MODERN COAL-HOISTING APPARATUS.

By FRANK C. PERKINS.

At the present time coal is conveyed in large quantities by rail and by sea to various manufacturing

boom, digging up 4,000 pounds of coal and raising it to the level of the hopper and discharging it into the same, all within this short period of time.

The Hunt steeple tower for coal hoisting requires two engines and two engineers, one for hoisting the

this equipment, it will be noted, have a capacity of making nearly three round trips in one minute with a two-ton automatic shovel. The Hunt steeple tower rigs used in this equipment have electrically-driven moving gears and coal crackers, while the hoisting engines are direct connected. The towers have to move 30 feet at a time without changing steam connection, and have to traverse overhead the whole length of the coal storage pocket. Several of these towers can work at the same time, as a single tower can operate on each hatch of the vessel. The boom has an overhang of 40 feet, so that it can operate on coal steamers of the largest dimensions and the widest beam, and works entirely free from the vessels with their rigging, as the boom folds up as mentioned above.

An electrically-driven crane for construction work, using a somewhat similar shovel, is constructed at Karlsruhe, Baden, by the Gesellschaft für Elektrische Industrie. Many engineers claim that the hoisting machinery for this class of work is worked more economically by electric power than by steam or hydraulic power. Among the advantages claimed for the use of electric motors for working this class of hoisting machinery are the small space required as well as the comparatively small weight necessary, with the slight attention required, and the ease with which the electric energy may be transmitted to the hoisting apparatus. The starting and stopping of the motors is so simple that even persons possessing no technical knowledge at all may soon be efficient in attending them. The hoisting machinery actuated by an electric motor is ready for work at any time, and the motor starts very easily. By adjusting the starting apparatus or current regulator, the strength of the current may be diminished or increased; the speed of the motors, therefore, may, if required, be carried within certain limits, and the direction of their rotation altered. The electric hoisting machinery is well adapted for use in central station and at harbor, on account of the convenience in the distribution of power. Portal and semi-portal cranes are frequently preferred on account of their taking up the least room on a wharf, and not even restricting the railway traffic.

The accompanying illustrations show excellent examples of movable quay cranes with large pedestals, having an opening through them of sufficient width and height to allow railway cars and locomotives to pass through them, and have the great advantage of offering very little obstruction to the traffic on the quay. One of the movable hydraulic cranes shown was constructed by Sir W. G. Armstrong, Whitworth & Co., Ltd., of Newcastle-on-Tyne, England, for shipping coal direct from cars, whether of the end-tip or hopper type. These cranes are said to be very convenient for use in connection with a fixed coal hoist, as coal can then be loaded at two hatches at once, and they are especially adapted for shipping bunker coal. Another movable hydraulic hoist for shipping coal was specially designed by Sir W. G. Armstrong, Whitworth & Co., Ltd., to lift from either of two lines of rail running parallel with the quay edge; but the same type with modifications is said to be adapted for sites where the

GENERAL VIEW OF THE HOISTING TOWERS AND THE COAL POCKETS OVER WHICH THEY TRAVEL.

plants and power stations, where it is stored for boiler service in high coal bunkers or pockets. Very efficient coal hoisting and handling machinery has come in use on account of the demand for increased speed with this apparatus. At the Lincoln wharf power station of the Boston Elevated Railway Company, a modern equipment has recently been installed by the C. W. Hunt Company, of West New Brighton, which is claimed to be one of the most rapid unloading equipments in use at the present time.

It is very important that the cars and steamships have their large coal cargoes unloaded with the greatest dispatch, as the demurrage amounts to a considerable item, which every economical management desires carefully to avoid. It is claimed that the problem involved in these cases is more difficult and very different from that of bulk unloading and storage of coal on the ground level from the vessels or cars. The accompanying illustrations show the coal-hoisting towers at the Lincoln plant, as well as the main hoisting and trolley engines and automatic duplex two-ton shovels utilized for this purpose. The piping is arranged with Moran flexible steam-pipe connections, which permit each tower to travel 15 feet in either direction without breaking joints. The engines employed have a capacity of 300 horse-power, which is three or four times the output usually developed. With this equipment the bituminous coal was raised from one hatch of a vessel and delivered to the storage pockets 90 feet above tide water at the rate of 640,000 pounds per hour, using one tower, while usually a single tower has an ordinary speed of 40 to 50 tons per hour and a maximum speed of 100 tons per hour, hoisting the coal to a height of about 50 feet above tide water.

A coal-cracking machine is used for breaking the coal to proper dimensions for automatic stokers before passing to the pocket, and handles over 10,000 pounds per minute. The coal is delivered to the coal-cracking machines by the hoisting machinery by automatic steam shovels having a capacity at each lift of 4,000 pounds. The machinery installed in the coal-hoisting towers is subjected to great shocks, the work being of the severest and hardest kind, as the service changes constantly, in some cases soft pea coal being unloaded from open wooden barges, while in other cases large cubes of hard foreign coal being unloaded from steel vessels with very small hatches. With the equipment of the Boston Elevated Railway car station it has been possible to raise two tons of coal nearly 100 feet above the hold of the vessel to the discharging hopper in six seconds. The equipment will perform an entire operation, including a round trip of the shovel, in about one-third of a minute. This operation includes the lowering and moving of the shovel out of the

steam shovel and the other for running the trolley in and out on the boom. The steel booms hold up in a vertical plane, thus avoiding any danger of interfering with the shrouds of the vessel. The engines used in

AN ELECTRIC CRANE USED FOR CONSTRUCTION AT KARLSRUHE.
MODERN COAL-HOISTING APPARATUS.

rails approach at right angles to the quay, in which case a fan-shaped arrangement of rails is used, and the hoist is brought up to either of the lines of rail forming the fan which may best suit the ship.

THE RAILROADS OF THE WORLD.

THE annual statistics of the Archiv für Eisenbahnwesen, giving as near as may be the figures for the end

being an average of 12,233 miles per year. The average mileage built was greatest from 1880 to 1890, when it was 15,218 per year.

The considerable decrease in construction from 1901 to 1902 was due chiefly to the reduced construction in Asia (4,345 miles in 1901 and 2,535 in 1902) and Africa (1,690 miles in 1901 and 364 in 1902). More was built in America in the latter year than for several years previous; and more than appears from the

Korea. The table also includes 1,490 miles in French Cochinchina, the larger part of which certainly is not built yet.

The English-speaking peoples maintain their position as the railroad-building race. Of the 520,955 miles of railroad in the world, 270,881 miles are in the United States and in Great Britain and its colonies. The railroad mileage of the British colonies in America, though not one-tenth as much as that of this country, is nearly twice as great as that of any other American country, and Great Britain still has more than three-fifths of the Asiatic railroads, and since 1898 has built a fourth more than Russia in Asia.

The South American countries (with which we have included the West Indies) make haste slowly. They added but 234 miles to their lines in 1902, and but 1,804 miles in the four years then ending. Brazil, that great country, is credited with no addition since 1899, and Argentina, the United States of the southern continent, with none in 1902, and but 406 miles since 1899.

The Archiv für Eisenbahnwesen continues its tables of the capital invested in the railroads of the different countries, which it began a few years ago. Naturally, they are less complete than the statements of mileage; but the mileage for which the figures are not attainable cannot be very important. According to these data, the investments in the railroads of the world amounted at the end of 1902 to the stately sum of \$34,964,342,000, of which more than \$18,800,000,000 have been spent on the 184,000 miles in Europe and \$16,160,000,000 on the 337,000 miles in the rest of the world. This gives an average of \$114,760 per mile for the European, and of \$57,009 for the Barbarian railroads. The country with the highest capital cost per mile is, of course, Great Britain (\$256,839); the nearest approach to it is Belgium (\$150,239). The cheapest in Europe are the Finnish State railroads (\$32,104); but the private railroads of Sweden are put down at \$22,558 per mile. Elsewhere the colony of West Australia has spent but \$27,597 per mile for its lines (light, narrow-gauge railroads); Japan, \$38,320 (also mostly narrow-gauge).

The summing up of the acquisitions of the world, all made within the last eighty years, in these instruments of production, results in something like awe. The capital which they represent could not possibly have been obtained in any previous age, and it is safe to say that the improved means of transportation themselves have made possible its accumulation and vastly more. The imagination is lost in efforts to foresee what may be the result in the next eighty years of these and of the other appliances which have so greatly multiplied the productive powers of man.

ARMSTRONG MOVABLE QUAY CRANE WITH LARGE PEDESTALS FOR THE PASSAGE OF LOCOMOTIVES AND CARS.

of the year 1902, show the mileage of railroad at that time in each grand division of the world to have been as follows:

Europe	183,997	North America ..	233,186
Asia	44,358	South America ...	28,822
Africa	14,554	Australia	16,038

Old World	242,909	New World	278,046
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This makes a grand total of 520,955 miles for the whole world, of which 53.13 per cent is in the New World and 44.4 per cent in North America.

The additions to the railroads of the world for seven successive years have been, in miles:

1896.	1897.	1898.	1899.	1900.	1901.	1902.
9,796	10,747	10,864	13,533	10,800	16,551	13,338

This gives a total of 85,629 miles for the seven years,

Archiv's statistics, which takes its figures for the fiscal year ending with June for both Canada and the United States, which together have more than two-fifths of the world's mileage, and where more than two-thirds of the railroad completed in any calendar year is opened in the last half of such year.

The countries of Europe which added most to their railroad mileage in 1902 were:

France.	Germany.	Russia.	Sweden.	Austria Hungary.
619	615	581	366	340

All the rest of Europe built but 664 miles. Russia is credited with no addition to its mileage in Asia in 1902, but 629 miles were opened in India and Ceylon, 165 in Japan, 174 in China, 95 in Siam, and 12 in

Typesetting Machines in Germany.—The central commission of machine typesetters of the book-printing trade of Germany gives the following statistics:

There are 1,023 typesetting machines used by 513 firms, which are scattered throughout Germany, but it is believed that there are in reality 1,040 of these machines in use in Germany.

There are 1,508 persons employed, of whom 1,457 males and 13 females are assistant operators.

The setters work permanently on the machines from thirty-six to sixty hours a week. The approximate time of working is forty-eight hours a week.

At the minimum tariff rate there are 163 setters employed; above this rate 895 and below this rate 115. Some are paid by the month and receive from \$31.65 to \$44.03.

It is claimed that about 2,600 typesetters have lost

LOADED BUCKET HOLDING 2 TONS OF COAL, DEPOSITING ITS LOAD IN A POCKET 100 FEET ABOVE THE HOPPER IN 6 SECONDS.

MAIN HOISTING ENGINES OF ARMSTRONG COAL-HOIST.
MODERN COAL-HOISTING APPARATUS.