unbalanced patch of 15 pounds, caused a breaking radial pressure outward upon the broken rim at the position of the patch of 7½ cwt. This was quite sufficient to break the rim outward with enormous force, so that the pieces flew about the shop like fragments of a bursting shell. It will be well for machinists to remember this incident when they have occasion to repair fly-wheels.—*Scientific American*.

ENORMOUS POWER REQUIRED FOR ELECTRIC LIGHT.

Notwithstanding all the claims about the economy of electric illumination, it appears that it is by no means cheap after all, but, on the contrary, highly expensive. It has often struck us that the power driving the magneto-electric machines used for evolving this light was much greater than represented; one had only to make an estimate by the combined consideration of the dimensions of the belt used and its velocity, also of the furnace used to furnish the steam. Last winter, in order to furnish two electric lights outside the Roman Catholic Cathedral in New York, quite a large fire was required under a good sized boiler, consuming an amount of coal, which, if converted into gas, would have been sufficient to feed gas jets by the hundred. The same has been observed in Paris; the furnishing of light for 1,000 feet length of streets required an engine of 20 horse-power, so that in order to furnish electric light for the 550,000 feet of streets in Paris it would require a motive force of more than 100,000 horses, which is more than double the power employed in all the industries in Paris and the departments for 100 miles around, taken together.

Statistics show that for every 1,000 cubic feet of gas consumed in the streets of Paris, 9,000 cubic feet are burned in private houses, churches, hotels, operas, gardens and places of amusement; so that in order to furnish light for all would require a force of 1,000,000 horses; taking the average consumption of coal to be 3 lbs. per hour for every horse-power, it would require 3,000,000 pounds, or 1,500 tons of coal per hour to furnish the power required to develop illumination by electricity. After such exposés holders of gas stock may feel easier.

RESERVIN EOPATRA'S NEEDLE.

The London Metropolitan Board of Works recently took in hand the subject of preserving their Cleopatra's Needle, which had caused so much trouble to float to its destination. After consultation with experts it was decided to grant to one Henry Browning the job of cleaning and coating the monolith with a solution of his own invention.

The effect, says the *Times*, has exceeded the most sanguine expectations of the Board of Works. In operating upon the granite Mr. Browning first gave it a thorough cleansing, removing all the sooty and greasy matter from the surface, and indurated it with his invisible preservative solution. The effect has been to give a freshness to the granite as if only just chiseled from the rock, retaining the original color, disclosing the several veins, the white spar shining in the sun's rays like crystals, and exhibiting the polished portions as they formerly existed. More than this, the "intaglio," or the hieroglyphic engravings, come out far more pointedly than before, and the injuries the stone has received are now plainly distinguishable from the hieroglyphics. The solution soaks well into the pores of the granite, and the best authorities consider that it will have the effect of thoroughly preserving the monolith for centuries yet to come.

Gas and Electricity.—After a full survey of the field, the New York *Times* concludes that gas companies have been driven from every stronghold except that of purely domestic illuminating by the electric light, and that they may be driven from that before the year 1879 closes. There are four electric lamps claiming to meet the conditions of subdivision, namely, Edison's, Holcombe's, Werdermann's and Fuller's, with one comprehensive method of subdivision, D'Ivernois', and one double-circuit generator, that of Mr. Keith. Neither of these has yet been submitted to test on a comprehensive scale, but all have done satisfactory work in the laboratory, and one of them, Werdermann's, has been tested in out-door experiments equivalent to street lighting. We have already referred to the fact that electricity and gas are not exclusives. A more perfect system of illumination will be introduced, and gas find other and more appropriate uses than as a means of illumination, as cooking, heating, etc.

THE WORLD'S COMMERCE.

Dr. Neuman, of Stuttgart, Germany, has completed a book on the subject of the world's commerce, upon which he has bestowed a great deal of labor, and which covers the subject very fully. He puts down the total wealth of Great Britain at $4,500,000,000, with an average yearly increase of over $125,000,000. The grain trade, or rather that part of it exported, which, of course, is but small compared with the whole, proves a tenth part of the international commerce of the world. The coal production he estimates at nearly 300,000,000 tons; it has doubled since 1860. Nearly 14,000,000 tons of iron are manufactured yearly, though the industry is comparatively in its infancy. The consumption of iron is yet less than one pound per annum for the majority of the inhabitants of the world. Such countries as Russia use up 10 pounds of iron per head per annum.

The imports and exports of each country may be stated in round numbers as follows:—

	Millions.	Millions.
Great Britain	3,260	
Germany	1,600	
France	1,520	
Balance of Europe	3,600	
United States	1,090	
Brazil	210	
Canada	180	
Balance of America	620 —	2,100
British India	470	
China	230	
Japan	70	
Balance of Asia	340 —	1,140
Australia		460
Africa		300

The internal, however, is the great trade of the United States, which, of course, does not at all appear in the above figures.

Scientific.

THE TELEPHONE AN INSTRUMENT OF THE PRESENT.

There are said to be about 30,000 telephones now in service in this country, and only 500 in England—a fair sample of the greater quickness of the younger country to adopt new inventions. Prof. Wm. Henry Preece, an eminent English electrician, recently said he did not think that the telephone would be an instrument of the future, and be largely adopted by the public; "for although it had been largely adopted in America, we had not the same necessity for it, for we had a superabundance of messengers for all purposes, which the Americans had not."—*Ex.*

Perhaps not. We must, however, give Prof. P. credit for his foresight. The telephone, truly, will not be an instrument of the *future*, because in this country, at least, it is an instrument of the *present*, and as to England, refer to the following:

Twelve sets of telephones have been sent out to Sir Garnet Wolseley, for use at the seat of war in South Africa. The great advantage of the telephone over the telegraph, is that the General can carry on confidential talk with the officer at the district station, or a soldier can creep out toward the enemy's lines and whisper back the information as to position. A fine wire—the thinner the better—is all that is needed. This the soldier carries on a reel upon his back—a mile weighing only a few pounds. This will be the first time the telephone has been used as an instrument of warfare.

Lightning Rods.—Mr. E. S. Brough has been discussing, in the *Philosophical Magazine*, the proper sectional areas of iron and copper lightning rods. So far as mere conductivity is concerned, a comparatively thin wire of either metal would suffice for any conductor; but such a thin conductor would be dangerous, because it would be fused by a heavy discharge of lightning. Iron being more liable to be fused than copper, Mr. Brough sought to determine the relative sectional areas of rods of two metals, so that neither would be more liable to fuse than the other. Ordinarily, it is stated that the iron rod should have four times the sectional area of the copper rod. Mr. Brough shows that these areas should be as eight to three; or since the rods are invariably made circular, and circular areas are to each other as the square of their diameters, the diameters of iron and copper rods of equal effectiveness should be in the proportion of 1.63 to 1. Iron is, therefore, much the cheaper metal for lightning rods.