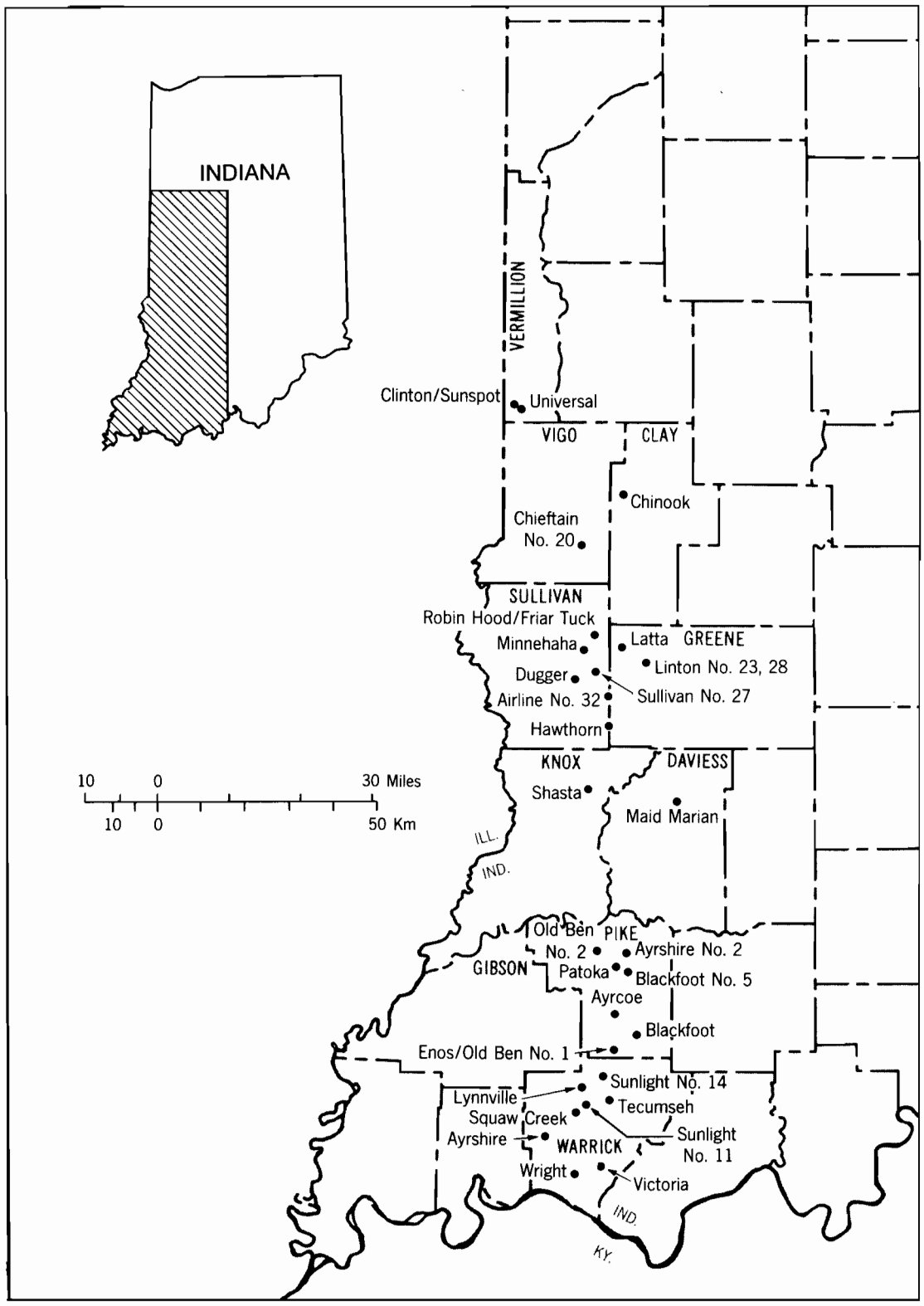

Figure 2. Map showing locations of selected major surface mines (active and inactive) in Indiana.

Figure 3. Horse-drawn slip scoop, one of several animal-powered forerunners of modern surface-mining machinery. From Wier, 1959, p. 11.

40 years, 10 to 19 large active mines have produced more than two-thirds of the state's annual surface output. Taken together, the mines shown in figure 2 are the source of about 80 percent of the state's total cumulative surface output. Large numbers of small mines have contributed the remaining 20 percent.

Not only is the thickness of overburden important to surface mining but so is its character. Unconsolidated overburden, such as glacial or stream deposits, is easy to dig, and much early mining was done where such overburden directly overlies the coal. But where it is thick, such overburden may create problems of stability of steep slopes within the mine pit. In Indiana large-scale surface mining has been conducted mostly where the unconsolidated overburden is less than 50 feet thick. The character of the consolidated (rock) overburden also influences the profitability of surface mining. Thick, strong strata may interfere with preparatory blasting of the overburden and make removal of the blasted material more difficult. Local geologic structures, such as domes, troughs, and faults, may affect maneuverability of digging machines and haulage vehicles and may affect drainage of the pits. Coal seams of Indiana commonly show local doming and troughing, and minor faulting and other seam discontinuities, such as rock partings, commonly have an adverse effect on local mining.

Throughout history operators of large-scale surface mines in the midwestern United States have relied on shovels and draglines to remove overburden. The amount and the thickness of overburden that can be removed depend on the size of available shovels and draglines. Because reserves of surface-minable coal that can be mined by any given size of machinery are soon exhausted, the growth of coal production by surface methods has required constant technologic advances that have made available larger machines able to exploit new reserves under greater thicknesses of overburden. Before 1969 the digging capacity of shovels and draglines almost doubled every 10 years. This growth made possible a great increase in the thickness of overburden that