SCIENCE

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THE NUMBER OF PERSONS who have been killed by explosions in mines during the past fifty years is 11,000, as stated by Mr. Ellis Lever in a recent number of the London *Times*. This number is, however, only a small proportion of those who have met their deaths by colliery accidents. The number of deaths through accidents of all kinds in mines since the Queen's accession is nearly six times greater, — 60,000, Mr. Lever says, — while 4,000,000 persons have been maimed or otherwise injured. Mr. Burt, M.P., an undoubted authority, states that the average number of those killed in mining operations is now 1,200 a year, and that 100,000 persons annually are injured in following the hazardous occupation of the miner. What are the causes which conduce to this terrible loss of human life? Mr. Lever says the want of a better and safer light is mainly responsible. The Royal Commission on Accidents in Mines has condemned as unsafe the lamps of Davy, Clancy, and Stephenson. The House of Commons confirmed the conclusions arrived at by the royal commissioners, and government inspectors of mines are now advocating and hoping for the immediate and universal introduction of the electric light into coal-mines. This state of affairs leads the English *Electrical Review* to say that it is to the electric light that the miner must look for emancipation from many of the horrible dangers to which he is subject. There are many forms of electric lamps now competing for the favor of miners and mine inspectors, and some of them possess undoubted advantages over the older types of safety-lamps. But there are also, in most of these, serious drawbacks which prevent their speedy introduction to mine uses. Weight, complication, and cost are among the principal disadvantages; and it behooves electricians to give their utmost thought to the task of overcoming the difficulties which the peculiar needs of the miner present. We have it on the testimony of Sir Frederick Abel that very great progress has been made towards providing the miner with a thoroughly safe, sufficiently portable, and generally efficient self-contained electric lamp since the Royal Commission submitted its final report; but the same authority is of opinion that strenuous exertions are yet needed before the comparatively heavy first cost of electric lamps will be so greatly counterbalanced by their durability and simplicity in construction and maintenance as to afford hope of their being generally or even very extensively substituted for oil-lamps. So that it is evident that the electrician is, in this direction as in many others, still behind the needs of the age, and behind what is expected of him.

AN EARLY MAP OF THE FAR WEST.

THE classic transcontinental expedition of Captains Lewis and Clarke, under instructions of President Jefferson to cross the plains and mountains to the Pacific Ocean, left the Mississippi on their venturesome journey, May 14, 1804. Their first winter encampment was made among the Mandan Indian villages, not far from the present site of the town of Bismarck. During the winter of 1804–05 their time was mainly occupied in preparation for the continuation of their journey westward. They were in frequent communication with the Indians, and received occasional visits from a few straggling French *voyageurs* and traders of the North-west Fur Company, who came from their headquarters in Canada as far as the Missouri. On the eve of the departure of the expedition, the following spring, Captain Lewis sent back a number of men with despatches, journals, and collections addressed to the government at Washington.

Among the articles forwarded was a map, prepared by Captain Lewis from all available data, of the country lying between the Mississippi River and the Pacific Ocean. The information obtained of the country to the westward of their winter quarters was for the most part derived from Indians more or less acquainted with the country near the head waters of the Missouri and Columbia.

In a letter of transmittal to President Jefferson, dated Fort Mandan, April 7, 1805, Captain Lewis says, "The map which has been forwarded to the secretary of war will give you the idea we entertain of the connection of these rivers, which has been formed from the corresponding testimony of a number of Indians who have visited that country, and who have been separately and carefully examined on that subject, and we therefore think it entitled to some degree of confidence." In a following paragraph, he adds, "You may therefore expect me to meet you at Montachello in September, 1806. On our return we shall probably pass down the Yellowstone River, which, from Indian information, waters one of the finest portions of this continent."

On Feb. 19, 1806, President Jefferson, in a message to Congress communicating the discoveries of Lewis, says, "During his stay among the Mandans, he had been able to lay down the Missouri, according to courses and distances taken on his passage up it, corrected by frequent observations of longitude and latitude; and to add to the actual survey of this portion of the river, a general map of the country between the Mississippi and Pacific, from the thirty-fourth to the fifty-fourth degrees of latitude. . . . Copies of this map are now presented to both houses of Congress."

After despatching the party for the return trip, the main body of the expedition crossed the mountains, wintered near the mouth of the Columbia, and, returning, reached St. Louis in September the following year.

As is well known, they brought back a large amount of most valuable geographical knowledge. In the map compiled by Captain Clarke, published in the authorized editions of the history of the expedition (Philadelphia and London, 1814), the main features of the country are in very many essential particulars different from the way they were originally represented on the preliminary map forwarded from Fort Mandan. The map was never ordered by Congress, and, so far as I can ascertain, was never published. It seems quite probable that after the return of the expedition means may have been taken to suppress so erroneous a production. At all events, no mention is made of this map in the published history of the expedition. In their journal they say, "At the same time that we took our departure, our barge, manned with seven soldiers, two Frenchmen, and Mr. Gravelines as pilot, sailed for the United States loaded with our presents and despatches."

To-day, however, the original drawing has considerable historic interest, as it gives the opinions of the highest authorities of the time upon the physical geography of the country and its inhabitants, and at the same time presents a clear idea of the value of the aid they received from Indian guides and others.

One of the copies of this map has been preserved in the Archives of the War Department, and through the courtesy of Gen. J. C. Duane, chief of engineers, I have been able to photograph it for reproduction.

The only public reference to this map which has come to my attention is a short editorial notice in the *Medical Repository*, New York, 1806. The journal was edited by Dr. Samuel Latham Mitchell, who was also a member of the House of Representatives. While in Congress, he served upon the Committee on Commerce and Manufactures, and in that capacity advocated all measures for the exploration of the Louisiana Purchase. There is evidence to show that he was one of the pioneers in Congress in favor of the exploration of the Far West by the general government. A copy of the map accompanies this communication. It was reproduced for

other purposes, but it cannot fail to interest a large number of the readers of *Science*. By reference to the map, it would appear that Captains Lewis and Clarke received no intimation whatever of the interior drainage of the Columbia. They represent the entire area of the Great Basin and the Snake River country as drained by the Missouri and the Yellowstone. The Yellowstone, named by them before reaching it, is shown as a longer river than the Missouri, rising as far south as the 39th parallel of north latitude, near the sources of the Rio Grande. In their map published in 1814 the drainage-area is already much restricted, and the river represented as finding its source in a large lake.

It is well known to all students familiar with the history of the North-west that the Yellowstone received its name in very early times. To most visitors to the Yellowstone National Park, however, the origin of the name is always a matter of special inquiry. It may be well, therefore, to add that Lewis and Clarke encamped near the junction of the Missouri and Yellowstone, April 26, 1805, seventeen days after leaving Fort Mandan. In their journal occurs the following: "This river, which had been known to the French as the *Roche jaune*, or, as we have called it, the Yellowstone, rises, according to Indian information, in the Rocky Mountains; its sources are near those of the Missouri and the Platte, and it may be navigated in canoes almost to its head."

On the map there is one very significant designation to a comparatively small river quite remote from the country the party intended to traverse. In the region which has since been set apart as the National Park a small stream is shown tributary to the Yellowstone River, and curiously designated as 'Stinking Cabin River.' 'Brimstone' and 'Stinking Water' are names found on the maps of this region since the days of Colter's trip through the Yellowstone Park region, in 1807. But this still earlier name suggests that some adventurous *voyageur* unknown to history had already penetrated the country which has since become world-renowned for its remarkable thermal waters.

On the north side of the Missouri, Milk River is well represented on the map, but undesignated except by the amusing note, "The Indians call this the river which scolds at all other rivers."

The coast-line of the Pacific and Puget Sound is of course taken from early English admiralty charts, and doubtless in the possession of the distinguished explorer, Meriwether Lewis.

ARNOLD HAGUE.

SANITARY SCIENCE AND EDUCATION.[1]

GENTLEMEN, — When I accepted the invitation of your president to participate in this discussion, it was not in the hope of being able to add any thing to the general store of information on sanitary topics, for sanitation and hygienic science are subjects that, on their technical side, I know very little about; but I accepted Dr. Newton's invitation because as a teacher, and one who is engaged in the training of teachers, I desired to express my appreciation of the importance of sanitary science for sound educational doctrine and correct educational practice, and to add my testimony to that of the other gentlemen who are to address you, to the fact that your researches and conclusions are of the greatest practical value to us.

Mens sana in corpore sano is as much to be prayed for now as it was in the time of Juvenal, and we are far better equipped than was the satirist or his contemporaries to work toward that end. The sound mind and the sound body seemed to the Roman to be two distinct and separate things whose conjunction was desirable. We have come to know that the two are so intimately related, indeed so interdependent, as to be practically one thing. Aristotle furnished the educators of antiquity with a psychology upon which to base their praxis. It was a wonderful achievement. But the great modern science of physiology, whose beginnings are to be seen in the discoveries of Servetus, Harvey, Leeuwenhoeck, and others, compelled the entire rewriting of that science; and the result is an infinitely more complex and accurate and practical, though less final psychology, than that which was bequeathed to us by the great Stagyrite. This new psychology has taught us how truly vital the dependence of mind on body is. We know, for example, that a decreased or impoverished supply of blood to the brain produces mental inertia and lassitude. We know that an organ develops by exercise, and that the neglect of an organ or its excessive stimulation is alike harmful, no matter whether the organ be mental or physical. We can promptly and surely trace the mental results from unduly intense or too prolonged brain-work, from lack of exercise, and from improper nutrition. We are aware, in like manner, of the bodily results induced by the various emotions and passions, by expectant attention, by concentrated will-power, and other mental phenomena.

Now, it seems to me that it is just at this point that the sanitarian and the educator join hands. Both having a full understanding of the relation that subsists between mind and body, the former brings the results of his studies to the latter, and formulates them into suggestions and rules for the teacher's guidance. The teacher, in return, adopts these suggestions and rules as parts of his science, and communicates to the sanitarian in due time the effects that follow such adoption. Thus sanitary science is aided in one of its most important applications, and the science of education adds a most valuable chapter to its book.

Perhaps this co-operation of sanitarian and educator is more ideal than real, but it is nevertheless far more noticeable now than it was twenty-five or even ten years ago. This is proved, if proof be needed, by the fact that instruction in physiology and hygiene, and in the mental and physical effects of stimulants and narcotics, has been generally added to the curriculum of the common school within that period. It is not to be disputed, on the other hand, that much remains to be done. An illustration of this will be found in one of the opening pages of a recent book on the ventilation and warming of school-buildings, by Mr. Morrison of Kansas City. The author reminds us (p. 18) that "no subject has been more carefully and intelligently studied than the direct and ultimate effects of improper air on the human system, and that on no subject is there greater unanimity of competent opinion." School-building goes on, however, year after year, and it goes on in too many cases utterly regardless of whether a child vitiates two cubic feet of air per hour or two thousand cubic feet, whether 62° F. is the better average temperature or 82°, or whether 45 per cent of saturation is desirable in the atmosphere or 70 per cent. Nevertheless, science and common sense are making headway, and there is every reason to believe that in a few years' time all the school-buildings that are erected, however humble and unpretentious they may be, will be well ventilated and properly heated.

You will pardon, Mr. President, my apparent digression from the four specified subjects of this evening's discussion, for it seems to me that it is only on such broad lines as those which I have indicated, that these questions can profitably be considered. It would be no great advantage were we to bring together a mass of merely empirical statements. We must get below the statements to the facts and principles which explain them. We want to get at the philosophical and scientific reason for the relation that sanitation bears to education. We want to understand exactly what it is that is common to both sciences. That much being clearly before us, the application of the results of the former science to the problems of the latter is not a difficult matter.

The educational topics before you are four: (A) the length of school days and terms, (B) recesses, (C) competition, (D) industrial education. I shall pass over the first two in order to say a word about each of the others. These are competition and industrial education. Permit me a few words concerning each.

Competition may be defined as a common striving for the same end. It involves two or more competitors. As a principle it has long been dominant, not only in business-life, but in the science of economics. It has been prescribed as the proper stimulus for all stagnation, and as the solvent for all difficulties. Of late years, however, a school of economic thinkers has arisen which asserts that unrestricted competition is an evil to humanity and to the State. We are told that it is proved to be demoralizing, destructive, and, as a principle of political economy, inefficient. Have not you sanitarians and have not we teachers reached an analogous conclusion as to competition in our common field? Is not competition, when

[1] Abstract of an address by Nicholas Murray Butler, Ph.D., president of the Industrial Education Association's College for the Training of Teachers, delivered at the thirteenth annual meeting of the New Jersey Sanitary Association, held at Trenton, Oct. 28, 1887.