SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO., - - Editors and Proprietors

Published Weekly at

No. 361 Broadway, New York

TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....$3.00 a year
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Monthly (Established 1885)..... 2.50 "
Scientific American Export Edition (Established 1878)..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, JANUARY 17, 1903.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

RAILROAD BUILDING IN 1902.

It is gratifying to learn that, during the year just closed, there has been greater activity in railroad building than in any twelve months for ten years past. After the extraordinary activity of the period of 1885-1890, when the total construction in one year was about 12,000 miles, there was a rapid decline until 1895, when the small total of 1,428 miles was built. Since that year there has been a steady increase, the total in 1898 being 3,265 miles; in 1900, 4,894 miles; in 1901, 5,368 miles; while in 1902 the total exceeded 6,000 miles. All but a few of the States in the Union participated in this extension. The greatest aggregate length, 570 miles, was laid in Oklahoma; the West, as is natural, being the field of the greatest activity. The second greatest length of road was that built in Texas, where about 500 miles were constructed. Then follow in their order Arkansas, with 370 miles; Indian Territory, with 363 miles; and Georgia with 336 miles. In addition to the total track embraced in these figures, it must be remembered that a considerable length of second track and track for sidings was constructed. There was also a vast amount of reconstruction work carried out which does not figure in this estimate; and this, if recorded, would convey an even stronger impression of the gratifying railroad activity of the year just closed.

NEW SHIPS FOR THE NAVY.

It is now probable that the naval appropriation bill, as presented to Congress, will be changed as regards its main provision for new ships, so that instead of recommending the construction of two battleships of the "Connecticut" class and two cruisers of the "Tennessee" class, three battleships and only one cruiser will be recommended. Although the number of ships of the first class called for will be the same, the change involves a great increase in actual fighting power, for there can be no comparison in this respect between a "Connecticut" and a "Tennessee." Although it is claimed by some naval officers that the "Tennessee" could put up a stiff fight against many modern battleships, it is certain that she could not stand up very long against our own "Connecticut." The total number of heavy guns on the cruiser is twenty, while the total number on the battleship is twenty-four. It would be a case of four 10-inch guns against four 12-inch, and sixteen 6-inch guns against twelve 7-inch and eight 8-inch guns, while as against the 5-inch armor of the cruiser the battleship would offer a protection of 11 inches. In addition to the three battleships and the armored cruiser, Congress will be asked to authorize two training ships and a small brig for training the younger apprentices in our navy.

While there is reason to be gratified with the proposal as thus drawn up, we cannot but regret that steps are not being taken by the present Congress to commit the country to an elaborate programme of construction, calling for a certain number of ships to be built each year, the appropriations to be voted as they are required. Such a course would insure a steady growth of the navy along predetermined lines, and at the same time it would be sufficiently elastic to allow of supplementary programmes being passed at any time—a method which is being followed with great success in the German navy. Another provision of the naval bill which will meet with universal approval, is that for an increase in the personnel to correspond with the increase in the number of ships in commission. The bill will call for the immediate doubling of the number of cadets in the Naval Academy; when it is passed one of the most serious defects in the naval policy of this country will have been remedied.

RECONSTRUCTION OF THE ERIE CANAL.

There is unquestionably a growing conviction among the people of this State that it is indispensable, both to the commercial supremacy of its principal seaport and to the full realization of the commercial possibilities of the State itself, that the Erie Canal should be rescued from the condition of neglect and inefficiency into which it is so rapidly declining, and restored to something of its original standing as the most important line of transportation through the State of New York. Every year that passes brings nearer the day when, if the canal be not modernized, it will have to be abandoned altogether. As matters now stand the barges are too small, and the locks too many and too slow of operation to enable the canal any longer to compete successfully with the railroads, and act as the guardian of the transportation interests of the State by maintaining rates at an equitable figure. It is gratifying to note that Gov. Odell, in his annual message, strongly advocates the construction of a 1,000-ton barge canal, thereby proving that, on a more thorough study of the problem, he is convinced that the half-measures advocated by him when he first took office, contemplating the mere improvement of the present 9-foot canal, were a mistake, and that a broader view of the question, taking in the probable future developments of transportation, demands the construction of nothing less than a 12-foot, 1,000-ton barge canal. Of the schemes of reconstruction proposed, there are practically three. One proposes to follow the Niagara River to a point above Niagara Falls; construct a canal around the Falls to Lewiston and thence to Lake Ontario, or else use the present canal as far as Lockport, and construct a canal from Lockport to Olcott on the lake; then use the lake itself as far as Oswego; proceed by the route of the old Oswego Canal to Syracuse, and then follow the course of the present Erie Canal from Syracuse to the Hudson River. Another scheme proposes to utilize Lake Ontario and the St. Lawrence River to the point on the river to the north of Lake Champlain, where it will be most practicable to "break through;" construct a canal from there to Lake Champlain; and then follow the old canal from Whitehall down to Troy. Now, while these two schemes save a large amount of canal construction or reconstruction, they are open to the objection that the navigation of the lake is at times extremely stormy and that, therefore, the barges would have to be built much more strongly than they would if they used an all-canal route, the difference being estimated at as high as 20 per cent. There is also the drawback of heavier insurance rates; while in respect of the lake and St. Lawrence route there will be the danger that having got so far down the St. Lawrence River, the freight might be tempted to use the St. Lawrence River altogether; in which event the canal would defeat the very object for which it was built.

The third route, which is the one recommended by Gov. Odell, is known as the inland route. It follows approximately the route of the present Erie Canal from Buffalo to a point a few miles beyond Lyons. Here it leaves the old canal and is laid through easier country to the north of it, finally entering the western end of Oneida Lake, traversing that lake and striking the route of the present canal between Oneida and Rome. From this point on through the Mohawk Valley it is proposed to abandon the old canal, and utilize instead the Mohawk River, canalizing the same and dredging or excavating it to the required prism. The last route is the one recommended by a sub-committee of the Canal Association of Greater New York, and it is generally favored by the engineers on the ground of construction, and by the experts in traffic, who judge it from the standpoint of economy and facility of ultimate operation. In the current issue of the SUPPLEMENT we publish a map showing the alternative routes, and also an exhaustive analysis of the discussion of the problem contained in Gov. Odell's report.

THE COAL FIELDS OF NATAL.

The building of the various railroads projected in South Africa, and the completion of those now in course of construction, the scope of which was described recently in the SCIENTIFIC AMERICAN, will tap, and bring into communication with the coast, the various extensive and rich coalfield areas of South Africa, so that in the near future that country will play an important part in the world's supply of coal.

A considerable part of Natal, and several large tracts of country in the Transvaal and Cape Colony, contain rich coalbeds, many of them as yet unexploited. To stimulate the coal-mining industry, and in order to attract attention to the immense possibilities in this connection in South Africa, the British Board of Trade have issued a report dealing with the question. The coal-producing areas may be divided into four districts. The first district comprises the largest coal mine in Cape Colony, the Indwe Mine, furnishing about half the total output of the colony. It is connected with the main railroad at Sterkstroom by a branch track 66½ miles in length. The second largest producing district comprises the mines of the Cyphergat Coal Mining Company (Limited), the Wallsend Colliery Company (Limited), the Fairview Coal Mining Company, and the Sterkstroom Mines. The third area comprises the mines in the Molteno district; the fourth district is the smallest, and includes the Romansfontein mine, twelve miles southwest of Molteno and six miles from the terminus of the Cape Collieries Railroad; the principal mine of the Cape collieries is on the farm of Zeekoegat. Other mines of this company are the Speedwell and Silkstone collieries on the Zandfontein farm. The company has built a railroad 17½ miles long to the main line, four miles west of Stormberg Junction.

The coal deposits of Natal are situated in the extreme northern portion of the colony, the southern limit being a line drawn east and west about twelve miles north of Ladysmith. Outside this area, coal has been found in small quantities near Estcourt, and on the coast northward from Mount Edgecombe, but up to the present only in thin seams of no practical value. In the northern district the deposits lie almost horizontally from 3,800 to 4,000 feet above the sea level. On the other side of the mountains, coal has been found near Charlestown, and at Volksrust in the Transvaal. About a dozen seams of coal have been discovered, but only four or five of these are at present worked. The Dundee district is at present the best developed area, and here the seams go up to four feet six inches in thickness, and yield coal of good quality. Further north, between Dundee and Ingagane, prospecting operations have revealed seams of good coal up to six feet in thickness, which were just being developed previous to the war. In the Newcastle district both the quality of the coal and the thickness of the seams are very variable. The coal fields of Rhodesia are situated some 180 miles northwest of Bulawayo, and are known to extend over 400 square miles. The seams vary from 5 feet to 16 feet in width, and as the coal lies within 40 feet of the surface, it will be worked by means of inclines instead of shafts. In so large an area the quality naturally varies, but it is claimed that the coal is better than that now in use in the Cape Colony, Natal, and the Transvaal.

The output of coal in Natal has been steadily increasing. The figures for the last five years are: 1897, 243,960 tons; 1898, 387,811 tons; 1899, 328,580 tons; 1900, 241,330 tons; and 1901, 569,200 tons. The export of coal from Natal in 1901 amounted to 204,788 tons, of which 55,757 tons were exported from Durban by sea, 1,865 tons overland to Orange River and Transvaal colonies, and 241,166 tons were bunkered by vessels at Durban. The total output of the collieries being 569,200 tons, it will be seen that 264,412 tons were either consumed or stocked in Natal; 146,234 tons of colonial coal were consumed on the Natal Government Railroads during 1901. The output of the Cape collieries in 1898 was 191,853 tons. The development of the coal areas and prospecting for new deposits is going on steadily. The largest market for coal in South Africa is that of the Witwatersrand gold fields. For the coal of Natal, the bunkering trade of Durban has furnished the largest market up to the present, the Natal Government Railroads being the next largest consumers. The demand in South Africa for its coal is equal to the supply. Nearly all the mines can readily sell all the coal they can produce, and most of them would increase their output if labor were more plentiful. Many of the companies suffer from the scarcity of labor. The railroad system on the whole affords fair facilities for the development of the coalfields. In 1899 the committee on coal for railroad purposes recommended a reduction of the tariff for coastwise conveyance of colonial coal in return empties, from the rate of a cent to half a cent per ton per mile from Stormberg to East London, from Rosemead to Port Elizabeth, and via De Aar to Capetown, the rate of a cent per ton per mile to operate only for the distance from Sterkstroom, via Stormberg Junction, to Rosemead Junction; and that all these rates should be also for intermediate stations *en route* to the ports. They did not recommend a reduction of the existing rate for coal northward. In making these recommendations the committee were of the opinion that, if accepted, they would lead to the use of colonial coal in a very considerably greater degree, and for a great many more new purposes than it had been used, would add to the net revenue of the colonial railways, and would enable the consumer to obtain colonial coal at a cheaper rate. Next year it is anticipated that the extensive and virgin regions of the Wankie country will be tapped by the Cape to Cairo Railroad. Although at present South Africa can scarcely meet the native demands for the fuel, as new regions are opened, and the output of those already in operation is increased, the country will be in a position to direct its attention to foreign markets.