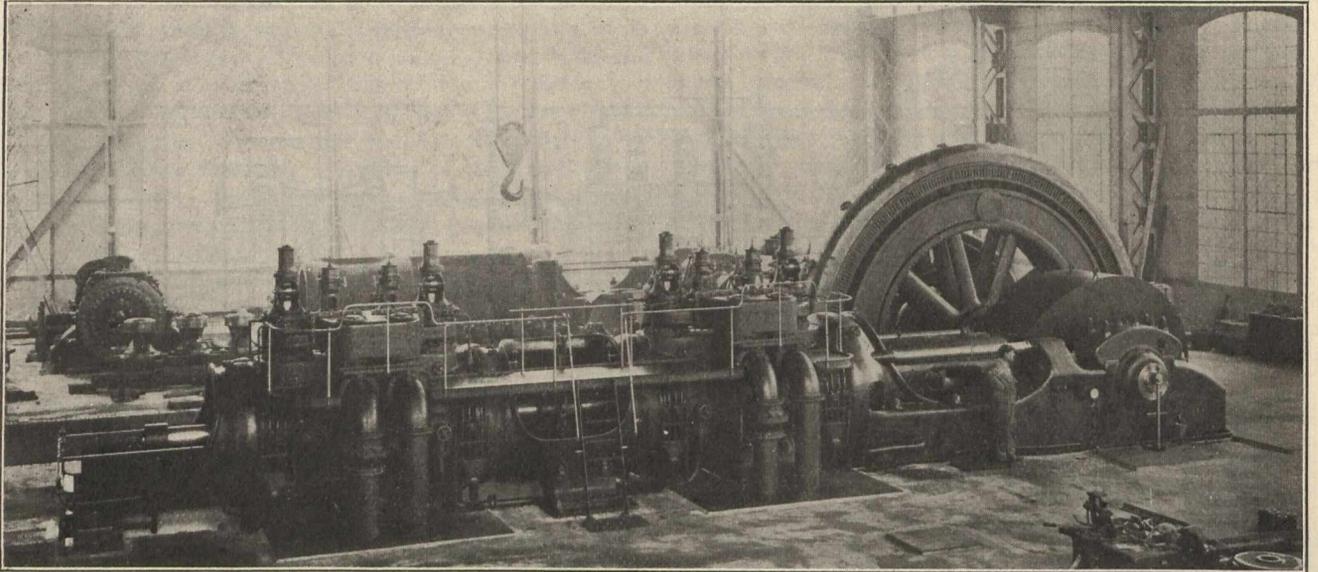


Steel Works, where 16 2,000 horse-power blowing gas engines are being erected, and 8 1,000 horse-power gas engines for driving electrical generators of both alternating and direct current type by the De la Vergne Machine Company, of New York, who are constructing these engines of 40,000 horse-power output at their works, after the designs of the German engineers.

The double-acting and single-acting four-cycle German gas engines for blast furnace gases of prominence include

alternators were constructed at Baden, Switzerland, by Brown, Boveri and Company, and operate at 132.6 and 140 R.P.M. supplying 164 amperes and 106 amperes at 3,000 volts pressure, the larger alternators having a capacity of 492 kilowatts and the smaller machines an output of 318 kilowatts.

Double-acting Deutz blast furnace gas engines operating blowing engines have recently been installed at the power-house of the Burbacher Hutte, having a capacity of



Showing One of Two Units, 1800 Horse-power Double-acting Nurnberg Engine at Gilsenkirchen, Operated by the Aktien-Gesellschaft Schalker Gruben-u. Hutten-Verein, and Installed by the Vereinigte Maschinenfabrik Augsburg und Maschinenbaugesellschaft Nurnberg, A.-G. Work, Nurnberg.

the Nürnberg and Augsburg types, as well as those of the Gas-Motoren Fabrik Deutz. The latter German engineers have installed two 1,000 horse-power four-cycle engines and two 600 horse-power machines driving alternating current generators of the three-phase type machines at Düdelingen at the power-house of the Eiden Hutten-Actien-Verein. The

1,400 horse-power, and at the mining power plant at Hoerde I.W. at the Hoerder Bergwerks und Hutten Verein of 200 and 2,000 horse-power capacity for operating mining ventilators and three-phase alternating current electric generators respectively. The double-acting gas engine is now receiving special attention for this class of service.

#### TEST OF ELECTRIC RAILWAY APPLIANCES.

A volume that has circulated widely amongst those interested in electric railways, both city and suburban, is the "Report of the Electric Railway Test Commission," which made its investigations under the auspices of the Louisiana Purchase Exposition, the report being made to the president of the Exposition.

Tests were made of almost every type of electric railway equipment then existing. Single truck and double truck city cars were tested in service, as was an inter-urban car. Acceleration tests of these cars were also made, and the many types of brakes were tested on the different cars. A test was also made of a storage battery industrial locomotive. In fact the commission did its work so thoroughly that every conceivable test was made of electric railway equipment.

That section of the report dealing with the test car "Louisiana," a car specially designed for the purpose of determining the effect of the air pressure upon the front, sides, and rear of a car when running at various speeds up to 70 miles per hour. The construction of this car was given every attention, and nothing was left undone that would make it as nearly perfect as possible. The methods of support for the car body were given careful consideration. Various knife-edge supports and ball and roller bearings were considered, and it was finally decided that the double ball bearings manufactured by the Chapman Ball Bearing Company were the most practical for the purpose. The use of this bearing combined a number of important features for safety and convenience, but it is possible that if time had permitted, a spring hinge would have been devised.

The axles were also carried by the Chapman bearing. The success of the experiments depended largely upon the

character of the bearings employed, and for this purpose the Chapman was again considered to be the best. Since these bearings played such an important part in this test, a short description will be of interest.

The bearings consist of two rings of large balls carried between cones, one on each side of the hub. The cones are of hard tool steel, and are adjusted by means of screw threads. A peculiar feature of the bearing is that the large balls are spaced by smaller ones, each of which is carried in a small cage. These spacing balls are arranged in such a manner as to avoid slipping between any pair of the adjacent large balls. The hub of the bearing slips loosely over the shaft to be driven, which is free to revolve inside the hub in case the friction in the ball rings becomes excessive for any reason. Dust-proof cases cover the hub at each end.

The air resistance tests of this car showed that the least resistance was offered to the parabolic-wedge vestibule, the pressure being 2.10 pounds per square foot, with the car running at 60 miles per hour. The other types of vestibules met with resistances as shown: Parabola, 2.50 pounds per square foot; standard, 4.53, and flat, 8.20.

Altogether the report of the commission is a most exhaustive one, and the members are to be commended on the admirable way in which the tests were conducted.

#### MERCHANT MARINE CONSTRUCTION.

The shipbuilding business in Japan according to current reports, has been showing unprecedented activity of late. The Mitsui Bishi and Kawasaki yards are full with orders. Owing to the increase of wages and the advance in the price of imported materials necessary for shipbuilding, however, it is said to have been found cheaper to order a steamer from England than to build in Japan, unless a shipbuilding bounty is granted.