while a capillary tube, dipping into a reservoir of mercury, and curved at the end next the tube, dropped the mercury into the tube as it rose above the bend, (after the exhaustion had been carried as far as possible,) by dipping a glass rod into the reservoir. The mercury as it comes into the tube is heated to a temperature sufficient to boil it, and it is desiccated by a bottle of strong sulphuric acid, which is made to communicate with the canal into which the tube to be filled, and the capillary filling tube are luted. Colonel Everest mentioned that the best material for the valves of an air-pump was the swimming bladder of a fish.—(*Proc. Brit. Assoc.*)

Lond. Athenæum.

Report on a Hydrogen Furnace for Vitrification, and other applications of Heat in the Laboratory. By the Rev. W. V. HARCOURT.

At the request of the British Association Mr. Harcourt had undertaken, some years since, to make experiments on vitrification. Dr. Faraday, in his experiments on glass, had the greatest difficulty in procuring perfectly homogeneous masses, arising, in most cases, from the almost impossibility of procuring a regulated heat in the ordinary furnaces. Mr. Harcourt, impressed with the advantages which might be gained for optical purposes, by procuring glasses formed by other salts and bases, instituted some experiments with a view of ascertaining this point. It was considered, that if a tribasic phosphate formed a glass, and the bibasic phosphate formed a glass, we should have, in all probability, glasses having different optical properties. Finding difficulty in proceeding with these experiments, at the heat given by ordinary furnaces, and the risk to which the platina crucibles were exposed, he was induced to try the effects of hydrogen burning in common air. Dr. Dalton was consulted on the construction of the first hydrogen furnaces, and he suggested the difficulty which was found to arise in practice—that hydrogen gas burning, through small orifices, with great pressure, would blow itself out. This difficulty was, however, overcome in the management of the apparatus brought before the Section. This apparatus consisted of an iron tube, in which the gas was generated by the addition of 15 ounces of zinc to three-quarters of a pint of oil of vitriol, and ten pints and a half of water. The gas produced was found to be in ten minutes under a pressure of 21 atmospheres, in sixteen minutes and a half under a pressure of 25 atmospheres, and in eighteen minutes under a pressure of 26 atmospheres. The gas was conducted into another cylinder, and from thence to the jets, over which was suspended a platina crucible. The gas being ignited at these jets, maintained, with the above charge, the platina crucible at a white heat for twenty minutes. Gems had been fused by the heat thus generated. Several kinds of jets were used, as it might be necessary to surround the crucible with heat, or only to apply the heat to the bottom of it. Experiments with this apparatus have been made upon the phosphates of antimony, zinc, barytes, and cadmium: the results have not been, however, quite satisfactory. In some the striæ inter-

ferred with the transparency of the glass formed; and in the case of the monobasic phosphate of zinc, it was found that, to whatever heat the compound may have been exposed, the glass, thus formed, was deliquescent. The reading of this report was accompanied by some experiments with the hydrogen furnace in question, for the purpose of showing the intense heat which could be produced.

Dr. Faraday bore testimony to the advantages of this arrangement. He had found in all his experiments on glass, in which the elements were chemically combined, that crystallization took place. He regarded all common glass as examples of solution, rather than of chemical combination. Borate of lead, and silicate of lead, if fused in small quantities, so that they cooled quickly, were transparent, but if fused in masses, which required a longer time, they were in a crystalline condition.—Mr. Harcourt remarked, that in the monobasic phosphate of zinc, which was transparent when vitrified, the quantity of acid was probably exceedingly small, but this glass was striated.—Dr. Faraday said, that some of the purest specimens of American ice show similar striæ, although it was in a state of exceeding purity, yielding the purest of all water when liquified.—Some remarks were then made by Mr. Pearsall, on the action of hydrogen on platina. An experiment was named by Mr. Harcourt, in which a platina tube was destroyed by an attempt to fuse ultra-marine in it.—Prof. Liebig stated, that platina was soon fused if exposed to a charcoal fire, from the action of the silicon contained in the charcoal.—(*Ib.*)

Ibid.

Contributions to Actino-Chemistry.—On the Amphitype, a new Photographic Process. By Sir J. HERSCHELL.

At the end of my paper "On the Action of the Solar Spectrum on Vegetable Colors," communicated to the Royal Society, in 1842, a process is alluded to (in Art. 230,) by which positive pictures are obtained, having a perfect resemblance to impressions of engravings taken with common printers' ink. I had hoped speedily to have perfected this process so far as to have reduced it to a definite statement of manipulations, which would insure success. But, capricious as photographic processes notoriously are, this has proved so beyond even the ordinary measure of such caprice; and, having of late been able to give little or no time to this pursuit, I have thought it preferable to describe the process in a general way, and in a form in which I have found it frequently, and sometimes eminently successful; not so much for the sake of its results, which yet are not wanting in interest, or beauty, as for the curious and very complicated photographic habitudes of iron, mercury, and lead, which are concerned in their production,—rather, in short, as a contribution to the newly created science of *actino-chemistry*; than to the photographic art. Paper proper for producing an amphitype picture may be prepared either with the ferro-tartrate, or the ferro-citrate, of the protoxide, or the peroxide, of mercury, or of the protoxide of lead, by using creams of