COAL AGE

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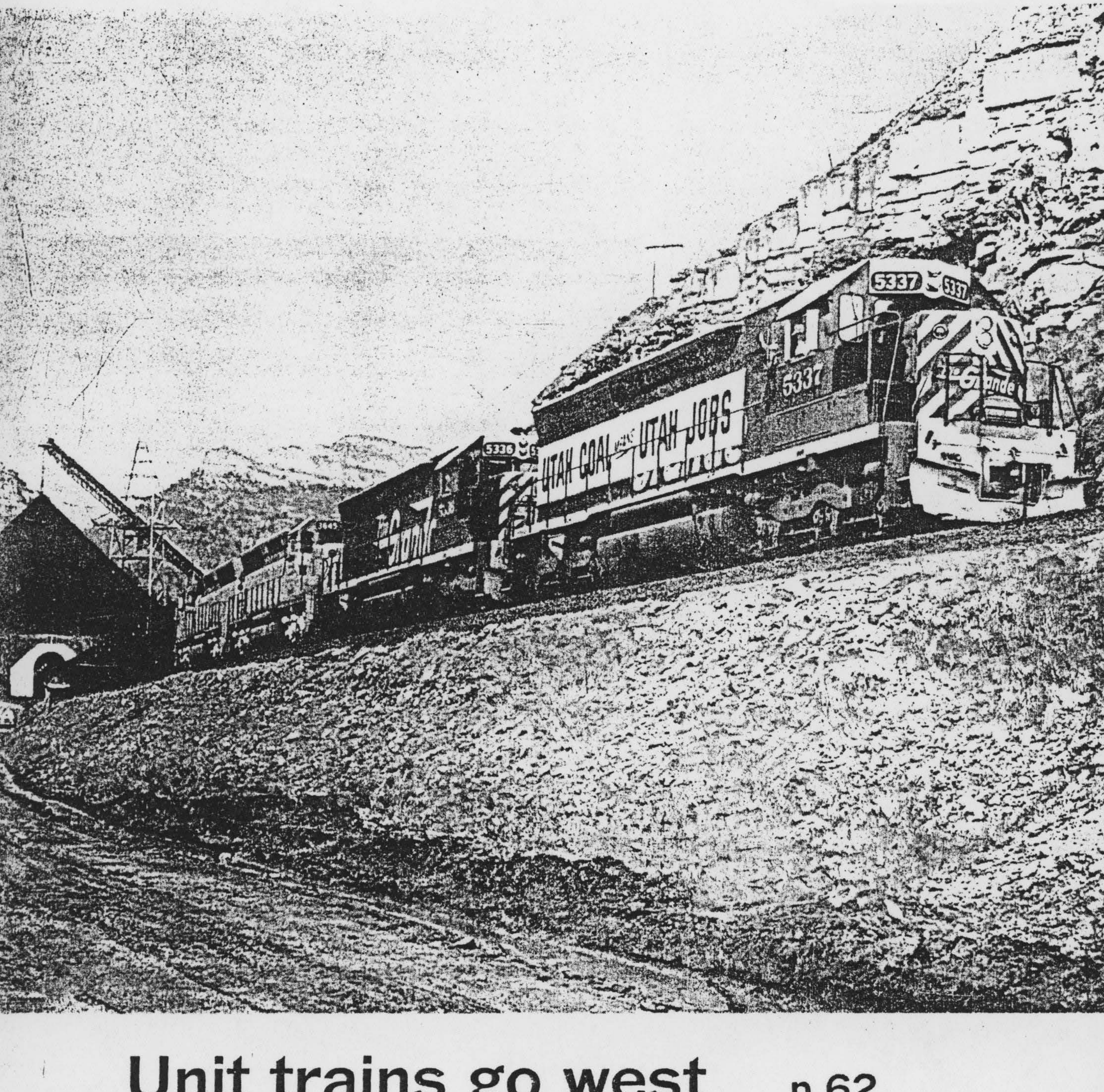

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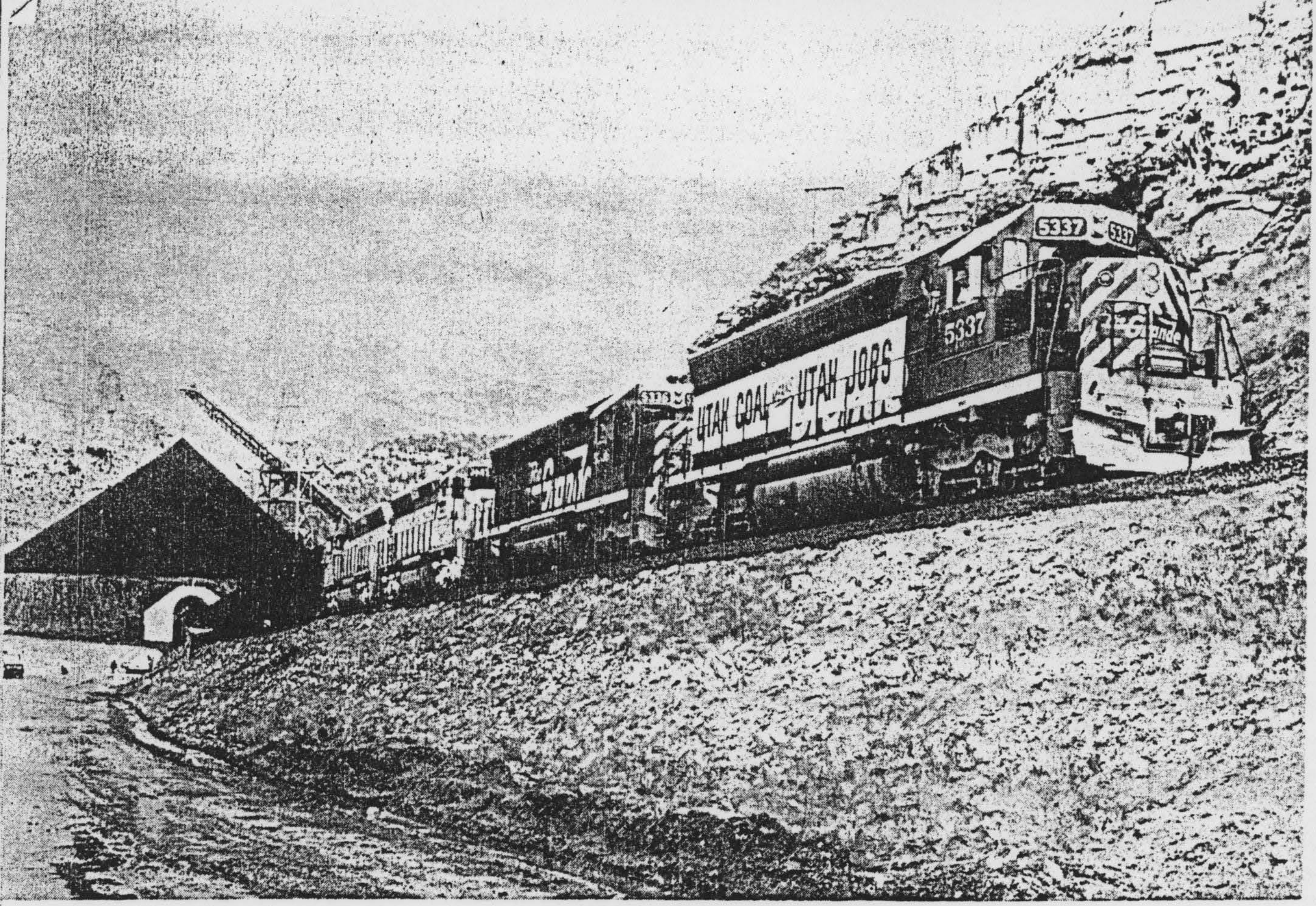


New facility loads 8,400 tons of coal in less than 1 hr as the 84-car Rio Grande-Union Pacific unit train moves at a constant speed. The two railroads provided four 3,600-hp diesel-electric locomotives.

CA 74(9): 62-7 (Sep 69)

Kaiser Steel's 11,000-tph loading facility sets record as . . .

Unit trains go west

Daniel Jackson Jr.
Managing Editor
Coal Age

Kaiser Steel's Sunnyside mine in central Utah exhibits the most modern designs—and even the unique—for high efficiency in coal handling and unit-train shipments from Sunnyside, Utah, to Kaiser's Fontana steel plant at Fontana, Calif.

- Lower freight rate of coal shipments and a dependable coal supply line were the prime reasons for designing and constructing a system that moves 8,400 tons per unit train a distance of 806 mi (round trip distance 1,612 mi) in a 96-hr cycle. This cycle effectively handles Sunnyside's entire output of 5,500 tpd. Unit-train loading is performed at a rate of 11,000 tph. At times of heavy demand a stand-by train of conventional sized cars is used.

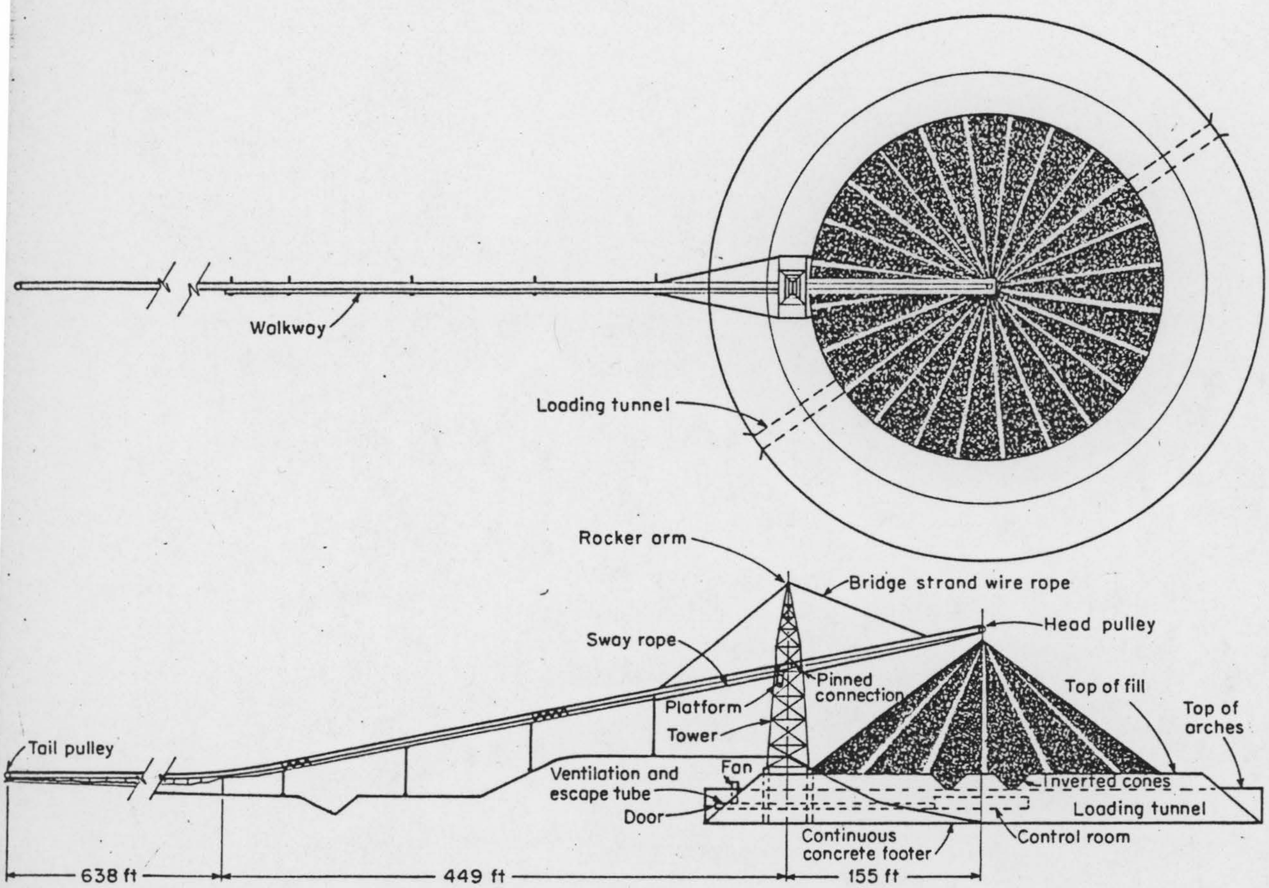
- Additional advantage includes relief of railroad car shortages which not only benefits Kaiser but other mines in the area as well, especially during the fall beet harvest. The new 100 Coal Liner cars, with a 100-ton capacity, are assigned to Kaiser alone, releasing the regular railroad cars to other mines.

- Storage capacity also permits a more uniform work schedule even though the Fontana steel mill may not require the normal coal production from Sunnyside. Production can be stockpiled—70,000 tons and more—even though shipments may not be needed.

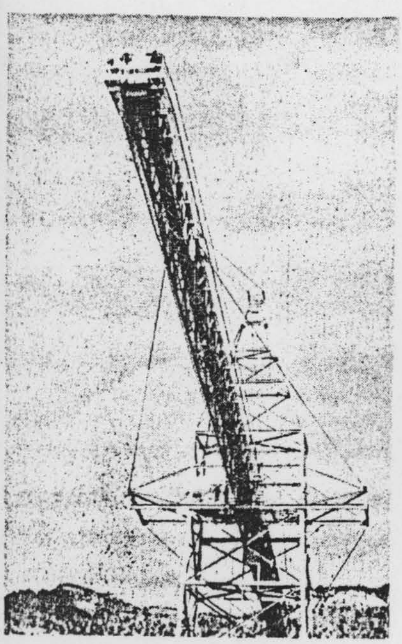
Coal remaining in storage loses much of its surface moisture in the Sunnyside area and, as a result, less moisture and also weight is loaded into each 84-car unit train shipment to California.

Sunnyside: an expanding operation

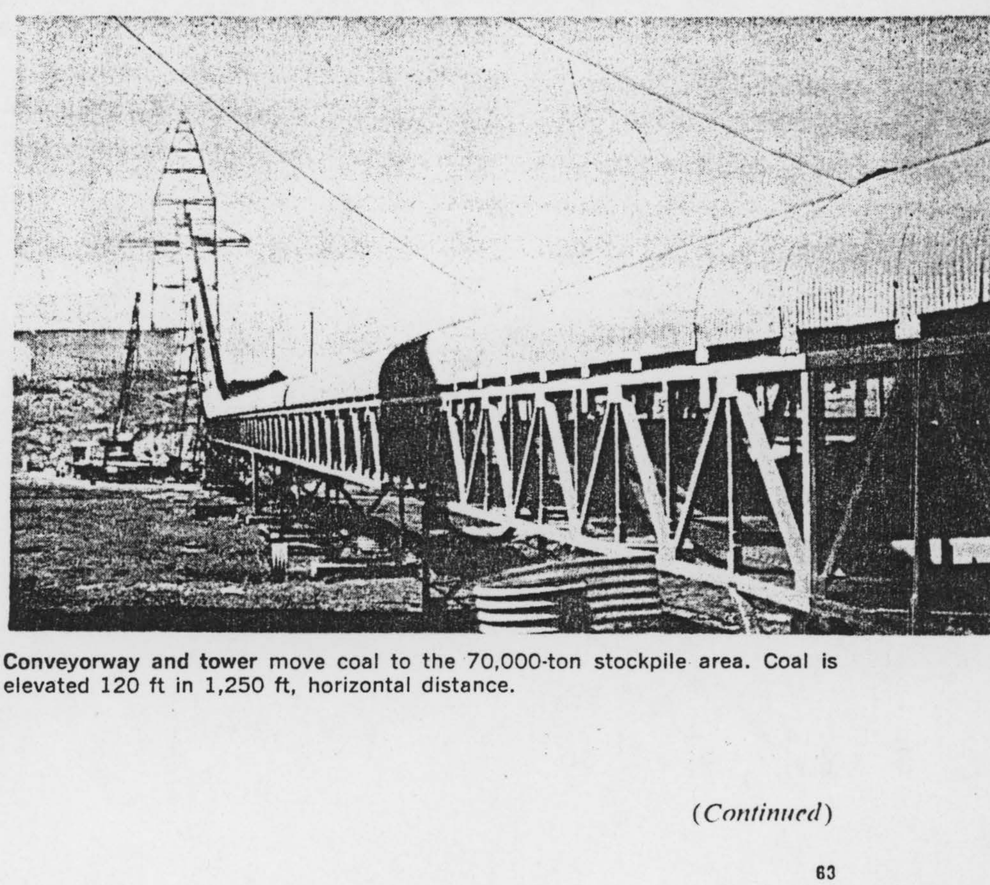
Since 1942, the Sunnyside mine has shipped more than 26.6 million tons of coking coal to the Fontana steel mill. Even with this production record, Sunnyside is an expanding operation, installing a new longwall unit with entry drivers for exclusive longwall mining. It has purchased its own shaft-drilling machine to drill 6- or 7-ft-diameter man-and-material and ventilating shafts to keep up with expansion.



General arrangement of Sunnyside's high-capacity unit-train loading facility details major features, including the conveyorway, tunnel, steel cones, loading gates and tower. More than 400 tons of steel was used.



Coal, elevated 120 ft, discharges onto the 456-ft-diameter storage pad.



Conveyorway and tower move coal to the 70,000-ton stockpile area. Coal is elevated 120 ft in 1,250 ft, horizontal distance.

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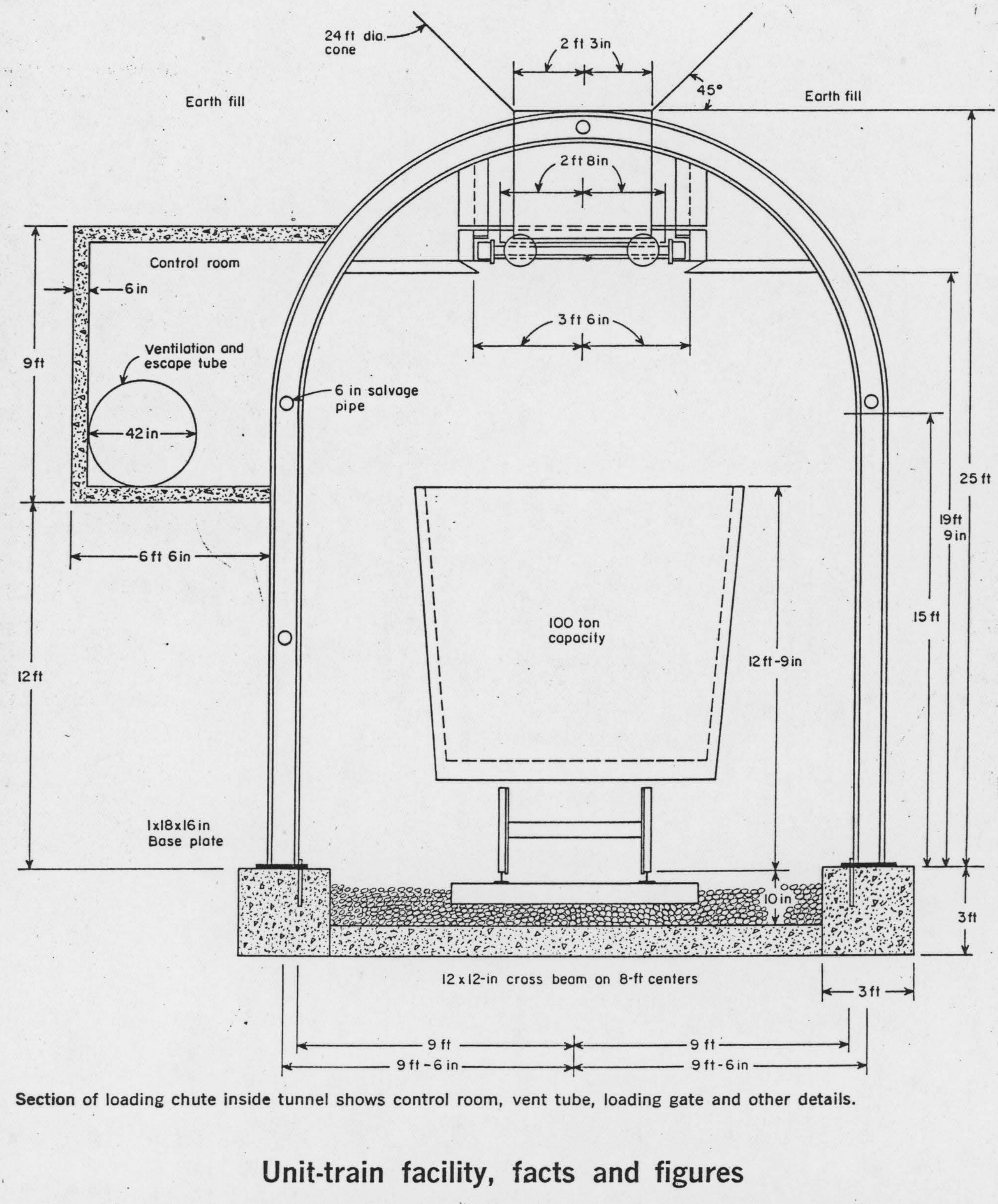


Section of loading chute inside tunnel shows control room, vent tube, loading gate and other details.

Unit-train facility, facts and figures

Normal loading time, 84 cars — 51 min.

Average weight of loaded train — 8,507 tons (6-26-69).

Maximum loading rate — 11,943 tph (6-26-69).

Tonnage shipped via unit train — 842,000 tons (6-26-69).

Minimum round-trip time—76 hr, 44 min (6-26-69).

Conveyor belt—36 in, 2 ply, 440 fpm.

Capacity of belt—600 tph of 6x0 coal.

Idlers—35 deg.

Belt-drive motor—150 hp.

Parallel-shaft speed reducer.

Fluid-drive coupling.

Conveyor tower—156 ft high; 35 ft square base.

Tower platform—80 ft above ground; 26 ft square.

Conveyorway length — 1,250 ft horizontal.

Conveyorway rise—120 ft vertical.

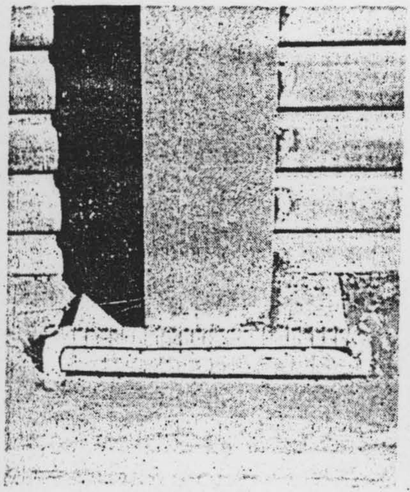
Cantilever section—148 ft, pins 3½ in diameter.

Earth pad—approximately 460 ft diameter.

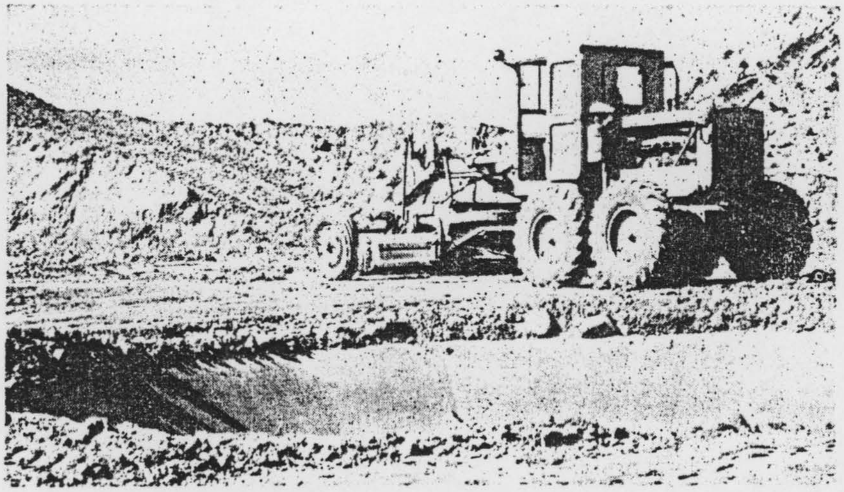
Diameter of cones—24 ft on pad, 4 ft at outlet.

Control room size—6 ft 6 in wide x 9 ft high x 75 ft long.

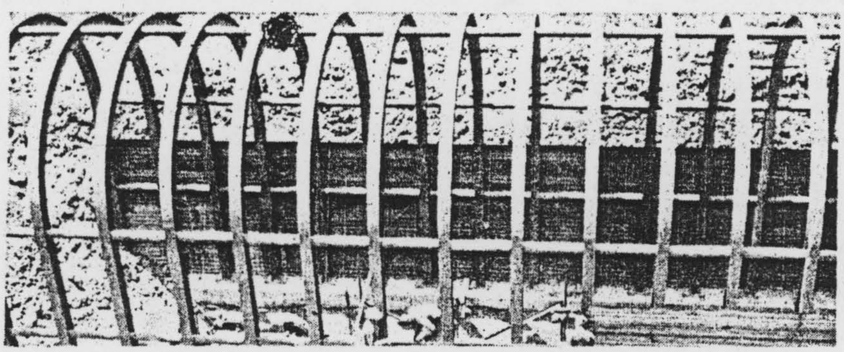
Personnel required during loading—gate operators, supervisor.



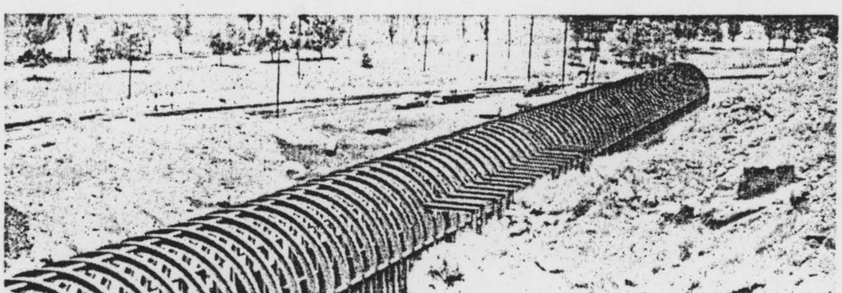
Flanges of arches were slipped under reinforcing bars set in concrete.



Two cones, 24½ ft wide at the top and 10 ft high, were placed near the center of the pad. Bottom opening is 4 ft wide.



Arches and reject steel mats form tunnel structure.



Tunnel is 456 ft long with control room in center. Structure is covered with approximately 10 ft of earth material.

Coal handling: plant to stockpile

Designed and built to Kaiser's specifications by the H&J Supply Co., Price, Utah, the unit-train facility was fabricated in Price and shipped to the site for assembly. Major components, including the conveyorway, tunnel, steel cones, loading gates and tower, were assembled much like the components of an Erector set. Except for two or three minor changes, all prefabricated components fit as designed. All structural components 20 ft above ground level were painted prior to installation. It took some 400 tons of steel for the complete installation.

Coal size conveyed to stockpile is 6x0. Ash content varies from 5½% to 6%; sulfur, 0.8%; volatile, 40%; and FSI, 4½ to 5. Prepared coal from the plant is conveyed by flight conveyor and dropped directly onto a chute which discharges onto a belt conveyor. Coal is carried 1,250 ft—horizontal distance—over a vertical lift of 120 ft to the stockpile.

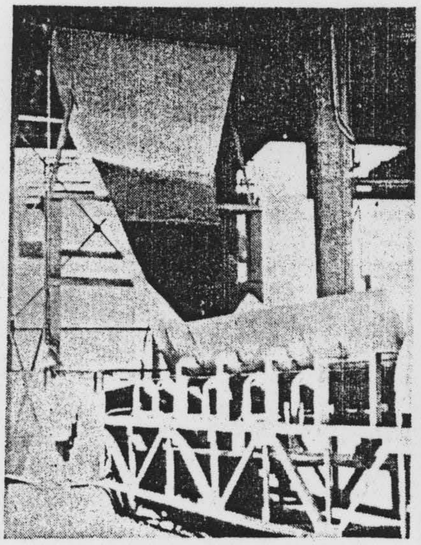
The chute is equipped with ½-in-thick abrasive-resistant steel plate. It is set on an angle of 53 deg to handle large volumes of fine coal and filter cake which has a tendency to hang up if the angle is small, especially during the winter months.

A three-stage coal-sampling system located in the preparation plant was extended to the chute so that samples could be made at this point, using the same equipment.

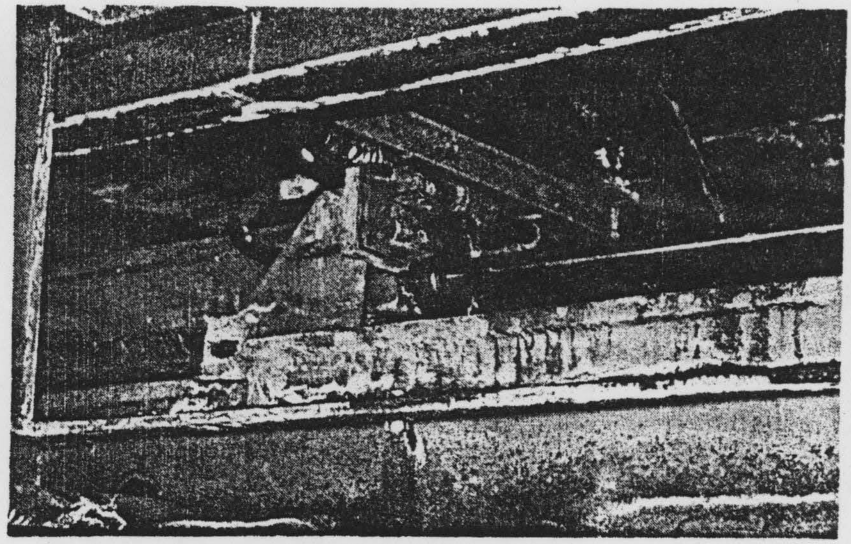
The new 36-in Jeffrey belt conveyor is equipped to weigh the coal enroute to the stockpile. Designed to travel at 400 fpm, the conveyor carries coal at a rate between 500 and 600 tph. The preparation plant capacity, presently, is set at 600 tph.

The belt conveyor is designed to handle up to 700 tph without changing belt speed. It is equipped with a 150-tph U. S. Motor and Link-Belt speed reducer. Five impact rollers are installed at the chute discharge point.

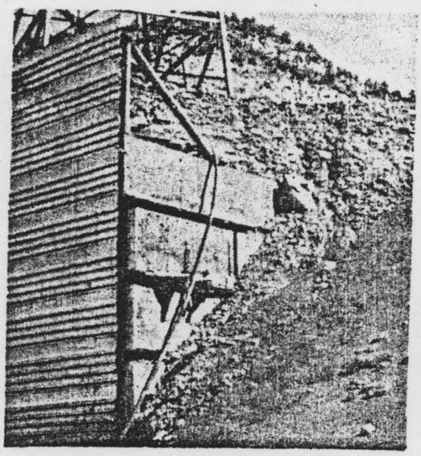
The conveyor runs level for 638 ft from the preparation plant and then it has a slight transitional section on a 500-ft radius. It then curves from this section up to the end of the cantilevered beam. At the point of discharge, the belt is



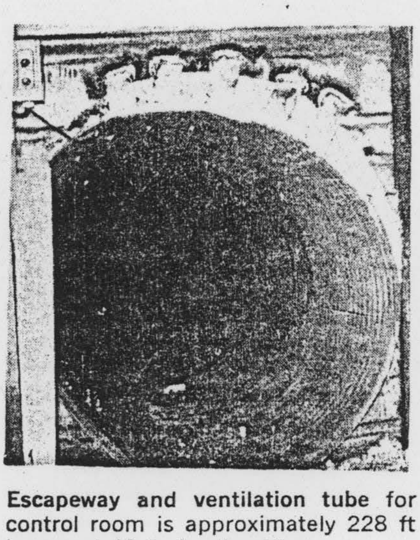
Chute at preparation plant discharges 6x0 clean coal onto conveyorway.



Loading gates are opened and closed by air-operated rams. Limit switches and pushbuttons control gate operation.



Retaining walls at each end of tunnel were constructed with old mine cars filled with earth material.



Escapeway and ventilation tube for control room is approximately 228 ft long and 42 in in diameter.

on a 25% grade, 120 ft above pad.

The supporting tower, where the drive is located and also where the cantilevered section is supported, is 156 ft high. Two 1¾-in pre-stressed galvanized wire ropes support the cantilevered section. Two additional pre-stressed wire ropes 2 in in diameter are attached to each side of the cantilevered section and tower to reduce sway. These sway ropes are designed for a 100-mph wind load.

The cantilevered section is 155 ft long. It is attached to the tower at a point 80 ft above ground level with a 3½-in-diameter steel pin.

Installation of the conveyor structure was simplified and speeded up by fabricating sections prior to installation. Starting at the plant, six 100-ft sections were installed first, with most of the remaining sections 40 ft long.

The conveyor is equipped with training idlers and 35-deg troughing idlers. Special effort was made to enclose all moving parts. Rounded corrugated metal sections were used to protect the belt structure and reduce or eliminate the dust problem compared with the totally enclosed type. Lighting problems also were eliminated. Culvert material, reportedly, was more economical.

Stockpile: pad and cones

Coal from the conveyor discharges onto the storage pad at a point between two steel inverted cones installed on top of the pad, forming a conical-shaped coal storage pile. The maximum storage is 70,000 tons, but this can be increased by using dozers and storing additional coal along the east side of the pad which contacts a sloped hillside.

The two cones previously mentioned are installed in the stockpile pad 25 ft on each side of the tunnel center, or 51 ft apart, center to center. They are centered directly over the railroad in the tunnel. The tops of the cones are even with the earth pad which is 10 ft above the steel arches forming the tunnel.

During the loading cycle, coal flows from the stockpile through the cones and into the railroad cars.

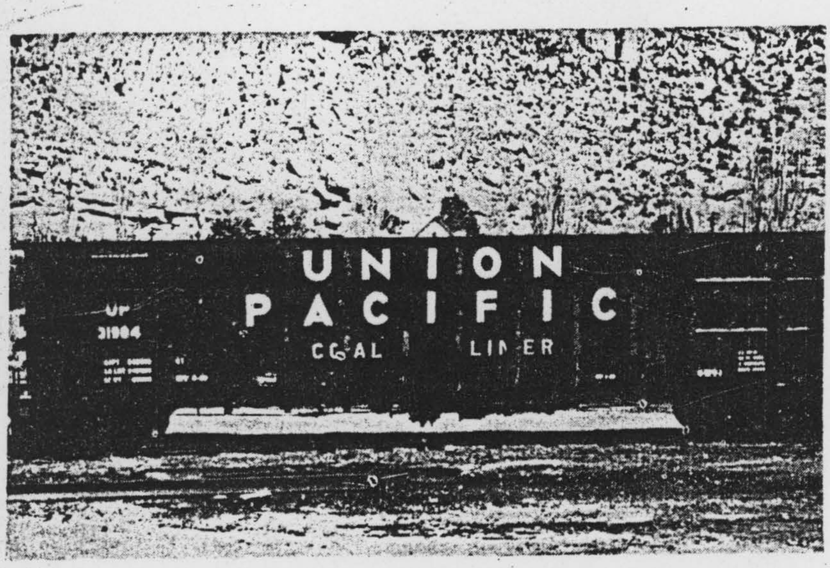
Live storage capacity is between 35,000 and 40,000 tons, with more than 70,000 tons of actual storage space available. However, the pad can be enlarged if necessary, to increase storage capabilities.

The steel cones, which form the chutes or hoppers for loading are equipped with special ¼-in abrasive-resistant steel plate. Thickness of the cones is ½ in, plus the ¼-in special steel. They are 24½ ft in diameter at the top and 10 ft deep. Cone angle is 45 deg.

The pad surface is sloped between 1% and 2% from the center of the cones to the outer edges for drainage.

loading cycle. If a gate fails to function due to loss of air pressure, two counterweights attached to each gate would automatically close the gate and stop coal flow. If this fails, the escape tube is available for the operator to evacuate the control room.

The counterweight equipment noted is located on each side of the tunnel and inside the flanges of the arches. Each weight is approximately 1,000 lb. These weights are screened so that personnel cannot get too close to them.



One-hundred 100-ton, specially-designed high-side gondola cars will haul more than 700,000 tons of coal annually in 8,400-ton unit trains.

Unit train: railroad, loading, hauling

The loading rate of more than 11,000 tph at the Sunnyside stockpile facility may be an all-time high for loading unit trains. The two loading cones under the stockpile contribute greatly to achieving this high rate of loading, as does the large live storage capacity of the pad.

The loading cycle requires that the first railroad car behind the locomotive be positioned under the first gate. This car, while moving at a constant speed of 0.9 mph, is loaded to two-thirds capacity. The second gate loads the remaining one-third of the car while the second car is being loaded to the two-thirds capacity at the first gate. This procedure continues until the 84-car unit train is loaded.

The 100-ton cars were supplied by Union Pacific and the Denver & Rio Grande railroads. A total of 100 cars were built, with 16 serving as spares. Four 3,600-hp diesel-electric locomotives move the train to Fontana, Calif., and return in the 96-hr cycle. The Denver & Rio Grande handles the train to Provo, Utah; the Union Pacific from Provo to Barstow, Calif.; and the Santa Fe from Barstow to Kaiser Steel's plant at Fontana.

Approximately 1.6 mi of railroad track was installed to complete the new unit-train facility. In addition, a 1,200-ft extension to existing side track was necessary to handle the 84 cars in a unit train.

Finishing touches to the unit-train facility call for landscaping the surrounding area to prevent erosion and to beautify the area. ■

Tunnel: data and construction

The 456-ft-long tunnel running under the stockpile consists of a railroad track on a 1½% grade over which are placed steel arches. These arches are 25 ft high and 20 ft wide. They are mounted on 3-ft single continuous concrete footers. Tunnel width is 16 ft.

A control room is located above the track and outside the steel arches at the loading cones or chutes. The arches are placed on 4-ft centers and are tied down with reinforcing bars protruding from the concrete rather than the standard anchor bolt. After these arches were installed, 12-ft lengths of reject steel mats were used to cover the arches. While the arches were being covered on both sides at the same time, backfilling was underway, taking care that the height of earth fill on each side was approximately the same to balance the pressure exerted on both legs of the arches.

Old mine cars were used at both ends of the tunnel as retaining walls. The cars were placed in a staggered "brick" position and then filled with earth material. Then another layer of cars were added until the desired height was achieved. Steel mats were then welded to the cars to form the outside wall face.

The tunnel is equipped with a separate escapeway and ventilation system. This was connected to the loading control room to satisfy the safety requirement established by Kaiser Steel management. It consists of a 42-in corrugated culvert running from the control room or center of the tunnel—228 ft—to one end.

This was put in primarily as an escapeway in case the loading gates break or fail to close. While the tunnel has good natural ventilation, the escape tube is equipped with a blower fan to provide additional ventilation as necessary. Dust or methane has not presented any problems during unit-train loading.

Loading station: gates, rams, controls

Above the tunnel and control station rests approximately 70,000 tons of coal which flows through the two cones for loading into railroad cars. Coal flow is regulated by two pneumatic ram-operated loading gates. These gates are patterned after similar successful gates used at shaft loading stations underground. The gate consists of a 4x6-ft door welded to the double air ram and attached to mine-car wheels which run on 60-lb track. Air rams are 10 in in diameter.

The operator can use a manual lever connected to an air valve located in the control room to control gate movement. An electrical system with limit switch and push-buttons are standard for opening and closing the gates during the