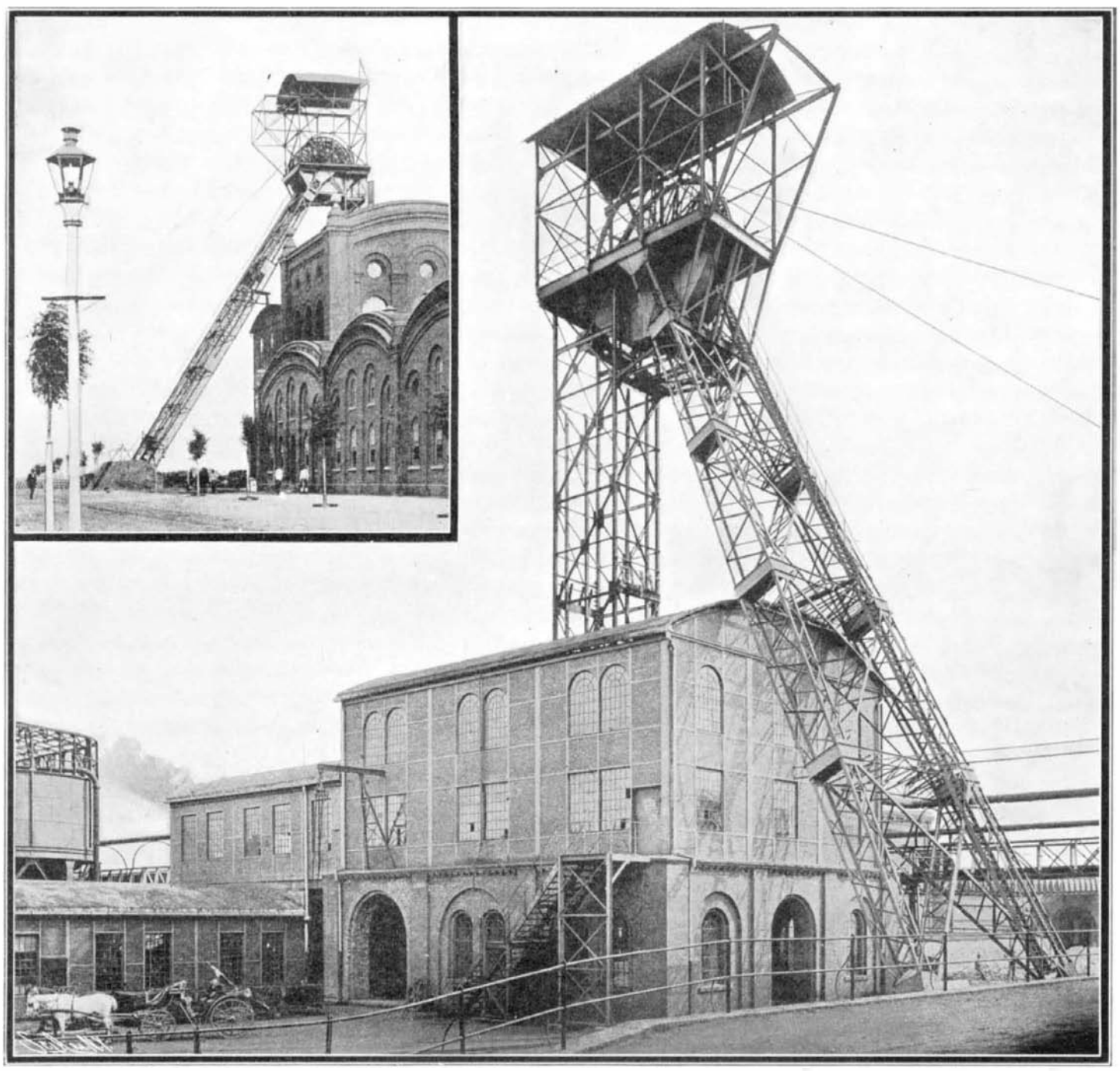
ELECTRICALLY-OPERATED VERSUS STEAM-DRIVEN MINE HOISTS.

Until very recently electric hoists have not been employed extensively for the main shafts of deep mines; but the high efficiency of the electric motor, and the success which has been attained in the design and construction of large electric motors for this work, have increased the number of engineers who favor this system of main shaft mine hoisting.

At the Harpener Bergbau A. G. pit, Scharnhorst II., is installed a twin tandem hauling engine with cone valve motion. The depth of the shaft is 1,968 feet, and the load normally raised is 4 tons, 8 hundredweight. This twin tandem hauling engine has a stroke of 63 inches, and the high-pressure cylinder measures 31 inches in diameter, while the low-pressure cylinder is 47.4 inches in diameter. The drums of this hoisting engine are 19 and 25 feet in diameter.

While heretofore engines of the above character have been exclusively used for this class of mine hoisting, electric installations are now in operation which do the work equally as well, and are favored in preference to the steam hoisting plant, on account of the fact that a large electric central power station can be installed, which will supply current for operating the entire mine as well. Such a power station is installed in the "Gneisenau" mine, and also at the electric station of the "Scharnhorst" mine of the Harpener Bergbau - Actien - Gesellschaft.

These two electric power stations supply current for operating electric mining pumps and electric hoists as well as various mining machinery. It is well understood that if the main hoisting plant was also operated by electric motors of large size, and the entire mine operated by electric power, greater economy would result, on account of the more efficient steam plant which could be installed on a larger scale with units of higher power.



THE SHAFT OF THE RHEINPREUSSEN MINE.

The Gneisenau power station is equipped with a 600-horse-power, horizontal, compound steam engine directly connected to three-phase generators generating a current of 2,400 volts pressure with a frequency of 3,000 alternations per minute, the speed being 100 revolutions per minute. The current is transmitted a distance of 2,460 feet to a double-acting plunger mining pump underground, which raises 176½ cubic feet of water per minute a height of 1,476 feet. The motor is a Helios asynchronous machine operating at 65 revolutions per minute directly from the 2,400-volt power circuit.

The Scharnhorst power station is equipped with two Helios three-phase generators of 300 kilowatts capacity, each operating at a speed of 150 revolutions per minute, and supplying a current of 500 volts pressure. This current is used for operating motors of from 10 to 100 horse-power each, for driving mining pumps and other mining machinery.

Electric hoists have been constructed up to 2,800-horse-power capacity for taking the place of the large steam hauling engines for the main shafts, one of these being described in this journal but a short time ago. This electric hauling engine was directly connected to two direct-current motors of 500 volts pressure built by Siemens & Halske, of Berlin. The diameter of the driving wheel is 6 meters, and a load of 4 tons is raised from a depth of 1,640 feet at a maximum speed of 65.62 feet per second. This wonderful electric hoist was installed at the Zollern II. mine of the Gelsenkirchener Bergwers A. G.

At the Germania I. mine of this same company, there is in operation a Helios polyphase electric hoist which operates at a speed of 9.84 feet per second, raising a load of 3,968 pounds from a depth of 1,312 feet. This machine has a motor of 120-horse-power capacity, which runs at a speed of 485 revolutions per minute, operating the winding drums at a speed of 61 revolutions per minute. This electric motor receives its three-phase current directly from a 2,000-volt power transmission line.

At the Tiederhall mine a Siemens & Halske double electric hoist is operated by two direct-current motors, and carries a load of 1,763 pounds, the speed being 9.84 feet per second. This hoist hauls the material from a depth of 984 feet, and is located at that distance from the surface. Another electric hoist operates a cage in another shaft, going 200 feet deeper into the mine, this hoist also being installed in an underground chamber.

The use of steam engines in place of electric motors would not be considered wise after the experience of mining engineers with modern electric power underground. In a paper before the Federated Institution of Mining Engineers in England some time ago, W. C. Mountain, speaking on the subject of "Electric Motors for Transmission of Power in Mines," said:

"Mining engineers are probably not generally acquainted with the loss that occurs in steam-pipes in mines. Mr. Hy. Davey carried out tests on a main steam pipe 1,100 feet long, 7½ inches in diameter, and 1 inch thick. The main was used for conveying steam at a pressure of 45 pounds per square inch to an underground pumping engine at the Morton pit of the Clay Cross collieries. The pipes were covered with non-conducting composition. As a result of careful experiments, it was found that the condensation of steam in the main amounted to 500 pounds of water per hour when the engine was standing, and 750 pounds of water per hour when the engine was working, equivalent to 0.183 and 0.274 pound per square foot of surface of pipe per hour respectively."

He further stated that—

"At the Staveley Hill Collieries, Mr. W. Worby Beaumont carried out experiments which showed that with a length of 2,300 feet of pipe, 1,900 feet of which was underground, and covered in some instances to a depth of two feet with rough stuff left after cutting away the coal, the condensation in pipe 6½ inches in diameter and 1⅛ inches thick, conveying steam at 34 pounds per square inch, was 600 pounds of water per hour with the engine standing and 400 pounds per hour with the engine working. This condensation is equivalent to a condensation of 0.113 and 0.265 pound of water per square foot of surface of pipe per hour. For uncovered pipes, of which unfortunately there are very many in mines, it may be safely assumed that the condensation is not less than 1 pound of water per superficial foot of pipe exposed. If the pipe at the Staveley Hill colliery be taken as a fair example of underground work, a simple calculation shows that, assuming we evaporate 6 pounds of water per pound of coal, it is necessary to burn 233 pounds of coal per hour in order to make up for the loss due to condensation."

There is no question but what mining engineers at the present time realize that the losses in steam pipes operating pumps, ventilators, hoists, and other mining machinery by simple engines of small capacity, as well as the low efficiency of these engines, make it desirable to utilize electric power wherever possible. The mines may then be lighted as well as supplied with the necessary power from the same conductors.

Numerous examples of electric hoisting plants in American mines could be given, showing the extended use of this class of electric machinery.

A new world's record for the conveyance of mails was established recently by the Great Western Railroad of Great Britain. The mails from the North German Lloyd steamship "Kronprinz Wilhelm" were landed at Plymouth and embarked upon the first section of the waiting train. The first train left the port with 1,085 bags at 9.23 A. M. and arrived at Bristol at 11.27, where the North of England mails were dropped. A fresh engine was attached to the train, which left Bristol at 11.30 A. M. and arrived at Paddington, the London terminus, at 1.10. The whole journey from Plymouth to London, a distance of 246 miles, was thus covered in 3 hours 47 minutes, including the stop at Bristol. The train thus maintained an average speed throughout the whole journey of over 65.02 miles per hour. The last 118 miles from Bristol to London were covered exactly in 100 minutes, which is equivalent to 70.8 miles per hour.

During the year 1903, the German navy was augmented by the construction of ten warships representing an aggregate displacement of 59,477 tons. This is an increase in the tonnage over the previous year of 29,082 tons. Of this total launched, there were three armorclads aggregating 39,600 tons; one armored cruiser of 9,500 tons; three small cruisers of 9,000 tons; and a gunboat of 977 tons.