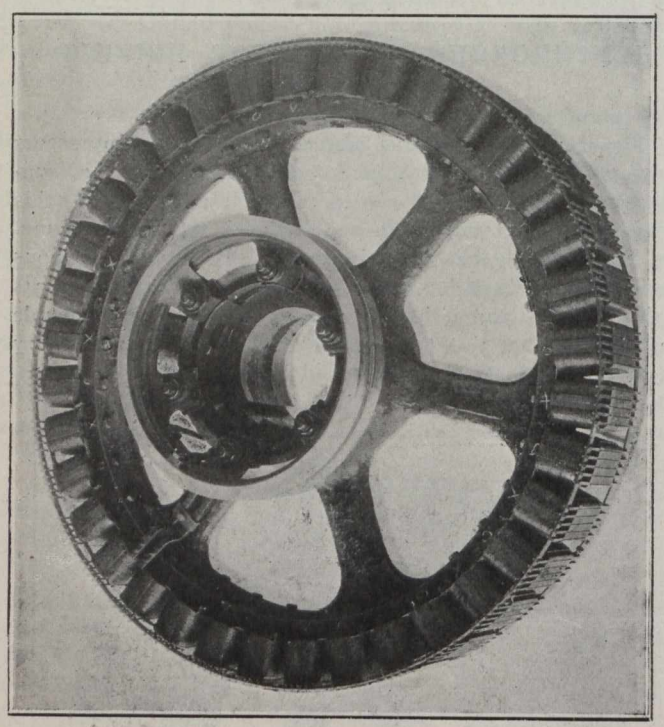
tor, and the other delivers 995 cubic feet of air at 235 r.p.m. and is driven by a 175 horse-power motor. These compressors have been in operation over a year and have proven very satisfactory.

As compared with other forms of drive for large compressors, synchronous motors possess a number of advantages. In the first place, the first cost of a synchronous motor compares very favorably with that of other types of motors or engines. The motor is especially adapted for direct connection, so that it costs less to install and takes up minimum floor space. The illustration shows what a compact unit is formed. The elimination of belts also decreases the maintenance expense.

The reliability of these motors in this service is proven beyond question. There are a number of installations which have been giving perfect satisfaction for a long time. A notable instance is that of the Anaconda mines where a total of 7,200 horse-power of Westinghouse synchronous motors have been driving compressors for nearly four years without a hitch, in spite of very variable operating conditions.



Synchronous Motor.

One of the chief objections to the old type of synchronous motor was the fact that it required some auxiliary starting device, but this difficulty has been eliminated. The modern synchronous motor is self-starting and self-synchronizing.

Another advantage of the synchronous motor is its ability to operate at 100 per cent. power factor, which tends to improve the operation of generators and to increase the capacity of transformers and transmission lines. If desired, these motors can be arranged to raise the power factor of the entire circuit by being supplied with excess capacity and used as synchronous condensers; thus greatly increasing the operating efficiency of the generating and transmission system.

The synchronous motors used at Wickwire represent the most modern design. They are characterized by great strength and simplicity of construction, as the illustrations show. The stator is supported by a heavy cast iron frame, and the coils are form wound and so arranged that they can be easily removed and replaced if the necessity ever arises. The rotor consists of a cast iron spider which carries the field poles. The windings are so arranged that they receive ample ventilation, and each field coil can be easily removed. An interesting feature of the rotor is the squirrel cage winding that encircles the field poles. This winding makes the motor self-starting and eliminates "hunting," or surging, which was one of the disadvantages of the early type of synchronous motors.

The Wickwire mine is operated from 6,600 volt, 60 cycle, three-phase power supplied by the Peninsular Power Company. This voltage is stepped down to 2,200 volts for the synchronous motors, and 220 volts for the motors for driving pumps and other apparatus.

THE IGNITION OF MINE GASES.

"The Ignition of Mine Gases by the Filaments of Incandescent Lamps," is the title of Bulletin No. 52, which has just been issued by the United States Bureau of Mines.

The authors, H. H. Clark and L. C. Ilsley, make the following general statement:—

As part of its investigations of the causes of mine accidents and of the safest and most efficient methods of handling electricity underground, the Bureau of Mines undertook a study of the ignition of mine gases by the filaments of electric incandescent lamps. This bulletin describes the investigation in detail and gives a complete record of the results obtained.

The investigation was undertaken for the purpose of determining the degree of danger that attends the use of certain specific sizes of incandescent lamps in atmospheres containing inflammable gas. Previous investigators have, to a greater or less extent, been concerned with certain theoretical features of the problem, such as the effect of the temperature and the dimensions of the lamp filaments; and the question whether a lamp may ignite gas by the heat of its glowing filament or by the spark that is drawn when the filament is broken. Although these features were considered in the present investigation and are briefly discussed in this bulletin, the principal object of the tests was to determine what sizes of incandescent lamps suitable for mine use would ignite explosive mixtures of mine gas and air, and what were the circumstances most effective in causing such ignition.

The results of the investigation may be generally summarized as follows:—

The naked carbon filaments of standard lamps, burning at rated voltage, will invariably ignite explosive gaseous mixtures.

If gas can reach the filaments of standard lamps without breaking the filaments of producing partial combustion within the bulbs, the explosive gaseous mixture is sure to be ignited.

Several sizes of both standard and miniature lamps, when smashed while burning at rated voltage, will ignite gas.

Standard lamps that do not usually ignite explosive gaseous mixtures may do so if the broken pieces of the filament cause a short circuit when the lamps are smashed.

Copies of this bulletin may be obtained by addressing the Director, Bureau of Mines, Washington, D.C.