and living well, but involved in the cares, and burdened with the responsibilities, of great business enterprises — are more liable than other men to break down and die at about these latter ages." The comparison here instituted — between Americans who belong to the classes to which Herbert Spencer's strictures chiefly refer, and other Americans — seems much more likely to lead to a reliable result than a comparison between Americans and Englishmen. F. F.

An attempt to photograph the solar corona.

Judging by the tone of Dr. Huggins's communication in *Science* for May 15, I think he fails to understand a point I particularly emphasized in my communication of April 3; namely, that I was not criticising his work, but merely stating the results of my own investigations. I have not, as yet, had an opportunity to experiment with a reflector; but, when we consider the greater visibility of minute companions of bright stars in refractors as compared with reflectors, it does not seem evident how chromatic aberration and internal reflection from the surfaces of a lens can totally unfit it for work, which, according to Dr. Huggins, is perfectly possible for a reflector. In the mean time, an account of some experiments which I have recently made with my refractor may be of interest.

Dr. Huggins suggests that the dark fringe on the negative, which was obtained around the sun, is largely due to diffraction at the instants of opening and closing my shutter. If this were so, the darkening should extend farthest, and be most marked in the direction parallel to the line of motion of the shutter, and should be almost *nil* in the direction at right angles to this line. A careful inspection of my results shows no such effect, the greatest darkening lying sometimes in one direction, and sometimes in another. I therefore think that this objection, although theoretically sound, is not of practical importance with my apparatus. The real causes which would tend to produce a dark fringe around the sun's image are fourfold, and may be classified as follows: (*a*) the solar corona, (*b*) the atmospheric reflection, (*c*) instrumental defects, (*d*) photographic properties of the plate. In the last class I include chemical reduction of the particles of the silver salt contiguous to reduced particles of metallic silver; also halos produced by insufficient backing, and irregularities in the film itself. At the time of a partial solar eclipse, the effect of the corona alone is removed from around a portion of the sun's limb, the other three causes of the darkening remaining. By photographing the sun when its disk is half hidden behind a high neighboring building, the first two causes alone of the darkening are removed. By pasting a strip of black paper across the middle of the plate in such a position that the sun's image shall fall, half on the paper, and half on the plate, and then, before development, removing the paper, the first three causes alone of the darkening will be removed, leaving the fourth. By these devices the effect of each of these four causes has been sifted out, and the relative importance of each determined.

Dr. Huggins claims that my results are due almost wholly to instrumental defects, and not to atmospheric reflection. In this I think he is mistaken. The dark fringe is in part due to both causes; but, even in the clearest weather, the part due to atmospheric reflection is still prominent. Dr. Huggins says, "When the sky is free from clouds, but white from a strong scattering of the sun's light, the sun is well defined upon a *sensibly uniform*[1] surrounding of air-glare, but without any indication of the corona. It is only when the sky becomes clear and blue in color that coronal appearances present themselves with more or less distinctness." I do not know what to make of this statement; for it certainly runs counter to all that one would naturally expect, to all visual experience, and to all my photographic results. As every one knows, whether the sky is clear or hazy, that portion of it in the immediate vicinity of the sun is considerably brighter than those portions more remote. To test the matter photographically, on a hazy day such as he describes, I took a picture of the sun when it was half hidden behind a high building. If, as he claims, the dark fringe was due solely to instrumental defects, it should be equally well marked all round the semicircular image of the sun. If, on the other hand, it were due solely to atmospheric reflection, the part protected by the chimney should be entirely devoid of halo. On development, a very strong halo surrounded the sun's image, going as far round as the brick wall. Here it abruptly ceased, and was replaced by a barely perceptible darkening along the straight side of the image. This increase of brilliancy on approaching the sun's limb was very marked. This appearance can be verified by any one visually with a piece of colored glass. It therefore appears evident that a great part of the corona-like fringe shown in my photographs is due to causes outside of the instrument, and hence cannot be diminished by changes in the latter. On the photographs taken at the time of the eclipse, the fringe was as strongly marked in front of the moon as on the other side of the sun. It therefore appears that the effect of the corona was imperceptible as compared with the effect of the other sources of light, although the atmospheric conditions were exceptionably favorable. On a clear day the atmospheric reflection is less marked than on a hazy one, but is still always present. I hope soon to repeat the experiment with an instrument closely resembling that of Dr. Huggins, although the advantages of his form of apparatus do not seem very evident to me.

There are one or two points raised in Dr. Huggins's article which should be answered here. As stated in *Science*, April 17, all the plates employed were backed with asphalt varnish. The image of the sun obtained through the violet glass was not reversed, although there is no question but that it would have been, as Dr. Huggins suggests, by a longer exposure. I did not care for a 'different result,' and merely made the statement as one of the facts observed under the conditions named. Dr. Huggins objects to my reference to Dr. Lohse, maintaining that his 'published statement reads differently.' But, in fact, Dr. Lohse only states, that, after overcoming certain difficulties, results were obtained which justify a continuation of the experiments. He does not state that he considers his results coronal, but merely that a continuation of the experiments would be desirable, in which statement I thoroughly agree with him. As I do not feel at liberty to print a private letter, I have written to Dr. Lohse for an exact expression of his views.

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[1] The italics are my own.

A BRONZE MEDALLION PORTRAIT OF DR. ASA GRAY.

We present to our readers on the opposite page a faithful copy of the admirable bronze medallion, by Saint Gaudens, of Professor Asa