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FLUORSPAR INVESTIGATIONS

PRELIMINARY NOTES ON THE GEOLOGY OF THE ROYAL MINE AREA

LIVINGSTON COUNTY, KENTUCKY

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The Royal mine (known also as the Royal Silver mine or the Old Silver mine) is located on the bank of the Cumberland River, approximately  $2\frac{1}{2}$  miles northeast of Smithland in Livingston County, Ky. The mine is on the Latrobe fault 1/, which branches off the Pittsburg fault (Weller's fault 56) 2/ in the vicinity of the Klondike mine and which has been traced southwestward across Livingston County to the flood plain of the Ohio River.

About 1865 the Royal mine was opened in search of silver that was reputed to be present in the galena associated with the fluor spar. At the time of Norwood's visit in 1874 3/ three shafts had been sunk but only one, reputed to be 175 feet deep, was open (though inaccessible because of water). This "175-foot shaft" is doubtless the Old Royal No. 1 shaft, which was actually 125 feet deep. Recently it has been cleaned out and connected with the 150-foot level from the New Royal shaft. The Old Royal No. 2 shaft was approximately 60 feet deep when it was abandoned because of caving ground. The location of the third shaft mentioned by Norwood is not known. About 1900 the Black shaft was opened but was abandoned at

1/ Norwood, C. J., Report of a reconnaissance in the lead region of Livingston, Crittenden, and Caldwell Counties; Kentucky Geol. Survey Repts. of Progress ser. 2, vol. 1, pp. 464, 471, and map, 1876; Ulrich, E. O., and Smith, W. S. T., The lead, zinc, and fluor spar deposits of western Kentucky: U. S. Geol. Survey Prof. Paper 36, p. 80, pl. 8, 1905; Weller, Stuart, and others, Map of the areal and structural geology (fault pattern) of Livingston County, Ky.: Kentucky Geol. Survey, ser. 6, 1926.

2/ Weller, Stuart, and others, idem.

3/ Norwood, C. J., op. cit., p. 471.

\*/ Accompanied by two illustrations:

Plate 1. Preliminary geologic and topographic map of the Royal mine area, Livingston County, Ky.

2. Geologic maps and sections of the Royal mine.

a depth of about 60 feet. No further work was done in this area until 1916 when Mr. F. B. Moody, Sr., sank the Moody shaft to a depth of 200 feet and drove a crosscut to a fault believed to be fault 3 (see pl. 1). Some fluorspar was found but owing to bad ground, the crosscut was abandoned. The shaft was then sunk to a depth of 300 feet, but no crosscut was driven to the vein. In 1943 Moody and Butler, the present operators, sank the New Royal shaft to a depth of 150 feet, cleaned out the 100- and 125-foot levels from the Old Royal No. 1 shaft, and extended the 100-foot level (see pl. 2). Recently they drove a crosscut southeast from the 150-foot level to fault 2 and drifted both ways. It is estimated that approximately 5,000 tons of fluorspar has been mined from this area.

The sedimentary formations of the Royal mine area are limestones, sandstones and shales of the Meramec and Chester groups of Mississippian age (see accompanying stratigraphic section). These formations are broken by four normal faults, two of which are known to be mineralized.

Generalized section of Mississippian formations in the Royal mine area

	Formation	Character	Thickness (feet)
P	Hardinsburg sandstone	Massive sandstone with some dark shale.	140
O	Golconda formation	Dark-gray shale and limestone.	140
G	Cypress sandstone	Massive sandstone with some dark shale.	80
E	Paint Creek shale	Dark-gray shale.	10-20
S	Bethel sandstone	Massive light-gray sandstone.	50-60
H	Renault formation	Medium to dark-gray limestone, shale, and shaly limestone.	50-60
M E R A M E C G R O U P	Ste. Genevieve limestone		
	Leviias limestone member (Lower Ohara limestone member of some reports)	Light-gray oolitic limestone.	Apparently missing
	Rosiclare sandstone member	Fine-grained shaly calcareous sandstone.	10-20
	Fredonia limestone member	Light-gray oolitic limestone.	200
M	St. Louis limestone	Dark-gray cherty limestone.	350

In the Royal mine area the Latrobe fault (No. 1, pl. 1) strikes N.  $45^{\circ}$ - $55^{\circ}$  E. and has a stratigraphic displacement of about 275 feet. The Fredonia limestone member of the Ste. Genevieve limestone is at the surface on the northwest or footwall side. Hardinsburg sandstone is at the surface on the hanging wall (southeast side of fault 1 through most of the area; but toward the northeast beyond the junction of faults 1 and 3, the Cypress, Paint Creek, and Bethel formations are at the surface in the block between faults 1 and 2.

Fault 2 parallels the main (Latrobe) fault for a distance of at least 800 feet. It has been mapped from the river to a point where it is apparently cut off by fault 3. The stratigraphic displacement along fault 2 is about 120 feet. Rock of the Cypress, Paint Creek, and Bethel sequence are at the surface on the northwest side and the hanging wall block is limestone of the Golconda formation.

Fault 3 trending N.  $80^{\circ}$ - $85^{\circ}$  E. was mapped from the bank of the Cumberland River westward for a distance of 1,000 feet to the point where it joins fault 1. A stratigraphic displacement of approximately 130 feet is indicated by the presence of the Golconda formation on the north or footwall side and outcrops of Hardinsburg sandstone on the hanging wall side of the fault.

The existence of fault 4 is indicated by stratigraphic relations. About 200 feet south of the area mapped, limestone and shale of the Golconda formation occur at an altitude of 390 to 395 feet. This is 60 to 70 feet topographically above the level of the lowest outcrop of the Hardinsburg sandstone in the block south of fault 3, and approximately 600 feet farther south. A fault must therefore be present some place between these two exposures, but its exact location is uncertain. Inferred mainly from topography, the trend of fault 4 is N.  $80^{\circ}$ - $85^{\circ}$  E. This inferred fault has been mapped from the Cumberland River westward for a distance of 2,500 feet to the point where it presumably joins the Latrobe fault. The lowest outcrop of the Hardinsburg is believed to be approximately 30 feet above the base of the formation, which indicates a stratigraphic separation along fault 4 of about 100 feet. Hardinsburg sandstone is at the surface on the north or hanging wall side and the Golconda and Hardinsburg formations occur in the footwall block.