Conflagration Dangers in Large Cities.

At a recent meeting of the American Society of Civil Engineers, in this city, a paper by E. B. Dorsey, C.E., on "The Comparative Liability to and Danger from Conflagrations in New York and London" was read by the author.

The following were among the reasons given for the comparatively smaller number of fires in London as compared with American cities, and especially with New York. The comparatively damp climate of London, which prevents sparks or weak flames from igniting wood; the much higher temperature of the winter months, and consequently the smaller number of domestic fires. Statistics were given showing that lower temperature always largely increased the number of fires. The population of New York south of 40th Street is more dense than in an equal area of London, New York averaging 208 persons per acre, and London 191½ per acre for the same area. New York averages for the same area 16½ persons per dwelling. Another comparison of about 750 acres of the most densely populated portions of London and New York gives for London 249 persons per acre, and for New York 352 persons. The size of the houses in London is in general considerably less than in New York. Many London houses do not exceed 15 feet wide, 25 feet deep, and 22 feet high, and a very large number do not exceed 16 feet wide, 30 feet deep, and 40 feet high. All the London houses have fireproof roofs, and in all cases there is proportionately much less wood and more brick or stone than in New York buildings. There are also fewer and smaller windows than in New York. The walls are short, low, and generally well tied together, and so built that they will not fall after the little woodwork in them has been burnt, thus rendering it easier to confine a fire to the house in which it begins. There are no wooden roofs on buildings, and but little wood in the yards, in fences, or outbuildings. The ash barrel or ash box, so frequent a cause in New York, is unknown in London, each house being required to have a vault built of masonry for ashes. Lumber yards, large stables, carpenter shops, furniture makers, wooden manufacturers, places for storage, the manufacture of combustible material, are not found in the thickly built portions of London. The river Thames and the parks divide London in such a way as to greatly aid in preventing the spread of conflagrations. The numerous railroads running into London form effective barriers against the spread of fires. These railroads, with the exception of the Metropolitan and District Underground roads, are built upon heavy viaducts of brick or earthen embankments, not less than 60 feet wide, or are in open cuts not less than 80 feet wide. There are also many wide streets in London and numerous squares, crescents, church yards, and private grounds.

Glucose in Leather.

According to the *Shoe and Leather Review*, the falsification of the weight of leather by adding glucose, or grape sugar, appears to be carried on rather extensively in Germany, and the shoe trade societies are taking steps to protect themselves from the imposition. A simple test is recommended, which consists in placing pieces of the leather in water for the space of twenty-four hours, when the glucose will be dissolved by the water, and the result will be a thick, sirupy liquid. When two pieces of the leather are placed together and left in that position for a time, it will be found difficult to separate them, as the gummy exudations will stick them together. It is stated that some samples of sole leather were found to contain as high as 30 to 40 per cent of extra weight. Another test recommended is to cut off small pieces of the leather, and, wrapping them up in a damp cloth, lay them away for a few days in a temperate place. If the leather is adulterated, the pieces will be found to be stuck together, and surrounded by a sirupy substance in proportion to the quantity of the adulterant used; and the peculiarity about leather treated with grape sugar is that, after wetting, it is difficult to dry, and resembles gutta percha or untanned leather more than the genuine article.

THE "setting of gypsum" is the result of two distinct phenomena. On the one hand, portions of anhydrous calcium sulphate, when moistened with water, dissolve as they are hydrated, forming a supersaturated solution. Again, this same solution deposits crystals of the hydrated sulphate, gradually augment in bulk, and unite together.

IMPROVED WARPING MACHINE.

Fig. 1 is a perspective view of the warping machine as constructed by Messrs. Howard & Bullough, Fig. 2 is a side elevation, and Fig. 3 a sectional plan, which indicates more clearly the improvements adopted. The presence of

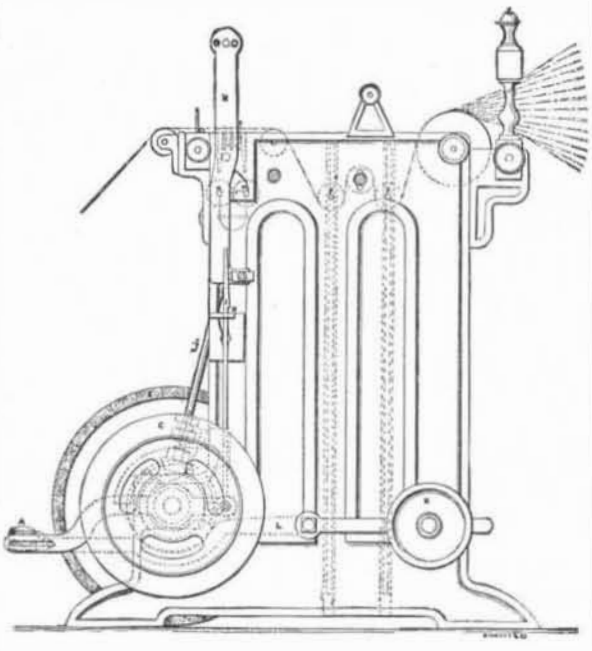


Fig. 2.—BEAMING OR WARPING MACHINE.

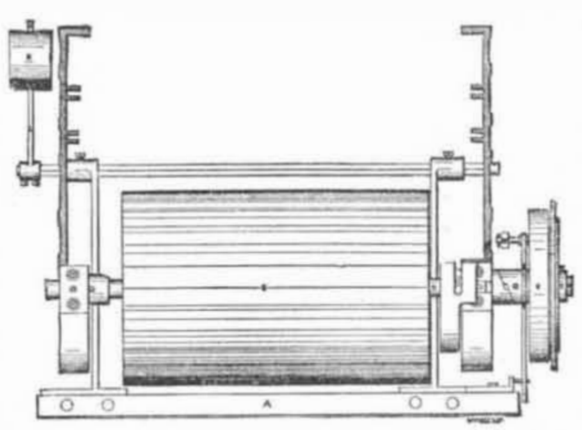


Fig. 3.—BEAMING OR WARPING MACHINE.

a stop motion renders a large number of falling rods unnecessary. Two only are required (*bb*, Fig. 2) to take up the slack due to over-running of the bobbins on a stoppage. They also serve to reduce the strain on the yarn due to the inertia of the bobbins on starting again, the tension being applied gradually as the falling rods are lifted to their normal working position. Upon the shaft, D, is fixed the surface drum, E. The warper's beam that rests upon it is not shown, but the course of the warp toward it is indicated by the dotted lines. The self-stoppage is effected as follows: The two rollers, M M, are of equal length to the width of the frame, and revolve in contact with the right-hand roller, being driven by means of inclined shaft, J, and bevel wheels from the surface drum shaft, D. The threads are about 3 inches above the rollers, as are also three slots in the table of the machine. These slots contain a set of fallers or staples of ∩ shape, each staple, I (see Fig. 2), hanging upon its own thread, and being kept up thereby. Suppose a thread fails; the staple it supports falls into the nip of the rollers and separates them, pushing the left-hand roller toward the left. The small movement due to the entry of the faller into the nip is multiplied at the foot of the lever, N, to an extent sufficient to knock the notch of trigger, I, off its support, H. When this occurs the weight, K, which is kept up by the trigger, is allowed to fall, in doing which it disengages the driving motion and causes the stop.

This motion, as will be understood, is very rapid in its action. The only time lost before the driving is knocked off is that taken up by a faller falling 3 or 4 inches, as the case may be, say about one-tenth of a second, and immediately it is in the nip the slightest revolution of the rollers causes their separation and stoppage of the warping before the broken end has reached the beam. The faller drops into a trough below, and no further notice is taken of it for the time being. When the end is pieced and the machine again started, which is done by depressing the treadle, A, the minder places another faller upon that end, and so on in every case, the fallers that from breakages accumulate in the trough being collected from time to time and used over again. The choking of the slots by the accumulation of floss is prevented by the mode of suspending the fallers. The threads run in close proximity to the top of that part of the frame containing the slots, and consequently the fallers are allowed to sink for their full depth into the slits and away from possible contact with floss, only the very tops being exposed, and the collection of fibers at these points is practically impossible, the threads rushing in close proximity to the surface, effectually sweeping them away as they fall from the yarn. The machine is driven by the belt pulley, B, which, when the machine is stopped, runs loose on the shaft. By depressing the treadle, the inclined surface of the clutch or cam forces the pulley against the friction plate, C, and causes the surface drum to be gradually set in motion, in this way also easing the strain on the yarn.

An improvement has been added to the Singleton machine by Mr. Tweedale, of the firm of Messrs. Howard & Bullough, that should be mentioned. It consists in applying a clutch (as shown in dotted lines) on the inclined shaft, J, that drives the stop motion rollers. When the machine is knocked off, this clutch is automatically disengaged at the same time. This allows the beam to be turned back for finding a lost end, when necessary, with far greater ease than in the old Singleton, because the rollers are not now turned by the operative. When the treadle is depressed and the machine started, the clutch is simultaneously put into gear. The roller on the right in Fig. 2, that the yarn first passes over after leaving the creel, is a measuring roller, 18 inches, or half a yard, in circumference, and it is made to actuate a stop motion when certain lengths have been wound. For instance, it is usual for this motion to be adjusted to stop for every "wrap" of say 3,500 yards, as an indication to the minder that this length has been wound, the warper's beam containing several "wraps" (about four or five) when full.

It only remains to add that the commonest width of machine is $\frac{9}{8}$, or 54 inches wide inside of warp beam flanges, but they have been made on Singleton's principle in all widths up to $\frac{14}{4}$, or 108 inches wide inside of warp beam flanges, and this machine has so much merit in practice that Messrs. Howard & Bullough have made the astonishing number of 7,000, and this number is being added to at a rapid rate.—*Textile Manufacturer.*

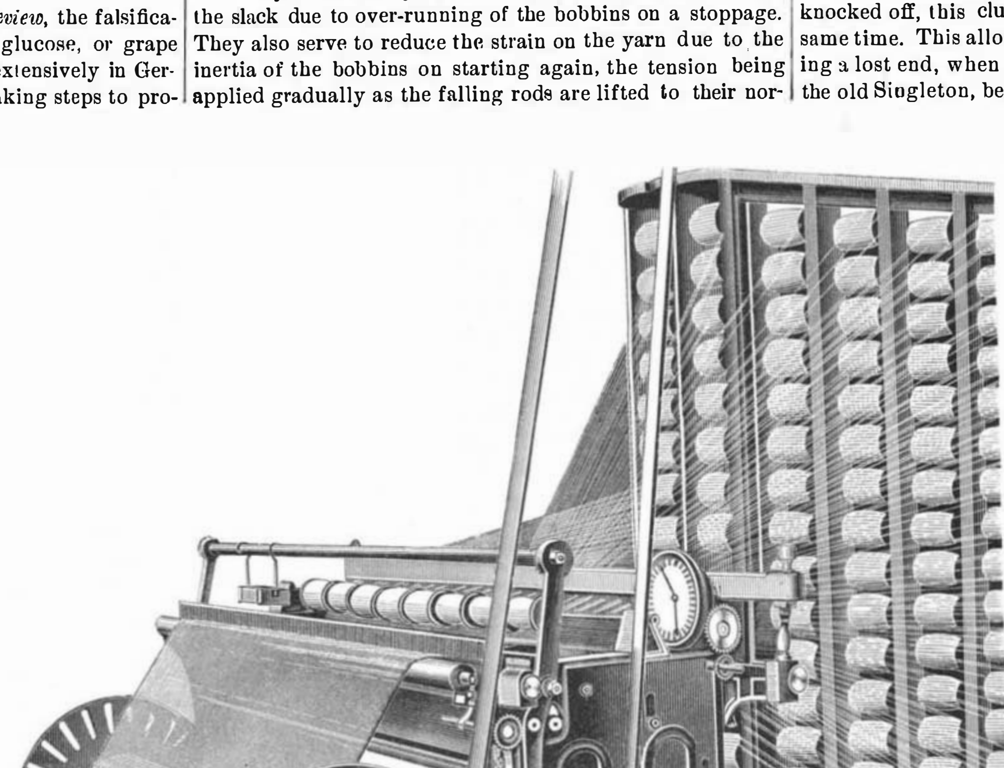


Fig. 1.—HOWARD & BULLOUGH'S BEAMING OR WARPING MACHINE.

Softening Water.

An account is given in *The Engineer* of a method of softening water followed in some industrial establishments in Germany. The principle of the process is based upon the fact that heated and hydrated oxide of magnesia readily absorbs the free carbonic acid of natural water; and by thus depriving the water of its dissolved gas, precipitates the carbonate of lime previously held in solution. The magnesia then dissolves, and unites with the bicarbonate of magnesia in the water. At first, water thus softened was suspected of attacking old boilers fed with it, and filling them with mud. It was afterward found, however, that it was the old hard scale that had been dissolved into mud; thus exposing any weak places and leaks that might have been corroded over before the purified water was introduced. The water thus treated has an alkaline reaction, and counteracts any possible acid corrosion. At first, stirring was considered an indispensable part of the process; but, eventually, it was found that straining the water, through an excess of the hydrated oxide of magnesia spread on a filtering medium, would produce the desired effect without further trouble. By mixing proportionate quantities of finely powdered oxide of magnesia and sawdust with water, and subsequent heating, hydrated oxide of magnesia will be formed throughout the whole mass. This preparation forms a most valuable filtering material. Metal cylinders are tightly filled with the mixture, and used as filters; and they are efficient, not only in cleaning dirty water, but also in softening it, for the carbonate of lime crystallizes directly upon the sawdust.

CENTRAL FRANCE UNDER THE CLOUDS.

It frequently happens that the plateaus of the center of France are covered with fogs, and even with a stratum of clouds that descend as far as the ground, while the mountains and elevated plains are enjoying a clear sky and atmosphere. Such a phenomenon has just again occurred between the 25th and 31st of December, 1883, and between the 18th and 24th of January of the present year. The annexed engraving gives an exact idea of the extraordinary spectacle as seen at the time from the top of the Puy de Dome.

The formation of this low stratum of clouds is due to atmospheric whirlwinds that have their origin near the Gulf of Genoa, and that remain afterward upon the Mediterranean. In order to prove this, let us go back a little. On the 28th and 29th of October, 1883, the winds from the southwest, under the influence of areas of low pressure that were passing over the Channel, blew tempestuously in mountain and plain, and carried along as they did so an excess of moisture that resolved itself into a drizzling rain. On the 30th, a zone of high pressure had established itself upon the east coast of Europe, and a gyratory motion made its appearance over the Gulf of Genoa. As always happens, the central plateau immediately came under the influence of the latter; the wind fell in the plain, and, preserving its force, turned to the northwest, at the altitude of the summit of the Puy de Dome. This state of things kept up until the 12th of November, and caused a few falls of snow. Low pressures succeeded over the Western Mediterranean, and the upper wind oscillated from northeast to southwest, and frequently blew strongly.

Eight times during this period it was possible from the summit of the Puy de Dome to enjoy the spectacle of a sea of clouds covering the plains, nothing being seen but the summits of the Puys, the culminating points of the Forez chain and of Mount Dore, like islands here and there.

On the 13th, the zone of strong pressures that had been prevailing over Western Europe since the 30th of October was driven toward the south. The gyratory motions upon the Mediterranean ceased, the phenomenon disappeared, and, up to the 21st, a series of tempests agitated the atmosphere of the country, under the influence of strong depressions that entered England or Brittany and afterward traversed the north of Europe. The stratum of clouds reappeared on the 21st and 22d, after a fall of snow, and this reappearance coincided again with the existence of a new barometric minimum in the latitude of the Gulf of Genoa. From the 25th to the 27th, Central France was again free from its stratum of clouds, because a zone of strong pressure had established itself over Italy and Southern France, while great cyclonic disturbances were passing over England. But, on the 28th, these movements became weaker, and went off through the north of Europe. Then a slight center of depression manifested itself anew over the Mediterranean, and the stratum of clouds again formed.

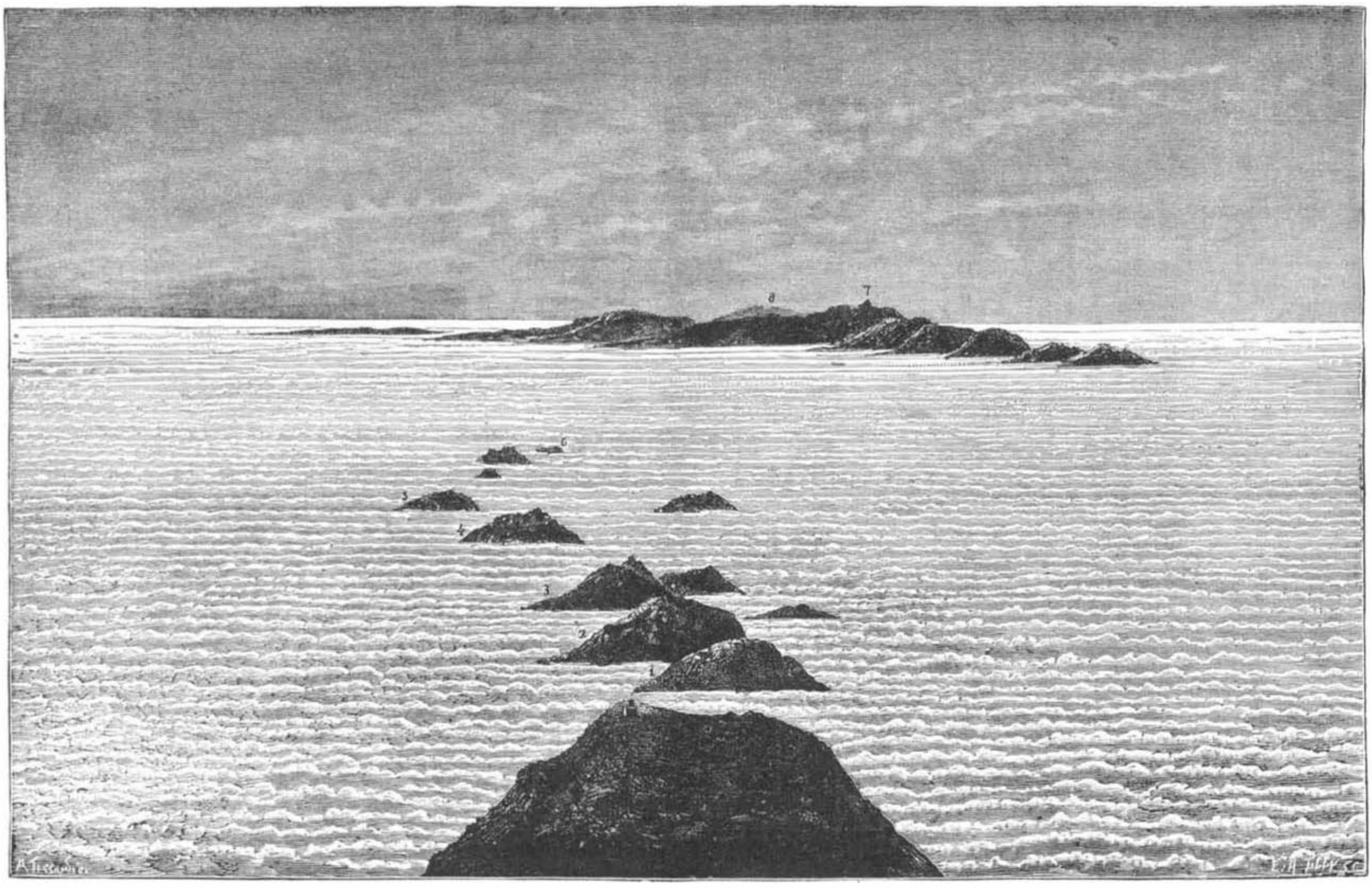
Since I have observed this phenomenon, it has always occurred under the same conditions; so its formation and disappearance may be foretold. Thus, on the 22d of January last I was able to announce that the clouds and fog that had lasted since the 18th would disappear the next day, on the 23d; and this really happened.

The stratum of clouds, which envelops us like a winding sheet and which involves a portion of France, and doubtless many other countries, in a misty and unwholesome atmosphere, is always thin, although its opacity is very great. Its lower surface, when it does not graze the ground, may rise to 1,500 or 2,200 feet, and is then perceptibly plane and horizontal and appears to be uniformly gray. Its upper surface, which is of a dazzling white, is sometimes mamillated, sometimes jagged, and sometimes plowed up into long parallel furrows that make it resemble the surface of a rolling sea. It oscillates between 2,200 feet and 3,800 feet.

The thickness of the stratum varies, then, between 625 and 2,200 feet. Sometimes it is only necessary to ascend the declivities in the vicinity of Clermont in order to emerge from the cold and damp clouds, and to get into the sunshine and breathe a pure and mild atmosphere.

In the midst of these clouds abundant deposits of hoar frost are observed to be frequent, and below them there sometimes falls snow or a drizzling rain. It is especially during the existence of this stratum of clouds that a comparison of temperature observed in the two stations of the Observatory of the Puy de Dome presents great anomalies. They are then very pronounced, because the upper surface of the clouds is in contact with very dry air, and there occurs a very active evaporation; because the warm currents can prevail at the altitude of the summit of the Puy de Dome; and because near the ground the air, which is already chilled when the clouds form, is entirely shielded for several days from the calorific action of the sun.

On the 28th of last December, toward 7 o'clock in the morning, the thermometer marked 0° at Clermont, and +7·9° at the summit of the Puy de Dome. This fact is remarkable enough; but on the 26th of December, 1879, the temperature ascertained at the Puy de Dome was +4 7°, while at Clermont it was 15·6° above zero. Again, it should be remarked that the mean temperature at the Puy de Dome (4,600 feet) being about 4°, while at Clermont (1,200 feet) it is 10°, the inversion is still greater than it at first appears, reaching really 26°.—*M. Plumandon, in La Nature.*



SEA OF CLOUDS OBSERVED FROM THE SUMMIT OF THE PUY DE DOME FRANCE.

The Theory of Magnetism.

At a recent meeting of the Royal Institution, Professor D. E. Hughes gave a lecture on " The Theory of Magnetism," illustrated by experiments. The mechanical theory of magnetism may be deemed to be the proper style and title of that brought forward by the lecturer. The phenomena of magnetism he explains by a simple rotation of the molecules of iron, as well as of all metals; nay, more, of all matter—solid, liquid, gaseous, or ether. All matter, according to his views, has inherent magnetic power, varying in degree in molecules of different nature, but not to any great extent.

The lecturer demonstrated each portion of his theory by experiment, so that the effects were visible to the audience. The striking effects of vibration, torsion, or mechanical strain upon the destruction or creation of manifest magnetism he showed in a variety of ways, the soft iron obeying the slightest mechanical tremor, while hard iron or steel resisted the most violent treatment. The molecules of the same bar behaved with extreme freedom, as in the instance of soft iron, but when a slight strain was put upon them, as when slightly bent, like an archer's bow, the bar became as rigid as steel, and mechanical action had no longer any effect.

A detailed account was given of the lecturer's researches upon the atmosphere, in the course of which he has discovered that it has a saturating point, like iron, and that it is just like iron itself. This was illustrated by striking experiments upon the magnetism of the atmosphere as compared with that of iron, and with the effects of vibrations in allowing freedom of motion to magnetic conduction in iron, by means of which a magnetic pole was pushed forward to four times its previous distance. Heat and electricity produced like effects, whence Professor Hughes drew the conclusion that these three forces, each allowing molecular freedom when frictional resistance is lessened, must have a like origin, and that electrical currents can be fairly classed with heat as a mode of motion. When a bar of soft iron is strongly magnetized, as in the instance of an electromagnet, it returns, like a spring, to a neutral state upon the cessation of the inducing force.

This well known fact has long remained a mystery. All theories of magnetism up to the present time supposed that the molecules became, on the removal of the induced current, mixed or heterogeneous. Professor Hughes believes he has made a great discovery in having solved this problem, leaving no mystery any longer, as the demonstration which he will bring forward this week before the Royal Society will reduce the matter within the domain of absolute fact. He proved his case before his audience at the Royal Institution in a less formal way, but quite as effectually, rendering a bar of iron sensibly neutral or polarized at will by simply turning it upside down. The mechanical inertia of the molecules was demonstrated by magnetizing a bar,