Plant of the Williams Pocahontas Coal Co.

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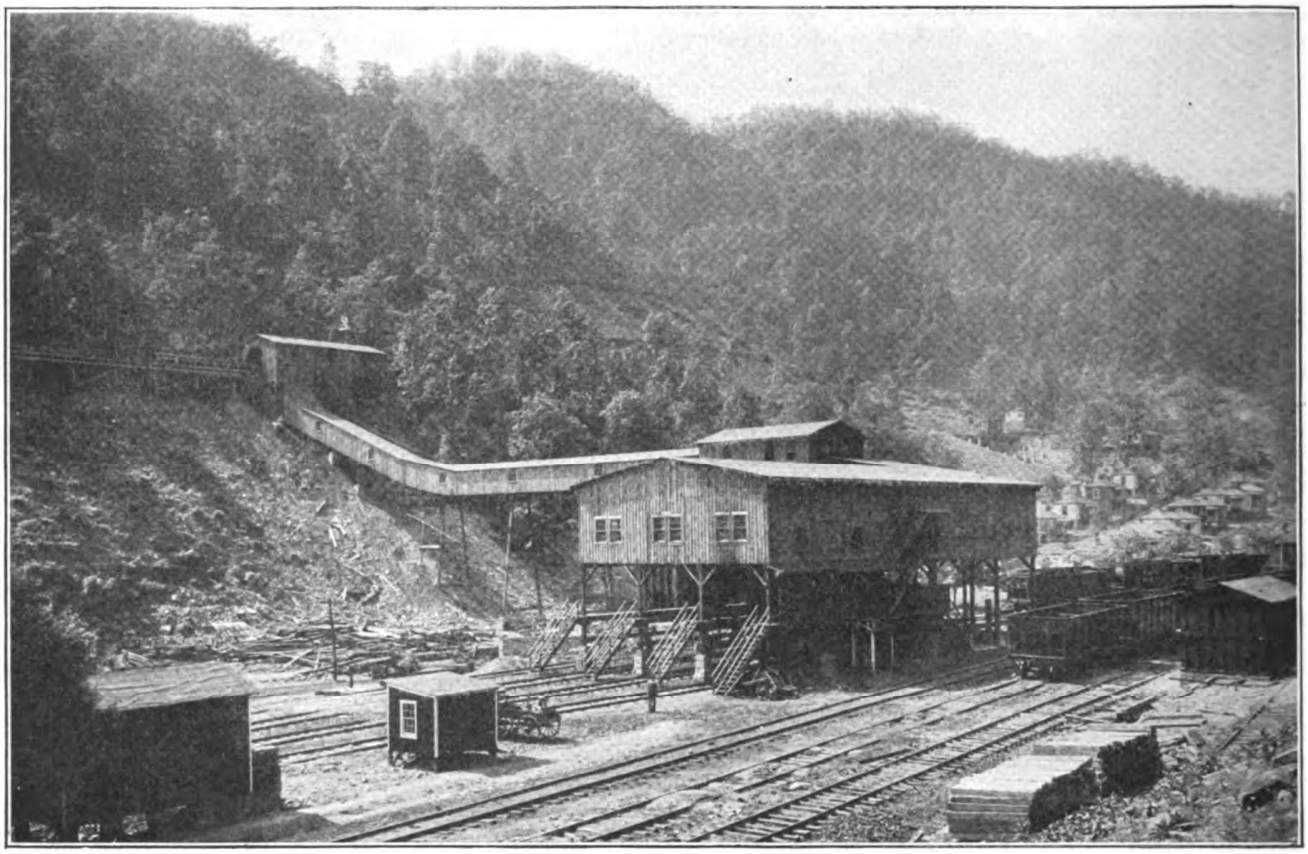

FIG. 1. GENERAL OUTSIDE VIEW OF THE WILLIAMS POCAHONTAS COAL CO.'S PLANT

THE present-day demands that the entire output of a coal mine be properly cleaned and sized in order to conform to the exacting requirements of its customers brings to the attention of the industry certain sizing plants which are worthy of mention. One of these is the modern wood-construction coal tipple of the Williams Pocahontas Coal Co., at War, McDowell County, West Virginia, on the Dry Fork branch of the Norfolk & Western R. R. The operation is known as the Howard mine and is comparatively young, having started shipping coal in May, 1916. The workings are in the "War Creek seam," which varies in thickness from 66 to 72 inches. A general outside view of the plant is shown in Fig. 1.

At the commencement of mining operations, coal from the working face was brought out in mine cars constructed of wood. From these it was dumped into an inclined wood storage chute, built on practically the same slope as that of the mountain profile. At the lower end of this chute gates were installed for drawing out quantities of coal and depositing them in a mine car which was drawn back and forth over a wooden trestle by a mule, and delivered to a dump hopper over the railroad car, which was located at approximately 160 ft. from the discharge gates of the storage hopper.

This crude method of loading straight run-of-mine coal, as shown in Fig. 2, in no way satisfied the officers of the coal company. The result was that around Christmas, 1916, designs for a new modern equipment were being considered. In March, 1917, Frank W. Truscott, the president of the company, signed a contract for a sizing and cleaning plant of such proportions as to properly handle a capacity of 150 tons of run-of-mine coal per hour, and prepare it in four different sizes, the three larger of which would be hand-picked. The different grades were based upon the following percentages: Lump, 25 per cent.; egg, 18 per cent.; nut, 17 per cent.; slack, 40 per cent. Total, 100 per cent.

The system of mining followed at this operation is that known as the "wall-and-pillar." Electrical mining machines are employed. The following is an illustrated description of the equipment that was chosen as the one being the most suitable to fulfill the requirements.

A trip of mine cars which are of about two tons capacity each are hauled by electric motor and spotted adjacent to the scalehouse. The cars are then cut loose from the motor and one at a time delivered to a Phillips crossover dump, after each car has been properly weighed on a platform scale. The dump empties each car as received into a substantial wood-frame hopper of about five tons capacity. This is lined with $\frac{1}{16}$-in. steel plates, the lining being held in place by means of countersunk bolts.

Attached to the bottom of this hopper is a reciprocating plate feeder which delivers the coal in a measured quantity to the trough of the lower strand of a re-

tarding conveyor. The crank of this feeder is so designed that the stroke may be easily and quickly changed to suit the capacity requirements. This feeder receives its mechanical power through spur gearing and chain drives from the take-up shaft of the conveyor.

The retarding conveyor here employed without question has been carefully designed and built for heavy service. Its speed of travel is 80 ft. per minute and it has an entire length of 255 ft. from center of head sprocket to center of tail sprocket. Of this length, 105 ft. is on an incline of 20 deg., while the remainder at the discharge end is horizontal. The inclined and horizontal sections are connected with a 75-ft. radius curve. This machine is employed for transporting the coal from the feeder to the shaking screens. The flights are made of ¼-in. steel plates and measure 10 in. deep by 30 in. long. They are rigidly attached at intervals of 36 in. to a double strand of 18 in. pitch-steel strap-bushed roller chain. The side bars of this chain are constructed of 2½ x ⅜-in. flats, the joints being ¾-in. riveted steel pins provided with bushings and encircled with 3¼-in. straight-face solid cast-iron rollers, which travel on both the carrying and return runs along steel bar trackage secured to the wooden frame by means of countersunk bolts.

At the lower end of the conveyor a large rack-and-pinion discharge gate is introduced for the purpose of permitting the discharge of run-of-mine coal direct to a 36-in. picking table 20 ft. long from center to center of sprockets. The coal is cleaned on this table prior to delivery to the railroad cars, but this

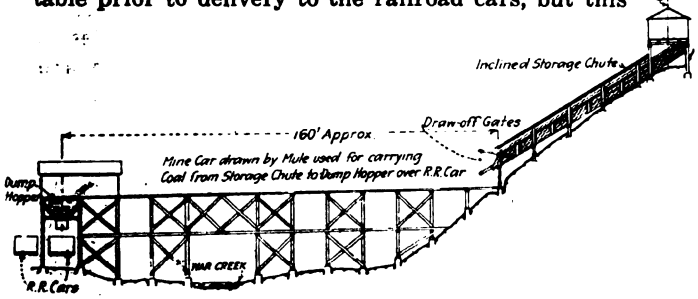

FIG. 2. CRUDE METHOD OF LOADING RUN-OF-MINE COAL

part of the equipment is only used in case of emergency when, for some reason, portions of the tipple equipment may be out of commission.

Fig. 3 shows the emergency run-of-mine table and the pickers at work. This table is constructed of $\frac{3}{16}$-in. steel pans of 9-in. pitch attached to a double strand of roller chain which travels at a speed of 50 ft. per minute. The extreme lower end of the retarding conveyor is the

FIG. 3. VIEW OF PICKERS AT WORK ON EMERGENCY RUN-OF-MINE TABLE

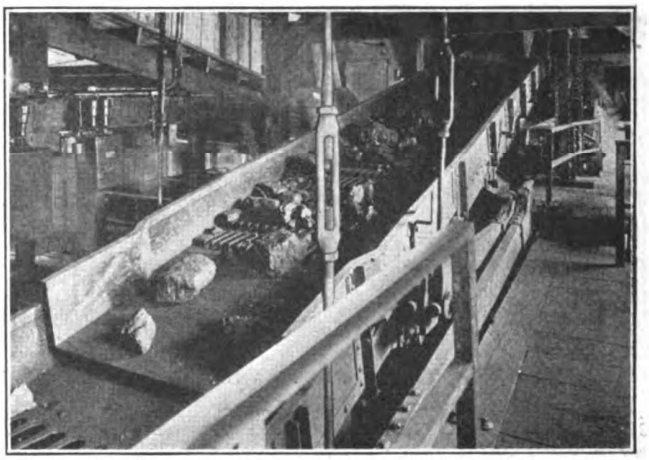

FIG. 4. VIEW OF THE SHAKER SCREENS

regular discharge point, where the coal is delivered without drop onto a steel chute which in turn delivers it to the sizing shaking screens.

The screening unit is composed of an upper and a lower screen, both being of the hanger-rod type. Each screen has a width of 60 in. and a length of approximately 25 ft. Each is moved back and forth at a speed of 100 shakes per minute.

The upper screen is utilized for separating slack and nut coal from the lump and egg, this separation being accomplished by means of slotted lip screen plates. This screen is so designed that the slack is delivered to the slack hopper directly below, while the nut coal may be delivered to the nut coal picking table, or by means of a fly valve in the lower deck of the screen it may be delivered and mixed with the slack in the hopper mentioned above.

The lower screen is equipped with the same type of slotted lip screen plates as mentioned above and also bar screens, and is used for removing or separating the egg size from the lump. The slotted lip screen plate is used when preparing 4-in. egg, and the bar screen when preparing 8-in. egg, the latter size being known as 8-in. run-of-mine. A veil plate is used for covering the 8-in. bar screen when this size of product is not being prepared.

These screens are shown in Fig. 4 and are operated by means of an eccentric shaft of ample proportions to oscillate them easily at the speed mentioned. They are connected to this shaft by ball-and-socket eccentric rods, which insure perfect alignment in operation. A successful shaking screen unit depends largely upon being carefully balanced. In the designing of these screens considerable study was given to attain this end.

The cleaning operation of the three sizes of coal—lump, egg and nut—is carried on in the following manner: Each size is automatically discharged onto a slow-moving overlapping corrugated apron picking table. The lump table shown in Fig. 5 is 36 in. wide and 66 ft. long, but has 30 ft. of its length mounted within a structural steel boom, for the purpose of delivering the lump coal without breakage to the railroad cars. The apron is constructed of a continuous section of $\frac{3}{16}$-in. steel pans, or flights, mounted on a double strand of 9 in. pitch steel roller chain with ¾-in. steel riveted pins at the joints. Rollers of 3¼ in. diameter encircle a case-hardened steel bushing, which in turn encircles the

FIGS. 5 AND 6. VIEWS OF LUMP, EGG AND NUT PICKING TABLES

joint pins. This table travels on flat steel bar track mounted on wooden framework along the horizontal picking section.

The egg and nut tables, as shown in Fig. 6, are similar to each other and are 48 in. wide and 32 ft. long each from center of head sprockets to center of foot sprockets. Both of these tables are horizontal and are constructed of the same kind of chain as that employed in the lump table, the only difference being that the steel corrugated flights have greater width to accommodate the smaller sizes of coal, which demand a thinner layer on the table for picking purposes.

These tables have no loading booms attached directly to them, but at the head end a discharge chute is introduced for the purpose of receiving the coal and delivering it to a special Link-Belt loading boom chute. The discharge chutes are provided with flygates made of perforated metal, the intention of these being to re-screen the coal as it is discharged from the picking table and so take out the fines which have been unavoidably made by the pickers on the table. These are deposited in the cross mixing conveyor, which is located directly below. By lifting the perforated-metal hinged flygates in these chutes all coal passing over the picking tables may be delivered to the cross conveyor for mixing purposes, or to the domestic coal bin as the case may demand.

Fig. 7 shows all three loading booms quite clearly. The lump boom being part of the lump table, as before mentioned, needs no explanation. It will be noticed that the booms which are utilized for egg and nut are of a distinct and separate type from those usually seen and are an entirely new feature in loading-boom design. These booms have proved themselves successful and have been used to good advantage in several other operations. They are of the drag scraper type and are constructed of a single strand of malleable iron H class chain, the carrying or top strand of which travels on the inside of a $\frac{3}{16}$-in. steel trough, with flared sides to prevent the crowding of coal en route, the chain and trough being supported on main channel members.

These units are each 27 ft. centers of head and foot

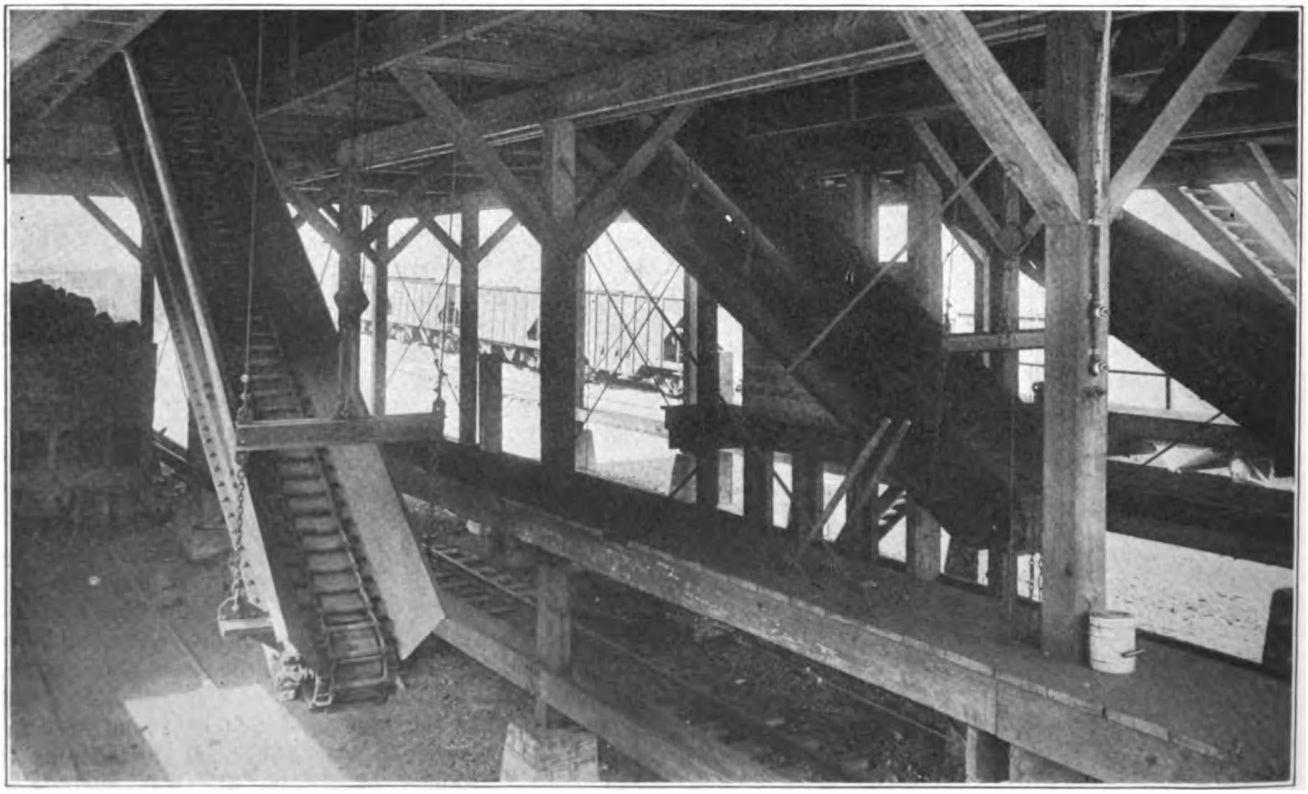

FIG. 7. INTERIOR VIEW OF TIPPLE, SHOWING THE THREE LOADING BOOMS IN USE AT PLANT

sprockets and hinged at the upper or foot end, where they receive the coal from the picking-table discharge chutes. The lower, or return, strand runs back on angle guides and is protected along the bottom by means of a plain steel plate which insures no obstructions to encounter the obstacles on the railroad cars, such as brake wheels, etc.

The booms are counterbalanced by means of steel ropes and cast-iron counterweights, while the raising and lowering is performed by means of a simple friction hoist. These hoists are located above the driving ends of the picking tables and are operated by means of a line shaft upon which are mounted paper friction pinions which supply the power for hoisting. By the easy manipulation of a hand lever the operator may either raise or lower the booms at will. This type of friction hoist has given excellent results at several other operations and has undoubtedly been a big step in the direction of simplicity in design of hoisting mechanism for use with loading booms.

The cross mixing conveyor it utilized for several purposes: First, for delivering the fine coal screenings from the picking tables to an auxiliary slack bin located adjacent to the slack railroad track; second, for delivering egg and nut coal to a domestic bin; third, for delivering refuse from the picking tables to the rock bin; fourth, for conveying hand-picked lumps from the egg table to the lump table.

This conveyor is so designed so as to receive in its lower strand from the discharge chutes at the end of the picking tables the following: Egg and nut for the domestic coal bin, the rescreenings from the picking tables and the refuse for the refuse or rock bin, while the upper strand performs the duty of carrying the above-mentioned hand-picked lumps. This machine is constructed of 6-in. pitch, double-strand, steel-strap, link chain with crossbars at 24-in. intervals. The chain travels in a $\frac{3}{16}$-in. steel trough upon a steel bar wearing track, the trough being equipped with a rack and pinion valve over the auxiliary slack bin for the purpose of discharging the fine coal rescreenings from the tables. The valve has three positions: No. 1, wide open to discharge fine screenings; No. 2, a perforated section which takes out fine coal when conveying domestic coal, which insures the delivery of clean egg and nut to the domestic bin; No. 3, a plain blank section which closes up the valve opening and makes a continuous trough when conveying refuse to the rock bin.

The entire plant is operated by means of three-phase, 60-cycle, 440-volt alternating-current motors manufactured by the General Electric Co. These are complete with starting compensators, circuit breakers, no-voltage release and overload relays. One 75-hp. motor is used for driving the reciprocating feeder, retarding conveyor, shaking screens, emergency run-of-mine picking table and cross mixing conveyor, while a 15-hp. motor is employed for driving the lump, egg and nut picking tables, along with the loading booms and friction hoists. All driving gears and parts are properly protected with steel-plate guards and all walkways and stairs are provided with double wooden hand railings.

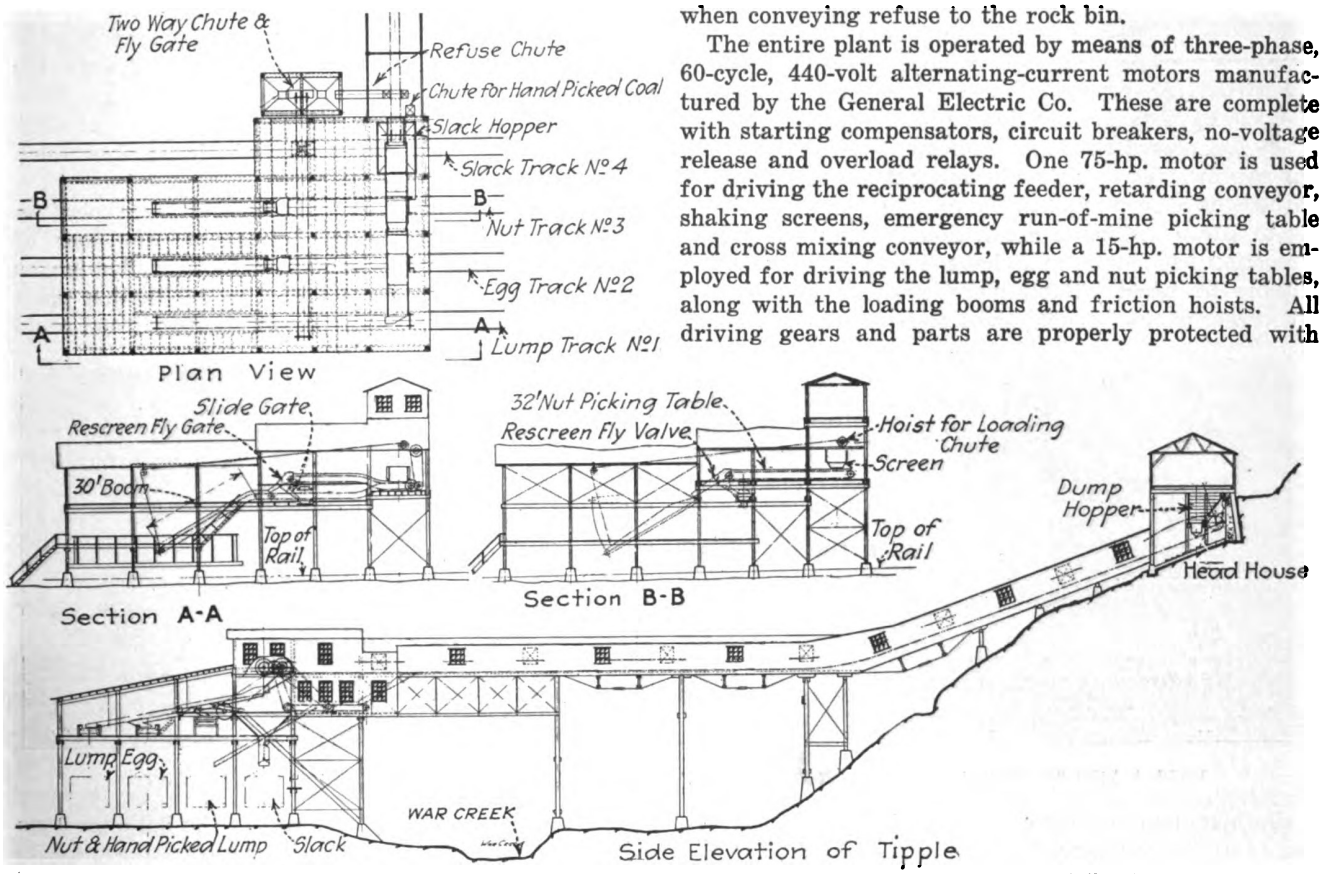

FIG. 8. DETAILS OF EQUIPMENT IN USE AT WILLIAMS POCAHONTAS COAL CO.'S PLANT

The tipple building is of longleaf yellow pine construction, properly dressed and thoroughly and substantially braced with steel rods. Considerable thought was given to the lighting and ventilating of this building, the result being that an abundance of windows and skylights are introduced to enable the thorough cleaning of the coal. Fig. 8 shows a general outline drawing of the entire equipment. "Car retarders" are used to facilitate the moving and spotting of railroad cars under the tipple building. Throughout the entire plant it is evident that considerable thought and study have been exercised in even the smallest details, mechanical devices having been properly installed to avoid unnecessary labor in the performance of sizing, cleaning and loading operations. The entire equipment was designed, fabricated and erected complete by the Link-Belt Co., of Philadelphia, Chicago and Indianapolis.