

ELECTRICAL DEPARTMENT
ANNUAL REPORT
YEAR 1948

ATHENS MINE:

Several repairs were made to the compressor equipment during the year, including a rebuilt starting compensator for the 325 H.P. Westinghouse synchronous motor on the Nordberg compressor. Repairs were also made to the exciter of the Rand compressor including bearings and a complete rewind of armature and a new commutator.

The Fenwal thermostiches for automatically stopping overheated compressors were tested periodically at 324°F for the Nordberg and 318°F for the Rand compressor.

Cleaning and repainting of the skip hoist motor and generator windings has occurred more often since the generator fire in May of 1948. This fire started while the M.G. set was up to speed so the burning particles spread rapidly until the machine could be stopped. After a shutdown of several hours and careful examination, it was learned that no insulating material was destroyed. The fire was apparently started by a spark from the commutator.

A complete change of lubricating oil for the circulating system of the skip hoist M.G. set was made in December of 1948. This is the first complete change of oil in the tank container since January 11, 1945, when Renown engine oil was used.

The gear driven oil pump connected to main shaft of this M.G. set has also been rebuilt after a failure of gears and bearings last October.

Repairs were also made to the torque motor for the liquid rheostat and the liquid rheostat tank, water-coils, bushings and plates were also repaired during the summer vacation period.

Routine repairs and minor changes were made to the haulage equipment.

The Jeffry locomotive taken from the Princeton Mine to the General Shops for repairs was sent to the Athens Mine to be used underground. This locomotive is C.C.I. object No. C-1-110-062.

The 400 H.P. Westinghouse slip ring motor of the No. 2 Prescott pump was repaired during the month of March after the failure of several rotor coils.

CAMBRIA-JACKSON MINE:

The stator winding difficulties of the 500 H.P. Westinghouse hoist motor continued to get worse during the first several months of the year until a complete set of coils were ordered for a stator rewind. The entire motor was finally shipped to the Milwaukee shops of the Westinghouse Co. on June 27 where it was rebuilt and returned to the mine for installation in July. During the repair period, a 400 H.P. G.E. motor borrowed from Inland Steel Co. Bristol Mine at Crystal Falls was used.

The work on electrical equipment of the compressors was mostly routine during the year. Fenwal thermo relays are used on the two larger machines and are tested periodically and kept at about 315°F.

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CAMBRIA--JACKSON: (Continued)

Several changes were made in the D.C. haulage set up. The load requires two 150 H.P. generators in parallel, which was arranged with considerable difficulty on account of the different characteristics of the General Electric and Crocker Wheeler machines. Some changes have been made in the panel and cable layout and two 800 amp. D.C. circuit breakers were purchased and installed during the year. One failure in the winding of the Crocker Wheeler generator occurred and was repaired in October.

The 250 H.P. starting compensator for the induction motor of the G.E. haulage M.G. set burned out in March, 1948. This was part of the equipment used by the Republic Steel Co. in the old engine house. The necessary material to keep the generator going was brought from the Princeton Mine and used until the faulty equipment was rebuilt.

The regular maintenance and repair work was carried on with the pumping equipment.

On the top tram, considerable difficulty has been encountered with Larry cars and controls, largely with old contactors getting out of adjustment, bearing failures, burned armatures and field coils. Two new cam type controllers were recently installed and grid resistors changed in the control house.

CLIFFS SHAFT MINE:

The band wire and stator coil difficulties in the 750 H.P. "A" shaft hoist motor continued to be the cause of costly delays during the first six months of the year.

A complete rewind job of the rotor and stator of this motor was commenced August 8, and completed August 15. The coils and insulating material was fabricated by Westinghouse and two of their men sent to take charge of the work with a crew from our General Shops to keep the work going 24 hours per day.

A double band wire was placed on the slip ring end of the rotor at 400 pounds pressure, and a single band on the coupling end.

Band wires and rotor connections of the "B" shaft hoist motor are inspected periodically.

The exciter armature of #1 Ingersoll-Rand compressor has been repaired.

The rotor coils and connections for the 438 H.P. synchronous motor of No. 1 compressor have also been repaired.

These compressors have also had temperature control tests several times during the year. The results of the last tests were #1 Rand compressor - 292°F, #2 - 317°F, and #3 - 302°F.

The haulage system has had the usual maintenance and minor repairs. The old Westinghouse synchronous motor of No. 1 haulage set became troublesome when its stator lamination slipped around in the outer casting. This was corrected by 3/8" plate curved to conform to the sides of the lamination and casting, and held in place with cap screws.

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CLIFFS SHAFT: (Continued)

Four G.E. Tungar battery chargers were bought during the year and taken underground for charging locomotive batteries.

Installation of cables, switches, sub-way boxes and a 150 KVA 3 phase transformer for 440 volt power distribution in the section 10 area has been completed. The 2300 volt 3 phase cable extension was made from 6th level "A" shaft, a distance of about 2000 feet.

Routine repairs were made to pumping equipment. A new section of 2300 volt 3 conductor 2/0 cable was put in from the disconnecting switches on the pole near "A" shaft to the oil circuit breaker to replace one which failed.

Installation of motors and controls for individual drives of grinders, rollers and crusher equipment at crusher room of the central laboratory was completed. The crusher room has also been rewired and fluorescent fixtures installed.

LLOYD MINE:

Some repairs and changes have been made on the primary contactors of the skip and cage hoist controls. Difficulty has been experienced in getting parts for these panels as well as the one at the underground hoist on account of their old model and parts being obsolete.

Compressor equipment has been in service with usual electrical maintenance. Temperature relay tests were made periodically, the tripping occurs at 290°F for the Sullivan and 346°F for the Ingersoll-Rand.

The D.C. and A.C. power cable and switch installations to the 9th level have been completed. A 30 H.P. Westinghouse motor from Cliffs Shaft formerly from Gwinn district was taken to the shops for repairs and used on a centrifugal pump at the 9th level. This motor was changed from 440 volts 3 phase to 220 volts 3 phase 3545 R.P.M. It is serial No. 6-966039 and operates with a magnetic switch. Three 10 KVA 2300/220 volt transformers were also taken to the 9th level for 220 volt A.C. power supply. One of these 10 KVA transformers failed October 22, and was scrapped. A new one was bought from stock for replacement.

The 25 H.P. Buffalo blower formerly used at the Princeton Mine was taken to the Lloyd Mine in November with a 25 H.P. SK Westinghouse motor from Negaunee Mine to be used for ventilating the 9th level.

The new 54B shovel used at the Negaunee Mine most of the loading season was moved to the Lloyd Mine in September. The oil circuit breaker, disconnecting switches and 1000 ft. of #4 - 3 conductor cable were also taken from Negaunee Mine.

MAAS MINE:

Some changes in the liquid rheostat and controls for the skip hoist were made during the year.

Control equipment for the new Ward Leonard controls has been purchased and delivered at the mine.

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MAAS MINE: (Continued)

The 1500 H.P. D.C. generator, 1500 H.P. D.C. hoist motor and the 1000 H.P. synchronous motor for the D.C. control of the skip hoist have been rebuilt in the General Shops and shipped to the mine for installation.

The stator of the 438 H.P. G.E. synchronous motor for #2 Ingersoll-Rand compressor was completely rewound in July. After the compressor fire in July, the Fenwal thermo relays have been tested periodically with No. 1 setting at 336°F and No. 2 setting at 324°F.

Failure of the stator winding of the 215 H.P. synchronous motor for #1 haulage set in February resulted in one coil being cut out of the winding.

The D.C. haulage panels and busses were changed for the installation of a new 2000 ampere circuit breaker.

Cable changes for using the old G.E. 2300 volt 3 conductor 2/0 pump cable as a D.C. single conductor feeder to improve the voltage for the 5th and 6th level haulage have been completed from the engine house to the 3rd level. This cable will carry the positive side of the load while the old German pump cable will carry the negative side of the haulage load.

Cables are on order for the 4/0 feeders from the 3rd level to the 6th level.

The upper section of the new 5000 volt, 3 conductor, 4/0 steel armored shaft cable was installed in February. This includes the section in the shaft from surface to 3rd level pump station and on surface from the shaft to the engine house.

The 250 H.P. Westinghouse motor and line starter recently moved from the Cliffs Shaft Mine to the Maas Mine 5th level with the Worthington centrifugal pump, was sent to the Holman Cliffs Mine in April after installation of the new Worthington piston pump on the 5th level. This equipment was returned to the Maas Mine in December and will be installed with the centrifugal pump on the 5th level.

The permanent layout of shovel cable connections have been completed, with ground protection equipment, switches and connections for east and west trestles, to replace temporary set up formerly used.

Westinghouse hoist generator serial No. 152N4711, Style 2-N-4711, 54 KW, 250 volts, Type SK, Frame 153, was taken from Maas 54B shovel in November to be used at the Atkins Mine at Kinney, Minnesota, while repairs are made to their generator, estimated four months.

Some work has been done on equipment for hoist to be installed on the 5th level for sinking the winze from the 6th to 7th level. The 200 H.P. motor object No. C-2-117-333 formerly used with Maas underground hoist and Princeton skip hoist, was taken to the General Shops with controller, grids, panels and circuit breaker from the hoist at #2 Princeton engine house to be reconditioned for the job.

Several changes have also been made on the top tram including removal of controllers and grids for the 50 H.P. A.C. motors formerly used with endless rope tram. The control equipment for the Larry cars was relocated after removal of the old equipment.

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MATHER A MINE:

There has been no change in the rope speed settings and the general regulations of the skip and cage hoists during the year. The new solenoid controlled, hydraulically operated emergency brake for the cage hoist has been installed and is now operating satisfactorily.

The commutators of the skip hoist generators have been turned true, and a set of G.E. brushes are being tried on one generator while National Carbon brushes are being used on the other.

The two operating compressors have been provided with thermo relays with a setting of 300°F.

Installation of the 500 H.P. G.E. synchronous motors, line starters and separate exciter M.G. sets with other electrical equipment for the operation of the two new Ingersoll-Rand compressors is about completed.

Changes in the engine house crane requiring the relocating of the cab, and moving and rewiring the controls has also been completed.

Installation of the control equipment for the new boiler plant and the heating and blower set up for the shaft, including the 50 H.P. blower has been completed.

Three 7½ KVA 2300/440/220 volt transformers for saw mill power and one 3 KVA 2300/110 volt transformer for lighting has been set up at the mill. A 2300 volt magnetic starter from Princeton Mine has been set up for starting the 40 H.P. saw motor. The cut off saw has a 10 H.P. 440 volt induction motor with magnetic starter. A blower has also been installed with a 5 H.P. 440 volt induction motor and a magnetic starter. Two 10 KVA 2300/440 volt transformers were set up near the mill to supply power for the Layne North-west pump near the stocking grounds.

Two of the Larry cars were rewired during the year, four spare motors bought from Westinghouse have arrived and are presently at the Lake Shore shops to be adapted to the Larry car job. A new electrically controlled oil burning heater has also been set up in the car repair house on the rock trestle.

Installation of the three new Worthington pumps on the 6th level has been completed. The electrical equipment for each pump consists of a G.E. slip cycle line starter, a G.E. 350 H.P. synchronous motor and a suction pump driven by a G.E. 15 H.P. 440 volt induction motor.

Transformers for the supply of 440 volt 3 phase power and 110 volts for lighting have also been set up in the pump station. Three 25 KVA 2300/440/220 volt are used for power distribution and one 7½ KVA 110 volt for lighting.

The two 5000 volt 350,000 C.M. 3 conductor A.C. power cables in the shaft have been extended to the 6th level where each cable terminates in a 4 way subway box. These subway boxes are on the plat near the shaft and are connected together with a 3 conductor 5000 volt 350,000 C.M. cable.

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MATHER A MINE: (Continued)

From this location a 1/0 5000 volt 3 conductor cable is used to connect to the 6 way subway box located in the pump station. Presently the connecting links in one of the 4 way boxes are open so that one shaft cable carries the pump load while the other carries the mine scraper and haulage load.

Routine maintenance of haulage equipment, and moving substations and cables for scraper power distribution has been carried on.

Two new 150 KVA 3 phase 2300/440 volt transformer stations were installed on the 5th level and two of the same size on the 6th level with the usual 3 KVA 2300/110 volt transformer for lighting with each sub location.

In conjunction with the moving of substations and scraper machines, approximately 5000 ft. of #2 - 3 conductor steel tape armored cable and about 5000 ft. of #1/0 600 volt 3 conductor steel tape cable has been used during the year.

The sinking hoist used underground on the 7th level of the Lloyd Mine was taken to the Mather A Mine and set up underground for sinking operations. A 37 H.P. slip ring motor was installed with this hoist since the motor for this equipment was being used on the ventilating pipe hoist at Mather B Mine. After the failure of the 37 H.P. motor in September, the original 35 H.P. G.E. motor for the Lloyd Mine hoist was taken from Mather B and installed at Mather A. The 37 H.P. motor was sent to the G.E. shops for a rewind and will be sent to Mather A as a spare for their underground hoist.

MATHER B MINE:

After the use of a temporary control set up using a liquid rheostat for control of the second 400 H.P. A.C. motor of the main hoist for shaft sinking, the new bank of grid resistors from G.E. Co. finally arrived and a more permanent control was installed, which was completed March 1. The switches, controller, primary and secondary contactors from the sinking hoist at Mather A was used to complete this control set up.

Two sections of the main A.C. power cables have been installed from surface to a depth of 1000 ft. These are 5000 volt 3 conductor 350,000 C.M. cables and are a part of the permanent mine installation.

Motor No. C-5-117-369 from the Lake storage is now being used on the ventilating pipe hoist to replace 35 H.P. motor which was taken to Mather A Mine.

NEGAUNEE MINE:

No appreciable change has been made in the hoisting, pumping or tram equipment at this mine during the year.

Rewinding of the 438 H.P. synchronous motor of the Ingersoll-Rand compressor was completed in March. There have been several failures in the new stator winding due to breaks in the copper. One faulty coil is cut out of the winding while the others have been repaired.

Some minor repairs have been made to pump cables and signal cables in the shaft.

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SPIES MINE:

Routine repairs have been made to the contactor panels and controls of the skip and cage hoists.

The 4/0 haulage cable installation from the engine house to the shaft was completed in September and a new cable was installed to replace the one which failed in the floor of the engine room.

The 40 H.P. 850 R.P.M. 220 volt motor for the 4th level plunger pump is in bad condition. An old motor from the turbo generator injection pump at the Maas plant was reconditioned at the shops and sent to the Spies Mine as a spare for this pump job.

Three 50 KVA 2400/240/480 volt transformers on order for 440 volt power for the blower and pumps at the air shaft arrived and were installed in August. The three 50 KVA 2400/120/240 volt transformers of the temporary set up were sent to the General Storehouse and sold to the Cliffs Power & Light Company.

Arthur Olson