the rays from copper at 390° and from incandescent platinum are compared by transmission through a rock-salt prism, as the temperature rises the refrangibility of the calorific emanations correspondingly increases. Those philosophers who regard light and heat as the same agent, will therefore see in this coincidence another argument in favor of their opinion.

In view of the foregoing facts I conclude, that, *as the temperature of an incandescent body rises, it emits rays of light of an increasing refrangibility*; and that the apparent departure from this law, discovered by an accurate prismatic analysis, is due to the special action of the eye in performing the function of vision.

As the luminous effects are undoubtedly owing to a vibratory movement executed by the molecules of the platinum, it seems from the foregoing considerations to follow, that the frequency of those vibrations increases with the temperature.

In this observation I am led by the principle, that "to a particular color there ever belongs a particular wave-length, and to a particular wave-length there ever belongs a particular color;" but, in the analysis of the spectrum made by Sir D. Brewster by the aid of absorptive media, this principle is indirectly controverted; that eminent philosopher showing that red, yellow, blue, and consequently white light, exist in every part of the spectrum. This must necessarily take place when a prism which has a refracting face of considerable magnitude is used; for it is obvious that a ray falling near the edge, and one falling near the back, after dispersion, will paint their several spectra on the screen; the colors of the one not coinciding with, but overlapping, the colors of the other. In such a spectrum there must undoubtedly be a general commixture of the rays; but may we not fairly inquire whether, if an elementary prism were used, the same facts would hold good? or, if the anterior face of the prism were covered by a screen, so as to expose a narrow fissure parallel to the axis of the instrument, would there be found in the spectrum it gave every color in every part, as in Sir David Brewster's original experiment? M. Melloni has shown how this very consideration complicates the phenomena of radiant heat; and it would seem a very plausible suggestion that the effect here pointed out must occur in an analogous manner for the phenomena of light.

(To be continued.)

Apparatus for the Fusion of Iridium or Rhodium, or masses of Platinum less than five ounces in weight. By Professor ROBERT HARE, M. D.

An account of the apparatus for the fusion of platinum on a large scale was recently published in this Journal. On the republication of that account in Silliman's American Journal of Science, it occurred to the author to give an account of some smaller apparatus which it is proper to employ for fusing small masses, whether of platinum, of iridium, or rhodium. This addition is now subjoined.

For the fusion of either iridium or rhodium or masses of platinum

not exceeding the weight of half an ounce, an instrument with three jets has been employed, the bore of each jet pipe being such as not to admit a wire larger than the $\frac{1}{32}$ of an inch in diameter. The flame produced by these means was quite sufficient to envelope the mass to which it was applied.

In fusing any lumps or congeries of platinum, not exceeding five ounces, an instrument has been used capable of giving seven jets of gas, issuing, of course, from as many pipes. Of these pipes, six protrude through the brass casting forming the bottom of the copper case constituting the refrigerator, so as to be equi-distant from each other upon a circumference of three-fourths of an inch in diameter, the seventh protruding from the centre. The bores of these jets are such as not to admit a wire larger than $\frac{1}{32}$ of an inch in thickness. Those of the larger instruments, represented by the accompanying engravings, (See page 196, vol. 13, March, 1847,) were such as to admit wires of $\frac{1}{32}$ th of an inch in thickness.

The jet pipes may be made by the following process:—A thin strip of sheet metal, somewhat wider than the length of the circumference required in the proposed pipe, after being roughly turned about a wire so as to form an imperfect tube, is drawn through several suitable holes in a steel plate, as in the wire-drawer's process. Under this treatment the strip becomes converted into a hollow wire; the edges of the strip being brought into contact reciprocally, so as to leave only an almost imperceptible crevice. Having drawn one strip of platina in this way, another strip sufficiently wide nearly to enclose it, is to be drawn over that first drawn; care being taken to have the crevices left at the meeting of the edges on contrary sides. The compound hollow wire or tube thus fabricated, is finally to be drawn upon a steel wire of the diameter of the requisite bore.

The following method of making jet pipes, though more difficult, is preferable; as there is less liability of the water of the refrigerator leaking into the bore:

Select a very sound and malleable cylinder of platinum, of about three-eighths of an inch in thickness, perforate it by drilling in a lathe, so that the perforation may be concentric with the axis. A drill between $\frac{1}{16}$ th and $\frac{1}{8}$ th of an inch in diameter may be employed. In the next place the cylinder may be elongated by the wire-drawing process, until the proper reduction of metallic thickness is effected, the diameter of the bore being prevented from undergoing an undue diminution, by the timely introduction of a steel wire.

Of course, the metal must be annealed, as often as it hardens, by drawing. For this purpose, a much higher temperature is necessary in the case of platinum, than in that of either copper, silver, or gold.

The annealing is best performed by the hydro-oxygen flame. If charcoal be used, the greatest care must be taken to have the fireplace clean.

Agreeably to a trial made last spring, palladium may be used as a solder for platinum; and as it is nearly as difficult to fuse as this metal, it is of course, for that purpose, preferable to gold where great heat is to be resisted. No doubt, by employing palladium to solder the ex-

terior juncture of the double drawn tubes above mentioned, they might answer as well nearly as when constructed of solid platinum.

This idea has been since verified by a successful trial; and, moreover, silver has been found to answer as solder for the portions of the tubes protected by being within the cavity filled with water. The exterior or protruding portions of the tubes, may be left unsoldered.

Vulcanized India Rubber Springs.

At the meeting of the Society of Arts, on the 14th inst., a paper was read "On Fuller and De Bergue's Vulcanized India Rubber Springs for Buffers, &c." The application of caoutchouc, or India rubber, to railway purposes, has of late years occupied, more or less, the attention of scientific men. Possessing, as this material does in a very high degree, the properties of flexibility and elasticity united with great tenacity and power of resistance under heavy pressure, its adaptation to various important and valuable purposes in mechanics was too obvious to have escaped notice; yet its liability to become hard and rigid when exposed to severe cold, and on the other hand soft and clammy under the influence of heat, were serious drawbacks to its extensive application; and it was not until very recently that the method of preparing it, by a patented process termed "vulcanizing," has imparted a value and importance to this simple material which is likely to lead to its much more extensive adoption in this and other departments than has hitherto been known. The process referred to, (and which is now pretty generally understood,) consists principally in the admixture of sulphur and some other ingredients at a high temperature, (see Hancock's patent, granted in November, 1843,) by which perfect elasticity is obtained, and non-liability to be affected by any heat or cold of climate. The present invention, for which a patent was granted in October, 1845, is for the application of the material above described for the purpose of buffer and other springs of railway carriages, according to various modes therein specified, and of which we shall now proceed to furnish a description. Instead of the steel springs, as at present, the patentees use a succession of rings or discs of India rubber of various diameters, from 4 in. to 6 in., according to the position and strength required, and from 1 in. to 2 in. in thickness. These are placed on the buffer-rod, (which passes through the centre,) and are separated by thin iron plates; each plate is provided with a conical collar, which serves to keep the India rubber firmly in its place, and at the same time admits of free expansion and contraction without coming into contact with the rod.

The advantages attending the use of this material over steel are numerous and striking. In the first place, their weight being scarcely a tenth part of that of steel, they may be placed in any part of the carriage, whilst the saving of weight in a long train (amounting to several tons) will, to some extent, economise the locomotive powers. Next we have their extreme simplicity, and the impossibility of their being damaged or broken, even in a collision. An opportunity occur-