

ELECTRICAL DEPARTMENT
ANNUAL REPORT
YEAR 1949

ATHENS MINE:

Several minor changes and repairs were made to the hoisting equipment during the year. New copper cooling coils for the skip hoist liquid rheostat were built and the change made in November.

After several failures in the original cage hoist control wiring which was installed in 1917, a new wiring job was put in from the control to the contactor panels.

The failure of one coil in the armature of the skip hoist generator occurred in the month of May and was repaired on the job over a week end with no delay in operations.

Considerable difficulty has arisen due to low voltage in the underground D.C. haulage system which also supplies power to blowers and sub-level scraper machines. Several tests were made with various load conditions. These tests reveal a considerable change in the diversity factor due largely to the nearly continuous operation of larger scraper machines in transfer sub-levels, and a more continuous operation of eight locomotives. This D.C. power is supplied by a 150 KW M-G set which was ample with a lesser operation of the mine equipment and a more diversified and short time operation of scrapers. The overload protection is set at 1200 amperes at a voltage from 260 to 270. With this high setting of 200% load on the generator, the power failures due to overloads are much too frequent. It would be unwise to set the protection higher on account of the heating and consequent commutator trouble with the generator. The voltage on the 4th and 6th levels is also very low on account of small feeders in the shaft and on the levels. The installation of larger feeders to improve the voltage would not be good with the present setup because of the increased burden on the M-G set. This all points to the fact that if we are going to continue increasing the size of scraper equipment, and the operating time, we must have more D.C. generating capacity plus larger feeders. The connected load of locomotives, blowers and scrapers is now approximately 1500 H.P.

Changes in the cooling water circulating pumps for the compressors in the engine house were completed and the old 3 H.P. motor set up with the new 5 H.P. motor so that either one may be used.

The regular maintenance of electrical equipment on air compressors and pumps was carried on during the year.

CAMBRIA-JACKSON MINE:

Some of the motor winding and bearing difficulties of the hoisting equipment continued into 1949. Work on preparing the foundation and conduits for the hoist motor change was started in July. The change in hoist motors was made during the vacation period from August 13 to August 23. The 500 H.P., 435 R.P.M. wound rotor Westinghouse motor was taken out and the 700 H.P., 390 R.P.M. wound rotor type Westinghouse motor from the Maas Mine skip hoist installed in its place. The spare rotor and bearings recently purchased by the Maas Mine for this 700 H.P. motor will be stored at the Cambria Mine.

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CAMBRIA--JACKSON: (Continued)

No changes worthy of note have been made in the haulage system and air compressors during the year.

The 200 H.P. pump motors on the 4th level Prescott pumps were taken to the General Shops for repairs in the month of March.

CLIFFS SHAFT MINE:

The 750 H.P. "A" Shaft hoist motor was taken apart for inspection and rotor banding repairs January 15 and June 12.

The rotor of the "B" Shaft 750 H.P. hoist motor was completely rewound during the vacation period and back in service August 22. The Lilly hoist controllers were also fitted with new worms and gears at this time.

Considerable work has been done on the haulage equipment during the year. The 150 KW M-G set was taken out in March and sent to the General Shops for repairs. The commutator of the D.C. generator was turned and slotted while the field coils were checked and painted. The A.C. motor was also repaired and painted while all bearings were rebuilt. The machine was returned to the engine house and set up for operation March 22. While this M-G set was tied up, D.C. power for the mine was supplied by the 100 KW M-G set and the 100 KW rotary converter connected in parallel.

On account of difficulties which arose from loose laminations in the synchronous motor of No. 1 haulage set, the motor was sent to the Westinghouse shops for restacking the laminations and a complete rewind of the stator. The rotor coils were repaired and bearings rebuilt in our shops. This machine was back in service in November after a two month tie-up.

Regular maintenance and repairs were made to the compressor controls. The synchronous motor for No. 3 Ingersoll-Rand compressor was repaired in April by a crew from the General Shops. The rotor bars were rebuilt and the stator coils repaired and rewedged in the slots. A similar repair job was done on the No. 2 Ingersoll-Rand synchronous compressor motor in January. New brush holders for more contact capacity of the slip ring circuit were put on to stop the pitting and burning difficulty which caused several shutdowns. The rotor bars and a number of stator coils were also repaired.

The 2300 volt line to "B" Shaft has been removed temporarily to clear the scaffold for the concrete work on the headframe. A 2/0 3-conductor steel armored cable is used for power connection while the repair work is being done.

A 220 volt, 3 phase line was also built to the location of the rock tram west of "B" Shaft. A 25 KVA transformer from the 2nd level "B" Shaft and a 15 KVA transformer formerly used at the laboratory is used to furnish 220 volt power for this rock hoist.

One of the rock trams at the crusher house was discontinued during the year. The primary contactor, switches, grids and controller for this rock car control were reconditioned and now stored at the mine.

Only minor changes were made in the pumping equipment during the year.

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LLOYD MINE:

Only minor changes and the regular maintenance on hoisting and haulage equipment and compressors were made in 1949.

Several changes were made in the pumping equipment. A 7½ H.P. pump and motor formerly used at the Princeton Mine were taken to the 9th level and set up about 200 ft. from the 30 KVA transformer station. Two hundred feet of #6 3-conductor cable and a 3 pole switch from Princeton were also sent with this pump. The C. C. I. Object Number of the pump is E-1-138-196.

A K-20 oil circuit breaker was also taken from the Maas rock tram for low voltage protection of the 7th level pumps.

The 8th level 25 H.P. blower motor armature failed and was rewound in October. The 4th level blower motor was also rebuilt including field coils and armature.

MAAS MINE:

The Maas Mine started operations on August 22, after a shutdown of one week while the new setup of D.C. controlled skip hoist equipment was connected and tested. This equipment consists of a motor generator set with a 1000 H.P. synchronous motor and 665 KW D.C. generator, 830 H.P. D.C. hoist motor and the necessary A.C. motor drive with the smaller D.C. generators for control and excitation. The above machinery plus oil circulating pumps and motors are war surplus equipment. The new controllers and contactor panels were built by the Cutler-Hammer Company.

The D.C. exciter generators for the Rand compressors failed and were repaired during the year. The 438 H.P. synchronous motors for these compressors were also repaired and repainted.

The armature of No. 1 - 100 KW haulage generator failed and was sent to Westinghouse for rewind February 6 and returned March 20. Failure of brush-holder insulation and cables from the generator to the switchboard also occurred at the time. This cable was replaced and the generator reconditioned. The re-wound armature is stored at the mine as a spare. Additional copper for the negative haulage cable was extended to the 6th level. The old 3-conductor pump cable recently disconnected from the 2300 volt lines is now used as a positive 250 volt conductor from the engine house to the 3rd level.

The stator winding of the synchronous motor for No. 2 haulage M-G set was repaired in the shops during the month of July.

Installation of a new 5000 volt 3-conductor 4/0 A.C. power cable in the shaft from the 3rd to the 5th level was completed and connected in April. This completes the #2 shaft cable from the engine house to the 5th level. Subway boxes and connections are also provided for the parallel operation of #1 and #2 cables and connections for pumps and winze equipment.

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MATHER MINE "A" SHAFT:

Installation of the new D.C. armature for the skip hoist generator was made during the year. This new equipment was bought after the flash-over difficulties in the generator due to oil and carbon collection in the risers. The faulty armature was brought to the General Shops for repairs.

The 2500 H.P. A.C. drive motor for the skip hoist M-G set, the other 1250 KW D.C. skip hoist generator and exciter were also completely repaired during the same period.

The liquid rheostat control of the 2500 H.P. skip hoist M-G set motor has been set to run the load up from 400 amperes to 560 amperes. The rope speed has also been set up from 2250 feet per minute to approximately 2400 feet per minute.

Single pole oil circuit breakers brought from Negaunee Mine are now being used as feeder switches for the top tram trolley lines to replace 3 pole, 100 ampere switches which failed and burned the cable ends.

The 85 H.P. G. E. 2300 volt induction motor formerly used to run the crusher at the Gwinn Crusher Plant was taken to the Mather Mine "A" Shaft and installed at their mill to run the large saw. A starting compensator from Negaunee Mine was also set up with this equipment.

Installation of subway boxes and cables for electrical connections for shovel operations are completed.

MATHER MINE "B" SHAFT:

The sinking equipment in the temporary engine house, including the hoist with its two 400 H.P. A.C. motors and controls, and the 325 H.P. Nordberg compressor, has worked very well with little delay in operations during the year.

The installation of the main 2300 volt feeder cables from the substation to the new engine house has been completed. The feeder panels and circuit breakers for the power distribution to the hoists, compressors, generators and underground power feeders were delivered to the engine house and set up during the year. Control panels for No. 1 and No. 2 Rand compressors were also set up and the wiring and conduit work of the No. 1 compressor completed.

The generators and motors for the cage and skip hoists with all the necessary control equipment were also delivered and the installation commenced the latter part of the year.

The two main 2300 volt 350,000 C.M. power cables and subway boxes were extended in the shaft to near 2000 ft. from the timber tunnel and are being connected and used for 440 volt power distribution for shaft pumps and loaders.

NEGAUNEE MINE:

Failure of the signal cable in the shaft between the 10th and 11th levels occurred in 1949, and a new 10-conductor steel armored cable was installed.

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NEGAUNEE MINE: (Continued)

The Ingersoll-Rand compressor motor failed several times and coils in the new winding were repaired. One coil could not be repaired so we now have one coil cut out of the stator winding.

The trolley and feeder cables for the haulage system were all taken out of the mine. The trolley wire was taken to Maas and Cambria-Jackson Mines and the feeder cable is used to build up the positive feeder capacity on the main haulage level at the Cambria-Jackson Mine.

The 350 H.P. wound rotor motor of the old motor-generator hoist set failed and coils have been ordered for a complete rewind of the stator.

SPIES MINE:

Some changes were made on the skip hoist equipment since hoisting operations increased from the 6th level. Larger rotor cables from the motor to control panels are now in use and a larger control transformer from Negaunee Mine is also being used.

One of the 800 ampere circuit breakers from the 150 KW haulage set at Negaunee Mine was sent to the Spies Mine and installed on the No. 2 haulage panel after the failure of the 600 ampere Westinghouse breaker formerly used at the Princeton Mine.

The installation of a 2-way subway box on the 6th level and a new section of 5000 volt 3-conductor 2/0 cable from 6th to 8th level was completed. This is Anhydrex, steel wire armored shaft cable and replaces varnished cambric and lead covered cable which failed due to moisture after a break in the lead sheath.

GENERAL:

Several tests were made on the Fenwal temperature relays for all compressors during the year. The breakers opened at the following temperatures on the latest tests:

| | | | | |
|-----------------------|---|--------------------------------|---|-------|
| Spies Mine | - | Ingersoll-Rand Compressor | - | 300°F |
| Athens Mine | - | Ingersoll-Rand Compressor | - | 338°F |
| Athens Mine | - | Nordberg Compressor | - | 330°F |
| Cambria-Jackson Mine | - | Ingersoll-Rand Compressor | - | 300°F |
| Cambria-Jackson Mine | - | Laidlaw-Dunn-Gordon Compressor | - | 310°F |
| Cliffs Shaft Mine | - | Ingersoll-Rand Compressor #1 | - | 320°F |
| Cliffs Shaft Mine | - | Ingersoll-Rand Compressor #2 | - | 338°F |
| Cliffs Shaft Mine | - | Ingersoll-Rand Compressor #3 | - | 322°F |
| Lloyd Mine | - | Ingersoll-Rand Compressor | - | 310°F |
| Lloyd Mine | - | Sullivan Compressor | - | 308°F |
| Negaunee Mine | - | Ingersoll-Rand Compressor | - | 360°F |
| Negaunee Mine | - | Nordberg Compressor | - | 338°F |
| Maas Mine | - | Ingersoll-Rand Compressor #1 | - | 328°F |
| Maas Mine | - | Ingersoll-Rand Compressor #2 | - | 310°F |
| Mather Mine "A" Shaft | - | Ingersoll-Rand Compressor #1, | - | 300°F |
| | | #2, #3 and #4 | | |
| Mather Mine "B" Shaft | - | Ingersoll-Rand Compressor #1 | - | 300°F |
| Mather Mine "B" Shaft | - | Nordberg Compressor #2 | - | 360°F |