

The efficiency of motor drive for coal crushers as measured by the output in crushed coal for a given motor capacity was recently demonstrated by an exhaustive test conducted for the United States Coal and Coke Co., at Gary, W. Va.

A 200 h.p. General Electric induction motor was direct connected to a crusher having a normal output of 200 tons per hour, which, during the test, delivered 262 tons of crushed coal per hour without exceeding the guaranteed temperature rise in the motor. Owing to the heavy starting torque and severe intermittent overloads to which a motor must necessarily be subjected in this service, the polyphase induction type should be used when alternating current is available. If direct current motors are used with either rock or coal crushers, they should be enclosed to avoid commutator trouble from abrasive or conductive dust; reference to the accompanying illustrations of coal crushers driven by induction motors will show that this type need not ordinarily be enclosed.

While the above references have considered only the centrifugal type of crusher the electric motor can be adapted to any form of coal breaker, disintegrator, roll crusher or pulverizer, and where their operation calls for relatively slow speeds standard back geared motors can generally be applied.

Breakers and Tipples.

The earliest attempt at individual motor drive was made with direct current enclosed motors, and was only partially successful, as the intense vibration inseparable from breaker operation tended to cause commutator troubles.

In those breakers where induction motors were used, the simplicity of the rotor and the absence of moving electrical contacts resulted in a practically complete immunity from motor troubles, and the breakers were supplied with current from a central generating station; no local reserve power plant being required.

For driving tipples individual motors have heretofore been more generally used than in breakers, and the typical modern steel tippie is usually equipped with separate motors for the conveyors, picking tables, screens, crushers, etc., although in some cases they are driven in groups by one or more large motors.

Where long conveyors or scraper lines are used the power waste inherent in rope transmission may be reduced by using a centrally located motor or individual motors for separate sections. If extensions to the system are made, as in the case of conveyor lines to culm or refuse piles, the additions may be made without interfering with the operation of the original equipment, by providing a separate motor for each new section.

Coal Cutters.

The typical modern coal cutter shown herewith is mounted on a self-propelling truck and all its movements in loading upon or unloading from the truck, and during the process of mining, are made under its own power without hand labor. The motive power is supplied by a specially designed, enclosed, direct current shunt wound, vertical shaft motor provided with a simple rheostatic controller and wound for operating at the voltages commonly used for mine locomotives, so that current can ordinarily be supplied by the generator equipment provided for haulage, and as the mining machines are usually in service at night their use does not as a rule call for any increase in the generator capacity.

The first generators in the older developments were direct current units provided for lighting and locomotive haulage, and were usually belt connected to exist-

ing engines, direct connected sets being adopted for additions to the original outfit. Engine driven alternators were eventually added as the transmission distances increased beyond the economical range of direct current, but many isolated mines are still equipped for direct current service only. The increasing use of alternating current motors and the high combined efficiencies of high speed turbine driven alternators led to the choice of high pressure turbines as prime movers for most of the new power plants, or else mixed pressure or low pressure turbines were adopted to supplement the engine equipment as they could ordinarily be operated with the exhaust steam of the engines already installed and in this way added greatly to the generator capacity of the power station without requiring extra boiler capacity.

Comparatively high transmission voltages are now commonly used in this industry and most of the recent substations are constructed and equipped in accordance with the most advanced engineering practice, while on the other hand many mining plants illustrate in their miscellaneous electrical equipment the successive stages in the advance of electric manufacture during the past twenty years.

U. S. RADIUM PRODUCTION.

The U. S. production of carnotite bearing ores during 1913 was the largest to date, and amounted to about 2,269 short tons of dry ore, which contained about 81,990 lb. of uranium oxide, equivalent to 34.8 tons (31,560 kilograms) of metallic uranium. Ruth-erford has estimated that the quantity of radium in equilibrium with uranium is equivalent to about one grain of radium to 3,000 kilograms of uranium, and workers in the U. S. Bureau of Mines have estimated that the uranium in carnotite is accompanied by about 90 per cent of the radium required for equilibrium. On the supposition that these figures are approximately correct and that 90 per cent. of the radium present is recoverable, then the ores produced contained 8.5 grams of recoverable metallic radium, equivalent to 15.9 grams of hydrous radium bromide, valued, at \$120,000 a gram of metallic radium, at \$1,020,000.

In the United States uranium minerals were produced in commercial quantities during 1913 only in Colorado and southeastern Utah, and the quantity produced in Colorado was much in excess of the Utah output. The great bulk of the uranium mineral was carnotite, but a small tonnage of pitchblende ore was taken from the Belcher and Calhoun mines, near Central City, Gilpin county, Colo. Only a few pounds were sold, and this was apparently for specimens or experimental use. Fifty dry tons of low grade material, carrying 1.49 per cent. uranium oxide, was shipped from the Kirk mine, which lies adjacent to the Calhoun and Belcher mines. This material had been mined in a previous year and had been picked over for pitchblende several times. It was too lean to ship under ordinary circumstances, but was bought by a French firm for experimental treatment.

KERR LAKE.

Kerr Lake Mining Co. during the year ending August 31, made a profit of \$620,786. There was produced 1,828,424 oz. of silver at a cost of 24.86 cents per oz. The company's surplus August 31 was \$961,094. The manager estimates ore reserves at 5,698,700 oz. and expects his estimate to prove a low one.