

minutes. On every successive trip the "Deutschland" showed an improvement in her speed, and after six months' service she covered the distance between Sandy Hook and Plymouth in five days, seven hours and thirty-eight minutes, at an average speed of 23.36 knots per hour, the engines showing an average indicated horse power for the whole trip of just under 37,000. This year the North German Lloyd Company have added to their fleet the "Kronprinz Wilhelm," which, in size and horse power, holds a middle position between the "Kaiser Wilhelm der Grosse" and the "Deutschland." She is 663 feet 4 inches in length and her horse power is 33,000. On the return trip of her maiden voyage, she gave promise of soon breaking all records for speed on the Atlantic, the route being covered in five days, nine hours and forty-eight minutes, or in several hours less time than the maiden trip of the "Deutschland." The best day's run of 540 knots was made at an average speed of 23.3 knots per hour.

A curious fact, not generally known, regarding vessels built by the Vulcan Works for the two great German companies is that while the Hamburg-American engineers are in favor of forced draft, the engineers of the North German Lloyd are strongly opposed to it. Forced draft is conducive to a high indicated horse power and a superior showing in efficiency; but while this fact is admitted by the North German Lloyd people, they claim that the decreased fuel consumption, (the "Deutschland" consuming only 1.3 pounds per horse power hour), is more than offset by the great wear and tear upon the boilers, the more frequent repairs, and the decreased life. The contest between the "Deutschland" and "Kronprinz" for the much-coveted record will be watched with great interest during the two years which will intervene before the giant vessel which is now building at Stettin for the North German Lloyd Company is completed and put in service. It is expected that the new vessel, which will be the longest and fastest in the world, will make its maiden voyage in May, 1903.

THE DEVELOPMENT OF THE BITUMINOUS COAL INDUSTRY.

BY WILLIAM GILBERT IRWIN.

There are no more interesting recitals in the annals of trade than that of the development of the fuel industries, for commerce and industry are very largely dependent upon the fuel supply. For many years the chief source of the world's fuel supply has consisted of those hydrocarbon compounds found in nature and known as coal. Scientists have long disputed over their origin, while in the meantime modern industry has adapted them to its varied requirements, and as a result has brought about achievements scarcely dreamed of a century ago. In the diversified fields of industry from which the capitalist reaps his millions and the workman toils for the necessities of life the coal trade has played a most important part. In its development we see the mightiest struggles of genius, the boldest strokes of business stratagem, the most gigantic projects involving the expenditure of enormous capital, and the organization of great armies of employes. The coal trade has constantly undergone an evolution involving a struggle for "the survival of the fittest," whether that of inventive genius, mechanical superiority, labor or capital.

In its adaptation to the uses of modern economic industry anthracite coal preceded bituminous, but of recent years the latter fuel and its products has had a much wider use in the iron and steel and allied industries, and present conditions foreshadow a continuance and even a rapid increase of this lead. The original area of the anthracite coal fields in this country did not exceed 500 square miles, and embraced the great field in Eastern Pennsylvania and the comparatively unimportant fields in Massachusetts, Rhode Island, Colorado, and New Mexico, while the bituminous fields already partially exploited in this country exceed 200,000 square miles, which shows conclusively that the latter coal is to form the fuel of the future.

Anthracite coal was first discovered in this country in Rhode Island in 1768, and in 1791 this fuel was discovered near Mauch Chunk, in Eastern Pennsylvania. The first discovery of coal in America was that of a bituminous vein near the present site of Ottawa, Ill., mentioned by Father Hennepin in 1679. The first coal mine opened in this country was a bituminous mine near Jamestown, first worked in the latter part of the seventeenth century. It is not the purpose of this article to trace these fuel industries through the period of their early development, but rather to trace the growth of the bituminous coal trade and the benefits which it has conferred upon modern industry.

The development of the bituminous coal industry up to 1850 was confined to the eastern part of the country. Then, as now, Pennsylvania held the lead, with Virginia, Illinois, Maryland, and Ohio making up the residuum of the output. The soft coal production in 1850 was, in round numbers, 10,000,000 tons. As yet the railway development of the country had not really been begun, and the iron and steel industries had not

yet emerged from that period when charcoal formed the principal fuel. The coal trade then depended upon the rivers for transportation to the markets. In the development of the soft coal fields of Western Pennsylvania we can divide the industry into a number of epochs in accordance with the development of transportation facilities. The latter days of the seventeenth century witnessed the opening of small mines for local consumption; this was followed by the days of keel-boating down the Ohio and the Mississippi; about 1817 the flatboating epoch began; in the early forties the development of the slackwater systems on the upper Ohio streams ushered in the days of steamboating as applied to the coal-carrying traffic; in the meantime the coking industry was undergoing its infantile vicissitudes; then came the iron way of the railroad; lastly, the introduction of modern mining appliances and advanced mine engineering practice marks the highest point in the history of this great fuel industry.

Coming down to 1870 we find nineteen States and Territories producing soft coal, and in that year the output was 17,000,000 tons; ten years later twenty-five States and Territories were producing 43,000,000 tons; by 1890 the number of bituminous coal producing States had increased to twenty-eight, and the aggregate output for that year was 111,000,000 tons. During the past ten years the industry has been developed in no new States, but many new fields have been exploited in the already soft coal producing States, as will be seen from the fact that the output for 1900 was, in round numbers, 208,000,000 tons. While, in part, the marvelous increase in the soft coal output for the past ten years has been due to the development of new fields this is not entirely the case. During this period the introduction of the mining machine, the application of electricity and compressed air to mining operations, steel tipples and automatic tippie appliances, and the advancement of mining engineering, have had much to do with the development of the industry, as have the stimulating influences of the great industrial revival which this country has experienced during that time.

The Western Pennsylvania field, better known as the Pittsburg coal field, has during all these years maintained its lead with comparative ease, the production for 1900 being, in round numbers, 78,000,000 tons. Of the other principal coal States Illinois follows with 25,000,000 tons; West Virginia, 22,000,000; Ohio, 17,000,000; Alabama, 8,000,000; Indiana, 6,000,000; Kentucky and Iowa, each 5,000,000; Kansas, a little over 4,000,000.

According to geology the bituminous coal fields of our country are classed in seven groups. The Triassic field embraces the Richmond basin in Virginia, and the Deep River and Dan River areas in North Carolina. The maximum output of this field was reached many years ago, and its present annual production does not exceed 50,000 tons. While not the largest in area, the Appalachian field far exceeds all other fields in importance, its annual production being about two-thirds of the entire bituminous output of the country. It embraces Central and Western Pennsylvania, Southeastern Ohio, Western Maryland, West Virginia, Eastern Kentucky and Tennessee, Northwestern Georgia, and Northern Alabama. It contains the well-known Connellsville coking field, the Clearfield and Pittsburg gas and steaming coal seams, and the Monongahela field in Pennsylvania; the Blossburg and Cumberland fields in Maryland; the Pocahontas and New River fields in Western Virginia; the Fairmount, Flat Top, Kanawha, Georges Creek, Elk Garden and other important fields in West Virginia; the Massilon and Hocking fields in Ohio; the Jellico field in Kentucky and Tennessee; and the Birmingham field in Alabama. The central field, including the coal areas in Indiana and Illinois, and Western Kentucky, has a considerable area and a large production, as will be seen from the production of States given above. The Western field embraces the States of Iowa, Missouri, Nebraska, Kansas, Arkansas, and Texas and Indian Territory. In extent it is the largest field in the country, and in production it ranks third. The Rocky Mountain field includes the coal areas in Colorado, Idaho, Montana, New Mexico, North Dakota, Utah, and Wyoming. This field is rapidly increasing in importance. In 1887 the production of the field was about three and one-half million tons. Within three years the annual output was doubled and the production for 1900 was, in round numbers, 14,000,000 tons. While California and Oregon produce small quantities of coal their combined annual output does not exceed 200,000 tons. The Washington field is being rapidly developed, and the output of the State has increased from 1,263,689 tons in 1890 to 2,418,834 tons in 1900.

The aggregate of the world's output of all kinds of coal for last year was about 800,000,000 tons. The production of bituminous coal in this country was more than one-fourth of the world's mineral fuel production. It exceeded that of Great Britain; was one-fourth greater than that of Germany; five times the production of Austria-Hungary; six times that of

France; fourteen times that of Russia, and fifty times the production of Canada. All kinds of mineral fuel produced by Continental Europe last year exceeded our bituminous production by a little more than one-fourth. More than a third of a million men are employed in the bituminous coal mines of our country, while a like number are engaged in its shipment, in the manufacture of coke, fuel gas and other accessories of the industry, and in the other labor required in handling the product from the mines to the markets. The office forces of the concerns engaged in the industry aggregate thousands, and there are superintendents, foremen, fire bosses, engineers, electricians and thousands of other skilled laborers dependent upon the soft coal industry. The industry has stimulated the construction of thousands of miles of railway, and the great trunk lines of the country are reaping rich revenues from the bituminous coal carrying trade. The sum total of the capital invested in this great fuel industry makes another interesting recital.

The economic methods of coal mining and fuel operations already adopted in the Old World have been made necessary, because of the depleted condition of the coal fields there. So far as concerns the bituminous coal industry, there is no danger of an early depletion of the fields of this country; but this does not mean that we are not adopting the more economic measures in every department of the industry. Allowing for the variation of the bituminous coal measures of this country, which run from a little less than four feet to eight or nine feet in thickness, it would not be far out of the way to estimate a production of 10,000 tons to the acre, which would give our entire bituminous coal area a producing capacity of 1,280,000,000 tons. At the present rate of mining the depletion of this area would require something like 6,000 years. However, it must be remembered that thousands of acres of barren territory are embraced within this coal area, the mining operations extending over the past sixty or seventy years have been quite extensive and thousands of acres of coal have already been rendered unminable, and future operations will make it impossible to mine much of the coal. However, it will be seen that so far as concerns the bituminous coal supply this country has nothing to fear as to the future.

Already American bituminous coal is playing an important part in the export trade, and is being received with favor in Europe in competition with the Welsh product. Our exportation of bituminous coal has grown from 1,138,681 tons in 1890 to 5,411,329 tons in 1900. It has been only a few years ago that American coal was practically unknown in the European markets, while during the past year our soft coal was exported to eleven countries of Europe to the aggregate amount of over a quarter of a million tons. The scarcity of the Welsh product caused by the Boer war gave an impetus to the market for our soft coal in Europe, and it seems to have found a permanent market there. Last year our soft coal was exported to fifty countries, and American coke was sent to twenty-two foreign countries, the total exportation of this soft coal product being about 400,000 tons. Pennsylvania, West Virginia and Maryland bituminous coal figures most largely in the export trade owing to the advantageous location of the fields of these States with respect to the great Atlantic ports.

Mile Automobile Track Record Lowered.

The fastest time ever made on a track by horse, bicycle or any machine was made on Thursday, October 10, at Empire City Park, N. Y., by M. Henri Fournier and his guest, Mr. William K. Vanderbilt, Jr. The total time for the six miles was 6 minutes 47 seconds. The fastest mile, which was the third, was done in 1 minute 6 4/5 seconds. The rules require that two persons be in the motor vehicle in a record-making endurance test. Some idea of the enormous speed which was developed can be gained when it is stated that the distance was traveled on the track in faster average time than is made by the Empire State Express. M. Fournier used the same machine with which he won the Paris-Berlin race last summer, and he broke his own records by nearly six seconds. The best former world's track record was 1 minute 13 1/4 seconds, which was made in September at Fort Erie by M. Fournier himself.

It is anticipated that when the Solent tunnel, connecting the mainland of the south coast of England with the Isle of Wight, is completed it will have a great influence upon the transatlantic shipping traffic. A pier is to be built at Yarmouth, near which the tunnel will emerge on the island, and the North German steamers will be able to discharge their mails, passengers, and cargo at this point, instead of proceeding up to Southampton. Owing to the great care that has to be exercised in traveling up this waterway to the port, and thence down Spithead, a considerable amount of time is wasted. By stopping at Yarmouth a great economy in this direction will be effected.