Pecos Mine: A New Zinc-Lead Project

Near Santa Fe, the American Metal Co. Has Equipped This Property for a Daily Output of 600 Tons of Ore, to Be Treated by Flotation

By A. H. Hubbell
Managing Editor

A MINING PROJECT about which little has been heard despite the fact that the company conducting it is now expending $2,000,000 on plant and development is that which the American Metal Company of New Mexico has undertaken at its Pecos mine. Here a deposit of complex zinc-lead ore, long known, is to be exploited.

The Pecos mine is in the upper part of the Pecos

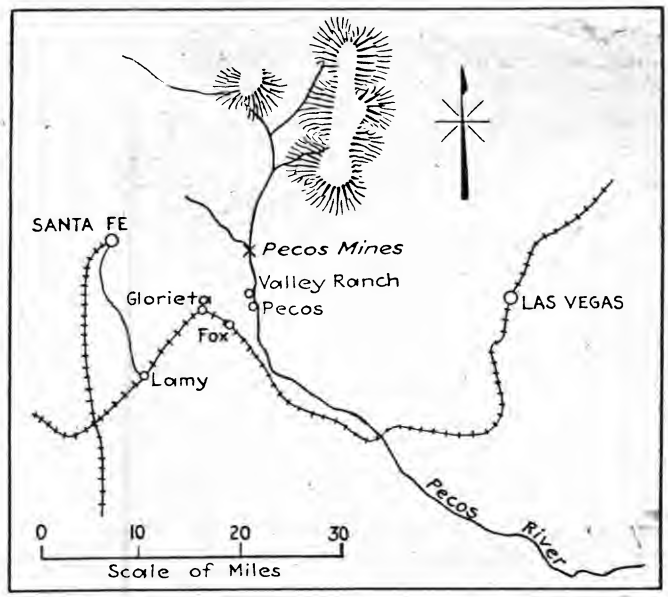


Fig. 1—Sketch map showing situation of Pecos mine, in New Mexico

River valley in northern New Mexico, about 15 miles in an airline east of Santa Fe, though more than twice that distance by wagon road. The nearest railroad point is 12½ miles away, at Alamitos, which only recently acquired the dignity of having rail communications when the Atchison, Topeka & Santa Fe ran in a spur from Fox, on its main line 4½ miles away. At Alamitos the mill that is to treat the Pecos ore has been erected. The link between mine and mill is an aërial tramway 12 miles long. Not far from Alamitos is Valley Ranch, a well-known resort, where, for a consideration, one may enjoy the pleasures that life affords in the attractive Pecos Valley. This place, it might be added, is on the route of the so-called "Indian Detour" for tourists, devised by the railroad to exploit the Indian villages and ruins that are found in this section of New Mexico. From Valley Ranch will come the water necessary for milling and power purposes at Alamitos. These various points are shown on the sketch map in Fig. 1.

Opportunity to visit the Pecos mine presented itself through the courtesy of the American Metal Co. about the middle of last October. My observations as given here are supplemented by data obtained from officials and operating executives of the company. It is a pleasure to acknowledge this indebtedness to Dr. Otto Sussman, Messrs. Heath Steele, H. L. Brown, C. C. Hoke, and J. T. Matson, the last of whom is manager of the Pecos property. Acknowledgment is also made to Messrs. W. J. Coulter, the mine superintendent; H. D. Bemis, mill superintendent, and E. C. Anderson, engineer. Access to the report of Mr. Basil Prescott on the geology of the Pecos property was afforded by Doctor Sussman, as well as to the report of Mr. Arthur D. Storke on the mining methods that it is proposed to use. On both of these reports I have freely drawn, as specifically indicated in the following text.

Deposit Known Forty-four Years

Discovery of the Pecos mine was made in 1882 by one Case, a prospector who came from Kansas. Organizing the Pecos River Mining Co., he sought to develop the property. Soon after it was examined by A. H. Cowles and his brother, and as a result was purchased by their father. In 1886 development was undertaken by A. H. Cowles, who quickly decided that the ore could not readily be handled in this country. Whereupon seventeen years of idleness ensued, lasting until 1903, when Mr. Cowles, having come into control of the property, organized the Pecos Copper Co. Development was then resumed and continued until 1907, when once again work ceased. For the next nine years the property was idle. In 1916 the Goodrich Lockhart Co. took an option on it and pushed development seriously, save during the war period, until 1921. Efforts were bent during the next four years to finding some method of treating the ores. In England, Australia, and on the Continent this work was carried on, and by many in this country. Finally differential flotation yielded satisfactory results. Last year the American Metal Co. acquired the property under option, and after examination by its engineers decided to develop and equip it. A subsidiary, the American Metal Company of New Mexico, is the operating company.

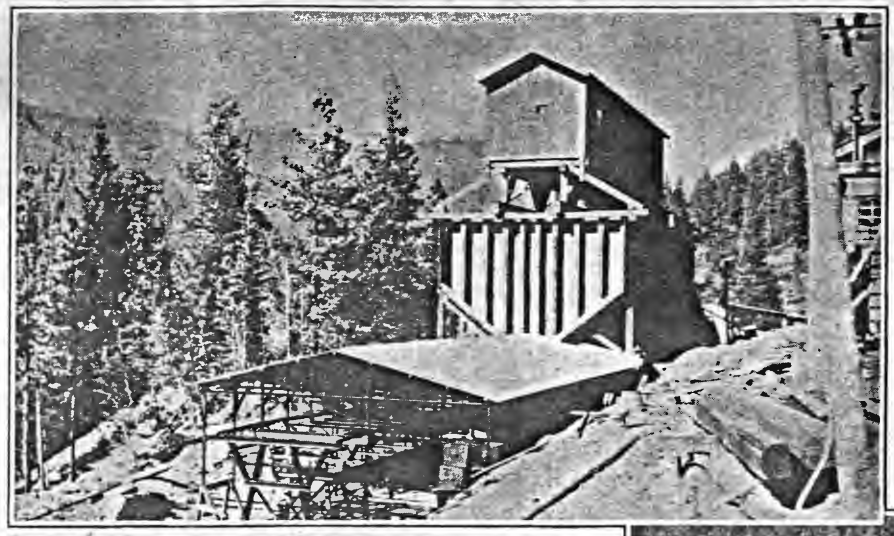
One Million Tons Developed

Unlike most other properties with so long a history, the Pecos mine has made no production in the past save for the ore that has been taken out in the course of exploration and development. Two shallow shafts and a few thousand feet of drifts and crosscuts constitute this old development work. To date it is estimated that the amount of ore developed by underground workings and diamond drilling approximates 1,000,000 tons averaging 17 per cent zinc, 5 per cent lead, 1 per cent copper, 3.5 oz. silver, and 0.13 oz. gold. The company engineers have concluded that there is sufficient ore in sight to warrant the expenditures involved in the present program, which is based on a proven five-year life of the mine.

The Program

The program includes the following:

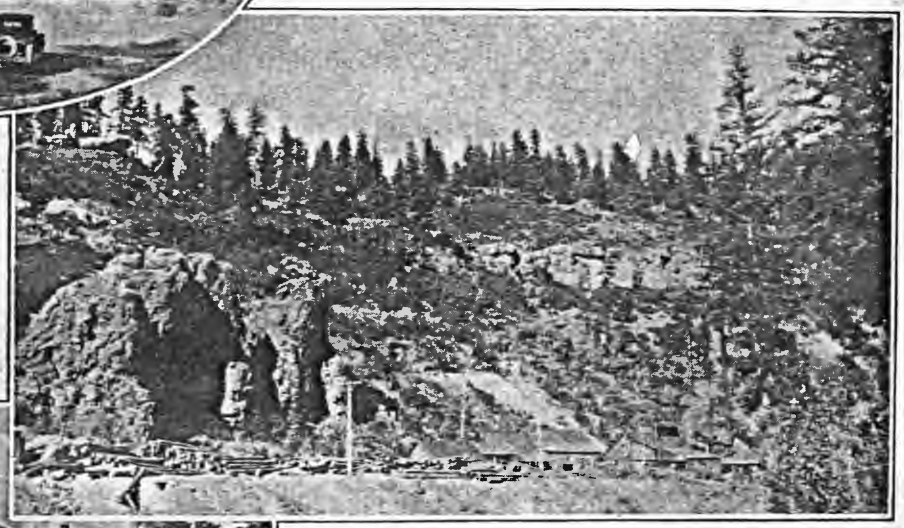
1. Development and equipping of the mine for a 600-ton daily output. Incidental to this are the sinking



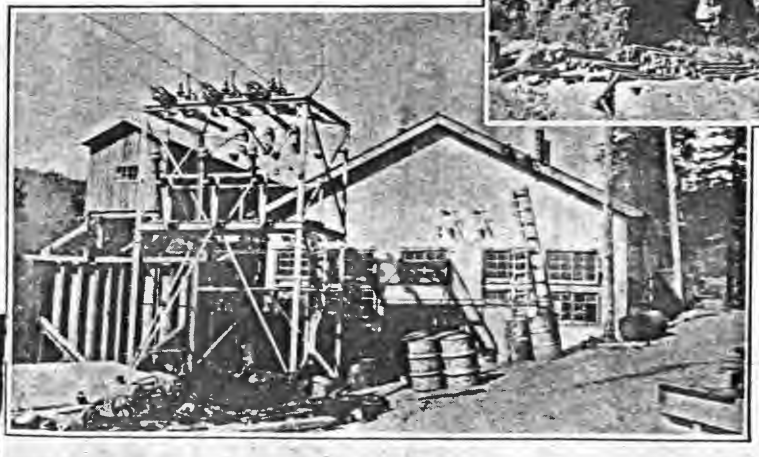
Loading bin and terminal of new 12-mile aërial tramway between Pecos mine and the mill at Alamitos. At the time this view was taken (Oct. 10, 1926) the tramway was about 75 per cent completed

Right—Sinking headframe over the new 375-ft. shaft at Pecos mine. This has since been replaced by a permanent 65-ft. structure

Oval—The seat of management at Pecos mine. At the left is seen the office of Mr. Matson, manager of the operating company



Right—The old steam plant at the Evangeline shaft. The shaft is entered through an adit on the 100 level



Left — Transformer station, hoist and compressor plant, adjoining the tramway loading station, at Pecos mine

(now complete) of a 375-ft. three-compartment shaft, the construction of a 65-ft. headframe to replace the sinking headframe, and the erection of a hoist and compressor plant, shops, and a warehouse at the mine.

2. Erection of a coarse-crushing plant at the mine.

At the north end, the (Evangeline) ore is more nearly vertical. The orebodies occupy a shear zone that is said to be very wide and of considerable though indefinite length. The wall rock most commonly noted in the Evangeline is a diorite; in the Katydid granite more often forms the walls. The ore is a mixture of zinc, lead, and copper sulphides carrying silver and gold. The average tenor of the two deposits has already been given (on page 1004).

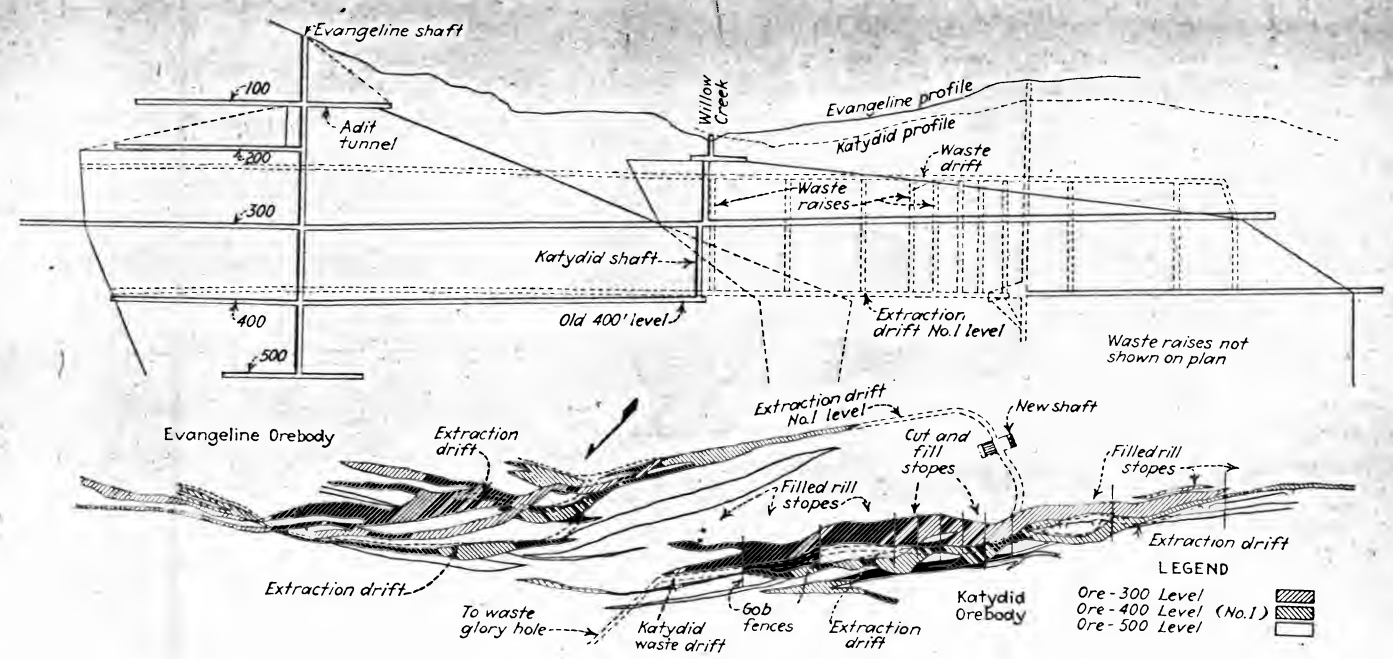


Fig. 2. Above—Sketch showing old and new development work of Pecos mine projected to the same vertical plane. Below—Horizontal projection of the two orebodies of Pecos mine, showing their approximate outlines on three levels as indicated by development work done to date; also the proposed and waste extraction drifts

3. Erection of a 600-ton differential flotation mill at Alamitos.

4. Construction of a 12-mile aërial tramway between mine and mill.

5. Erection of a 3,000-kw. power plant, near the mill, with power transmission lines to mine and pumping plant.

6. Erection of a pumping plant at Valley Ranch, 7,000 ft. from the mill, to supply water for power and milling purposes.

7. Construction of a dam to impound tailings and serve as a reservoir. This dam will contain 40,000 cu.yd. of earth.

8. Construction of camp and bunk houses at both mine and mill, and erection of a dry house at the mine.

A preliminary to the construction program at the mine was the task of widening the 12-mile wagon road that extends up the Pecos Valley between mine and mill so that at all points two cars or teams might pass. This included the catching up and underpinning of seven or eight highway bridges and redecking them. A company embarking on such a task as this, a task involving the creating of two or more communities where no settlement has previously existed, also finds it necessary to do many things not directly connected with the mining operation. One of these in the present instance is that of providing school facilities in co-operation with the county.

Ore Deposits and Geology

Two orebodies closely related to each other in position and ore characteristics and possibly connected below the present level of operations occupy the area to be worked. These are the Evangeline and the Katydid orebodies. The general strike of the deposits is N. 45 deg. E. In the south end (the Katydid) the dip is about 80 deg.

According to Mr. Prescott, the Pecos deposits are situated near the southern end of the main mass of the Pre-Cambrian of New Mexico. This formation is exposed locally only in the canyons of the Pecos River and its tributaries, the rest of the surface being covered by Carboniferous sediments. The ore is found in the Pre-Cambrian and does not extend into the overlying Carboniferous—this because it was on the eroded surface of the Pre-Cambrian that the Carboniferous beds were laid down. Thus the deposits appear to be of great antiquity.

From exposures in near-by canyons Mr. Prescott has formed the opinion that the Pre-Cambrian in the Pecos area is chiefly granite rock. The oldest rock noted seems to be a granite gneiss, not found in the mine, but cut and intruded by a dark fine-grained diorite such as is found underground. Both in turn are intruded by a hornblende granite which completely shattered the diorite; followed closely and cut by dikes and intrusions of the last phase of igneous activity and by acid segregations varying from hornblende porphyry to practically pure quartz.

Deposits in a Shear Zone

The general northeast trend of these intrusions indicates the existence of a line of weakness approximately parallel to the course of the present orebodies at the time of the intrusion. During the close of this period and following it a shear zone was developed along that line, which with the help of metamorphosing solutions altered the igneous rocks into bands of schists of various types. This shear zone, though faulted, Mr. Pres-

cott says, can be traced with reasonable certainty for several miles and is made up of a number of parallel bands striking N. 45 deg. E., each not generally exceeding 20 or 30 ft. in width, but with a total width of perhaps 2,000 ft.

Accompanying and following the development of the schist, the deposition of ore took place along this shear zone from a mineralizer, the character of which gradually changed over the long period of deposition. The earliest minerals deposited were of a high-temperature sort, such as tourmaline, actinolite, and biotite, accompanied by gold and copper, with much quartz and some pyrite. Later the mineralizer carried chiefly zinc, lead, and iron sulphides with comparatively little silica and no silicates. Throughout this period faulting and minor movements continued.

Two Orebodies Originally One?

Except for the N. 45 deg. E. shearing, only the movements later than the first of the mineralization are considered of economic importance by Mr. Prescott. For the most part these strike N. 75 deg. E. to east and west. Their movement is nearly horizontal, the individual movements varying from a few feet to 20 or 30 ft. and sometimes considerably more. As a rule, Mr. Prescott says, these east-west faults were post-mineral and cut and offset the ore. In some cases, though, they antedate the completion of ore deposition and occasionally were formed early in the period of mineralization. It is probable that the zone containing the Evangeline and Katydid orebodies was originally a single plane. After faulting, both segments were reopened along their strike, and a fissure, which represents a continuance of their walls, developed to the southwest beyond the Evangeline and mineralized and to the northeast along the Katydid without further mineralization.

Deposits Apparently Lenticular

The ore seems to occur in lenses along the N. 45 deg. E. fissures, usually in the schist but also in the granite phases, and in the diorite when the schistosity is lacking. Two main bodies, the Evangeline and Katydid, already mentioned, are known and several minor parallel occurrences. The relative position of these is shown in Fig. 2, after a sketch in Mr. A. D. Storke's report on mining methods. The lenses appear to reach their maximum development between the 300 and 400 levels. The lenticularity, however, may be more apparent than real.

Secondary enrichment is a negligible factor in this deposit, in Mr. Prescott's opinion. Although there may be some oxidation near the surface, with subsequent enrichment of sulphides below, he thinks the tonnage of such enriched ore will be unimportant.

Ore Possibilities

In discussing the possibilities of the property Mr. Prescott points out that toward the northeast (see Fig. 2) the Evangeline orebody seems stronger near the face than between that point and the shaft. On no level is there any sign of diminution in intensity of the mineralization in this direction. Likewise, the southwestern end of the Katydid still offers encouragement to development in this direction. As for the dying out of the mineralization at the ends of these two bodies opposite to those just referred to, this signifies little on the assumption that the two formerly constituted a single zone. As for continuance downward, positive proof has already been obtained of a continuation of at least part of the orebody to a depth of 750 ft., and there is nothing to indicate that it does not go below this point.

Outlying areas also offer possibilities. Exposures in neighboring canyons indicate that the shear zone may extend several miles and that it has an average width of possibly 1,000 ft. On the main shear zone of the property itself only a small width has been prospected. Both north and south are found other small prospects, mostly copper in the same formation.

Two Deposits to Be Worked As One

The two deposits are to be worked as a single mine under the proposed plan of development and stoping. The new 375-ft. three-compartment shaft, to be used as the main working shaft for both orebodies, has been sunk in the footwall (200 ft. in) of the Katydid deposit. This shaft is 289 ft. deep from the collar to the old 400 level. It has two 5x5-ft. skip compartments and a third compartment 5x7-ft. Two 70-cu.ft. skips in counterbalance are used, each with a cage beneath it. The 400 level, so called hitherto, is now known as the No. 1 level under the new development program (for the plan is already in operation), and on this No. 1 level is being driven what is to be the main extraction drift. This drift will run the entire length of the known mineralized area of the two deposits, connecting with both the Evangeline shaft (Fig. 2) and the main shaft. Through it and its various branches will be taken out all the ore in both orebodies between this No. 1 level and the surface. All mine work is to be done through the new

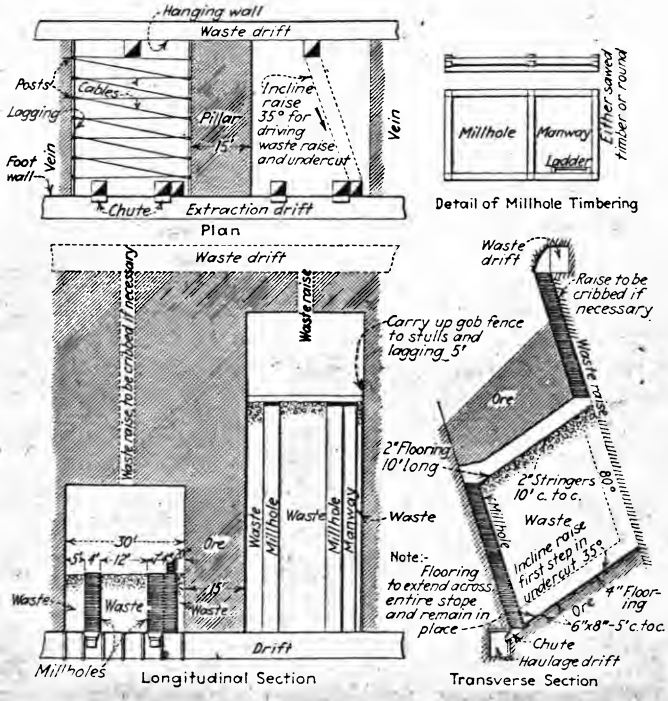


Fig. 3—Sketches showing proposed incline cut-and-fill method of stoping proposed for Pecos mine

shaft save pumping, which will probably be done through the Evangeline shaft.

The mining methods to be used will be described later. They include, briefly, the filled rill, the inclined cut-and-fill, and, in the pillars, the Magma top-slicing methods. To provide the fill a waste drift is being

driven 150 ft. above No. 1 level. It will communicate with a glory hole to be started in the hanging. This waste drift is being driven 6x7 ft. in size, and work is being pushed as rapidly as possible from nine separate faces, which were started from both the new shaft and the old Katydid shaft, as well as from various points on the old 300 level. Besides the waste from the glory hole

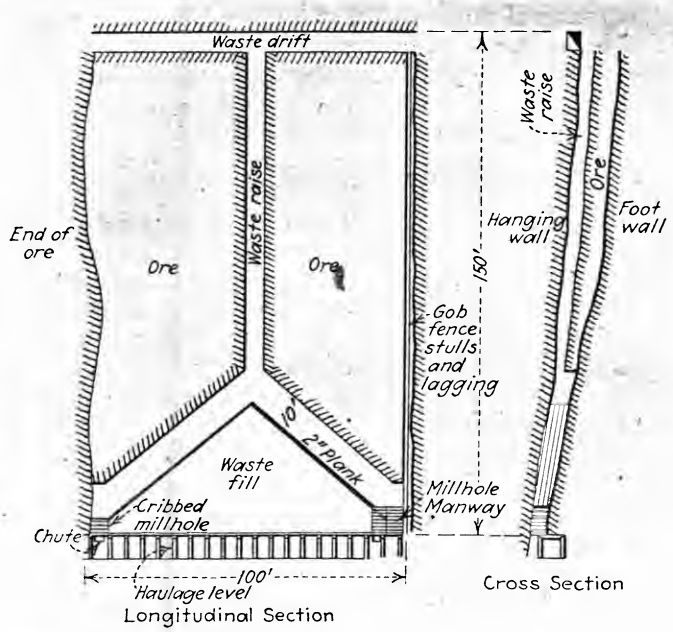


Fig. 4—Longitudinal section and cross-section of a filled rill stope, according to method proposed for Pecos mine

all development waste will be used for filling. It will be hoisted when necessary in cars to the waste level.

Such work as hitherto has been done was conducted from a two-compartment shaft on the Evangeline, already referred to as the Evangeline shaft. This shaft is entered through an adit tunnel on the 100 level. A 200, 300, 400, and 500 level were also opened from it. The shaft is 360 ft. deep to the 500 level, where it is bottomed. Save for two short drifts on this level there are no workings below the 400. Below the 400 level the shaft is under water. No headframe stands over the Evangeline shaft—nothing save a sheave, at the collar over which passes the hoisting rope from a converted steam hoist (operated by a 50-hp. geared motor) located at the adit mouth. The shaft and plant will be kept for emergency purposes.

On the Katydid orebody there is also an old shaft consisting of three separate offset sections, from the surface to the old 200 level, 200 to 300, and 300 to 400. Naturally, no work is done in this shaft. The elevation of the collar is considerably lower than that of the Evangeline shaft, so that from the collar to the 200 level is but a short distance.

Mining Methods Studied

Details of the mining methods proposed are given rather fully in the following paragraphs. It should be borne in mind, however, that practically no stoping has been done as yet and that, owing to the absence of openings on the dip, little is known about the walls save where they have been cut by drifts and crosscuts. It is therefore not at all unlikely that the proposed methods may have to be modified to a varying extent to adapt them to possible conditions that are different from those upon which calculations have been based. In 1920 a careful study of the Pecos deposits was made by Mr. Arthur D. Storke, now manager of the Climax Molybdenum Co., and based on this study a stoping plan was developed which the American Metal Company of New Mexico now proposes tentatively to follow. Figs. 2, 3 and 4 are reproductions from Mr. Storke's report. Likewise the description and discussion of the various methods given are his, though reworded and rearranged in places.

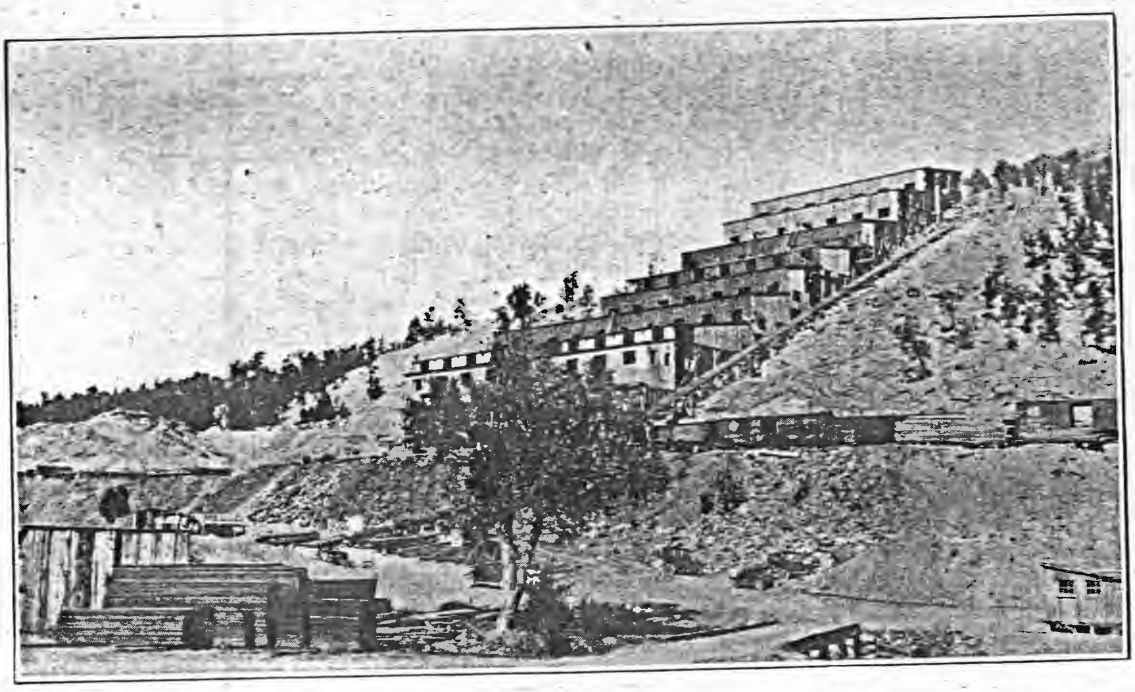
In both orebodies it is known that the ore stands well in drifts without timbers. The ore in the Katydid is firmer and will stand the largest opening without caving. Walls of both orebodies are blocky and are cut with strike faults, which are thought to prohibit shrinkage stoping through the excessive dilution they would cause. Walls of the Evangeline body are much weaker than those of the Katydid, so that greater care will be required in mining the former body. The width of ore that is to be mined varies from 4 ft. to 40 ft., and the irregular outlines as determined by drifts and crosscuts indicate that there will be wide variations in widths of the body in a single stope.

Thus it is apparent that some method must be used that will give secure wall support with as low a cost as is possible with safety, high extraction, and low dilution. Shrinkage stoping, it is thought, would result in high dilution and possible oxidation of sulphides in the stopes, owing to storage. In the wider sections of the veins with weak walls shrinkage stoping would be impossible, as high dilution would certainly result. Square-setting also has been considered, and the method was rejected because its high cost, together with its requirement of skilled timbermen, does not commend its use save where ore and walls are so soft and so heavy that no other known method will apply. Square sets will be necessary in small irregular sections of heavy ground in about 5 per cent of the tonnage to be mined, it is estimated.

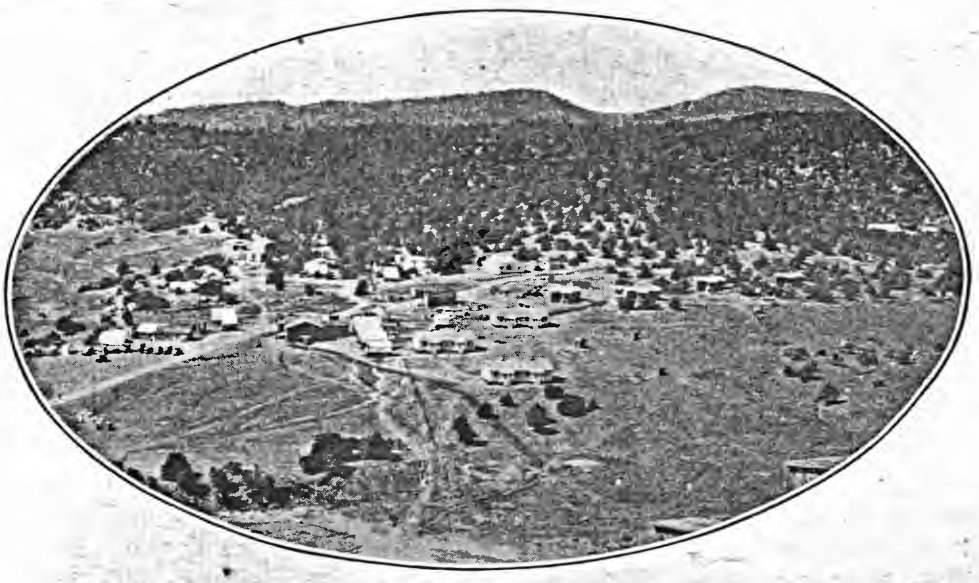
Methods as Proposed

In those parts of the veins where the width is likely to exceed 20 ft. it is proposed to mine the ore by means of incline cut-and-fill stopes positioned with the incline running from hanging to foot across the strike. The method proposed is indicated in Fig. 3 and is described as follows:

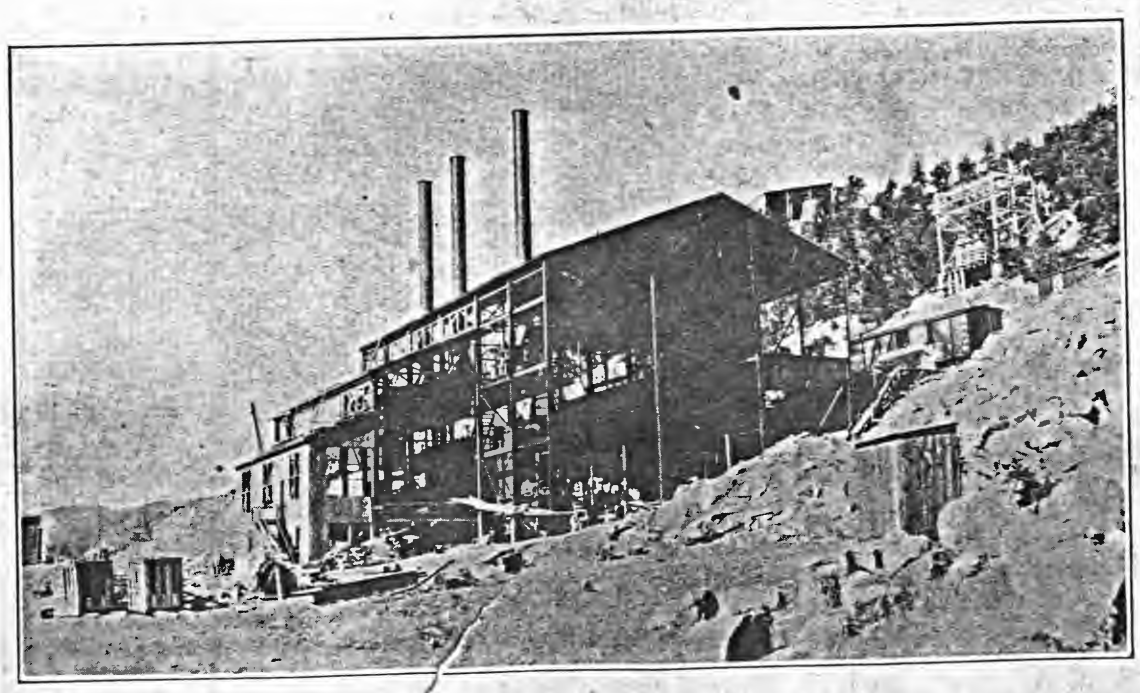
The haulage level is driven in the foot and timbered if necessary. With average ground it will probably be possible to carry a stope 30 ft. long. The stope will be started by cutting out ground for two chutes on 16-ft. centers. After these are built, from one of them a raise will be carried up on a 35-deg. incline to the hanging wall in the center of the stope. From this a waste raise will be carried up on the hanging wall in the ore to the waste level above, this raise to be timbered when necessary. The entire stope floor will then be undercut and a floor of 4-in. plank on 6x8-in. stringers will be laid so that the stope from below can be carried up to the fill. Stoping will then be started by taking two 5-ft. cuts in ore. The third round will then be drilled and left standing. The broken ore will be pulled through the chutes and a layer of waste placed through the waste raise. This waste will be leveled, a floor of 2-in. plank laid, and the round already drilled blasted. This procedure will be continued in cycles, carrying up cribbed mill holes and manways as stoping advances. Gob fences must be built on both ends of the fill, so that the succeeding stopes can be carried up alongside of the one



New 600-ton flotation plant at Alamitos which is to handle the lead-zinc ore from Pecos mine, 12 miles away. On the date when this view was taken (Oct. 11, 1926) the mill was rapidly nearing completion



Oval—The mill camp at Alamitos. This view was taken from a point on one of the benches above the mill



The new 3,000-kw. power plant at Alamitos. The mill building may be seen beyond it above the roof. This plant is provided with the most up-to-date equipment

Building tailing dam across Alamitos Canyon. For this 40,000 cu.yd. of earth has been required. The dam has a core wall of puddled clay

already mined out. These will consist of 10-ft. vertical posts tied into the fill with old cable or round lagging laced with split lagging or slabs.

When the ground is good (as in the Katydid) it will not be necessary to leave pillars, and one cut-and-fill stope can be carried up alongside of one already completed.

Where the ground is heavier (as in the Evangeline) 15-ft. pillars may be left between stopes and these pillars mined by the top-slicing system of stull stoping developed by the Magma Copper Co. The Magma method is described by W. C. Browning and Frederick Snow in *Engineering and Mining Journal-Press* of Jan. 31, 1925. It consists of milling into a footwall raise and timbering with stulls placed against the posts of the gob fences on either side. A segment set is placed at the top of the stope when the back is heavy. After completion the stope is filled and nearly all the stulls are recovered. In the Magma mine, however, long transfer raises to a lower haulage level are used. These will not be used at Pecos. Another difference is that whereas Magma sills out on the extraction level, at Pecos it is thought preferable to sill out above and take out the pillar from below.

Where the vein is 5 to 20 ft. wide, the use of filled rill stopes has been proposed. The essentials of this method are the same as in the cut-and-fill method just described. The stope will be started with a waste raise from level to level, chutes built, and the ore mined in successive cuts, the broken ore pulled between cuts and the open space filled with waste. In starting a filled rill stope it is considered best to cut out the sill the width of the drift and carry it on timbers.

The proposed scheme of mining, it is thought, will get the company into production quickly and will give clean mining, maximum extraction, minimum dilution, and minimum timbering with a cheap grade of timber, and with safety as to loss of ore and injury to men. It does not call for highly skilled mining labor and permits almost total elimination of shoveling.

Mechanical Haulage Underground

Maximum length of underground haul is estimated at 1,200 ft. Mancha 2-ton locomotives with Exide batteries (3.4 tons in all) are to be used. The main haulage drift has a grade of 0.4 per cent in favor of the load. The waste drift will be a little flatter. Forty-cubic-feet rocker dump mine cars of the C. S. Card Iron Works Co. will be used.

Drills used underground on development are I-R N70 drifters and CC 110W stopers, the latter in raises.

At present the waste from development is hoisted up the main shaft and dumped near the top of the old Katydid shaft. The development ore is also dumped near by, and is being hand-sorted in preparation for starting the mill. It is preferred to have the mill start on a poorer grade of ore.

To Flume Creek Over Workings

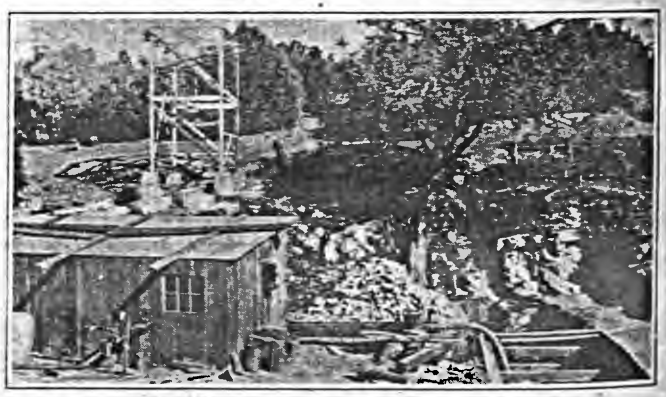
Unwatering of the mine to the old 400 level was completed last summer. At present the pump, an Aldrich triplex, is handling 300 gal. per minute. Considerable water from Willow Creek, a small stream flowing diagonally across the strike (and for a little ways along it) above the Katydid workings to join the Pecos River a short distance below, no doubt finds its way underground. To avoid this, work is under way to dam this creek some distance up its bed above the mine and to flume the water over the workings for a distance of some 2,000 ft. The capacity of this flume is 90 sec.-ft., or three times the average high water in the spring of 1926.

The mine plant is at No. 1 shaft, recently sunk. The new hoist is electrically operated with one rigid and one friction drum, geared to a 150-hp. motor. Rope speed will be 400 ft. per minute, and the rope 1⅛ in. in diameter and of flat-strand make. The hoist will be completely automatic, with oil braking and Lilly control.

Besides the hoist, the engine house at No. 1 shaft contains one Ingersoll-Rand PRE 2 electric-driven compressor, of a capacity of 2,620 cu.ft. of free air per minute at full load; one 600-ft. motor-driven I-R compressor; one 4-cylinder Fairbanks-Morse oil engine, and one 2-cylinder oil engine of the same make, the two having a combined horsepower of 225. These operate generators.

Crusher and Tramway

The ore hoisted will be crushed to ½-in. size before going to the tramway bins. This will be done in an 18x30-in. Allis-Chalmers jaw crusher followed by a Traylor Bulldog gyratory and rolls. The tramway, of Riblet construction, is now practically completed. It is about 12 miles long, having one angle point with a double control station. It will be operated by a 100-hp. motor at a full speed of 500 ft. per minute. Its capacity will be 60 tons per hour, 10-cu.ft. buckets being used with



Excavation for new pump station (at right) at Valley Ranch and transformer station as it appeared in October

a 300-ft. spacing. It contains two spans that are over 4,000 ft. in length. Four hundred buckets will be used on the tramway.

Mill to Start Jan. 1

The mill and power house have been located at Alamitos, 7,000 ft. from Valley Ranch. Tailings disposal would have been difficult at the mine, which is in a narrow section of the Pecos Valley. The ratio of concentration figured on is to be approximately 2½ or 3 into 1, so that in any case some means must be provided for moving a large tonnage to the railroad. Furthermore, the water necessary for power and milling purposes is obtained from Valley Ranch.

In the mill, which is to be of 600 tons' capacity, differential flotation followed by tabling will be employed. The flow sheet accompanying shows the equipment and the present proposed method of using it. It is likely that there will be changes in this flow sheet, possibly even before starting. Already there have been several. Marcy mills will be used for grinding in closed circuit with Dorr rake classifiers. The flotation machines will be of the Mineral Separation Sub A type on both the zinc and lead circuits. The first six cells on the zinc machines will carry spitzes. Oliver filters will be used for drying the concentrates.

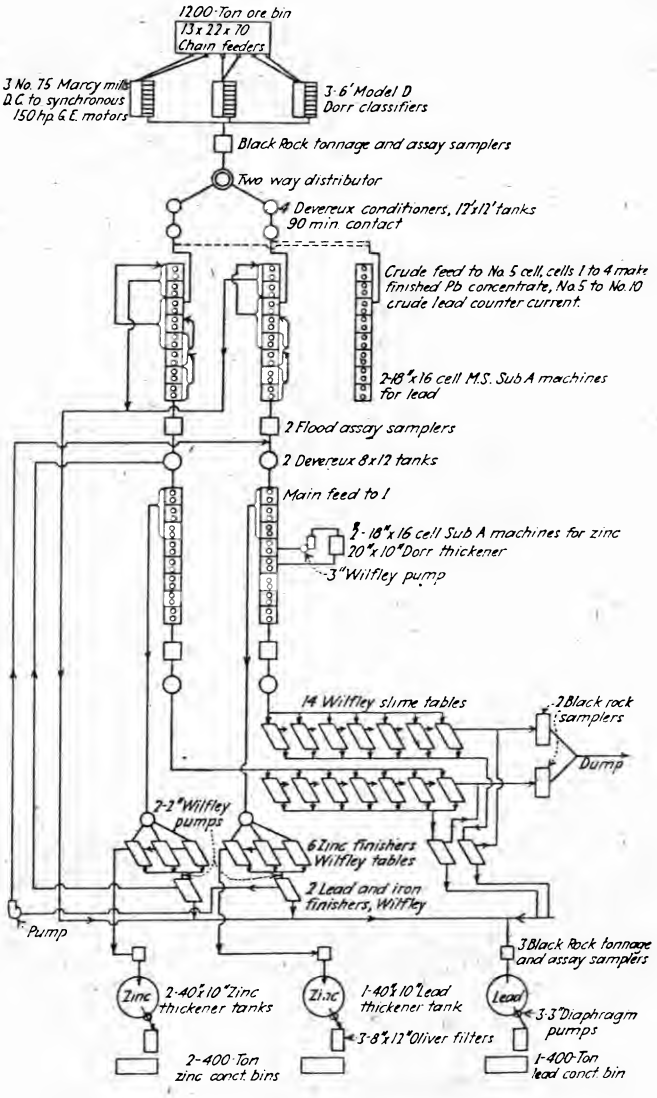
The ratio of concentration, as previously stated, will be low—2½ or 3 into 1. Production of concentrates is expected to amount to about 4,500 tons monthly of zinc concentrates averaging about 52 per cent zinc, 0.8 per cent lead, 2.08 per cent copper, 7 per cent iron, 3.86 oz. silver, and 0.14 oz. gold. An iron concentrate running about 45 per cent iron, 0.6 oz. gold, 2.5-3 oz. silver, and 0.25 per cent copper will probably be made. It has not yet been decided whether the lead concentrates will be cleaned as against copper and iron, producing a higher lead concentrate and a copper concentrate running 17 to 20 per cent copper. This will not be determined until the mill has been running and the most economical procedure established. To what point the concentrates will be shipped has not yet been decided. This may be either Langeloth, Blackwell, or Bartlesville, Okla. An effort is being made to have the plant going by Jan. 1. This, at full capacity, is impossible, but one unit will be running.

The Power Plant

Close to the mill, on a similar side-hill site, is the new 3,000-kw. power plant. Erection and operation of this is under supervision of C. C. Hoke, of the company's Monterey (Nuevo Leon) office. Coal is delivered by the Santa Fe railroad to steel bunkers on the tracks. It is ground in Aero unit pulverizers, each with its own magnetic separator for protection against tramp iron. Dead coal storage is also provided, with magnetic protection and elevators to pick up the coal again.

The boiler layout consists of three 346-hp. Springfield boilers. The horsepower rating is figured on a 10-sq.ft. basis. Foster superheaters are provided to give 200 deg. of superheat at 250 lb. pressure. Preheated air is used in the pulverizers. An American blower furnishes induced draft for each boiler. High-pressure (Kellogg Co.'s) piping is used throughout. The generating equipment consists of two 1,500-kw. G.E. turbines, 80 per cent power factor (or 1,875-kva. machines), 3-phase, 60-cycle, 2,400-volts. Worthington surface condensers are used, and Spray Co.'s cooling equipment and air washers. Hoppe's open feed-water heaters are installed and turbine-driven centrifugal feed pumps (Bethlehem Shipbuilding Corporation). Electrical equipment is General Electric throughout. Names of the makers of the equipment used are given both here and elsewhere, where known, with the idea that in the description of a new plant such information is of interest to the reader.

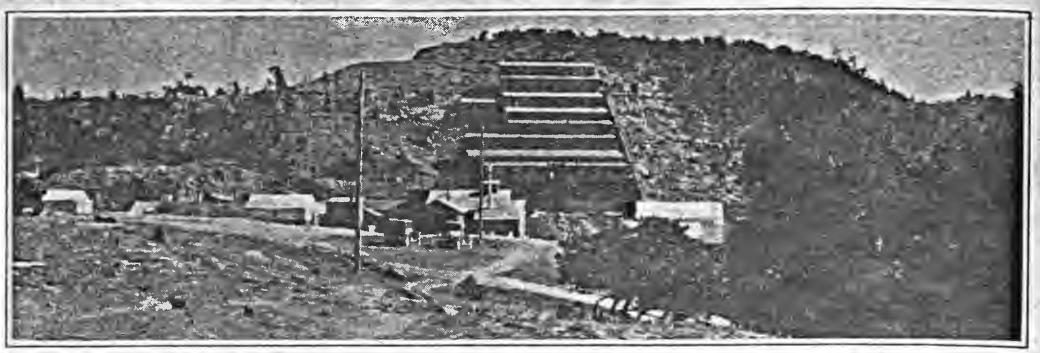
Power is generated at 2,400 volts (nominal), which is stepped up to 22,000 volts for the mine and river pump stations. It is stepped down again to 2,200 volts.



Tentative flow sheet of Pecos mill, that was under consideration in October. A third unit is partially indicated

All motors over 50 hp. at mine and mill are 2,200 volts; all under 50 hp. are 440 volts. All transformer substations are of the outdoor type. That at the power plant is 2,000 kva.; at the mine 1,500 kva.; at tramway 225 kva.; and that at the river pump station is also 225 kva. A power transmission line runs from the power plant to the mine and another to the pumping plant at Valley Ranch.

The power plant is of steel construction on concrete foundations. It is inclosed in corrugated iron except on the side against the switchboard and turbine bay, which is sheathed with lumber to reduce condensation and make this section of the plant warmer. The power



The new Pecos mill, from the camp at Alamitos

plant was designed in the Chrome, N. J., office. Provision has been made for another turbine unit and one more boiler.

Hot water for the mill pulp is taken from the turbine condenser circulating system discharge. It would be desirable to have water at 100 deg. F. for the mill all the year, but it is expected to give the water at 85 to 100 deg. F. Two Allis-Chalmers 400-gal. centrifugal pumps have been installed for this service.

WATER SUPPLY AND DAM

The water supply for mill and power plant is to be pumped from the pumping plant now being built at Valley Ranch on the Pecos River 7,000 ft. away. The installation will consist of two 450-gal. Aldrich triplex pumps working against a 650-ft. head. Each of these will be operated by a 100-hp. motor with a Morse silent-chain drive. Water will be allowed to seep into the sump from the river by infiltration through a gravel and boulder barrier. On a bench outside the mill and about 40 ft. above the ball mill floor two 143,000-gal. tanks have been installed.

A dam is being built across Alamitos Canyon to impound tailings and serve as a reservoir. It will hold 350 acre-feet of water on an 8-ft. freeboard and will back up the water 2,600 ft. Its construction involves the movement of 40,000 cu.yd. of material. It has a 12-ft. core wall of puddled clay. The dam is not in the path of any wave action, but is around a bend. No riprap is used, though it can be added later if found necessary.

Bunkhouse accommodations have been provided for about 200 men. In addition there are some old houses. At the mine five eight-room houses, each room with an outside door and each accommodating two men, have been built at a cost of $125 per man, which the superintendent claims is considerably less than a bunkhouse of the usual type and same capacity would cost. A dry for 100 men has also been erected with showers, lockers, and means for hoisting clothes overhead and locking them so that they cannot be lowered, except by the holders of the keys.

A force of 200 to 275 men will be employed on all operations, the company expects. Of these 200 will be engaged in the mine and the remainder in the mill, power house, tramway, and other departments. It is likely that, barring unforeseen obstacles, the entire project will be functioning early in 1927.

Handling Coal at Port Kembla Docks

AN INTERESTING INSTALLATION of material-handling equipment is that at Kembla, a port in southeastern Australia, where coal is mined and shipped by boat from the southern fields. It was decided to install a belt-conveyor system on a jetty of light construction rather than to erect storage bunkers at the berthing position of the ships and deliver the coal to the vessels by trucks on rails.

At the shore end of the jetty is a feeder bin of thirty-five tons' capacity, into which the coal is dumped from railroad cars. From this bin the coal is discharged through four chutes to a steel flight conveyor running parallel to the track. From the flight conveyor the coal discharges upon the main conveyor belt and is carried out to the ship's side, where it is transferred to another conveyor at right angles and discharged through an adjustable chute into the hatchway of the vessel.

The distance from the flight conveyor to the end of the jetty is 1,400 ft., and to handle this long carry the main conveyor is built in two sections, the coal being passed along from one to the other. These conveyor belts are made of rubber and canvas duck, 36 in. wide, suitably counterweighted to compensate for stretching and to avoid slipping in wet weather.

Two steel travelers, 46 ft. high, provide the means for delivering the coal into the vessels. Running on rails the entire length of the ocean end of the jetty, they may be brought to the most convenient position for loading, and either one may be used separately, or both together.

The flight conveyor is driven by a 30-hp. variable-speed motor, operated by a contactor panel and controller. The shorter section of the main conveyor is driven by a 70-hp. motor and the other by a 100-hp. motor. Each traveler has a 10-hp. traversing motor, a 25-hp. motor to operate the boom, a 10-hp. motor for handling the chute, and a 20-hp. motor for the boom belt. All these motors are of the G.E. slip-ring induction type. The belt motors are under push-button control so interlocked that the boom belt is the first to start, then the ocean end of the conveyor, followed by the shore end of the same and, last, by the flight conveyor.

Electricity is generated in a power house 300 yd. from the jetty. Two Browett & Lindley compound engines are direct-coupled to 300-kw., 2,300-volt, 3-phase generators made by the British Thomson-Houston Co., of England. Babcock water-tube boilers are fed from a reservoir erected in the hills adjoining, and circulation water is taken from the harbor.