the centre, that is, these zones, being made horizontal, are made of segments of c concentric with the centre of the great lens beneath and above them; and, b whole apparatus revolving, nearly the whole of the light is projected horizontal the eight directions of the octagonal prism. Proceeding upon the assumption the whole of the emitted rays from the central lamp may be made to assum horizontal direction, Mr. T. Stevenson has made several most excellent arrangem which, however, we cannot fully describe here. The simplest form is that hemispherical metallic reflector, in the focus of which is placed the lamp; before lamp is a refracting polyzonal lens, of such a section that the whole of the direct from the lamp, and the reflected rays from the posterior reflector, are parallelize their emergence. Carrying this principle to greater refinement, and as it was that the totally reflecting glass prisms were effective compared with metallic r tions as 140 to 87, a hemispherical arrangement of glass is proposed, which, by re tion and total reflection, produces the same result as the metallic hemisphere i former instance. The formulæ for the construction of this ingenious apparatus calculated by Mr. William Swan, F.R.S.E. The glass refracting mirror has advantage over a metallic mirror in its powers of radiation, as in an experiment heat in the interior of the apparatus was so great as to cause the oil to boil: an i venience, however, which was afterwards obviated mechanically. Very num other applications of his principle are also proposed.*

The beautiful holophotal adaptations have been established at several impo localities. The magnificent light at Whalsey Skerries, Shetland, constructe Messrs. Chance, of Birmingham, is perhaps the most powerful apparatus yet i Lundy Island, St. Abbs Head (constructing), the Red Sea, &c., have examples o extending system.

Mr. T. Stevenson has constructed a holophotal arrangement which he call azimuthal condensing light, by which the whole light is used down a narrow cha there are examples at Oronsay and Kyle Akin (1857), west of Scotland. An most ingenious appliance is that at Stornoway, Lewis Island, by which a Beac the dangerous Arnish Rock is made to show an *apparent* light, reflected by a pe apparatus from a light on the Lighthouse on the adjacent point.

As regards the history of the holophotal system, we may refer to Thomas Ro plan (1788), before mentioned. Sir David Brewster also proposed an arrangeme lenses, as a burning instrument, in 1812; and the same for Lighthouses, in Mr. Alex. Gordon, C.E., also constructed a combination of lens and reflector, w economised much of the stray light, in 1847. The carrying this system into full tice, by Mr. T. Stevenson, is as above related.

A first order lenticular apparatus is one of the most beautiful objects in the w It is a combination of elements, nearly 12 feet high and 6 feet in diameter, constru with the utmost skill and refinement, and involving in its structure some of highest principles of applied science.

A *first* order light apparatus, as above said, is 12 feet high and 6 feet in diame and the cost of the lenses alone varies from £1,288 to £1,536; or, with the cost o apparatus, and light-room or lantern, £2,488 to £2,984.

A *second* order of light apparatus is 4 feet 7 inches in diameter; the lens costs £788 to £1,131, or altogether, £1,624 to £2,187.

A *third* order apparatus, diameter 3 feet $3\frac{3}{8}$ inches, costs £378 to £704, or gether, £882 to £1,456.

A *fourth* order, or *harbour* light, is $19\frac{5}{8}$ inches in diameter; costs from £157 to for the lenses, or £329 to £427 complete.

A *fifth* order harbour light, $14\frac{1}{2}$ inches in diameter, costs £103 to £195, or to £349 complete.

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* See "Lighthouse Illumination; being a Description of the Holophotal System," By Thomas Stephenson, F.R.S.E. London, 1859.