

## MINERALOGY OF BAGE MINE

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The mine lies on the eastern margin of the Lower Carboniferous Limestone under the edge of the Millstone Grit Shales. The limestone varies from a white crinoidal limestone to a hard buff-coloured limestone with discontinuous bands of black chert.

The mine levels are driven entirely in limestone, and on the 190 ft and 238 ft levels they are partly in natural water courses. This is particularly well demonstrated in the northern extension of the 190 ft level. Here, the roof and high parts of the walls are an old phreatic water course, whilst the lower part is a mined level - possibly originally a narrow solution fissure enlarged by the miners. There is also evidence of further solution after the deposition of the vein minerals.

There are two major veins, Butler vein, coursing approximately north-south, and Bage Vein coursing northwest-southeast. Bage Vein is intersected by a number of smaller east-west veins and scrins, and at its northern extremity splits into numerous 20 mm wide scrins, most of which carry galena.

The workings on the 300 ft level, south of the main shaft, are thought to be on Butler Vein. Here, the vein is rich in sphalerite but poor in galena. In places, the vein consists of a loose baryte-shale breccia. Elsewhere, loose black shales possibly derived from the overlying basal shales of the Millstone Grits have dropped into the fissure.

Good vein exposures are rarely encountered in the 190 ft level, and one of the better ones may be seen in the heading of the short level driven to the west of the main shaft from the top of the 14 ft rise. Here, the vein is 110 mm in width, consisting of a thin (1mm) layer of calcite adjacent to the walls, upon which is deposited a 3 mm wide baryte string carrying galena. Overgrown on this, is a 10 mm wide band of light brown sphalerite, followed by a 20 mm wide band of intermixed baryte and fluorite carrying the main galena values. Finally, the central rib is infilled with white calcite, 50 mm in width. This is the only area in the two upper levels of the mine where sphalerite occurs. Elsewhere, it has been completely oxidized and replaced by hemimorphite (zinc silicate).

Calcite is the final mineral to crystallize in the veins, and in generally barren of ore minerals. Solution cavities in the limestone contain scalenohedral crystals of calcite, varying in size up to 300 mm in length.

When sphalerite is present it always pre-dates the main galena deposition. Small scrins (up to 25 mm) are mainly composed of galena adjacent to the walls with a central rib of calcite. Baryte is the main ore-bearing mineral, the vuggy texture permitting the formation of small clusters of white cockscomb crystals associated with small transparent cubic crystals of fluorite.

Hemimorphite occurs in crusts of brown sheaf-like crystal aggregates, forming drusy surfaces in cavities in the baryte. A post-mining formation of selenite (calcium sulphate) commonly forms stellate groups of lustrous transparent crystals up to 30 mm in length, encrusting the sides and roof of the passages - particularly where shale is present, usually in the higher parts of the 190 ft level. Another post-mining mineral is to be found in the 300 ft level, hydrozincite (zinc carbonate hydroxide), an oxidation product of sphalerite, which usually forms pure white crusts in old mine passages, but here it is a pale green colour, possibly caused by impurities from a small amount of copper higher in the vein.

Small spots of green malachite have been noted in the calcite, and are an oxidation product of minor amounts of chalcopyrite.

During initial exploration in 1981 a kibble containing galena was found in a short level high in the stope above the 190 ft level on the north end of Bage Vein. The galena contained small cavities in which were crystals of anglesite (lead sulphate), and one small crystal of phosgenite\* (lead chloro-carbonate). A diligent search in the stope failed to locate the source of the galena, and to date (July 1982) no further anglesite or phosgenite has been found.

\* The name Phosgenite has priority over Cromfordite which was introduced wrongly as a new name when the Bage Mine deposits were found.

Bage Mine is also the locality for another very rare mineral first discovered about 1800 in an air shaft. The mineral was named Matlockite (lead fluoro-chloride) after the area where it was first found, and to this day it is still one of Britain's rarest mineral species.

The date of discovery is a critical point in working out the site of these two rare minerals. The first record was by J. Mawe in 1802, but Bridges and Smith (1983) have noted that "Cromfordite" was "found" by Charles Grenvill in 1785, and they suggest that the miners had found it even earlier. Greg & Lettsom (1858) recorded that Mr. Brice Wright re-located the air shaft in 1851 and found more specimens but unfortunately they do not give sufficient information to locate it today. Grenvill's locality was "Cromford Level". Taking these records at face value, Rieuwerts (1982, pp.311-312) has worked out that a branch of Cromford Sough at c.300 feet depth below Bage Mine collar was driven along Wall Close vein between 1777 and c.1800 reaching its intersection with Butler Vein about 1800, 110 ft below the presently accessible workings on the 190 ft level. As the Bage branch of Cromford Sough was not driven until 1807-1826, it did not exist at the time of Mawe's and Klaproth's records of Cromfordite in 1802-3. Thus the site of the original discovery must have been either in workings on Wall Close vein as yet unentered, or in the old Bage or Butler vein workings nearby.

A full account of the Bage Mine occurrence of Phosgenite and Matlockite has been prepared by Bridges and Smith (1983).

#### REFERENCES

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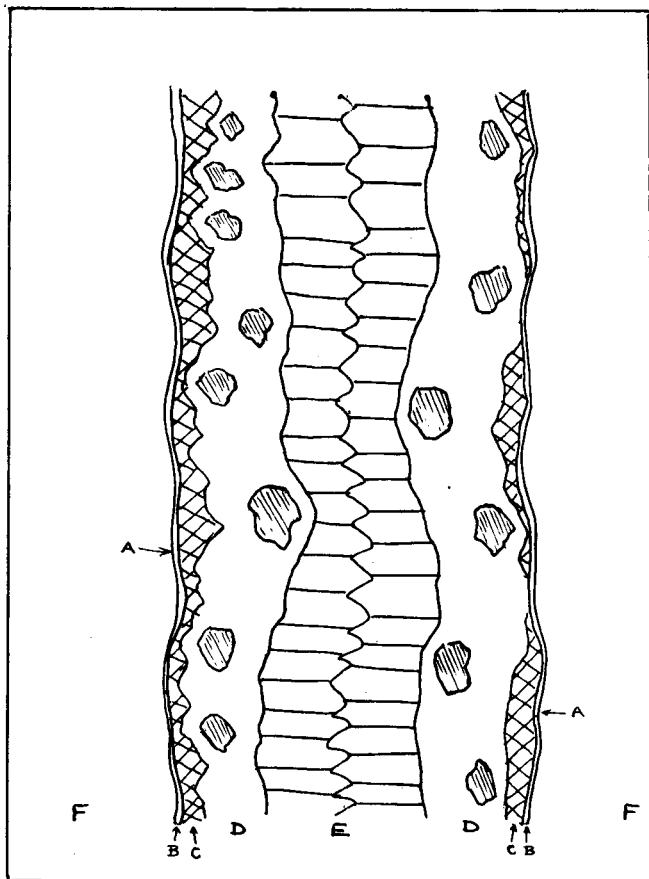


Fig. 1 Vein Section 190ft Level

- A - Calcite (1mm).
- B - Baryte - galena (3mm).
- C - Sphalerite.
- D - Intergrown baryte-fluorite with galena.
- E - Calcite.
- F - Limestone wallrock.