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# Organization and development of a Missouri coal mining corporation

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ORGANIZATION AND DEVELOPMENT OF A MISSOURI COAL
MINING CORPORATION

BY

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THESIS

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# ORGANIZATION AND DEVELOPMENT OF A MISSOURI COAL MINING CORPORATION.

## Introduction.

Approximately 2350 acres of land in and around the town of Mosby, Clay County, Missouri, are held under Coal Mining Leases by the Mosby Coal Company, a Missouri Corporation.

These leases were grouped to form a block under which mining operations might proceed in all directions from one principal working shaft.

It is intended to set forth in the following report the factors which influenced the original incorporators of the Mosby Coal Company in leasing and prospecting this land for coal, and to describe, in a general way, the incorporation, financing, development and valuation of the property.

I. Factors Favoring the Location of Mine.

(a) Importance and Advantages of the Location.

Mosby, Mo. is situated about twenty-five miles northeast of Kansas City, Missouri, eight miles northeast of Liberty, five miles west of Excelsior Springs, and four miles north of Missouri City, Missouri.

The K.C.C.C. & St. Joseph Electric Railway traverses the tract under lease in running from Excelsior Springs through Liberty into North Kansas City, Kansas City and St. Joseph, Missouri.

The Chicago, Milwaukee and St. Paul Railroad parallels the Electric Railway through the tract on its course to Kansas City, Missouri.

A permanent rock highway, under construction from Kansas City through Liberty to Excelsior Springs, also passes through the tract under lease offering easy truck transportation to the local towns in the vicinity.

The Lease Block (See Fig.1 ) is situated in the western portion of the Lexington Coal Field, the most important coal field in Missouri, and is also located in that portion of the Lexington Field situated closest, from a transportation standpoint to the Kansas City market.

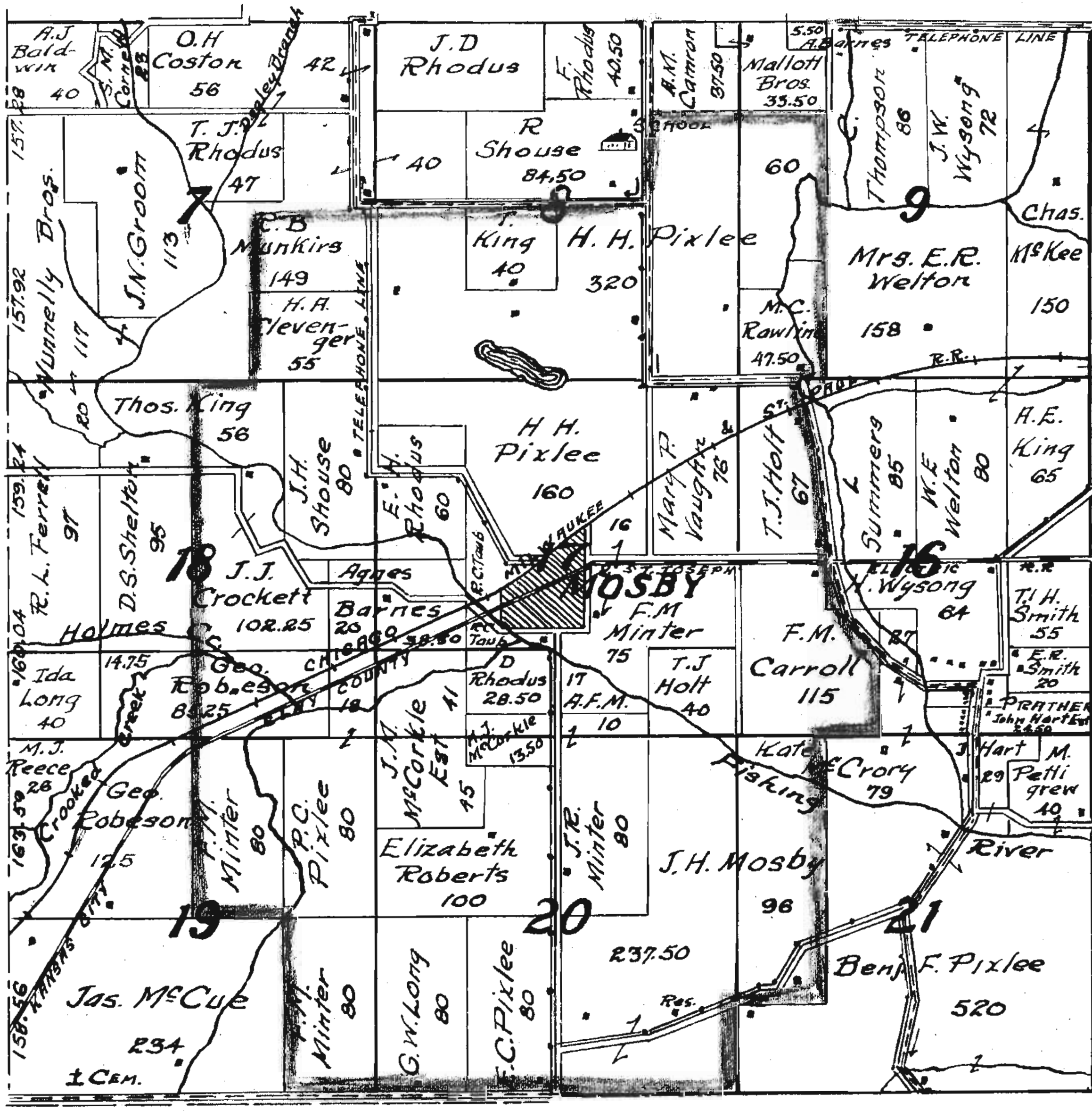
In 1912 the importance of the proximity of the Lexington Coal Field to the large local market was emphasized by the Missouri Bureau of Geology and Mines in its Vol. XI, "The Coal Deposits of Missouri." In this volume the field at Mosby is shown to lie toward the western edge of the commercial portion of the Lexington Coal Field.

Core drill tests made in 1920 between Liberty and Kansas City verified the report of the Missouri Bureau of Geology and Mines and also convinced the incorporators of the Mosby Coal Company of the improbability of competitive mines being developed in the Lexington vein between the Mosby Field and the Kansas City market.

Freight tariffs give a decided advantage to the Mosby field over the mines shipping coal to the Kansas City market from Iowa, Illinois, Northern Missouri, and even the local field at Richmond, Missouri, which has no direct line into Kansas City.

Being the only mining location on the K.C.C.C. & St. Joseph Electric Railway,(which offers a lower rate than does the steam railroads) the Mosby location has a decided advantage in the Excelsior Springs, Liberty, North Kansas City, Kansas City and St. Joseph

PLAT SHOWING HOLDINGS OF THE MOSEBY COAL COMPANY.




PART OF
TOWNSHIP 52 N., RANGE 30 W.
CLAY COUNTY
MISSOURI
SCALE 2" = 1 Mile

Figure I.

markets. Mosby has lower freight rates to its local markets than any competitive mining locality.

(b) Power for the Mine.

A 33,000 volt A.C., 3 phase, 60 cycle transmission line from Kansas City passes directly through the tract at Mosby eliminating the necessity of an expensive steam-electric installation for the mine.

(c) Labor Conditions.

Only once in the history of the Missouri City Mine, (four miles south of Mosby) has that mine suspended operations because of labor troubles or wage disputes. This mine has proved very profitable to its owners.

Miners from other localities have expressed their desire to move to Mosby because of its living advantages, its schools and its proximity to Kansas City. These conditions would insure a better class of labor in sufficient quantities and freedom from interruptions of mining operations due to labor troubles.

The facilities offered by the K.C.C.C.& St. Joseph Electric Railway to employees living in Excelsior Springs or Liberty and the apparent desire of the local citizens of Mosby to co-operate in building new homes would eliminate the expense usually incurred by mining companies in providing homes for employees.

(d) Markets for Product.

A survey of local market demands produced the following information,- Liberty consumes 25,000 tons of coal annually; Excelsior Springs 50,000 tons; the C.M. & St. P.R.R. running through the tract is a large constant user of coal and is served by only one other mine on its right of way in the State; there is a considerable demand for coal in the Mosby locality; the K.C.C.C. & St. Joseph Electric R.R. serves a number of small towns which are on no other Railroad; Kansas City and St. Jpseph present practically an unlimited market for coal; and North Kansas City, the largest industrial development in the West, offers an unusually convenient market for the output of a mine at Mosby.

(e) Geology

Prior to testing the tract at Mosby with Core Drills a study was made of conditions existing at mines in other sections of the Lexington Field for purposes of comparison with conditions existing at the Missouri City Mine, which lays a comparatively short distance south of the Mosby tract.

It was noted that in the greater part of the Richmond District the coal lies in two benches with limestone resting on the coal thus:-

| | Feet | Inches |
|---|---|---|
| Limestone - | 5 | -- |
| Coal, Pyritiferous (top coal) | | 5 |
| Clay | | 2 |
| Coal, clean (bottom coal) | 1 | 6 |

and that frequently the underclay is too thin for convenient pick or machine work, and that by virtue of the absence of "block slate" over the coal, a larger amount of timber props are required and the height of working faces are extremely low in places. Presence of "floaters" or detached lenses of limestone in the roof was also frequently noted.

In the mines of the Lexington field it was learned that two important physical causes contributed to making mining more expensive than where these conditions do not exist:-

1st, A "band slate" laying between the roof and the "block slate" for which a bonus was frequently paid to the miners for handling;

2nd, Presence of "Sulphur Bands" or "Sulphur Balls" in the clay beneath the coal which contributed to a decreased output and increased cost of production.

At Camden, Fleming, Orrick, and Missouri City, the following is an average section -

| | Feet. | Inches. |
|---|---|---|
| Limestone | 7 | -- |
| Shale, black (slate) | | 10 |
| Coal | 1 | 9 |

with sufficient "underclay " beneath the coal to insure easy pick or machine undercutting.

The southern edge of the Mosby tract extends to within a comparatively short distance of the north face of the Missouri City Mine. In the north face of the Missouri Mine it was noted that the vein had increased to 28 inches in thickness with a slight decrease in the thickness of the slate between the coal and the limestone roof rock.

Based upon the investigations in the Richmond and Lexington districts the following advantages apparently would exist in the field north of Missouri City covered by the Mosby Tract:-

1. Absence of "Sulphur Bands" or "Sulphur balls" in the clay under the coal.

2. Saving in timbers and convenience in mining by virtue of the presence of "Block Slate" between the coal and the limestone roof rock.

3. Absence of "parting clay" or "benching" of the coal.

4. Greater thickness of the coal vein.

A hole drilled to test the Lexington vein at Mosby by the Hannibal & St. Joseph R.R. a number of years ago was said to have shown practically the same formation as at Missouri City with the vein of coal being 28 inches in thickness. The test was made, however, with a crude churn drill.

With the foregoing information at hand it was decided to lease the Mosby tract and to prospect the Lexington and Bevier veins with a Diamond Core Drill.

II. Securing Coal Mining Rights.

For reasons readily evident it was decided to secure coal mining rights before testing with a core drill the Lexington and Bevier veins on the tract at Mosby.

The land constituting the block or tract desired was comprised of a number of small and large farms and town lots owned by various individuals.

Various conditions arose which finally resulted in the lease block being limited to a total of 2350 acres, a definite site for the working shaft being secured with option for the incorporators to purchase, and the coal mining rights being secured by the following methods:-

Plan "A" - Outright purchase of the Coal Mining Rights at a set price per acre under a deferred payment plan.

Plan "B" - Leasing with provision for payment of royalties on tonnage produced and sold - under a Prorated Royalty Sharing Basis.

Under the Plan "B", the total acreage in the block being limited to 2350 acres, each landowner shared monthly in the royalty money (at 6¼ cents per ton of coal produced and sold ) in like proportion as the land he has leased is a part of the total acreage in the block.

Under Plan "A" the incorporators secured options to purchase for the Mosby Coal Company the coal mining rights at $40.00 peracre with long time terms of payment. Under this plan the Mosby Coal Company retains the royalty for this acreage on the same basis as the owners of the land do under Plan "B".

By working under both plans the coal mining rights were successfully secured on the entire tract and no landowner in the block is compelled to await actual mining under his land before he begins to receive royalty money for coal under his land.

## III. PROSPECTING.

The coal mining rights having been secured under the plans as shown, a contract was made with the Contract Drilling department of the Sullivan Machinery Company of Chicago, Ill. to make several Diamond Core Drill tests through the Lexington and Bevier Veins on the tract.

These tests tallying so closely in results, the drill record of one test only is shown, it being Test No. 1, located at the site of the main working shaft of the Mosby Coal Company.

Log of Test No. 1.

| From | | To | | Thickness | | Material |
|---|---|---|---|---|---|---|
| Feet, | In. | Feet, | In. | Feet, | In. | |
| 0 | - | 4 | - | 4 | - | Dark soil. |
| 4 | - | 48 | - | 44 | - | Gray soil. |
| 48 | - | 59 | - | 11 | - | Fine Sand. |
| 59 | - | 60 | - | 1 | - | Fine Gravel. |
| 60 | - | 64 | - | 4 | - | Gravel & Boulders |
| 64 | - | 72 | - | 8 | - | Fine Gravel. |
| 72 | - | 77 | - | 5 | - | Fine Sand. |
| 77 | - | 97 | - | 20 | - | Gray Shale. |
| 97 | - | 102 | - | 5 | - | Gray Clay Shale |
| 102 | - | 108 | - | 6 | - | Gray Sandy Shale |
| 108 | - | 113 | - | 5 | - | Gray Clay Shale. |

| From | | To | | Thickness | | Material |
|---|---|---|---|---|---|---|
| 113 | - | 116' | 5" | 3' | 5" | Red Clay Shale. |
| 116 | 5 | 123 | - | 6 | 7 | Gray Shale. |
| 123 | - | 141 | - | 18 | - | Sandy Limestone |
| 141 | - | 150 | - | 9 | - | Gray Shale. |
| 150 | - | 162 | - | 12 | - | Tough Blue Shale. |
| 162 | - | 165 | - | 3 | - | Limestone |
| 165 | - | 174 | - | 9 | - | Lime Shale. |
| 174 | - | 181 | - | 7 | - | Gray Sandy Shale |
| 181 | - | 189 | - | 8 | - | Shaley Limestone |
| 189 | - | 194 | 8 | 5 | 8 | Hard Limestone |
| 194 | 8 | 198 | 2 | 3 | 6 | Shaley Limestone |
| 198 | 2 | 200 | 6 | 2 | 4 | Gray Shale. |
| 200 | 6 | 208 | 10 | 8 | 4 | Dark Shale |
| 208 | 10 | 212 | 8 | 3 | 10 | Blue Limestone |
| 212 | 8 | 213 | 1 | - | 5 | Black Shale(Block Slate) |
| 213 | 1 | 215 | 5 | 2 | 4 | Coal(Lexington) |
| 215 | 5 | 218 | 8 | 3 | 3 | Fire-Clay(under-clay) |
| 218 | 8 | 221 | | 2 | 4 | Lime Shale |
| 221 | - | 235 | - | 14 | - | Gray Shale |
| 235 | - | 235 | 11 | - | 11 | Dark Gray Shale. |
| 235 | 11 | 237 | 4 | 1 | 5 | Sandy Shale |
| 237 | 4 | 240 | 9 | 3 | 5 | Black Shale. |
| 240 | 9 | 240 | 10 | - | 1 | Boney Coal |
| 240 | 10 | 245 | 10 | 5 | - | Shaley Limestone |

| From | | To | | Thickness | | Material |
|---|---|---|---|---|---|---|
| Ft. | In. | Ft. | In. | Ft. | In. | |
| 245 | 10 | 254 | 1 | 8 | 3 | Hard Limestone. |
| 254 | 1 | 255 | 6 | 1 | 5 | Black Shale |
| 255 | 6 | 258 | - | 2 | 6 | Gray Clay Shale. |
| 258 | - | 263 | 8 | 5 | 8 | Sandy Shale |
| 263 | 8 | 266 | - | 2 | 4 | Sandstone |
| 266 | - | 276 | - | 10 | - | Sandy Shale |
| 276 | - | 289 | - | 13 | - | Blue Shale |
| 289 | - | 290 | - | 1 | 6 | Limestone |
| 290 | 6 | 291 | 4 | - | 10 | Coal |
| 291 | 4 | 302 | - | 10 | 8 | Sandstone |
| 302 | - | 318 | 2 | 16 | 2 | Sandy Shale |
| 318 | 2 | 321 | 4 | 3 | 2 | Gray Shale |
| 321 | 4 | 323 | 2 | 1 | 10 | Coal (Bevier) |
| 323 | 2 | 331 | - | 7 | 8 | Sandy Shale |

Note:

$4\frac{1}{2}$" Standpipe Put In -----------81 Feet.

3" Casing Put In ---------------81 Feet 6 inches.

Size of core --------2 inches.

Amount of Coal shown in the test is the amount of coal actually recovered in the core barrel. Great care must be used in coring through coal to avoid grinding up the coal. Practise has shown that better success is had in recovering the core intact when a 2" diamond bit is used than when a smaller bit is used in the Coal. Although the drill runner can readily discern the difference in drilling when the diamond bit strikes the coal and passes through it and can gage the thickness of the coal accordingly, it is desirable to recover the coal core intact in the initial tests, for purposes of examination and analysis.

From the results of the drilling at Mosby it was readily apparent that excellent conditions exist in the Lexington vein for mining, such features being noted as follows:-

(a) Hard Limestone Roof.

(b) Block Slate between the Limestone and the Coal which showed a ready parting from the Limestone and from the coal.

(c) Thick vein of clean coal free from parting clay and of uniform quality from top to bottom.

(d) Thick bed of "underclay" free from grit and sulphur and sufficiently soft to assure easy undercutting with machine or pick.

(e) Hard lime shale beneath the "underclay".

A correlation of beds in the various drill tests also indicated a general uniformity of beds free from folds and any structural conditions other than the normal dip of the region. It was also noted that no water was encountered in the beds below the water containing sand and gravel beds, and that these lower beds lay fairly uniform and compact, no openings, cavities, or water courses being encountered in the lower beds in any of the tests.

An analysis of the coal obtained from the Lexington vein by the Kansas City Testing Laboratory resulted as follows:-

| | |
|---|---|
| Moisture (105 C) | 10.91% |
| Volatile Combustibile | 37.90 |
| Fixed Carbon | 41.30 |
| Ash | 9.89 |
| Total Combustibile | 79.20 |
| Sulphur (S) | 1.99 |
| B.T.U!s. | 11,660 |

The University of Iowa, Department of Chemistry after an examination of the coal from the mine later reported as follows:-

"The sulphur content is fairly low for a western coal and the ash, judging from appearances, seems fairly low in iron, which points to moderate freedom from clogging troubles."

Upon completion of Test No.I the stand pipe which had been set at 81 feet was raised 6 feet permitting the water to raise in the standpipe from the bottom of the sand and gravel beds. Water raised to a point in the standpipe within 16 feet of the surface indicating a static head of 61 feet at the bottom of the water bearing beds which would be penetrated by the shaft.

## IV. INCORPORATION AND FINANCING.

The Mosby Coal Company was incorporated in November, 1921 under the Laws of Missouri (Sec.I-P.662) -1921, beginning business with a capital of $150,000.00 divided as follows:-

(1) 1250 Shares-8% Cumulative Preferred Stock - $100.00 par value. (2) 2500 Shares- Common or No-Par Value Stock.

This stock was subscribed for and marketed by a financial house of Davenport, Iowa. This concern offered at first a 100% bonus of Common Stock with each share of preferred purchased, later reducing the amount of bonus allowed with each share of Preferred Stock.

## V. DEVELOPMENT.

Owing to the conditions as indicated by the drill tests it was decided to secure a crew of shaft men experienced in sinking shafts in sand and gravel. Also it was thought advisable to employ only non-union men in the development work:-

(a) To economize in labor expense.

(b) To avoid strikes and labor difficulties.

An experienced crew of shaft men was secured from a large Michigan mining company, a quantity of native timber (chiefly white oak) was sawed and framed to meet immediate needs for shaft timbering and tipple.

It having been estimated that a flow of water of possibly 500 gallons perminute would be encountered in sinking the shaft the following equipment was secured:- 2-60 H.P. Horizontal Fire Box Type Boilers;

3-No.9, 10-7-13- Horizontal Simplex Cameron Steam Pumps. These pumps were selected as being especially suitable for handling sand and gravel in the water because of the large water valves and ports and the ease with which they can be packed and repaired.

An 8x8-two cylinder Ledgerwood geared steam hoisting engine with a mounted 20 H.P.O.&S. boiler was employed in hoisting.

(a) Size of Shaft.

In view of the fact that considerable difficulty in sinking the shaft to bed-rock was expected that might result in the shaft timbers being thrown out of vertical alignment due to unequal lateral pressure in the sand gravel beds it was decided to start with inside shaft dimensions two feet greater in breadth and one foot greater in length than the inside shaft dimensions desired in the coal vein.

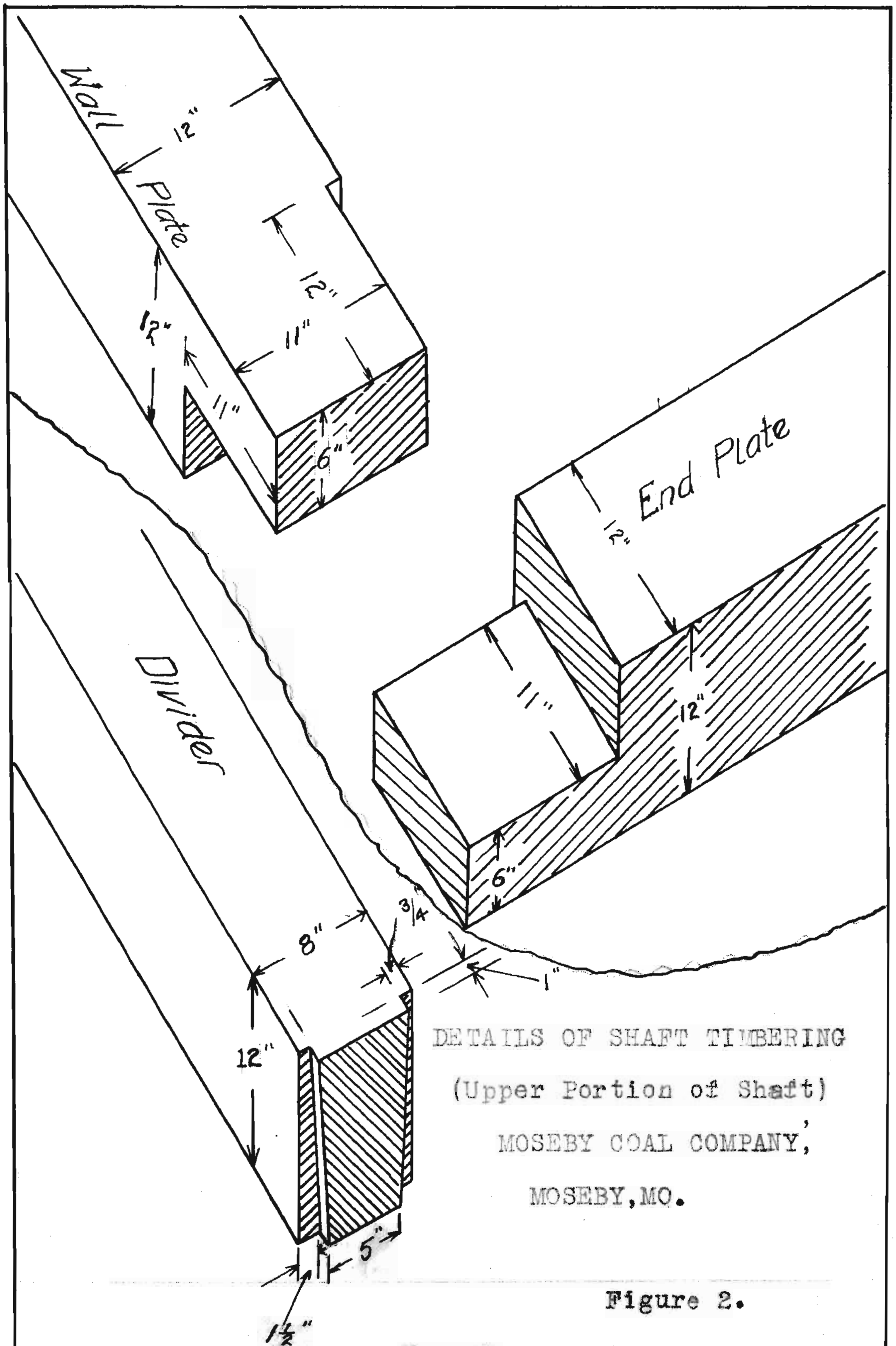
In Figs.2 & 3, is shown the timbering for the shaft 10 x 18 feet inside with which the work was started.

(b) Sinking Shaft to Bed-Rock.

After the surface at the shaft was leveled off two cross bearing pieces of 16" x 20" hewed white oak timbers 24 feet in length were placed at the ends of the shaft 18 feet apart.

The first set was then put in place with the end pieces of 12" x 12" - 12 feet long resting on the bearing pieces.

The first set below the bearing pieces was swung by four straight hanging bolts of 1" round mild steel and the studdles of this set fit into one-half inch




DETAILS OF SHAFT TIMBERING
(Upper Portion of Shaft)
MOSEBY COAL COMPANY,
MOSEBY, MO.

Figure 2.

joggles cut in the bearing pieces. The studdles between these two sets were cut off, on account of the bearing pieces, making the distance between the sets five feet. Subsequent sets to a depth of about forty feet in the shaft had studdles of four foot length.

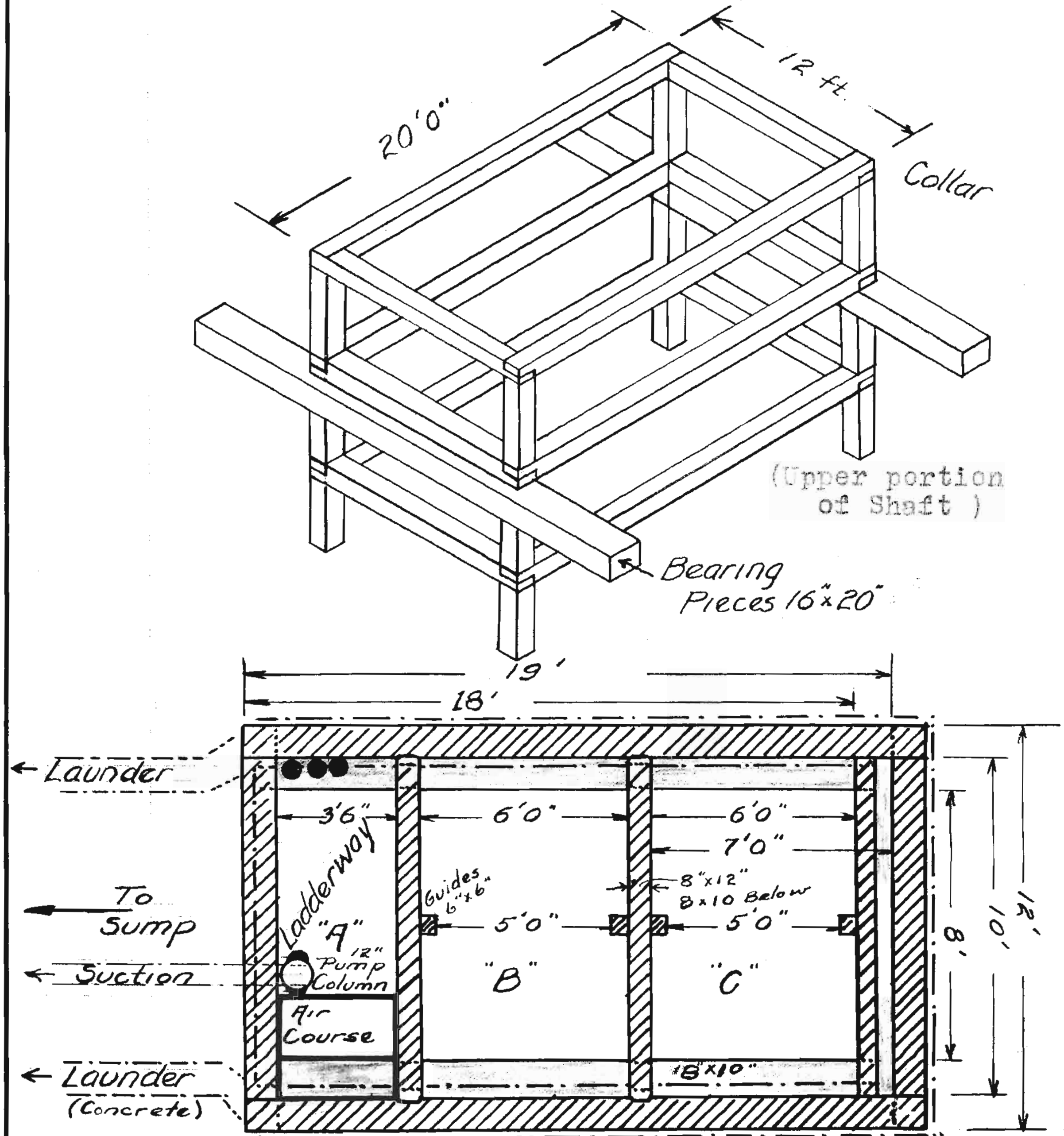
A four post derrick without back-braces was erected with legs standing on the outer ends of the bearing pieces and guyed from the top with four one-half inch steel cables anchored to posts set six feet into the ground, the hoist being set fifty feet away from one end.

It was considered advisable to set not only the hoist but also the boilers and all buildings at least 50 feet away from the shaft because of subsequent settling of the surface as sinking the shaft progressed in the sand and gravel beds.

A gasoline driven pump, having been installed at drill hole No. 1 (near the shaft) supplied water for the boilers until clear water could be obtained from the shaft.

The collar set was next placed above the set resting on the bearing pieces (Fig.3) and diagonally braced to the four legs of the derrick.

As dirt was hoisted from the shaft it was banked around the shaft collar to steady the timber and keep




End & Wall Plates in Lower Portion of Shaft 8"x10"
" " " " " Upper " " " 12"x12"

Note:
Shaft reduced at 113 ft. to cut water into sump.

PLAN OF MINE SHAFT TIMBERING
MOSEBY COAL COMPANY

Figure 3.

Showing Shaft reduced and launders carrying water to sump from shaft at depth 113 feet.

out the surface water.

Ladders with landings every third set were carried down the shaft in Compartment A (See Fig. 3) and the middle compartment which was used for hoisting and the lowering of timbers was boarded up as fast as dividers were placed to avoid bumping or catching of the bucket on the dividers.

Until water was encountered and the pressure on the walls of the shaft became too great the two bottom sets were left open to permit landing of the long timbers.

2" x 2" strips were spiked along the outside of each end plate and each wall plate in the center as a bearing for the 3" plank used for lagging.

Center studdles of 12" x 12" were used between wall plates under the dividers and in hanging subsequent sets, after the first set was hung, hooked hanging rods were used because of the greater convenience.

Sinking progressed at a rapid rate through the first forty feet, no water having been encountered except in a negligible amount to this point. At forty-four feet, however, water broke through boiling up from one corner in the bottom of the shaft and bringing sand up with it. "Spiles" or "laths" of 3" plank sharpened at one end were driven downwards behind the bottom timber set.

The three pumps having been installed (two in compartment C, and one in compartment A, Fig.2.) were put in operation. Steam pipe lines, exhaust pipe lines, and discharge lines were connected to each pump with flexible or swinging connections to prevent breaking of these lines in case breaking rods should permit the sets carrying the pumps to settle. The weight of these lines was carried by clamps bolted to the pipes and fastened to large spikes driven into the wall plates.

A sump, 6'x 12' was then carried down ahead of the main shaft timbering and the water was pumped down to the bottom of this sump and held there until the boiling sand settled and solidified permitting excavation and timbering the shaft walls around the top of the sump in the usual manner. Timber sets formed the walls of the sump, framed in practically the same manner as the regular shaft sets, without, however, the studdles and dividers; and with the bottom set beveled to form a shoe. These sets, fastened together with $\frac{1}{2}$" x 4" strap irons and lag screws, were forced downward into the sand by the use of screw-jacks, one man being stationed with a jack at each of the four corners to keep the sump sets levelled as they were forced downward.

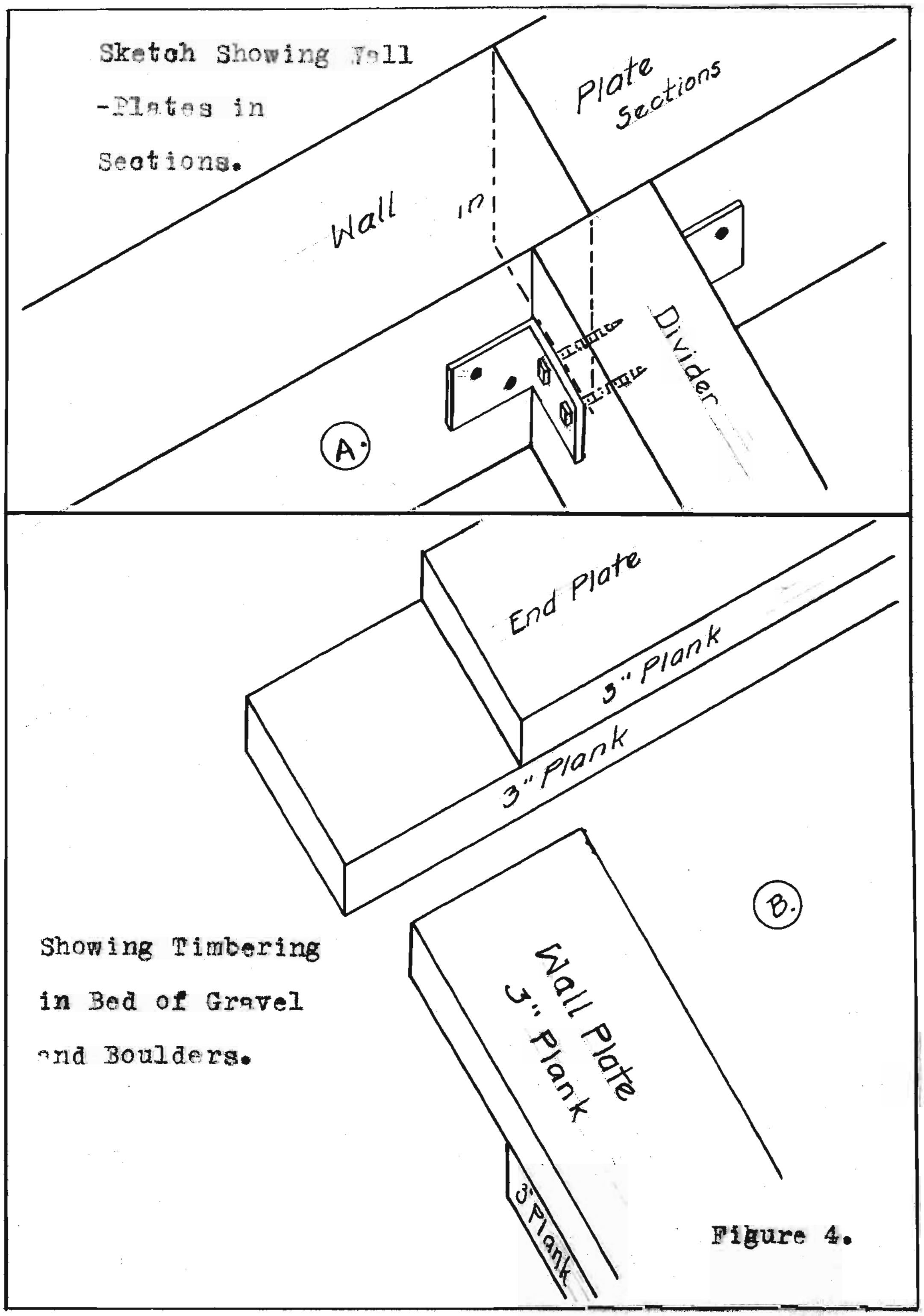
The sand and gravel was excavated from the inside of the sump sets as they were forced downward.

Studdles were omitted in the main shaft timbering from this point until the next set of carriers was placed at bed-rock, each set abutting and being fastened to the set above with ½" x 4" strap irons and 5/8"x 8" lag screws, after being forced back into place with screw jacks.

The pressure being so great through the sand and gravel beds each wall plate was lowered in two pieces with squared ends (See Fig.4), abutting at the center of the divider betwēen Compartments A and B, or between B and C,(Fig.2). These dividers instead of being notched into the wall plates were fastened by means of ½" x 4" angle irons and 5/8" x 7" lag screws, one divider being placed with each set at the point where the wall plate was joined.

When the coarse gravel and boulder beds were reached and the sump sets could not longer be forced downward by the jacks, end pieces and wall plates in sections ( as in Fig. 4.-A) composed of 3" x 12" planks spiked together,(as shown in Fig.4 - B ) were jacked back into place under the bottom shaft sets and the timbering completed in this manner.

A bed of clay being encountered between the bottom




Sketch Showing Wall -Plates in Sections.

Showing Timbering in Bed of Gravel and Boulders.

Figure 4.

of the gravel and boulder, water-bearing, beds and the first rock ledge, the sets were placed three inches apart and "spiles" of sharpened 3" x 4 ft. white oak plank were driven horizontally between the sets into the clay walls thus preventing the gravel from following down behind the shaft timbers.

Short drifts were driven into the clay at the top of the first rock ledge,(depth 98 feet,) and 16 feet cross bearing pieces of 12" x 12" timbers put in place at either end and leveled up.

End plates with "I" hooked hanging rods extending downward through the cross bearers were placed in position on the cross bearers and the timbering completed upward to the set above, straw, wedges and plank being used where necessary behind the lagging to effectively stop the gravel from following down behind the timbers.

Throughout the sinking to this point, the water being drained out of the sand and gravel beds above, and the sand that was pumped out contributed to a constant settling at the surface around the collar of the shaft and of the shaft lining itself. The amount of this settling totalled 28 feet.

This necessitated adding several new collar sets and frequent raising of the derrick as well as a subsequent repairing and re-alignment of a portion of the upper part of the shaft. The water level having been lowered, the work of repairing and re-alignment was accomplished without considerable difficulty.

The rock encountered at 98 feet being of sufficient hardness, three Ingersoll-Rand Jackhammer Drills, (running on compressed air at 85 lb pressure, furnished by a 10x10 Union Compressor) using hollow hexagon drill steel with six point bits, were employed in the drilling.

There were employed in the shaft seven men on each of three shifts, as follows:- One pump man, one shift foreman, and five miners or shaft laborers.

The preparing and using of all explosives was entrusted to the foreman in charge of each shift.

Twenty-six holes were drilled in each round to a vertical depth of five feet. The six center, cut, or sump holes, being loaded with two and a half sticks each of 40% Nitro-glycerine Dynamite, were fired with No. 6 Instantaneous Electric Blasting caps; and the remaining holes loaded with two sticks of 40% Dynamite each were fired with 1st, 2nd, and 4th delay igniters, each shot being timed by cutting the fuse of the delay igniter to the proper length.

(c) Construction of the Sump and Pump Seat.

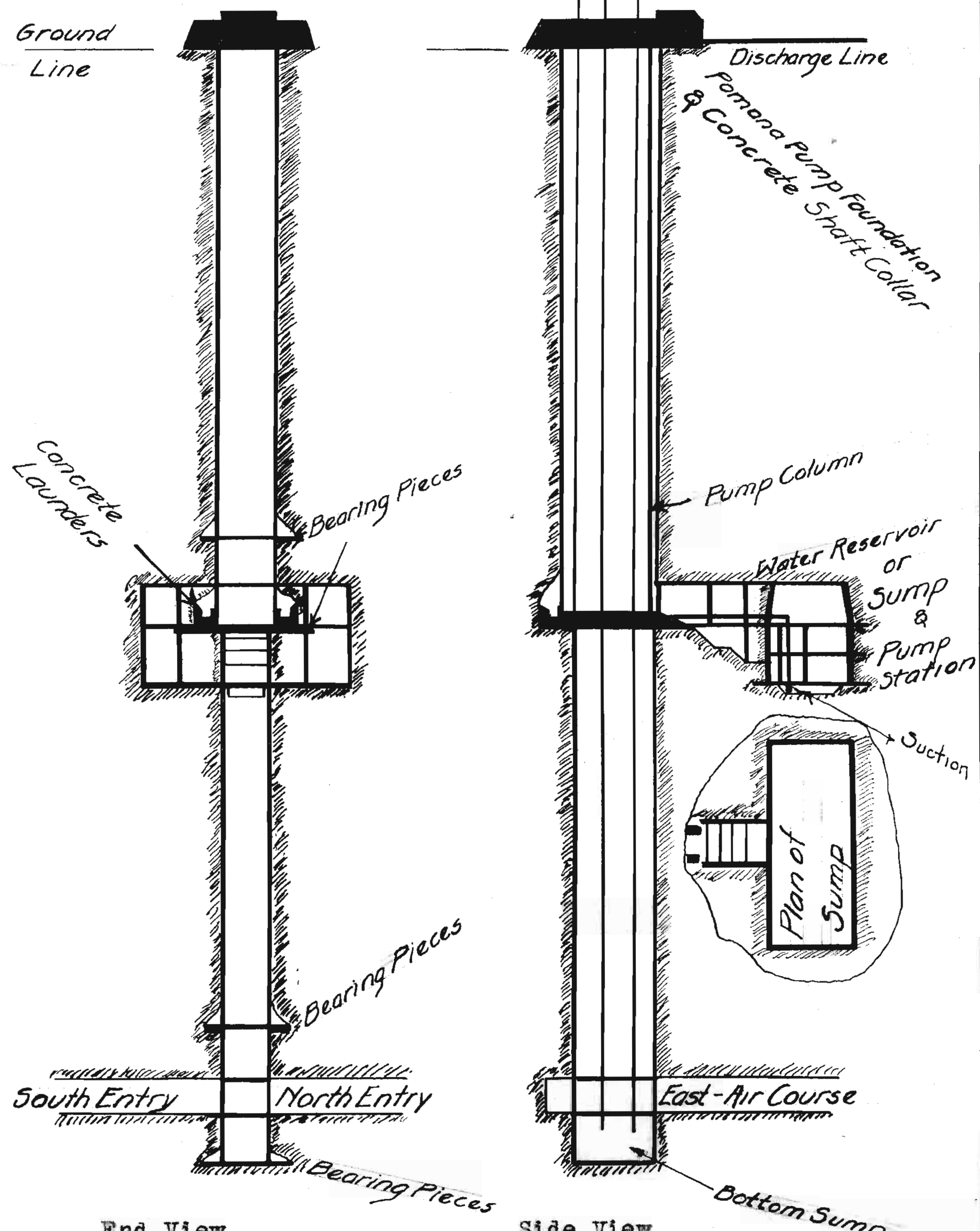
The formations from 97 feet to 108 feet in the shaft offering a compact, solid roof, it was decided to reduce the size of the shaft at a depth of 113 feet and cut the water out of the shaft into a permanent sump, and also, to place the steam pumps in this pump seat.

Accordingly, four bearing pieces, one at either end, and one under each of the center dividers were placed in the same manner as the bearing pieces above were placed. The reduced set of 8" x 10" timbers was placed on the bearing pieces with 1" hooked hanging rods extending downward through the bearing pieces.

A sump was excavated in the center of the shaft in the soft red clay at this point to enable the pumps to hold the water below the bottom of the drift leading out from the end of the shaft to the permanent sump.

A seven foot drift, six feet high, was driven out of the east end of the shaft (See Fig 5.) and a cross-cut forty feet long by fourteen feet wide then driven at right angles to the drift at a distance of twenty-three feet from the shaft.

SHAFT OF MOSEBY COAL COMPANY at MOSEBY, MO.




End View    Side View

Figure 5.

Bearing pieces were set across the floor of the cross-cut in deep hitches in the wall and the cross-cut was timbered with drift sets as shown in Fig.5, and the walls and roof of the cross-cut carefully lagged with 3" plank.

The bottom of the cross-cut being in clay was excavated to a depth of eleven feet by under-hand stoping and carefully timbered and lagged. Very little blasting was required in excavating the bottom of the cross-cut or sump.

The drift, leading out from the shaft to the sump, having been timbered, the sinking buckets used in hoisting the dirt and rock were trammed back and forth to the shaft from the sump on small flat-decked mine trucks, similar to the trucks used in Joplin zinc mines.

The sump and pump station were dry, no water coming through the roof, and the bottom of the sump, being of clay, offered an impervious basin or container for the water from the shaft.

The forms for the concrete launders were then placed on top of the reduced 8" x 10" set and care was taken in pouring the concrete that the water raining down the shaft from above did not wash the cement out of the concrete before it could thoroughly set.

After the concrete had thoroughly set, the three steam pumps were installed in the pump station, one being moved and placed in operation at a time, the other two being used in pumping the water while the change was being effected. By using galvanized roofing and one inch plank, the water raining down the shaft from above was effectively sealed back so as to fall into the concrete launders, whence it flowed back into the permanent sump.

(d) Completion of the Shaft and Underground Development.

The difficulties in shaft sinking due to the large amount of water being overcome, the remaining 100 feet of shaft was sunk to the coal in thirty days, a bottom sump was constructed (as shown in Fig 5) and timbered, and heavy station timber sets placed.

After the water was cut out of the shaft, the 6" x 6" guides were bolted in place and a cross-head placed over the bucket used in sinking.

A main entry 17 feet wide, by 6½ feet high, was driven north and south from the shaft at the same time an eight foot air course was being driven east in the coal from the east side, or air compartment side of the shaft.

In Fig. 6, is shown the method of driving the main entries. It was thought advisable to "brush" the bottom or fire-clay under the coal to secure the requisite height in the main entries in preference to shooting down and breaking a portion of the hard limestone which formed the roof.

Twelve holes were drilled in the fire-clay with Jackhammers (FI G.6) in each round. The fire-clay was then blasted with 40% Nitro-glycerine Dynamite and removed.from under the coal which remained in place. Planks were then laid under the coal and the coal shot down with two holes, one on either side of entry near the top as shown in Fig. 6. Very little dynamite was used in shooting down the coal so as not to shatter it.

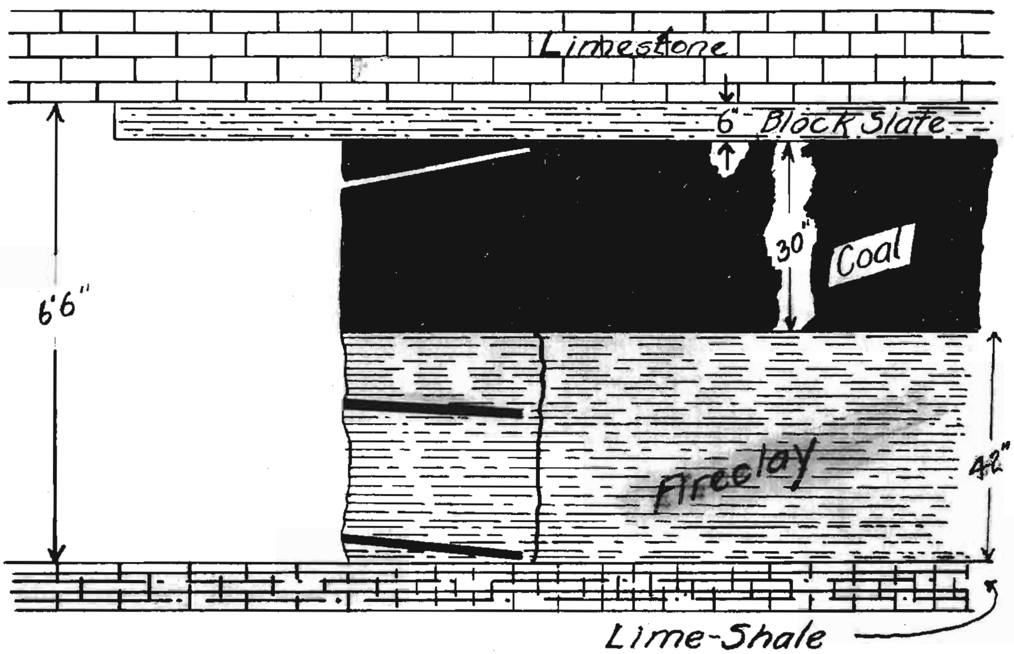
This method of entry driving was found to be the most satisfactory method of driving the main entries.

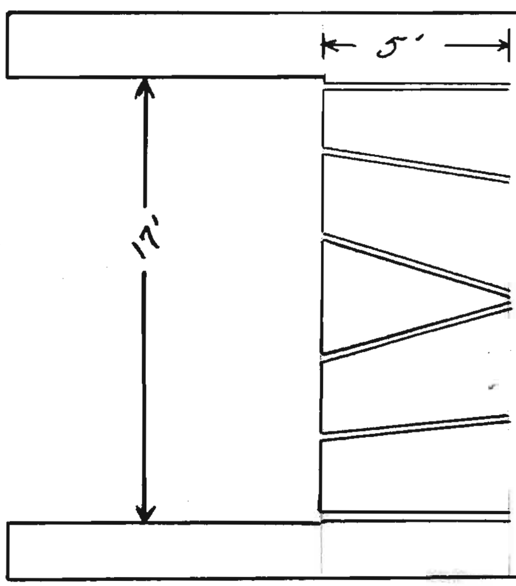
Diamond Crossover Switches were laid at the shaft bottom and roadhead switches employed at each roadhead in preference to flat-sheets.

The main entry runs north and south from the shaft bottom with cross-entries laid out on the Scotch 45 degree system, in such manner that no roadhead or inter-

DRIVING MAIN ENTRIES

MOSEBY COAL COMPANY- Moseby, Mo.




Sketch Showing
Plan of Holes Drilled
in the Underclay.

Figure 6.

section of a haulage entry with the working face can be at a greater distance from the next roadhead than the set maximum distance for the mine.

Because of the conditions encountered in the shaft, a main shaft pillar 350 feet wide by 450 feet long, was left for ample shaft protection. This pillar extends across under the right-of-way of the adjacent railroads and it is the intention of the Coal Company to leave pillars under the railroad tracks as the operation goes forward.

The developed working face opened up by the pillar entry is worked on the longwall plan with a 36 inch gage face track. As each main entry and cross-cut reached the edge of the main shaft-pillar, the pillar entry was turned and driven in both directions from each roadhead.

A traverse line was carried down the shaft by means of plumbing with two wires, an underground survey made and the pillar entry made continuous around the pillar by connecting up the various roadheads.

In driving the pillar entry, hand drilling or boring machines were used in drilling the coal, black powder was used in shooting the coal from the solid, and no clay was removed from underneath the coal. The "block-slate" taken down from above the coal was used in constructing pack-walls along the main entries and in constructing slate props or pillars along the pillar entry.

Coal cars, $6\frac{1}{2}$ feet long with a 36 inch track gage, hoisted to the surface by temporary cages, were used in handling the coal from the pillar entries. It is intended to use self-dumping cages for hoisting the coal, however, when the permanent tipple is erected.

(e) Installation of Permanent Pumping Equipment.

The expense of pumping water being the chief factor in the general overhead expense, whether the mine is producing or idle, it was readily seen that a pumping unit must be installed that would -

1st, Be dependable,

2nd, Require less power than the steam pumps,

3rd, Reduce or eliminate the labor attached to pumping,

4th, Reduce supply and repair expense of pumping,

5th, Be more efficient than steam pumps.

The maximum flow of water encountered in sinking had been gauged at approximately 600 gallons per minute, which flow was later reduced to a guaged flow of 265 gallons per minute.

It seemed desirable to install a pump that would handle the lesser flow efficiently and one which had a range of capacity sufficiently large to handle a maximum amount of water in case of any emergency.

A No.28 Pomona Pump with a 62 inch stoke, and the following specifications, was installed on the foundation as shown in Fig.5:-

1. No. 28 Pomona Double Stroke, Balanced Power Pump Head.
2. Discharge Tee with 8 inch discharge opening, with base to fit the 10 5/8 in.column pipe.
3. Friction clutch drive pulley-60" diameter by 12 inch face.
4. Working barrel (seamless brass), 10 inch inside diameter, 100 " long, 8 inch suction.

   Displacement capacity 21.08 gallons per revolution of pump.
5. Inside (solid) rods $1\frac{1}{2}$" diameter with bronze couplings.
6. Outside (hollow) rods $2\frac{1}{2}$" diameter with forged steel couplings.

Allowing 10% for slippage, 14 strokes per minute proved sufficiently fast to run the pump to handle the water. Twenty-six trokes per minute of the pump would lift 500 gallons per minute against the head of 125 feet.

The bottom of the working barrel containing the two plungers was placed as near to the bottom of the drift leading from the shaft to the sump as convenient in order to minimize the suction head or suction lift from the vertical foot-valve at the bottom of the sump.

Immediately above the working barrel a two inch orifice in the pump column opened into a three inch return line. A 200 pound pressure Balanced Tank Float Valve was placed in this three inch line at the sump with a float connected by a rod in guides to the lever of the valve.

By using this method of automatic control it became unnecessary to have the constant attention of a regular pump man. By running the pump slightly faster than necessary to hold the water and using the Balanced Float Valve in the return line the pump could not "go on air", nor could the water fill the sump and spill over ~~the~~ into the shaft below.

A light 10" x 10" steam engine, with governor, belted to the pump furnished the driving power.

The Pomona Pump has proved entirely satisfactory, practically eliminating all expense but a small portion of the power expense formerly required in pumping the water with steam pumps. Possessing a long stroke, being well balanced, and operating at a slow speed it presents a high degree of efficiency and freedom from the ordinary pumping troubles.

VI. VALUATION OF THE PROPERTY.

The Topping Valuation Company, Certified Public Appraisers and Industrial Engineers, of Kansas City, Missouri, were engaged by the Mosby Coal Company to investigate and prepare an Appraisal and Industrial Report of the mining properties at Mosby.

Following are a few observations made by their engineers in their report:-

"It is our contention, after making our investigation, that the deposits discovered by the Mosby Coal Company are not only far superior in thickness of vein but the conditions found indicate an economy of production greater than any other of the many mines now operating in the "Lexington Field."

"In our opinion, it is beyond any question of doubt in view of the location of this mine and its transportation facilities that its output would be readily absorbed in view of the conditions as above stated, therefore, affording a course of continuous operation during all seasons of the year."

"The proper determination of the Value of coal lands depends on a large number of factors, many of them variable. The character and thickness of the coal beds and the rocks immediately above and below them, their accessibility, their dip, the amount of water that may enter the proposed mine and many other factors must be considered. One of the most important of all considerations is the market-ability of the product as determined by competition with coal from the same and other fields, and likewise, with other fuels. Also the distance to the various centers of consumption, railroad facilities; and still further, and of especial importance, the cost of labor. All these factors enter into the creation of a Value of a coal deposit."

"While these various factors and elements may necessitate extensive study and analysis of conditions as above mentioned, located and under development in virgin territory and in a new field, however, they are readily apparent and easily ascertained when the mine under consideration is located in an already discovered and old established territory. In this particular district, known as the Lexington Field, there are now operating approximately 100 mines, the report of which have been accepted in our analysis in making comparisons with conditions found at the Mosby Coal Company's properties at Moseby, Missouri."

"In the development of a Public Utility or any other Commercial enterprise, there are certain steps which must be taken before the project can be said to have been financially launched. These embrace the preliminary development of the project, and the securing of sufficient capital or funds for the preliminary out-pay and for the actual construction of the Utility or enterprise. All these steps involve the expenditure of money. The proper percent to be set aside or provided, is somewhat fluctuating. However, after taking an analysis of the Appraisals on other Deposits and Operating Mines, that were called by various State Commissions in ascertaining a value of coal properties, we concluded that the following itemized per cent is a justifiable average and have used this in creating our Valuation upon this element.

| | |
|---|---|
| The development of an Enterprise | 2½% |
| The cost of money - | 5 |
| The promoters remuneration | 10 |
| Total - | 17½%" |

The following comment is also noted:-

"In making our investigation and analysis surrounding the various elements which we have previously set forth in this report, we have been surprised at the readily apparent advantageous conditions found at the Moseby Coal Company's mine. its location is ideal, being the closest mine within the Boundaries of Kansas City proper, its geology shows a coal vein in thickness far exceeding any of the now operating mines within the Lexington Field. Its vein is free from "Sulphur Balls" and "Partings" as found in its neighboring mines; the transportation facilities are excellent, and labor conditions are superior to any other district within the State.

"Its Lexington Vein alone contains sufficient coal, that upon our estimate of daily production, this mine will last sixty-five years. The economy with which this mine can be operated and its coal recovered will surpass any mine now operating within the Lexington Field."

In brief the following is the Appraisal of the Topping Co.,Developing, consisting of Lumber, Rails, Piping, Boilers, Machinery, Liability, Insurance, Labor, etc, etc, ---------------------------$115,350.60

Deposit as taken upon this basis of Government allowance of Value on Natural Resources @ 10¢ per ton, unrecovered ------------1,030,175.00

Organizing & Financing (See 17½%) -------- 20,186.35

Grand Total------$1,165,711.85

## CONCLUSION.

The sinking of an air shaft, as required by law will shortly begin, under contract. It has been decided to make this a hoisting shaft also, and to locate this shaft on the rock ledge or bluff overlooking Fishing River bottoms in which the first shaft was sunk in order to avoid the difficulties encountered in sinking through the sand and gravel, water containing beds.

When this shaft is completed a connecting entry will be driven from the two shafts simultaneously in order to expedite the work of securing proper ventilation and to provide an escape shaft as required by law.

Seven percent First Mortgage Gold Bonds of the Mosby Coal Company have just been voted, issued and underwritten by a financial house. The money obtained from the sale of these bonds will be used in the further development and equipment of the properties of the Mosby Coal Company.

A plan is under consideration at present whereby a large Ice Manufacturing Plant may be constructed on the property, utilizing both the water and a portion of the coal from the mine, and loading chutes and a water tank may be erected to serve the needs of the C.M.& St. P. R.R.

While accurate cost data was kept of the various phases and details of the promotion, organization and development of the Mosby Coal Company, no attempt has been made to present any of these figures in this report.

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Acknowledgment is made of information used in the foregoing report secured from the sources as shown above.

# INDEX.