me. I now proceeded to extend the scale of operations as follows:—

I charged sixteen melting pots with 44 lb. each of Bessemer metal, and when this was melted I poured into each pot 3 lb. of melted spiegeleisen. I then poured the contents of the sixteen melting pots into a large ingot mold, and the ingot thus made was sent to the Ebbw Vale Ironworks, and then rolled at one heat into a double-headed rail. This rail was sent to me for inspection, and to be by me forwarded to Mr. Ellis at Derby station, to be laid down there at a place where iron rails had to be changed once in three months.

When the rail, which was very perfect, came to me, it was so thickly studded with the words "Ebbw Vale Iron Co ," that no space remained to squeeze in the words " Robert Mushet."

I sent the rail to Derby, and I read a public statement made by Mr. Adams of the Ebbw Vale, some time ago, to the effect that this rail remained as perfect as ever, after six years wear and tear from the passage over it of 700 trains daily. That was the first Bessemer rail.

I next charged twenty melting pots with 46 lb. each of Bessemer metal, and when melted I poured into each pot 2 lb. of melted spiegeleisen, and then emptied the contents of all the melting pots into one ingot mold. The ingot was rolled at two heats, at Ebbw Vale Ironworks, into a bridge rail, which would have been about thirty feet long, but the engine was overpowered when the rail was in the last groove and stopped, so that the rail had to be cut in two. One piece, sixteen feet long, was exhibited in the office of an influential Iron Company in London, as the produce of the Uchatius or atomic process of steel making.

Let us charitably suppose that the gentlemen who exhibited this rail were at the time laboring under some mental hallucination. To enable me to specify my patent, I was very generously furnished by Mr. S. H. Blackwell of Dudley with a blowing machine capable of sustaining a pillar of blast of 10 lb. per square inch. With this blowing apparatus and some small furnaces operating upon from 60 lb. to 600 lb. melted cast iron, I experimented for six months, and satisfied myself that the whole affair was as simple, and, indeed, far more simple, than the ordinary foundery process for melting and casting iron. I made cast steel direct from the Bessemer, of a quality fairly valued at £56 per tun, but which apparently has not been accomplished subsequently by others who have adopted the process. I am well aware of the cause of the failure and of many difficulties that beset, and will still continue to beset, this process, until it is reduced to the simple first principles which govern it. I do not in the least grudge to Mr. Bessemer the £100,000 per annum which my invention is enabling him to realize. It was not by any fault of his that my patent was lost; but I wish, for his own sake, that he had manfully acknowledged the source of his success, and had been content with the amply sufficient merit of his own inventions and perseverance, without endeavoring tacitly to monopolize the credit due to me and to himself jointly. R. MUSHET.

Cheltenham, Jan. 23, 1865.

COUNT RUMFORD.

Professor Youmans, in the introduction to his collection of treatises on the Correlation of Forces gives this sketch of Count Rumford:—

" Benjamin Thompson was born at Woburn, Mass., in 1753. He received the rudiments of a common school education, became a merchant's apprentice at twelve, and subsequently taught school. Having a strong taste for mechanical and chemical studies, he cultivated them assiduously during his leisure time. At seventeen he took charge of an academy in the village of Rumford, (now Concord), N. H., and in 1772 married a wealthy widow, by whom he had one daughter. At the outbreak of revolutionary hostilities he applied for a commission in the American service, was charged with toryism, left the country in disgust and went to England. His talents were there appreciated, and he took a responsible position under the government, which he held for some years.

"After receiving the honor of knighthood he left England and entered the service of the Elector of Bavaria. He settled in Munich in 1784, and was appointed aide-de-camp and chamberlain to the Prince. The labors which he now undertook were of the most extensive and laborious character, and could never have been accomplished but for the rigorous habits of order which he carried into all his pursuits. He reorganized the entire military establishment of Bavaria, introduced not only a simpler code of tactics, and a new system of order, discipline and economy among the troops and industrial schools for the soldiers' children, but greatly improved the construction and modes of manufacture of arms and ordnance. He suppressed the system of beggary which had grown into a recognized profession in Bavaria, and become an enormous public evil—one of the most remarkable social reforms on record. He also devoted himself to various ameliorations, such as improving the construction and arrangement of the dwellings of the working classes, providing for them a better education, organizing houses of industry, introducing superior breeds of horses and cattle, and promoting landscape gardening, which he did by converting an old abandoned hunting-ground near Munich into a park, where after his departure, the inhabitants erected a monument to his honor. For these services Sir Benjamin Thompson received many distinctions, and among others was made count of the holy Roman Empire. On receiving this dignity he chose a title in remembrance of the country of his nativity, and was thenceforth known as Count of Rumford.

" His health failing from excessive labor and what he considered the unfavorable climate, he came back to England in 1798, and had serious thoughts of returning to the United States. Having received from the American government the compliment of a formal invitation to revisit his native land, he wrote to an old friend requesting him to look out for a 'little quiet retreat' for himself and daughter in the vicinity of Boston. This intention, however, failed, as he shortly after became involved in the enterprise of founding the Royal Institution of England.

"There was in Rumford's character a happy combination of philanthropic impulses, executive power in carrying out great projects, and versatility of talent in physical research. His scientific investigations were largely guided and determined by his philanthropic plans and public duties. His interest in the more needy classes led him to the assiduous study of the physical wants of mankind, and the best methods of relieving them; the laws and domestic management of heat accordingly engaged a large share of his attention. He determined the amount of heat arising from the combustion of different kinds of fuel, by means of a calorimeter of his own invention. He reconstructed the fireplace, and so improved the methods of heating apartments and cooking food as to produce a saving in the precious element, varying from one-half to seven-eighths of the fuel previously consumed. He improved the construction of stoves, cooking ranges, coal grates and chimneys; showed that the non-conducting power of cloth is due to the air enclosed among its fibers, and first pointed out that mode of action of heat called *convection;* indeed he was the first clearly to discriminate between the three modes of propagating heat—radiation, conduction and convection. He determined the almost perfect non-conducting properties of liquids, investigated the production of light, and invented a mode of measuring it. He was the first to apply steam generally to the warming of fluids and the culinary art; he experimented upon the use of gunpowder, the strength of materials, and the maximum density of water, and made many valuable and original observations upon an extensive range of subjects.

"Prof. James D. Forbes, in his able Dissertation on the recent Progress of the Mathematical and Physical Sciences, in the last edition of the 'Encyclopedia Britannica,' gives a full account of Rumford's contributions to science, and remarks:—

" 'All Rumford's experiments were made with admirable precision, and recorded with elaborate fidelity, and in the plainest language. Every thing with him was reduced to weight and measure, and no pains were spared to attain the best results.

" 'Rumford's name will ever be connected with the progress of science in England by two circumstances: first, by the foundation of a perpetual medal and prize in the gift of the council of the Royal Society of London, for the reward of discoveries connected with heat and light; and, secondly, by the establishment in 1800 of the Royal Institution in London, destined, primarily, for the promotion of original discovery, and, secondarily, for the diffusion of a taste for science among the educated classes. The plan was conceived with the sagacity which characterized Rumford, and its success has been greater than could have been anticipated. Davy was there brought into notice by Rumford himself, and furnished with the means of prosecuting his admirable experiments. He and Mr. Faraday have given to that institution its just celebrity with little intermission for half a century.'

" Leaving England, Rumford took up his residence in France, and the estimation in which he was held may be judged of by the fact that he was elected one of the eight foreign associates of the Academy of Sciences.

"Count Rumford bequeathed to Harvard University the funds for endowing its professorship of the Application of Science to the Art of Living, and instituted a prize to be awarded by the American Academy of Sciences, for the most important discoveries and improvements relating to heat and light. In 1804 he married the widow of the celebrated chemist Lavoisier, and with her retired to the villa of Auteuil, the residence of her former husband, where he died in 1814."

A New Electro-Magnet.

Is it possible that our present electro-magnet is to what it might be, what the cog wheel of the early railway engineers was to the present smooth one? For after our electricians have for so many years been exhausting their ingenuity to accomplish a certain object, M. Du Moncel—no mean authority in such matters—comes forward and declares that the object gained by that ingenuity is worse than useless. An electro-magnet may be briefly defined to be a cylinder of iron covered with a helix of wire; very powerless is the iron if no current is passing through the wire; very powerful is it—witness the Royal Institution magnet, and the one in Paris which is covered with 20,000 ft. of wire and lifts a weight of three tuns—while a current passes. We may say, therefore, that the power of the magnet depends on the wire; and it has always been considered necessary that the wire, thin or thick, according to the work to be done or the strength of the current used, must be most carefully covered with an insulated substance. So we have wires covered with silk, with cotton, india-rubber, and varnishes of different kinds. And this equally in the electro-magnets used for experiments as in those used for the ten thousand purposes in which electricity is now being daily employed; indeed, we may almost say that electricity works by electro-magnets. Some time ago, M. Carlier, an electrician in Paris, asked himself the question—Is this covering necessary? And he very properly set to work to make an electro-magnet with uncovered wire to answer the question. M. Du Moncel, in a communication to the Paris Academy, on the 9th inst., declares that the answer thus given is so extraordinary, and the power of the uncovered electro-magnet so great, that he can scarcely believe his own experiments. Not only can these new magnets produce all the effects of attraction of the covered ones, but the effects in some cases are more than doubled. Let us produce M. Du Moncel's figures. A bar of iron 4½ centimeters long, and 7 millimeters in diameter, covered with a single spiral of wire 0.277 millimeters in diameter, with two small Bunsen's elements, sustained a weight of 3·9 kilogrammes; covered, it could only support 2·4 kilogrammes. A larger magnet, covered with twelve coats of wire, held up 940 grammes; with covered wire it could only support 540 grammes. The effects of distant attraction were even more favorable. At a distance of one millimeter, and with a Daniell's pile of twenty-eight elements, the weights attracted were as follows:—

Circuit.	New Magnet.	Old Magnet.
0 kilometres	83	12
10 „	12	3
20 „	4	0

The requisite condition to obtain these effects is that the different " coats " of wire shall be separated from each other by a piece of paper, and that the interior of the bobbins, whether in wood or copper, should be covered also with an isolated substance. The advantages of this system are obvious, the first being reduced cost of the magnets. Then we have greater effects, which is tantamount to a reduction of size—and consequently another reduction of the cost. The "extra currents" being also done away with, a more prompt movement of the armatures results, and therefore greater usefulness in induction coils. In telegraphic instruments they present the additional advantage of remaining unaffected by lightning. M. Du Moncel remarks, by way of explanation—explanation is easier than prediction—"I consider that in magnets of the new construction the surface of contact of the spirals between themselves represents, in fact, a linear spiral, of which the points furnish derivations. We can easily imagine that the electric flux provoked by these derivations can only be produced by furnishing a series of superposed currents circulating through all the folds of the metallic helix, by reason of the resistance to the passage from one spiral to the other. Now, if the primitive current circulating through the helix is weakened by these derivations, it is reinforced by the derived and superposed current, which, in over exciting the pile, furnishes at last a more energetic current. Besides it must be borne in mind that the direct current which results from the derivations, and which passes through the spirals towards the axis, ought to be derived from them, and as it is not enfeebled by its passage, it should augment the intensity of the current which flows through it." Lastly, the quantity of uncovered wire which can be used for a given magnet is greater than that of covered. We shall, doubtless, at once hear of some experiments disproving or supporting M. Du Moncel's; in the latter case the method he points out should be immediately acted upon.—*Reader.*

The Origin of the Locomotive.

In the matter of priority of invention in, or rather of attempts at, land propulsion by steam, the French may well claim to be our *devanciers*, and we do not think that any true Englishman will be inclined to grudge them this honor. The first steam carriage seems to have been made by a Frenchman, Cugnot, in 1760, that same marvellous year which witnessed the birth of Napoleon I., Wellington, Humboldt, Mehemet Ali, Lord Castlereagh, Sir E. I. Brunel, Cuvier, and the first patent of Arkwright, the first patent of Watt, as also some other events almost as great in their eventual influence on the present era. An engine made by Cugnot is still in existence in the Conservatoire des Arts et Metiers at Paris. It has a copper boiler, very much like a common kettle without the handle and spout, furnishing with steam a pair of 13-in. single-acting cylinders. The engine propels a single driving wheel, which is roughened on its periphery. Altogether, this engine bears considerable testimony to the mechanical genius of its inventor. It was unsuccessful, having got overturned once or twice on the very bad roads then existing in France, and it was put on one side. It is stated, however, that arrangements were made, in 1801, to put it to work in the presence of Napoleon Bonaparte. The departure, however, of Napoleon for Egypt, prevented the trial—a circumstance which recalls Fulton's subsequent unsuccessful negotiations with Napoleon for aid in attempting marine propulsion by steam. Watt, then, in 1784, patented a locomotive engine, the boiler of which was to be "of *wood,*" hooped like a beer barrel. Watt, however, had not much faith in steam carriages, and he objected to the attempts made in this direction, in 1784, by William Murdoch, his very able assistant. The miniature engine made by Murdoch in that year is still carefully preserved at Soho. Careful and elaborate researches, such as those lately made by Mr. Zerah Colburn, into the history of the locomotive, seem to more and more confirm existing impressions as to the great part done by Trevethick in the introduction of the locomotive engine.—*Builder.*

Chloride of Barium against Boiler Incrustation.

The applicability of chloride of barium for removing and preventing boiler incrustations of sulphate of lime is not so well known as it should be. Recent experiments made in Hanover show that it may be used with advantage in many cases. Chloride of barium decomposes the sulphate of lime present in many waters, forming chloride of lime, which remains in solution, and sulphate of barium which precipitates in the form of powder, producing a yellowish white slush at the bottom of the boiler. The chloride of barium should always be present in excess in the boiler, which is the case when no further turbidity is produced on adding some to a sample of the water. The high specific gravity of the sulphate of barium, which is double that of any lime salt, requires the use of a shovel for removing the slush, but also prevents the possibility of any of the particles being carried up by the steam. When the boiler is stopped for cleansing purposes, the water should not be entirely drawn off until cold, the slush becoming otherwise dried and hardened by the heat. The water may also be purified previous to use, time being allowed for the settling down of the turbidity. Unlike certain other chemicals frequently employed, chloride of barium has not the least injurious effect upon iron.—*Engineer.*

Various Sources of Vegetable Oils.

A very large white pea is grown near Shanghae, in China from which oil is extracted for burning. So extensively is this article used that from Shanghae alone £2,000,000 worth is yearly distributed over China. This leguminous plant is called teuss. There is another Chinese production called the tea oil, said to be produced from the seeds of species of the two genera, thea and camellia, which oil is nearly unknown in Europe. When fresh it is quite free from smell, of a pale yellow tint, and devoid of sediment. It resists a cold of 40°, and its density is 927. It burns with a remarkably clear white flame. This oil might prove an important article of commerce in the East, because in its properties it is superior to cocoanut oil, and the various other oils used for burning. From the leaves of the Australian eucalypte on oil can be procured of equal utility to the cajeput oil of the East. Among the various kinds of oils used in Northern Germany, especially in the kingdom of Hanover, that extracted from the nuts of the beech is deserving of notice. Beech oil does not play a prominent part in commerce, nor is it likely to do so, owing to the fact that it cannot be obtained in large quantities. The country people who collect the nuts, or who cause them to be collected, use the greater part of the oil extracted from them in their household, and dispose only of the remaining fraction. About the beginning of November the nuts are gathered, either by picking up those which have fallen to the ground, or by spreading large sheets under the trees and beating the branches with poles, so as to cause the nuts to separate from them. Twenty-five pounds of nuts yield about five pounds of oil. The oil is of a pale yellow color, and has an extremely agreeable taste. It is often adulterated with walnut oil; the latter is even sold as beech oil, and this may account for the difference of opinion respecting the quality of beech oil. The townspeople use it chiefly as salad oil, but the peasantry employ it as a substitute for butter, etc., and only when there has been a good harvest for nuts, for burning in their lamps. The nuts are, after the oil has been expressed, made into cakes about nine inches square, and an inch and a-half thick: these are used for combustibles.—*Technologist.*

Rubidium.

According to the latest experiments of Prof. Bunsen in connection with the preparation and properties of this metal, it appears that it may be reduced from carbonated aciferous tartrite of oxide of rubidium (in a manner similar to the reduction of kalium): 75 grains of that salt will yield 5 grains of pure metal melted to a compact mass. It is very light, like silver, its color is white, with a yellowish *nuance*, hardly perceptible. In contact with air it covers itself immediately with a bluish gray coating of suboxyd, and is inflamed (even when in large lumps) after a few seconds, much quicker than kalium. At a temperature of 14° Fahr., it is still as soft as wax; it becomes liquid at 101·3° Fahr., and in red heat it is transformed in to a greenish-blue vapor. The specific gravity of rubidium is about 1·52. It is much more electro-positive than kalium, if combined with the latter to a galvanic chain, by acidiferous water. The rubidium, thrown on water, will burn and show a flame of the same appearance as that exhibited by kalium.

Correspondence.

Pyroligneous Acid in Chimneys.

MESSRS. EDITORS:—In your last paper I noticed the article under the above heading, and believe I can suggest a remedy for the moisture in the chimney, which is as follows:—The pipe should not be less than six inches diameter, with round joints or elbows to give the smoke a natural curve around the corners, and where it enters the chimney the pipe should be enlarged and made oval, so that the widest way will be equal to the width of the flue, and the narrowest way equal to the thickness of the flue. The chimney is small, but will improve the draught, and be, I think, an effectual remedy, provided no other pipes enter the chimney near this one.

WM. O. GLOVER.

New Milford, Conn., Feb. 20, 1865.

Dental Plates.

MESSRS. EDITORS:—If your correspondent S. H. will use pure platinum for his plates, and have the teeth soldered fast with pure gold, he will have no further trouble with the galvanic action of which he justly complains. Or, he may have the teeth baked on to the platinum plate, by Allen's or Moffit's plan or process. This kind of work is better for under sets, but almost too heavy for upper. The best plate for upper sets, when properly got up, is the vulcanite or hard rubber.

Philadelphia. W. P. H., Dentist.

The English and the American Patent Offices.

Our English contemporaries have for some months been discussing the important subject of patents and laws relating thereto, some suggesting the need of reform, others advocating the entire abolishment of them, and similar views. In a late number of the *Westminster Review* can be found the following tribute to the system pursued in our Patent Office:—

The *Review* gives the decided perference to our patent system over that of Great Britain in two particulars. The first is the preliminary examination as to the novelty of an invention by the office previous to the issuing of the patent. This is obviously on the ground that the office can perform this work much better than the inventor, especially where, as in this country, according to the *Review*, the examiners "are men of exceptional talent."

He is thus saved the expense of taking out a patent which has been anticipated, or from the greater expense, besides the loss of time involved, of having this examination made for him. The records of the English courts show a vast amount of litigation which is thereby avoided. Instances are cited in which patents have been litigated for years at a cost ranging from £15,000 to £25,000, when at last it has been discovered that the invention was not novel. The writer sums up the argument on this point by saying; —"Moreover, it (this examination) prevails in a country which is more worthy to instruct us in patent matters than all European countries combined—the United States of America." The other respect in which the preference is given to our system is the relative cheapness of patents. This, evidently, is a wonderful stimulus to invention.

Engineering Schools.

We judge that "parents and guardians" are beginning to appreciate the value of instruction on practical subjects, or, to speak more postively, feel that by familiarizing their children or wards with science from their youth they will have something certain to rely upon when their majority is attained. We infer this from the number of institutions where engineering and other scientific studies are prominent courses. At the Delaware Literary Institute in Franklin, Delaware Co., N. Y., surveying, civil engineering, geometrical and mechanical drawing, as well as the construction of common roads and railroads are taught; lectures on the various elements, imponderable agencies, etc., are given, and the general course at the Institute is to make the pupils proficient in the modern professions. We understand that this institution is in a flourishing condition.