

sumer's) voltage portion (below 300 volts) has a grounded neutral point.

Lightning has caused frequent interruption of the electrical service between generating plants and the towns and villages in west Java, and the Government is continually experimenting with the new types of protective equipment. Horn gap arresters are used to some extent. At present the Government is experimenting with an arrester made by an American firm.

## ELECTRICITY IN INDUSTRY

### THE SUGAR INDUSTRY

Java's most important industry, the sugar industry, offers one of the best potential markets for electrical equipment. At present most of the mills produce their own current, particularly since they all have an ample supply of cheap fuel in the form of bagasse, by-product of the sugarcane. As the transmission lines of the public-utility companies are extended into the sugar-growing area and power costs become cheaper, perhaps the mills will find it cheaper to avail themselves of public-utility power; but until that time they will continue to make their own.

In the 188 sugar mills there are over 500 motors installed, most of which generate current for lighting purposes. The generators are usually driven by small reciprocating steam engines, as steam is always available for power purposes during the grinding season. The small generators vary in size from 10 kilovolt amperes to 200 kilovolt amperes capacity, but the majority are of about 25 kilovolt amperes capacity. Direct current is used almost exclusively for lighting purposes by the sugar mills, and the voltages are usually 110/115 and 220/230, the former being the most common.

Twenty-five mills are using power more extensively, and have installed facilities for the operation of electrically-driven centrifugals. These 25 mills have over 600 centrifugals installed; the majority are driven by small alternating-current motors. These electrically-driven centrifugals are usually made in the Netherland East Indies by Dutch and German engineering firms. The centrifugals are direct coupled and are equipped with automatic switches for lifting the bowl. High-amperage, low-voltage motors are used for this work.

Sixteen mills use electric current to such an extent that they have installed steam turbines that operate generators having capacities ranging from 400 to 1,600 kilovolt amperes. These mills have a total of 30 steam turbines installed and the total generator capacity is approximately 24,000 kilovolt amperes. Four of the mills are using direct current exclusively, and 26 are utilizing alternating.

Four sugar mills in Java have been completely electrified. These mills have the largest motors in use in the Netherland East Indies. The first to install electrical equipment throughout was the Redjo Agoeng mill at Madioen, which was ready for operation in 1927. Three-phase current is used and the energy for the electric motors is supplied by one 1,250 kilovolt ampere, 240-volt, 60-cycle constant-frequency turbogenerator and two 1,250 kilovolt ampere, 360/520-volt, 45/66-cycle variable-frequency turbogenerators. One of these turbogenerators is always in use and one is held in reserve. The turbogenerators supply power to five 250-horsepower slip ring induc-