

vance copies had been provided, was verbally introduced by the author. He said that his object in making the experiments recorded was to determine the relative amount of light obtained from the illuminants used in mines; to state their economic value; to point out certain adjuncts used for increasing their light; and to call attention to defects and dangers which occasionally accompanied their use. Experiments were made to ascertain the light intensity of safety lamps and candles, when compared with a standard candle; safety lamps and candles had also been compared with each other. Comment was made on the misleading compound names given to oils, in some cases adopted to indicate a vegetable extraction, while, in fact, it was a low-flashing mineral oil. The flashing point of petroleum varied considerably; it should not have a lower flashing point than 73 degrees Fahr., but in one sample the flashing point was 75 degrees Fahr., while another sample flashed at 58 degrees Fahr. Under the petroleum Acts, legal regulations with respect to the sale of petroleum required that any mineral oil of a lower flashing point than 80 degrees Fahr. should not be used. In the experiments, two descriptions of candles were used, viz., common tallow and wax composite. Thirteen series of experiments had been made, in most of which the intensity of light given by a standard sperm candle burning 120 grains per hour was compared with the light obtained from various oils and mixtures of oils specified, burnt in well-trimmed Marsaut safety lamps covered with one or more gauzes, and with the same lamps uncovered; also with tallow and composite candles of various numbers to the pound. The measure of the effect of two gauzes upon the full burning of the light when surrounded by a clear lamp-glass was noted, as detrimental to the free ingress of air to feed the flame and to impede the egress of the products of combustion. With only one gauze and a lamp-glass having one-third of its internal surface enamelled white, as a reflector, the measure of increased light in a forward direction was found in some cases to be more than double that given by the same oil and wick in the previous experiment. Comparisons of the standard candle with tallow and wax composite candles of various specified sizes showed that miners' candles ordinarily used gave a greater amount of light than the sperm candle, and generally an equal intensity with the safety lamp. An experiment with the recently-introduced Sussman portable electric lamp showed the intensity of the light to be practically the same as that of the standard sperm candle. A series of experiments with miners' candles showed the rate of burning in grains per hour, and the time occupied in burning one candle, and deductions resulting therefrom. A similar series ascertained the rate of burning of various oils. The concluding tables showed the cost of oil burnt in safety lamps, also of candles per hour and per day. It was remarked that whereas a candle was a self-contained and fully complete illuminant, the total cost of a safety lamp must include renewals, repairs, interest on capital, and cleaning; but where a large number of lamps were used it should not exceed 0.75¢ per day.

Practical suggestions were made as to the several parts of a safety lamp, such as that the wick tube for a flat wick should be corrugated on one side, and be only slightly less in width than the wick to be used in it, and an improved form of pricker for snuffing the wick was recommended. The result of the experiment clearly pointed to the conclusion that the value of an oil for illuminating purposes could best be known by actual photometric experiment. Seed oil when burnt alone had a tendency to form a crust and required frequent snuffing, but when mixed with petroleum they gave good results. The mixture suggested by the Royal Commission on Accidents in Mines was believed to be one of the safest and best illuminants that could be used in safety lamps—viz., a seed or refined colza oil of good quality, mixed with a paraffin oil of a flashing point not less than 80 degrees Fahr., in the proportion of not more than one part by measure to two parts of the vegetable or mineral oil. The object of the addition of the petroleum was two-fold: (1) To reduce the viscosity of the seed or colza oil and to increase its capillarity, and (2) to supply a mixture of hydrocarbon oil that would increase the illuminating power of the flame by rendering it white and clearer burning than when pure vegetable oil was solely used. The price of an oil did not appear to be any guide to its value as an illuminant, either in respect of light or lasting properties. Some of the cheap oils compared favorably in both respects under the same connection with higher priced ones. To obtain good light from a safety lamp, cleanliness and care must be the motto of the lamp cabin, and their full intent and meaning should be strictly enforced.

The dip of Strata met with in deep wells.—Mr. J. Francis in a paper before the last meeting of the British Association, gave the methods and results, hitherto unpublished, or incorrectly stated, of the attempt to determine the dip of strata met with in deep wells at Ware and Turnford. After rejecting various magnetic and mechanical appliances, the following device was hit upon. The boring tools were lowered with extreme precautions to prevent any torsion during the lowering, and by means of steel points connected with them, the direction of a known diameter was marked by vertical chases on the circumference of the core while still *in situ*; during the raising

of the tool no twisting occurred; a wax mould of the top of the core *in situ* was then taken, and again the lowering and raising were done without twisting. The core was then broken and lifted, and by means of the diameter marked on it *in situ*, confirmed by a known line on the wax mould, the direction and the amount of dip was ascertained. To test the method the boring was continued, and after the top of the core had been ground to a flat surface, steel punch marks along a known diameter, maintained by careful lowering and raising with the same precautions, were impressed on the surface, and again the core was broken and lifted. This observation was within a degree of the previous one; so that there is probably only a negligible error, or none, in the observations. The dip of the Silurian rock at Ware at 825 feet below the surface was 1° west of south, at an angle of 41'. Similar experiments at Turnford, carried out with rather less success, gave the dip of the Devonian rocks at 994 feet as 17° west of south at 25° from the horizon. These dips correspond with those of the Secondary rocks off the Wealden axis. The south-easterly dip which has been published for one of these instances is incorrect. Mr. Harmer, in a paper which followed advocated that the survey of deep-seated rocks by borings should be systematically carried out by the Geological Survey, the expense being provided for indirectly by the appreciation of real property, and directly by royalty, whatever success attended the operations.

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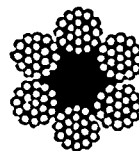
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