Correspondence.

Explosion of Stars Into Nebulæ.

To the Editor of the SCIENTIFIC AMERICAN:

In the various numbers of your journal you have referred to the extraordinary fact that Nova Persei had expanded into a nebula which was growing at the rate of some thousands of miles a second; you also referred to the fact that it seems as though it was the result of a violent explosion. Here in New Zealand the idea of an explosion of a star into a nebula is no new thing. More than a score of years ago it was shown by Prof. Bickerton, of Canterbury College, New Zealand, that if two stars grazed, the velocity with which they would graze, due to mutual attraction, would be hundreds of miles a second; and it was shown that the explosive force developed by the energy of the collision would be thousands of times greater than that of dynamite. Dr. Johnstone Stoney some thirty years ago discussed the grazing impact of stars, and Prof. Bickerton showed that the parts that lay in one another's way would both be grazed from the stars and form a third body, while the two stars would not be greatly affected by the encounter. He showed that this grazed portion would have the same temperature, no matter how much was cut off, and if only a very little were cut off, the gravitating power of the mass would be altogether too small to hold it together; every one of the molecules would be above the critical velocity, and it would expand first into a nebula, and then, if the mass grazed off were small in proportion to the bodies, the nebula would continue to expand until it was dissipated into space. Prof. Bickerton has followed this action, and has shown that most varied results follow from variety in the amount of impact. He has embodied the whole in a book called the "Romance of the Heavens," published by Macmillan & Company, New York. Should any of your readers be interested in the problems presented by Nova Persei they will find every detail of its character has been anticipated in the "Romance of the Heavens."

JAMES R. WILKINSON, M. A., Cant. Coll., N. Z.
Wainoni, Christchurch, May 28, 1902.

A Folding Range Finder.

The officers of the British army have been experimenting with a new range finder, the invention of Prof. G. Forbes, Fellow of the Royal Society. The official range finder at present in use by the infantry is the mekometer; but so inaccurate is this instrument, and so exposed are the two men necessary for its working, that it has never been used in action. Prof. Forbes in his invention has overcome this great drawback, and has devised a folding range finder, which only requires one man to operate it. The Forbes range finder consists of a six-foot folding base, and a pair of binoculars, magnifying twelve diameters. The whole instrument weighs three and a half pounds. On looking through the binoculars, the image of a balloon fitted with a trail rope is shown projected on the landscape. By moving a graduated wheel, the balloon appears to advance or recede, so that the trail rope can be brought over any part or point desired. This done, the range is read direct off the graduation. The great point about the Forbes range finder is that the man who takes the range need not expose himself, as he can do his work hidden behind a tree or cover of any kind. Prof. Forbes demonstrated the portability, practicability and the accuracy of his instrument while in South Africa, for he took part in several engagements, and the officers expressed a high opinion of its qualities, so that its adoption by the War Office appears imminent.

The Current Supplement.

The leading article of the current SUPPLEMENT is a fully-illustrated account of the making of the huge 50-ton anchor chains which are to be used by the Great Northern Steamship Company. The chains are probably the largest that have ever been made. Mr. H. W. Buck discourses on the education of the electrical engineer. The paper read by Messrs. B. J. Arnold and W. B. Potter before the American Institute of Electrical Engineers on "Comparative Acceleration Tests with Steam Locomotives and Electric Motor-Cars" is published in full. In contrast to this paper stands Mr. J. Swinburne's article on the electric problem of railways. The reconstruction of the underground foundations for the Paris metropolitan railway is a topic which is interestingly discussed and graphically illustrated. Mr. Havelock Ellis concludes his entertaining study of mescal. A brief illustrated article on magnetic separators should prove of interest. Mr. D. B. Dixon comes to the fore with a valuable article on boiler scale solvents. Of practical interest is an article on how to make and use lead-burning apparatus. Minor articles and the usual Trade Notes and Consular abstracts will be found in their usual places.

Electrical Notes.

A new method of making carbide and carbon and carbide filaments has been invented by an electrical engineer of London. The filament is soaked, previously to its being heated electrically, in a salt of the metal or metals of which the carbide is desired. If the salt in its decomposition by heat damages the filament it is reduced to oxide by means of ammonia. During carbonization of the impregnated filaments, carbonaceous gas is passed through the crucible. The filament is first treated electrically in an atmosphere of the metal or metals, or of a salt of the metal or metals to be comprised in the carbide, this heating being carried to such an extreme as will form the carbide desired.

Many devices have been proposed to prolong the life of electric arc lamps. The most effective arrangement consists of a chamber or cylindrical body around the pencil ends, which prevents access of air and thus secures longer life. But the use of such a chamber is objectionable by reason of the fact that it decreases the light ignition. While it raises the temperature of a luminous arc, no means are provided by which this increase of temperature is utilized. A German inventor believes that he has devised an improvement in such arc lamps by providing them with pencils containing an addition of metallic salts or substances having a higher temperature of combustion than the carbon itself. Such carbon pencils, it is claimed, will produce a highly luminous arc. The temperature of incandescence and the power of emission of light possessed by the metallic salts used, will be intensified in proportion to the heat generated by the combustion of the carbon. With pure carbon pencils the reflectors are disadvantageous as regards the yield of light, by reason of the higher temperature for reduced luminosity of the arc. With the use of this especial carbon, it is claimed that the very cause of this disadvantage is utilized in realizing a distinct improvement.

One of the most powerful engines ever built for driving a dynamo has been completed by an engineering firm of Leeds, England, and is to be utilized in connection with the municipal electric lighting plant of that city. It is of the vertical double-acting triple-expansion type, and every part is inclosed. The three cylinders are at the top of the structure and have respectively diameters of 23 inches (high pressure), 35 inches (intermediate) and 55 inches (low pressure). The length of the stroke is 30 inches, the shaft on which the cranks are set at 120 deg. is 12 inches in diameter, while the total height from bedplate to top is 22 feet, and it is designed to make from 200 to 250 revolutions of the crankshaft per minute. Some fine castings have been employed in its construction, notably the bedplate, which measures 21 feet by 8 feet and weighs 16 tons. The casing is cast in two pieces and weighs 22 tons, while the low-pressure cylinder weighs 9¼ tons. The total weight of the complete engine is 105 tons. The cylinders are fitted with slide valves, and are self-draining. The forced system of lubrication is employed. The oil is supplied to all the working parts by a pump without valves or packing, driven from the crankshaft, which discharges the oil at a pressure of 10 pounds to 25 pounds per square inch through specially designed oil channels. The oil that escapes from the bearings drains into the crankpit, and is used again. The engine is coupled direct to a dynamo with a normal output of 1400 kilowatts, but capable of generating 1540 kilowatts. The steam pressure of the engine is 200 pounds maximum per square inch, developing 2500 indicated horse power.

C. B. Jacobs has described a new application of the electric furnace, which may prove to be of great practical importance, before the New York section of the Society of Chemical Industry. Barytes, the natural barium sulphate, is usually converted into other barium compounds by treating it with coal or coke in a reverberatory furnace and then working up the crude barium sulphide thus obtained; but it has been found that when barium sulphate and sulphide are heated together in suitable proportions, at the temperature of the electric furnace, the sulphur is completely eliminated as sulphur dioxide and barium oxide remains, the conversion being so complete that only 2 to 3 per cent of barytes remains unacted upon, as against 25 to 45 per cent by the older process. By lixiviating with water and crystallizing out, almost pure barium hydroxide is obtained, and from that compound all the barium salts are readily obtained. The electrical energy required for the process is got from the Niagara Falls, and the plant in use at the present time is turning out sixty tons of barium hydroxide per day. The compound is largely used in the tanning industry, the white pigment and dry color trades, the purification of water for industrial purposes, and general manufacturing chemistry, the largest consumption being the beet-sugar industry, for the recovery of the sugar remaining uncrystallized in the molasses. Barium hydroxide is also an ideal substance for the softening of water for boiler purposes, and its general introduction in place of the methods at present in use is said to be only a question of price.

Engineering Notes.

The Norwegian government has voted a sum of $90,000 to provide a submarine boat for the Norwegian navy. Capt. Geelmuyden, of the Norwegian navy, was commissioned to visit this country to examine the various types of this class of craft, and has recommended the Holland submarine, the construction of which will be commenced immediately. The British government has also notified the company controlling the Holland patents of its acceptance of this type of boat for the British navy, the experiments with the first of the vessels built by the Vickers-Maxim Company, of Barrow, upon the Holland designs, having proved highly satisfactory.

While shipbuilding is flourishing all along the coast of Maine this year, Bath is particularly prosperous, and the new fleet turned out there in 1901 will be notable both for aggregate of tonnage and for character of the vessels. There are now under construction in the Bath yards naval vessels aggregating 21,435 tons, to cost $5,637,650, and merchant vessels aggregating 27,400 tons, to cost $1,503,000, a total of 48,835 tons, costing $7,140,650. Since January 1 this year there have been completed at Bath naval vessels aggregating 501 tons, costing $510,000, and 24,878 tons of merchantmen, costing $1,260,500, a total of 25,379 tons, costing $1,770,500. The grand total of vessels launched thus far this year and now under construction represents 74,214 tons, and, with ship machinery contracts now in hand, a value of $9,510,150. These figures establish a new record for Bath both in tonnage and in value. Wood still outranks steel in importance, the steel tonnage launched this year amounting to 4400 tons, valued at $770,000, while the wooden vessels aggregate 20,979 tons, valued at $1,000,500.

The Administration of Public Works in France has issued a report dealing with the history of French railways during the past ten years. During the great drop in French trade from 1889 to 1894, the railways suffered severely, and large demands were made on the French treasury to make good the interest guaranteed to the shareholders by the state. In 1889, 29,000,000 francs were required to make good this guarantee, but in 1892 the amount required was 60,000,000, and in 1894, 62,000,000 francs. The falling off in net receipts leading to this state of affairs caused the companies to cut down, so far as possible, the working expenses. In 1894 these amounted to 688,000,000 francs per year, but in 1896 they were but 686,000,000 francs, although the amount of traffic handled had considerably increased. Since then the exigencies of the growing traffic have rendered necessary considerable increases in the working expenses, but these have been only about one-fourth the increase in the receipts. It has, however, to be observed that during the period of rigid economy inaugurated in the early nineties, the expenditure on new plant and works was kept down as much as possible, so that the railways were not fully prepared to meet the boom of the closing years of the century, and much heavy work is now desirable. During the period from 1890 to 1894 the number of passengers per year averaged 288,000,000, while between 1895 and 1899 it was 375,000,000. Similarly the goods traffic over the lines in question averaged 962,000,000 tons per year for the period 1890-4, and 1,095,000,000 tons for the years 1895-9.

From the rate at which the timber in the United States is now being used, says the Railway Age, it is apparent that within a few years a question of some weight will be that of securing a suitable supply for those industries using this material in large quantities. Railroads will be affected because of the large demands made by them for timber for tie purposes. It is true that great tracts of timber yet remain, but these for the most part are located in such remote districts that the necessary freight charges practically prohibit their use. The most natural remedy to propose is that of so treating the tie as to lengthen its life. Various successful methods of treatment are now being used, but in practically all cases the tie with treatment is just about as expensive in the end as the untreated tie. Among the other speculations that have arisen since the discovery of oil in Texas is that of determining its preservative properties in the treatment of ties. To this end extensive experiments are now being made by the Atchison, Topeka & Santa Fe. A tank has been built by that company at its creosoting plant at Summerville, Tex., where ties are being soaked with crude oil. These will be placed in the track together with others treated by various creosoting processes and the comparative value of the treatments determined. Different localities have been chosen for the tests where the ties will be subjected to extreme conditions of weather and climate. The comparative cheapness of crude oil, together with the fact that the ties are merely to be soaked—a process attended by little expense—makes the present tests of considerable moment. Oil is one of the principal constituents in many of the preparations that are being used for this purpose, and though as yet undetermined, it is not improbable that the crude oil of Texas will prove of value in this regard.