OPTICAL PROBLEMS

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PREFACE.

The want which has been felt within the last few years of a systematic collection of Examples, elucidating the various theorems of Geometrical Optics, has induced me to publish the following pages. I have endeavoured, as far as the narrow limits that I had assigned myself allowed, to give each branch of the subject a fair amount of illustration. There is so little scope for originality in this department of Natural Philosophy, that a short treatise presenting, in their most general form, a few problems of each species will be found sufficient in the present state of the science. I have adapted the arrangement as much as possible to the method pursued in Griffin's *Treatise on Geometrical Optics*, and I hope that my collection will be found a useful supplement to it.

Craig by Kilmarnock, April 1850.

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CHAPTER I.

ILLUMINATION.

If a luminous surface (A) illuminates a surface (B), we find the illumination from A at a particular point of B by the method given in Griffin's *Optics* (Appendix, Art. 225), and then the illumination on an element of B at that point. We have now to integrate throughout the extent of B which is illuminated.

If a sphere be described with the point P of the illuminated surface as centre and radius R, and if (a) be the area of this sphere, intersected by a line through P moving round the boundary of A, it is shewn that the illumination at P from $A = \frac{C}{R^2} \times$ area of projection of (a) on the plane of P.

1. A plane surface touches a self-luminous paraboloid of revolution at its vertex, and is then moved parallel to itself along the axis produced; prove that the illumination of the plane at the point where the axis meets it, varies inversely as its distance from the focus.

Let (a) (fig. 1) be the vertex of the paraboloid; AB and AC tangents from A, defining the portion of it from which A receives illumination.

Also let S be the focus, $4a$ the latus rectum, $CN = y$, $aN = x = Aa$ by a property of the parabola.