during which the fire raged. It was visible from points near the fire—a few hundred yards—but was more striking from points a quarter to a half a mile away, from which the flames themselves could not be seen. It seemed to vary with some atmospheric condition (more or fewer snow crystals in the air?) as it might be dim when the diffuse reflection of fire-light from the low-lying clouds would be brightest, and might be sharp and bright during a lull in the flames. It was, however, often most striking when the conflagration was at its height.

It was not due to shadow of the still-standing walls—the light coming from the burning interior—for it was first noticed when the roof had just caught fire and most of the light came from the burning shingles—a case where no wall shadow was possible. Further, the beam was sensibly parallel-sided. A wall-shadow would have given a broadly diverging beam. The explanation offered is that of reflection from falling flat snow crystals, which, of course, were not over the burning building but were distributed in the atmosphere between the observer and the source of light.

The official record at the Queen's University station of the Canadian Meteorological Service, taken just before the fire broke out and less than a mile from Sydenham Hospital, gave "Temperature 12° Fht., Wind N.E. 20 miles per hour, Light Snow." In fact, the snow-fall was so light that the record of precipitation over the twelve hours, including the time of the observations on the beam, was only 0.03 inch.

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January 8.

Unusual Crystals.

THE following may be of interest to readers of NATURE:

I have a bottle of pure phenol which has not been opened for a dozen years. During this period I have been interested to watch the growth of crystals from the sides of the empty portion of the bottle by sublimation. These crystals are cylinders or prisms many of them between two and three centimetres in length and as many millimetres in diameter. The ends are not pointed but neatly trimmed off by an oblique plane.

On closer examination these crystals prove to be thin walled tubes. The stalk attached to the bottle is solid for a few millimetres. Then a fine capillary appears, spreading out conically until the wall is about a half millimetre thick and then continuing as a uniform tube. The explanation is of course that within the tube the air is just saturated with phenol vapour while outside it is slightly supersaturated.

I do not remember meeting any published description of such crystals.

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January 19.

Science and Armaments.

WHAT Dr. Martin regrets, in his letter to NATURE of January 20, p. 82, is to me a consolation—to know that scientific men in our universities are still working for the safety of the realm, for across the Channel there are fierce black clouds and ominous rumblings of strife that seem almost beyond control.

Dr. Martin says: "So may the temple of science be kept free from echoes of human quarrels," and instances the sojourn of Davy and Faraday in Paris. Is the example fortunate? Davy was irresistibly attracted to Paris by reports of a detonator of fearful

violence that had already deprived Dulong—its discoverer—of an eye and a finger. He spent much of his time there investigating another discovery of a manufacturer of saltpetre, a substance not unknown to Ministers of Munitions.

It was this very journey that occasioned the human quarrel that we seek to forget when contemplating the lives of these two great priests of the temple of science.

JAMES WEIR FRENCH.

Annie'sland, Glasgow, January 22.

The Opacity of an Ionised Gas.

IN a paper read before a joint meeting of the American Physical Society and the American Astronomical Society, in December, I pointed out that theoretically the absorption of radiation by free electrons should render an ionised gas highly opaque. The organised vibrational energy, due to the radiation, of the free electrons is transformed by collisions into disorganised thermal energy of translation. A tentative application of the methods of the well-known free electron theory of the optical properties of metals to conditions in an ionised gas gives the following equation for the volume opacity coefficient K . The quantity K is such that in distance z centimetres through the gas the intensity of the direct beam is reduced to e^{-Kz} of its initial value.

$$K = (6.7 \times 10^{20}) \frac{\lambda^2 A^2 i p^2}{T^2 (1+i)^2}.$$

Here λ is the wave-length of the radiation in centimetres; i is the ratio of the number of free electrons to the number of atoms and ions; p is the gas pressure in atmospheres, including the partial pressure $ip/(1+i)$ of the free electrons; T is the absolute temperature, Centigrade; and A is the radius in centimetres of an atom or ion (assumed equal in size—a very rough approximation). This type of opacity increases as the square of the gas pressure, while the opacity due to general scattering increases only as the first power of the pressure. Even at fairly low pressures, however, the effect of absorption predominates in an ionised gas.

The above equation follows from the following assumed equation of motion of a free electron in an ionised gas through which radiation is passing:

$$m \frac{du}{dt} + 2\gamma mu = eX,$$

where m is the mass, and e the charge of an electron, and u is its component velocity in the direction of the electric vector X of the radiation. The term $2\gamma mu$ represents a pseudo-frictional resistance due to collisions between electrons and atoms or ions; γ is the number of such collisions per second per electron. The usual assumption is made that the velocity of an electron after colliding with an atom is independent of its velocity before collision; and collisions between electrons are neglected. (When the scattering of radiation by free electrons is dealt with a term involving $-d^2u/dt^2$ is added to the left-hand member of the equation.) The average rate at which energy is absorbed from the radiation by each electron is the average value of $eXu dt$; and, remembering that the intensity I of the radiation is $eX_0^2/8\pi$, where X_0 is the amplitude of X , K is easily found. The number of collisions per second per electron is taken as $\pi NA^2 \sqrt{3RT}/m$, where N is the number of atoms and ions per unit volume, and R is the gas constant per molecule. This relation assumes equipartition of energy between free electrons and the other molecules in the gas.

The well-known experimental work of Dr. Anderson