

ELECTRICAL DEPARTMENT
ANNUAL REPORT
YEAR 1945

ATHENS MINE

The amplidyne control for the skip hoist has worked out very well since the changes in the master control resistors were made to equalize the steps between the segments, which avoids flashing and consequent burning. The liquid rheostat for the skip hoist M.G. set has been completely rebuilt during the year including new tile, gaskets, insulators, contact plates and a complete set of copper cooling coils.

No serious delays in hoisting operations have occurred since the skip hoist M.G. set generator risers were repaired and a new band placed over the riser connections to stop the destructive vibration which was continuously loosening the connections to the commutator.

After approximately seven years of service on the timber tunnel storage battery locomotive, the old battery was replaced with a new Exide battery in the month of October.

CAMBRIA-JACKSON MINE

Many improvements have taken place during the year, including the installation of a new 2300 volt, 3 conductor, #2/0 shaft cable which will be parallel with the old 2300 volt shaft cable which ran from the engine house to the 7th level. The installation is so arranged with subway boxes and disconnecting switches that either the new or old cable or any section between levels may be cut out in case of a fault in the system. The panels, motor and other electrical equipment purchased with the Prescott pump from the Holmes Mine have been reconditioned and made ready for installation as soon as the 7th level pump station is prepared for the installation. Repairs have also been made in the 4th level pump station including rearrangement of switches and cables and repairs to motor windings and bearings. Overhead "I" beams have been installed in this pump station for lifting the motor out of place to a convenient location for cleaning and repairing.

Changes have also been made in the ventilating system. One change was from A.C. to D.C. power on the 20 H.P. motor driven 7th level blower. When the blower was moved from near the shaft to about 1400 ft. into the 7th level the A.C. motor was replaced with a D.C. motor formerly used as a generator by the Republic Steel Company. A new Aerodyne type blower was taken from the Mather Mine and installed on the 6th level at the Cambria-Jackson and equipped with a 40 H.P. D.C. motor and automatic starter formerly stored in the Lake Mine engine house.

When the Cambria-Jackson Mine was taken over it was decided to rebuild all the Goodman locomotives at our General Shops and lower them to the 7th level. This job was completed during the year and the four Goodman locomotives are now on the 7th level.

The extension of the east end of the engine house to make room for the compressor purchased from the Holmes Mine required relocating the main 2300 volt service and the removal of several poles. The old entrance cable was replaced by 175 ft. of #4/0, 3 conductor, 350,000 C.M. cable and the main busses were extended to accommodate the switchboard installation for the compressor and relocating of the 150 K.W. haulage M.G. set.

Several costly interruptions have occurred in the hoisting operations at the Cambria-Jackson during 1945 due to failures in the 500 H.P. motor. The first difficulty arose on April 14th when a loose spacing iron between the laminations on the rotor tore the insulation from the rotor and stator coils. The 400 H.P. motor

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CAMBRIA-JACKSON MINE (Cont'd.)

recently used as a spare for the Maas cage hoist was taken to the Cambria-Jackson as a replacement while the 500 H.P. motor was sent to the Westinghouse shops for a repair job which continued until May 6th when the change to the regular equipment was completed.

Satisfactory performance was obtained until June 1st when the rotor insulation again failed and the change to the spare 400 H.P. motor was made until June 10th when the regular motor repair job was completed and the hoisting equipment restored to normal.

On July 7th a failure again occurred. The change to the spare motor was again made and the entire Westinghouse motor was shipped to the Westinghouse Milwaukee shops for another repair job which continued until August 5th. Normal operations have continued since that date and the spare motor is now stored in the Lake Mine storage house.

CLIFFS-SHAFT MINE

Some of the delays in hoisting which occurred at "A" and "B" shafts were caused by a time lag in the interlocking relays on the control panels which caused burning of contacts and arc shields. These relays have been replaced with equipment built in our shops and directly connected without coils and dashpots. The change has been completed for both hoist panels.

Some breaks in the rotor circuit of the 750 H.P. "B" shaft hoist motor occurred on July 21st which tied up the hoisting from 8 a.m. to 2 p.m. while repairs were made. A similar failure occurred again on the same rotor on October 21st requiring a repair job of 3 hours. On November 4th a more extensive repair was made when some new splices were made and replacement of conductors and clamps was made to strengthen the rotor winding and clean up some temporary repairs made during previous periods. This hoist motor difficulty will probably occur periodically on account of heavy surging and abrupt starts and stops. Any improvement in the general design of clamps and conductors would require a prolonged repair period.

Several changes have been made in the bell signal systems of "A" and "B" shafts on account of complications arising from the two systems being tied together. The job of separating these signal systems completely, with each having its 3 K.V.A., 2300/110 volt transformer, secondary fused switches and ground detectors has been finished. Each shaft station in the mine has been equipped with 3 pole fused switches for disconnecting and testing in case of faults in bell coils, pull switches, cables, etc. The cables connecting the bells and pull boxes to the switches and junction boxes have also been changed from lead covered and armored type to tirex rubber insulated cables.

Installation of the synchronous converter purchased from the Holmes Mine was completed in July. Circuit breakers and feeders were also installed for parallel operation of the converter and the existing 100 K.W. generator for mine haulage and D.C. power. The 150 H.P. synchronous motor for the 100 K.W. M.G. set has been completely rewound and the coils in the rotor repaired.

The 25 cell Gould battery recently purchased was put into service in July on one of the battery locomotives on the 11th level of "A" shaft.

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LLOYD MINE

Several interruptions occurred in the No. 1 compressor operation due to flashes in the exciter armature. This armature failed in February and the spare haulage converter was used for field excitation while the armature was taken to the shops for a repair job of several days.

Loose field coils were discovered on the Westinghouse synchronous motor of the 150 K.W. haulage M.G. set while commutator repairs were being made. In order to shim and repair these coils it was necessary to remove bearings and slip rings. The entire motor was therefore sent to the shops in September. Repairs were completed and the equipment put back in operation without delay to mining or hauling while the converter carried the load with little difficulty.

Some delays in hoisting operations occurred at the Lloyd Mine due to open circuits near the connections of the stator coils of the skip hoist motor. After several of these failures, it was decided that it must be due to vibration caused by weak and loose coils. The job of repairing and tying the coils was done on off periods and completed in October.

The controls and panels from the Maas 5th level winze have been taken out of the mine and sent to the General Shops for repairs and will be used for the 7th level hoist at the Lloyd Mine.

MAAS MINE

The failure of the rotor of the 700 H.P. skip hoist motor caused a shutdown of two shifts in January. The faulty rotor was replaced with a spare bought in 1936. A new flexible coupling was bought after the recent break in the shaft of this rotor and it was put on during the shutdown. After communicating with the Westinghouse engineers regarding the rotor which failed, it was decided to ship it to their shops for a new glass tape insulated winding. The job was completed in June. The rotor was fitted with a new half flexible coupling to match the present coupling and placed on the engine room floor for a spare.

The 400 H.P. cage hoist motor was removed in February on account of a loose coupling. The spare motor was brought in from the Lake Storage house and the regular motor sent to the shops for repairs to the shaft and keyway. The job was completed and the regular motor returned during February.

Haulage and signal cables have been extended to the 6th level and the trolley, rail bonding and other electrical equipment installed as far as the level has developed. Two LM-2T6 locomotives have also been lowered to the 6th level, one from the 4th level and one from the 5th level.

The 350 H.P. slip ring motor brought from the Gwinn district and overhauled in the shops has been taken to the 3rd level at the Maas Mine for the plunger pump installation. Panels, grids and controls from the old 3rd level Alberger pump have been temporarily connected to the 400 H.P. Allis Chalmers centrifugal pump motor while its controls are being removed for installation with the equipment in the new pump house.

An auto transformer for the starting equipment of No. 1 compressor failed and burned its coils and connecting leads. This caused considerable loss of air pressure due to the shutdown of the compressor for about two shifts during July.

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MAAS MINE (Cont'd.)

A spare compensator for the starting equipment of the Holmes Mine compressor purchased for the Cambria-Jackson Mine was put into service on this job and will be used until the regular equipment is repaired.

MATHER MINE

The main 2300 volt, 350,000 C.M. power cables have been extended to the 1900 ft. level with a temporary cable connection at this point connecting the north and south cables together, forming a loop with both cables energized from the engine house. An extension of 350,000 C.M., 3 conductor cable has also been made from the subway box on shaft set No. 269 near the 1900 ft. level to a subway box on the 2050 ft. level. This connection will supply 2300 volt power for the new Ignitron converter and 2300/440 volt substations for mining operations on sublevels.

The 200 K.W. Westinghouse Ignitron was lowered to the 5th level during December. The parts are being assembled for installation and test. This unit will convert 2300 volt, 3 phase power to 250 D.C. power for trolley locomotives and other D.C. equipment if required.

NEGAUNEE MINE

The No. 2 shaft blower plant with the heating system was started on Jan. 6th after a shutdown of several weeks due to a burnout of the 125 H.P. motor. The old plant had taken care of the ventilation since the motor failure, but on account of ice in the shaft it was necessary to start the newer plant with the heating system. In order to get this plant in operation at once, the Mather Mine 100 H.P. crusher motor was taken to the Negaunee Mine and installed in this plant to keep it operating until the 125 H.P. motor was repaired. The 125 H.P. motor stator was equipped with a complete rewind and returned to the plant in May. Fenwal thermo relays were ordered and installed in both bearings of the motor as insurance against the reoccurrence of this coil and bearing difficulty.

Hoisting operations have not been seriously interrupted during the year at the Negaunee Mine. An open coil caused considerable burning at the commutator of the skip hoist motor for several days in April. The burning was intermittent however, and did not cause any delay in ore hoisting. Repairs were completed on April 29th.

The 220 H.P. synchronous motor for No. 1 haulage M.G. set was stopped on account of excessive vibration on September 21st. A test of the rotor winding revealed failures of insulation between turns in the entire set of field coils. The coils were taken to the shops for further test and repair, but they were so badly shorted that it was decided to order a complete set from Westinghouse. New coils were received about December 10th and the job of replacement commenced at once. Plenty of difficulty arose from the unbalanced condition of the rotor due to the difference in the weight of the new coils which made it necessary to balance the rotor. The job was completed December 28th. This machine was running parallel with a 250 K.W. generator when the difficulty occurred. The entire mine haulage and scraper load was carried by one generator during this period from September 21st to December 28th.

The new 3 ton Whitcomb storage battery locomotive recently purchased for the Negaunee Mine arrived on October 2nd and is now used on several levels

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NEGAUNEE MINE (Cont'd.)

for repair work and ore hauling.

Electric shovel operations were carried on without electrical difficulties after the new 1000 feet of #4, 3 conductor tirex rubber cable was taken from the Mather Mine and connected for this shovel job on March 28th.

PRINCETON MINE

The rotor insulation failed on the 200 H.P. Princeton skip hoist motor on August 13th. The motor was taken out for repairs and replaced with a motor from the shaft sinking hoist at the Mather Mine. On account of its higher speed, this motor was used with much difficulty until August 24th when it was taken out and the Maas 5th level winze hoist motor was sent to the Princeton Mine and fitted to this hoist job. The Maas motor will remain on the Princeton job until the regular motor has been rewound with a complete set of rotor coils ordered from the General Electric Company.

Some difficulties have been encountered in equalizing the haulage load of the synchronous converter and the D.C. generator. No serious delays have occurred however. Several changes in the connections have been made in an attempt to improve the operation including a voltage adjustment to 280 volts D.C. on the converter and a change in the series field excitation of the generator.

The 6 ton trolley locomotive bought from the Holmes Mine and rebuilt in our shops has been added to the Princeton Mine haulage equipment and is now on the 7th level. All locomotives in the Princeton Mine are now on the bottom level.

SPIES-VIRGIL MINE

Installation of the 250 H.P. slip ring motor and electrical equipment for the 600 gallon Aldrich plunger pump on the 6th level was completed in October. The motor and pump from the 3rd level have been repaired in the General Shops. This motor is 50 H.P. and had been running with the rotor circuit resistance in bad shape. While in the shops, the motor was repaired and equipped with bearings, internal resistors and proper brushes and hand lever for manual operation of starting device.

Two sections of the new #2/0 3 conductor, 2300 volt shaft cable have been completed in the shaft, one from the 3rd to the 6th level and one from the 6th to the 8th level. This installation also includes the necessary subway boxes and switch connections to parallel each section with the old power cable. The necessary cable is also on the job for a complete installation from the 3rd level to the engine house.

TILDEN MINE

A ballbearing failure occurred during August which tied up the 120-B shovel at the Tilden Mine. Considerable time was required to locate and procure a bearing for the job and complete the repairs. The commutator for the large generator was repaired before the shovel was put back in service.

The winding of a 20 H.P. slip ring motor was destroyed when a rock wedged between the rotor and stator of one of the churn drill motors. The stator was sent to the General Electric shops in Milwaukee while the rotor was repaired in our shops.

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TILDEN MINE (Cont'd.)

One of the old 15 H.P. churn drill motors was installed as a temporary replacement.

GENERAL

During the year the following compressors have been equipped with new thermostatic relays for automatically stopping the compressor in case of dangerously high discharge air temperature:

Athens Mine	-	Ingersoll-Rand	-	358°F
Athens Mine	-	Nordberg	-	300°F
Cambria-Jackson Mine	-	#1 compressor	-	300°F
Cliffs-Shaft Mine	-	#1, #2, #3	-	300°F
Lloyd Mine	-	#1 compressor	-	300°F
Maas Mine	-	#1 and #2	-	300°F
Mather Mine	-	#1 and #2	-	300°F
Negaunee Mine	-	Ingersoll-Rand	-	330°F
Negaunee Mine	-	Nordberg	-	300°F
Princeton Mine	-	Nordberg	-	280°F
Spies-Virgil Mine	-	Ingersoll-Rand	-	300°F

Arthur Olson