CONGO MINE DEVELOPMENT AND EQUIPMENT.

BY MR. RAY.

The Congo Mine is owned by the Congo Coal Mining Company, of which Mr. H. D. Turney is President, and Mr. J. S. Jones is Vice-President; and is located on the C. S. & H. Ry., about two miles west of Corning, Ohio. It includes 800 acres of coal land in sections 7, 8 and 17, Monroe Tp. The flourishing town of Congo has 600 inhabitants, and the best equipped machine mine in the State of Ohio. A part of this tract of land was owned at one time by the Akron Iron Co., and was to have been the site for the town of Buchtel and Akron furnace.

The development of the plant until its near completion was under the supervision of our late friend, Mr. Thomas Corcoran, who was as practical and competent as he was true, honest and brave. He was succeeded in May, 1893, by Mr. J. H. Ferguson, who is now our successful superintendent.

The first work was to thoroughly test for the coal by sinking drill holes judiciously located over the entire tract. The drilling was done with the ordinary churn drill and spring pole.

Our coal is the No. 6 or Great vein, and from the opening made, averaged 13.1 ft. in height, of which 2 2–10 ft. is refuse, slate and bone, leaving 10 9–10 ft. of clean coal.

Having proved the coal as to quality and quantity, our Company decided to make Congo a modern mine and equip it with efficient machinery. A shaft centrally located on the property, with Butt entries running east and west from it, was deemed by all concerned to be the most practical way of opening; working the mine by the double entry, pillar and room system, using the Jeffrey Electric Mining Machine to cut the coal, and making Congo strictly a machine mine. This has been conscientiously carried out, and not a pound of pick coal has ever been shipped from the Congo mine.

The policy of the Company has been to build permanent and substantial structures that would stand at least twenty-five years service. The buildings which contain expensive machinery, including the powder house, are built of brick, and are as nearly

fire proof as it was practical to make them. All other buildings are frame, and all of them are covered with slate roofs.

The Company provides houses for all of their employees at reasonable rents, and also runs a first class general store which merits the large trade it is having. We began to sink the main shaft and the air shaft September 29, 1891, and completed them in 20 days, timbering them with 12x12 timber solid. The main shaft has two cage ways 7x10 each in the clear and a man way 5x10, with 8 inch buntings separating the compartments. The air shaft is 7x14 with 8 inch bunting across the center, dividing the shaft into two equal sections 7x7 each, which are the upcasts for the east and west sides of the mine.

The coal in the Valley east and west from the main shaft through which the main entries are driven, has only 25 to 30 feet of uncertain cover and it was necessary to timber the entries solidly 400 feet across the Valley. This took 398 sets of timber. The cap pieces are 12x15x13 with 12x12 leg pieces.

TIPPLE.

We endeavored to make the tipple strong and convenient, to have it simple, and to use as little machinery in it as possible. The cage landing was made high enough so that the coal when dumped, has fall enough to be screened and distributed on its way down to the cars or bins. No elevators are used. The tipple is built upon a secure foundation. A stone pier 3x3 footing and $1\frac{1}{2}$x$1\frac{1}{2}$ bearing face is placed under each post and a solid wall is built out from the hoist engine foundation to support the feet of the batter posts. All timbers for posts and batter posts are 12x12. All braces for same are 6x8 with 4 inch run. The building portion of the tipple has 8x8 posts and 4x4 braces with 4 inch run. The siding is $\frac{7}{8}$ by 12 dressed pine and is battened with 3 feet O. G. battings. The timber used in the frame and roof sheathing is oak. The flooring of the main part of the tipple is 2 inch plank. The weigh office has a $\frac{7}{8}$ inch tongued and grooved floor, and is ceiled with $\frac{7}{8}$ inch beaded pine. All of the frame timber was boxed and sized to $11\frac{1}{2}$x$11\frac{1}{2}$. Tenants and mortises in the 12x12 timber are 3x$11\frac{1}{2}$x6, double bored with 3–16 draw for $1\frac{1}{4}$ oak pins. All 6x8 braces are single bored with same draw for same sized pin. The lattice braces are all cut to fit and were driven into place. They are drift bolted at the toes with $\frac{7}{8}$ iron drift bolts. The bracing to the batter posts of the tower is made by cross braces of 6x8 oak running diagonally across panels, the points being held by 1", iron tension rods, binding them together. The cage landing is 36' above the

top of the railroad tracks under the tipple. We use two chutes, one for each cage landing, and each chute is adjustable within the limits of 2 degrees with the horizontal by means of long turn-buckles. Each chute is 5' wide and has a set of Akron bar screens 5' x14.4' long. Each chute is provided with a weigh box for weighing miners' coal; the beams of the scales being placed one over the other in the weigh office and graduated alike on both sides so that weighing can be done on either side of the desk. There are also two 70' track scales arranged in a similar way, i. e. Beams one over the other so that weighing can be done on both scales from the same desk.

The cage landing being high our chutes are necessarily long and the possibility of damage to the coal after it passes over the screens is avoided by the use of a traveling gate in each chute called a monkey, which travels up and down the chute between the lower end of the lump coal screen and the weigh box and is counter-balanced by a weight which brings it back to place when it is down and dumped. These monkeys ease the coal down the chutes without injury. They are built upon the Upson idea modified and adapted to suit our work. We use shaker screens 6'x18' with double crimped $1\frac{1}{4}$" mesh steel wire cloth for the nut coal screen and $\frac{7}{8}$" mesh of same material for the pea coal screen. These screens are run by an 8"x12" engine attached by means of a connecting rod and counter shaft. The tipple is so arranged that we can load straight lump, nut, pea slack or any mixture of these sizes. We use the Ray & McConnel self-dumping cages, which have proved to be quite successful and satisfactory.

POWER HOUSE.

This is an L shaped brick building of two rooms, one for the dynamos and high speed engines, the other for the hoist engine, it is thoroughly built. The foundations are of heavy sand-stone laid in cement. The foundation walls are 2' thick with $2\frac{1}{2}$' footings. The top 12" course shows above the yard level and is left rock face. The brick work is laid up with good, hard-burned brick and lime mortar the face brick being carefully selected as to color. Equal care was taken with the inside and outside wall lines and the mortar joints were carefully struck. Pilasters with 4" projections and $2\frac{1}{2}$' wide were spaced on outside of wall for roof truss and purloin bearings. The 4" projection is carried around the building next to the cornice and gives the building strength and a pleasing appearance without additional expense. The roof was made self-supporting by means of two trusses and two purloins. The windows and doors

are cased and a base board is put on, the bare brick wall left unfinished inside. The rafters and trusses are all built of dressed lumber. The rafters are sheathed with $\frac{3}{8}$" ceiling put on top of rafters face down; on top of this we spaced 1"x3" rough sheathing lath as nailings for the slate. In this way we obtained a cheap roof and a finished ceiling, as well as a cornice, which was made in same manner. The dynamo room is 45'x48', the hoist engine is 32'x22'.

SHOPS.

This building is also brick and similar in construction to the dynamo house except the roof which we did not line with ceiling. In this building we have three rooms i. e. blacksmith shop 30'x40', carpenter shop 20'x30' and machine shop 32'x24'.

POWDER HOUSE.

The powder house is built of brick and similar in construction to the shop building already described. In each gable we placed a bull's eye double latticed ventilator made of galvanized iron, by which we get a free circulation of air without the danger of moisture from a beating rain or snow. We are prepared to unload powder direct from the car into the powder house.

THE BOILER HOUSE.

The boiler house is an oak frame building 73'x54', covered with corrugated iron. Stone piers are placed under each post. The posts and plates are all 10" by 10". The principal rafters are built trusses spanning the width of the building and placed directly over side posts. The spaces between the trusses are spanned by 3" by 5" oak upon which the corrugated iron is fastened. The top chords of these trusses are built of two 3" by 8" pieces and the bottom chords of 2" by 8" pieces, they are placed edge-wise and 2" apart, at panel points single vertical 2" by 8" pieces connect top and bottom chord, placed in the two inch space of each and taking the place of tension rods. The diagonal braces are of double 2" by 8" pieces. All are bolted together with $\frac{5}{8}$.' bolts. The truss heels are held in place by 2" by 12" planks set in between chord pieces and bolted together. The lower chords are held in line by 3" by 5" stays from chord to chord. On the comb of the roof we built a ventilator, 10' wide, with 4' by 6" posts. running lengthwise with the building; with lattice sides for escape of steam, and corrugated iron roof.

THE STABLE.

The stable is a strong oak building 40' by 74' with 20 single stalls and two box stalls. All sill timber is 12" by 12", all post ties and plates are 10" by 10". The purloins and posts supporting them are 8" by 8" and the cross ties 6" by 6", and all braces to same are 4" by 4" with 4' run. Lower joists 2" by 12". The stable floor is made of 2" plank. The upper floor is made of 1" oak lumber laid double. Height between floors 12' length of posts 20". The building is enclosed with $\frac{7}{8}$" by 12" pine siding put on up and down with O. G. battens. The rafters are 2" by 6". The sheathing strips are 1" by 3" spaced to suit 14" by 24" slate. We used 1" pins for all braces and and $1\frac{1}{4}$" pins for the heavy frame which was doubly bored. Lock splices were made for all plates, sills, ties and purloins where necessary. Half windows were used for light and ventilation. The hay-loft will hold 75 tons of hay.

SLOPE ENTRANCE.

This we built of cut sand-stone. The opening is 10' wide and 9' high. It is roofed with a circular arch with a 5' radius. The length of the arch is 20'. The wing walls conform in heighth with the slope of the hill and are 38' long, extending right and left from the sides of the opening at an angle of 60 degrees with the face line. The two bottom courses are 2', all others are 18" except the arch which is turned with eleven courses 2' deep. The key-stone projects 4" from the front. The capping stones projects a like amount and rest on the key-stone which is made long enough to permit them to do so. The front is plumb while the wing walls have a batter of $1\frac{1}{2}$' to the vertical foot. $135\frac{1}{4}$ yards of stone were used in the structure. The slope is 420' long from the face of the stone work down to the mine level. From the end of the stone work in, until we got a secure roof, we timbered with 12" by 12" caps and legs set close together. The slope is an air inlet, a traveling way for men and horses, as well as an entrace for all mine supplies.

WATER SUPPLY.

As a source of water supply we built a reservoir by throwing an earth dam across the valley about 900' north of the tipple. The dam is 40' wide on top and 240' long with a waste weir 50' wide by 3' deep at one end of it, this weir is lined on each side with 2" plank and on the bottom with 1" boards. The reservoir will hold about 5,000,000 gallons of water. We have a 40,000

gallon railroad tank into which we pump water from the reservoir, and from which we supply the boilers. We at first tried to supply the town with water from drilled wells, but this supply proved to be insufficient. We then built a 40,000 gallon cistern on a high hill overlooking the town, this cistern we divided into two compartments by a filter wall 16" thick laid up with 4" courses of red brick 8" apart, tied with 4" cross walls every 2", the intervening space filled with sand and gravel. Water is pumped direct from the reservoir through a 2" pipe over the top of the cistern and into one of its compartments from which it filters through to the other side. Water is distributed through the town from this cistern by gravity through 1½" pipes leading from the bottom of the cistern. Hydrants are placed at points convenient to each eight houses. We have 60' water pressure for any building in town and about 200' pressure for any of the mine buildings. This furnishes us first class fire protection. We estimate that our 6 boilers consume about 30,000 gallons daily and that each of the 600 persons in town uses on an average 20 gallons daily or a total of 12,000 gallons per day; that the loss in the reservoir due to evaporation and other causes amounts to ⅛ vertical inch for its entire surface per day or 10,000 gallons. If this be true our total consumption of water in time of drought on present basis would be about 52,000 gallons daily and our supply would last us about 90 days without rain.

TENEMENT HOUSES.

Our houses are of four styles, located on two ridges connected by a bridge and conveniently near to the store. The streets are 40' wide and on the top of the hills. The houses are placed on either side of the streets on 50' by 150' lots, care being taken to prevent the drainage from one house interfering with its neighbors. The Company built 15 two room houses, 42 three room houses, 27 four room single story houses, 10 four room two story houses, two five room two story houses and four six room two story houses or a total of 100 houses. These houses are all thoroughly well built. We used 9" by 9" oak set on end for foundations, skirting the foundations with 1" oak and painting them a brick red. The houses have the ordinary balloon frames, floor joists 2" by 8" hemlock, spaced 2' centers; ceiling joists 2" by 6"; studding 2" by 4", spaced 16" centers; rafters 2" by 6", spaced 2' centers; sheathing lath 1" by 3", spaced for 14" by 24" sea green slate; cornice projection 12" and made plain; sills 6" by 8", built of three 2" by 8" joists notched to form the mortises for the studding and joists. The siding is

all 6" plain patent drop siding, corner boards $\frac{7}{8}$" by 4"; outside window and door casing 4". Doors 2' – 8" by 6' – 8" by $1\frac{3}{8}$" thick with transoms, glass 8" by 28"; windows are 2 sash of two 12" by 28" lights each. Inside casing is 4" and beveled on one edge. The case board is 8" wide and beveled on top edge. All inside doors have transoms. Houses are all plastered and white coated. All wood-work both inside and out is thoroughly painted. Each room in all of the houses is provided with either a chimney flue or an 18" grate and a neat home-made mantle painted black. The Company furnished the material and contracted the labor in building them. These are a better class of houses than can be found in the average mining town. The idea in building them being that a good comfortable house would attract better men, and that they would appreciate and care for them. This has proved true in most cases.

BOARDING HOUSE.

The boarding house is a two-story and basement building to accommodate unmarried employees and such others as desire to board. It is similar in construction to the tenement houses and contains eleven bed rooms, an attic, dining room, kitchen, laundry and cellar. A wash house 16' by 28', for bathing purposes, is situated conveniently near the boarding house. A plain 8' porch was built along the entire front of the boarding house.

THE STORE BUILDING.

The store building is a frame 70' by 20' for temporary use with ware-house 30' by 40'. The offices are situated in the rear of the store. The Company have not yet decided upon plans for the new and permanent store building.

SYSTEM OF MINE WORKINGS.

The mine is divided by the valley into the east and west sides which are similar in every way, and which are connected by the main east and west entries; driven 40 foot centers; on each side north and south face entries are turned. All entries are driven 40' centers. All rooms are turned at right angles to the butts. 50' centers parallel pairs of butt entries are driven 800' apart. Length of rooms 400', width 28' to 30'. Width of pillar 20'. For every 20 rooms a 100' pillar is left parallel with the rooms. When the 20 rooms are driven their distance, the idea is to commence at the ends of the 20 pillars and draw them back

taking out the top coal at the same time. The heavy pillar will then break the roof and protect the workings beyond from any possible danger of a squeeze.

VENTILATION.

Each side of the mine has an independent air course and provisions are made to use a 10' Hayden fan for each side in the same fan house. At present we obtain sufficient air from the one fan we are using. It has a capacity of about 50,000 cubic feet of air per minute. This fan is driven by a Nelsonville forty horse-power engine, the bed plate of which was designed at Congo. The fan-house is 22' by 38' with abundance of room for two fans and engines. It is built with 8" by 8" sills and 4" by 4" studding sided diagonally with 1" oak; this siding is covered carefully with tarred felt roofing paper and again with tongued and groved patent siding. The roof is treated in the same way, extra care being taken to make the whole air tight.

MACHINERY.

We have two 70' Howe track scales and two Howe pocket scales. Two pair of Shaker screens, built at Congo; and two traveling gates or monkeys, also home made. One Nelsonville hoist engine, 2nd motion, double 14" by 24" cylinders, 3' drums, geared 3 to 1. Rope 1¼" steel, 19 wires to the strand. Two Ray and McConnell automatic self-dumping cages, weight of each 7,200 pounds.

ELECTRICAL MACHINERY.

Two ideal automatic engines, cylinders 13" by 14", 258 revolutions per minute, rated 100 horse-power. Two Westinghouse dynamos, 525 revolutions per minute, 250 volts pressure and rated 80 horse-power. Two Westinghouse Rheostadts. Two automatic Regulators. Two Westinghouse circuit breakers, and two potential indicators. Two Edison ammeters. One Westinghouse lightening arrester. Two double pole switches and two single pole switches. Our Buss wire is 0000. The main wires leading into the mine are four 0000 lead covered cables. The branch wires are 000 and the room wires are No. 3. Brown & Sharp guage. These wires are held in place by the Jeffrey insulators and pins. We use Okonite cable equal to No. 3 wire to make connections with the mining machines. In the shops we use a Nelsonville engine 10" by 16", rates 40 horse-power, 150 revolutions, 4½" shaft, 30" pulley with 12" face, 2½" steam pipe

and 3" exhaust pipe. We use 2 7–16" main shafting and dogwood pulleys. We have one Harrington & Son lathe 20" swing and 5' between centers, one planer 22" by 22" by 5', and one 16" lever drill of same make fitted out with Morse twist drills from 1" down to ¼" by thirty seconds, also one Hart emery grinder for tools.

Our blacksmith shop is equipped with three Bradley forges, one Bradley heating furnace, three anvils, one root blower No. 3 size for four fires, one pipe and bolt machine from 4" down to 1" and two emery stands for sharpening bits. With this machinery we are able to do our own machine work and repairing. We use No. 9 Jas. G. Pulling & Co. pump and two smaller ones.

At present we have three batteries of two flue boilers 28' long by 48" in diameter, flues 18" in diameter. The stacks are sheet iron and 50' high. We use nothing but Congo slack for firing our boilers. Connections are made with the steam main independently. The steam main is 10" in diameter from the boilers to the dynamo house, and from thence on it is 9", at the beginning of this 9" run we have a 9" Stratton separator which works very satisfactorily. We cut our coal with the Jeffrey electric mining machine, which in reality is the only successful machine of the kind on the market. Congo uses five seven foot and two six foot machines. We are at present cutting the coal by the ton at Hocking Valley schedule. Our coal is of a very hard nature, and at first we experienced some difficulty in getting the machines to stand the severe strains put upon them, but by the untiring efforts of our electrician and machinist, Mr. Earnest Chilson, Mr. Beecher Dierdorf, of the Jeffrey Mfg. Co., and Mr. Turney, a mining machine has been evolved, known as the "Congo Machine", which is a thorough success. We are paying the schedule price for drilling, and the miners are doing the work with hand drills. The difficulty with electric drills is that they are so heavy that it requires two men to handle them, which makes the cost of running them so high that there is no economy in using them in their present state.

HAULAGE.

We are hauling all of our coal with horses and mules, this being cheaper for the present than a machine haulage owing to our short hauls. In the near future this question will have to be taken up and solved. The tail rope system will probably be used, although the mine is admirably adapted to some form of electric motor car which should be heavy and strong with a large drive wheel base.

ENGINEERING.

We have a fully equipped engineer's office. The Company require monthly surveys of their mines which are platted on a yearly map of 400' to the inch and on a monthly or working map of 100' to the inch. Each years work on the yearly map is given a diffetent color; each month's work on the monthly map is given a different tint of the year's color. This gives an accurate record of each months and years workings.

Such in brief is the story of the equipment and development of the Congo Mine and the completed plant stands a monument to the combined energies of all who had a part in giving it existence.

THE CHAIR: I think we are all greatly interested in this description of what we are going to see to-morrow. I hope you will allow me to call your attention to one or two matters before you disperse. It was mentioned at the beginning of the meeting, in the report of the secretary, that during the last year we have lost three of our members by death, Mr. Chauncey M. Andrews, Col. Thos. Corcoran and Mr. John Nicholson. I suggest before we adjourn that the institute take some action in regard to the death of these gentlemen. Certainly names such as these should not pass from our list of membership without some suitable recognition on the part of the society.

MR. ROY: I move the chair appoint a committee of three to draft appropriate resolutions touching the death of these members, and that they be published in the journal and copies sent to the relatives of the deceased.

The motion, being seconded by Secretary Haseltine, was unanimously carried.

THE CHAIR: The chair will appoint as such committee, Mr. Roy, as Chairman, Mr. Love and Mr. McDonald.