The lamentable loss of life occurring in coal mines from explosions of fire-damp or inflammable air disengaged from the workings, had for many years attracted the attention and sympathy of the public, and had likewise been carefully considered by scientific men. The explosive gas was known to be the light carburetted hydrogen. Two plans alone seemed to present themselves for diminishing the danger:—the one, to remove, or chemically to decompose the fire-damp altogether; the other, to provide a miners' lamp which, by its construction, should be incapable of causing explosion. The former of these modes of protection it was soon seen, could only be palliative; the only efficient form which it took was that of a more effectual ventilation; but the terrific rapidity with which a mine may be suddenly invaded by fire-damp, from channels opened by a single blow of the pickaxe, must prevent it from ever acting as a *cure*. The latter plan had as yet yielded nothing more effectual than the *steel mill* long used by miners, which produced an uncertain and intermitting light, by the rotation of a steel wheel against a flint, the scintillations of which were incapable of inflaming the fire-damp. The insufficiency of the light prevented it from being used, except in circumstances of known danger. The celebrated Baron Humboldt, Dr. Clanny, and several others had invented safety lamps on different principles, but they were all clumsy and more or less ineffectual.

At last, in the summer of 1815, the Rev. Dr. Gray, (afterwards Bishop of Bristol,) then Chairman of a committee appointed by a benevolent association at Bishop Wearmouth for the prevention of colliery accidents, applied to Davy, who was then on a sporting tour in Scotland, requesting his advice and assistance. Sir Humphry answered the call with promptitude. On his southward journey, in the latter part of August, he visited the collieries, ascertained the circumstances of the danger which he had to meet, and was provided by Mr. Buddle with specimens of the inflammable air for examination. Within a fortnight after his return to London, he had ascertained new and important qualities of the substance, and had already four schemes on hand for the prevention of accident. Before the end of October, he had arrived at the following principles of operation in connection with a safety-lamp:—"First. A certain mixture of azote and carbonic acid prevents the explosion of the fire-damp, and this mixture is necessarily formed in the safe-lantern. Secondly. The fire-damp will not explode in tubes or feeders of a certain small diameter. The ingress to, and egress of air from any lantern," he adds, "is through such tubes or feeders; and, therefore, when an explosion is artificially made in the safe-lantern it does not communicate to the external air." The effect of narrow tubes in intercepting the passage of flame is due to the cooling effect of their metallic sides upon the combustible gases of which flame is composed;* and one of his first and most important observations was the fortunate peculiarity that fire-damp, even when mixed with the amount of air most favorable to combustion (1 part of gas to 7 or 8 of air), requires an unusually high temperature to induce combination. Olefiant gas, carbonic oxide, and sulphuretted hydrogen are all inflamed by iron at a red heat, or ignited charcoal, but carburetted hydrogen does not take fire under a perfect white heat. The earliest safety-lamp consisted of a lantern with horn or glass sides, in which a current of air to supply the flame was admitted below by numerous tubes of small diameter

* This prime fact Davy had obtained from a committee of the R. S. which had been appointed to examine the possibility of gas-explosions being caused by the flame running back through the piping into the gasometer.