modeled and new universities founded. Men were prepared for every department by previous study and careful training. There were schools for forestry, schools for intercommunication, schools for diplomacy, for trades, for mines, for teachers, for soldiers, for professions, for everything that modern civilization required. The highest places in the gift of the Government were open to competition to the lowest citizen, and any man of sufficient talent could aspire to become the rector of the university or the minister of state, and in many instances the highest places were filled with men of the humblest origin.

The first fruits of the seeds sewn by Von Stein were a crop of men fully competent to fill every position of responsibility in the nation, and year after year thousands of able men have been at work raising the standard of knowledge and proficiency in every department until we come down to modern times and find a nation thoroughly drilled on every side, with the best scholars, the best soldiers, the best mechanics, the best citizens, the best officers of civil and military affairs; in fact, a nation maintaining a thorough system of scientific administration down to the most minute detail of public and private affairs.

Those who are intimately acquainted with the industries of Germany are aware that such establishments as the iron founderies of Krupp, the salts works of Grueneberg, the ultramarine factories of Nuremberg, and the great woolen and cotton mills scattered over the land, are conducted with the same precision of scientific administration as has been so conspicuous in everything relating to the Prussian armies. In this we have the secrets of success, and a lesson for our careful study and imitation. Scientific administration is what we need in public and private affairs, and we would do well to study the signs of the times and profit by its lesson.

THE GREAT BRITISH PROBLEM.

How to diffuse intelligence over a thousand leagues of ocean is the difficult problem which Hazel has to grapple with in the story of "Foul Play." But this problem was actually solved by the reverend jack-at-all-trades, and hence was certainly not so profound as the one which has so long perplexed the entire English nation, and which may be put as follows: "How to diffuse intelligence from the inside of an English railway coach to the guard at the end of the train."

The cord and bell with which every American is familiar would not answer the purpose of frisky John Bull, who could not refrain from pulling it every now and then, and the method of locking passengers up by themselves renders the execution of such a feeble joke peculiarly easy to young and mischievous Britons.

Many and diverse plans have been suggested by which the removal of the difficulties attending such communication has been sought, but it is a harder knot to untie than communication between England and France across the Straits of Dover, and still remains, like the perpetual motion, something which attracts the minds of inventors only to disappoint their hopes.

The American system of admitting a considerable number of passengers to a single car does not find favor in the eyes of Englishmen. The thing is too democratic, too leveling, to suit their taste. And though it would put an end to the practical jokes of bell pulling and cushion cutting, which seem the idiosyncrasy of youthful and sportive "Bulls," it is, for the reasons stated, a thing not to be thought of.

The peculiar features of the English passenger system have recently been brought out in a strong light by a fight which occurred in a first-class railway carriage between Carlisle and Penrith; one Thomas Bell, a calico printer, and James Quirey, a linen manufacturer, being the combatants. The *Electric Telegraph and Railway Review* thus describes the "mill" and its origin:

"Mr. Bell and Mr. Quirey were the sole occupants of a compartment in a first-class carriage. Immediately after the train left the Carlisle station on its southward journey it seems that Mr. Bell accused Mr. Quirey of having stolen his ticket. This the latter protested he had not done, but notwithstanding all the protestations of innocence, Mr. Bell, in an excited manner, rushed at his fellow-traveler, seized him by the throat with one hand, and, with the thumb and finger of the other hand thrust up his nostrils, dragged him violently backwards and forwards in the carriage until Mr. Quirey's face was sadly cut and bruised. In the course of the encounter Mr. Quirey's collar was torn from his neck, and thrown, saturated with blood, on the carpet, while the windows of the compartment were completely smashed. Passengers in the adjoining compartments heard the cries for help, but, as it unfortunately happened, the passengers' signal was not workable, and Mr. Quirey had to struggle against the violent assaults of his excited adversary, who threatened to kill him, for nearly half an hour, the time occupied in traveling between Carlisle and Penrith, a distance of eighteen miles. On pulling up at Penrith station Mr. Quirey alighted, bruised, bleeding, and much exhausted. Mr. Bell still charged his fellow traveler with having committed a robbery, and on both men being searched the ticket was found on the person of Bell himself. Mr. Quirey then preferred a charge of assault against his assailant, who was taken by the police and locked up in Penrith police station. About six o'clock in the morning a policeman who was on duty at the station looked into the prisoner's cell and found him hanging over the side of his bed with a deep gash in his throat, which had been inflicted with a penknife left in his possession. He was still sensible, but in a very exhausted state through loss of blood.

"On being interrogated by Superintendent Fowler the prisoner replied, 'I would rather suffer death in this way than that I should have been covered with such disgrace.' A medical man speedily dressed the wound, which was a dangerous one. On being brought before the magistrates the prisoner was sadly cast down. He was charged with the assault and also with committing suicide. He had apologized to Mr. Quirey, and offered to pay any amount to himself or to any infirmary if he would withdraw from the case; but this Mr. Quirey declined to do, remarking that it was his duty to the public to prosecute, and the prisoner was committed for trial on both charges, bail being accepted for his appearance."

Truly it would seem that the pugnacity of John Bull is scarcely inferior to his sense of humor.

The journal from which we gather the above statement suggests the electric telegraph as a means for conveying intelligence to the conductor. This might be better than an atmospheric railway, but have our English cousins ever thought of a flying machine for this purpose? If not, we throw out the hint as one that may lead to something.

THE FOREMANIZING PROCESS FOR PRESERVING TIMBER, THE VICTIMS OF ITS POISONOUS EFFECTS, AND THE SUITS AT LAW WHICH HAVE BEEN INSTITUTED TO RECOVER DAMAGES.

The use of the Foremanizing process by the St. Louis, Vandalia, Terre Haute, and Indianapolis Railroad in the preparation of timber for the erection of their depot at St. Louis, the poisoning of a large number of workmen employed on the work, and the death of four or five of the victims, are facts which have been already laid before our readers.

The process which has resulted in such a lamentable disaster is the invention of Mr. B. S. Foreman, of Morrison, Ill. The compound used to preserve the timber from decay consists of the following substances, in the proportions named: one ounce of corrosive sublimate, six ounces of arsenic, and sixteen ounces of common salt.

The directions given for the preparation of the timber are given in a pamphlet kindly sent us by a St. Louis correspondent, the pamphlet being published by B. S. Foreman & Son, of Morrison, Ill. The formula is as follows: "Take the lumber while still green, and pile one layer on the ground, packing close; over this layer sprinkle evenly the dry powder, in the ratio of twenty pounds of powder to every thousand feet of lumber. Lay another layer in the same manner, sprinkle powder in the same proportion, and continue the operation until the amount desired is prepared. Allow this to remain close packed until fermentation has taken place, when the lumber will be fully Foremanized, and from thenceforth free from shrinkage and practically seasoned. N. B.—To induce fermentation of timber a temperature of 45° F. is indispensable."

The effects of working timber prepared in this way were precisely what any one well versed in the nature of the poisonous materials employed would have expected. The men were attacked with blisters and sores. *Œdema arsenicalis* and symptoms imperfectly described as resembling those of venereal disease (the latter undoubtedly the result of exposure by sitting upon the poisoned timber) mingled with the well-known symptoms of poisoning by corrosive sublimate were among the effects of the poisoning.

A *post mortem* examination of one of the diseased workmen revealed the following facts: The stomach was found to be fearfully ulcerated, while the lungs and liver were nearly destroyed by abcesses, the right lung being one mass of corruption. The testimony showed that last spring the deceased had been engaged at work on the Vandalia railroad depot in East St. Louis, the timbers of which had been sprinkled with a white poisonous powder to render them non-combustible, the process being known as Foremanizing; that deceased inhaled this powder, and shortly broke out with ulcerous sores and blisters; experienced great difficulty in breathing; was taken with a chronic and painful diarrhea, and that he gradually became weak and emaciated, and died as before stated. The examining physicians testified that the condition of Smith's body pointed unmistakably to arsenic as the cause of death. The jury then unanimously rendered a verdict that Smith "came to his death by inhaling a poisonous composition used in building the freight depot of the Vandalia Railroad Company, at East St. Louis, Illinois, he being employed by the company as a laborer." Many of the surviving workmen are said to be permanently injured.

Eleven suits have been brought against the railroad company, laying damages at $25,000 each. The declaration of the parties asserts that the railroad company was bound to furnish them good timber to work with, but that instead they were compelled to work upon timber which had been sprinkled with a poisonous powder. This substance they inhaled, absorbed, and otherwise took into their systems, thereby being injured in body to the amount for which the suits are brought.

The case is a somewhat peculiar one, and as it could only have originated either in willful rashness or in culpable ignorance of the usual effects of well-known poisonous substances, we think the plaintiffs are fully entitled to recover the damages for which they sue.

SCIENTIFIC INTELLIGENCE.

IRON BLUE WITHOUT CYANIDES.

A beautiful blue color can be prepared from iron without the aid of ferro-cyanide of potassium. Make a saturated solution of sulphate of iron (green vitriol) in water; convert $\frac{1}{4}$ of this into the sulphate of the peroxide of iron by means of sulphuric and nitric acids, and then add the remaining $\frac{3}{4}$ to the original liquid. Concentrated sulphuric acid, cautiously poured in, to prevent too great heat, will occasion the formation of a blue precipitate, which is, however, soluble in water, but if it be separated from the liquid and rubbed with phosphate of soda, a beautiful blue phosphate of iron is obtained which will resist the action of water, and can be used as a paint.

The mixed hydrates of oxide and peroxide of iron are deprived of water, and prevented from forming higher oxides, by the acids and phosphate. The reaction works well in a small way, and it remains to be seen how far it is capable of application on a large scale. If we can prepare a substitute for Prussian blue without the use of poisonous cyanides it will be a real benefit to calico printers and color manufacturers.

CHLORATE OF BARYTA.

For experiments on explosive mixtures and on chloric acid, a very convenient salt is the chlorate of baryta. This can now be obtained, according to Brandau, in a very simple manner. Commercial crystallized sulphate of alumina, sulphuric acid, and chromate of potash in the ratio of one molecule of each of the two former to two of the latter, are cautiously mixed with water to the consistence of a thin paste, and warmed over a water bath, allowed to cool, and treated with alcohol in excess. Upon filtering and neutralizing with hydrate of baryta, precipitates of sulphate of baryta and hydrate of alumina are formed and barium chlorate remains in solution. The alcohol is distilled off, and on evaporation crystals of pure chlorate of barium are formed. Care must be taken not to pour sulphuric acid upon the chlorate of potash alone, but to use the mixture of acid with the aluminum salt. The chlorate of baryta has no uses at present in the arts, but chloric acid, on account of its powerfully oxidizing properties is capable of extensive application, and the new salt of baryta, above described, may be the means of affording it readily and economically.

NEW USE OF TUNGSTATE OF SODA.

Professor Sonnenschein, of Berlin, has found that when glue in thick solution is mixed with tungstate of soda, and hydrochloric acid is added, then is thrown down a compound of tungstic acid and glue, which, at from 86° to 104° F. is so elastic as to admit of being drawn out into very thin sheets. On cooling this mass becomes solid and brittle, but, on being heated, it becomes again soft and plastic.

This material has been employed as a substitute for albumen in fixing aniline colors in calico printing, and it has been tried in tanning, but produces very hard and stiff leather. As the tungstic acid renders fabrics incombustible, its use in combination with glue in calico printing would be a valuable feature. How far it is applicable in the manufacture of paper and as a substitute for albumen in photography, remains to be seen.

The tungstic glue may also have an application in the manufacture of billiard-balls, buttons, knife handles, and in general as a substitute for india-rubber. It is recommended as a lute and cement.

ADULTERATIONS OF COMMERCIAL ARTICLES.

Some calico of English manufacture was recently analyzed by a Swiss chemist and found to contain 25 per cent of the weight of the fiber of foreign substances, 5 per cent of which consisted of mineral matter. The calico was sold at a price below the value of the yarn it was made of.

A sample of starch intended for calico dressing was found to be adulterated with 16 per cent of gypsum. Some black silk in France was weighted with chemicals that proved to be spontaneously combustible, and nearly set fire to a warehouse in Paris. Paper is also notoriously loaded down with chalk, barytes, or clay, and to make the matter still more complicated, it is found that all of these articles are themselves adulterated, so that the microscope reveals adulterations of adulterations in commercial matters just as it does of parasites living on other parasites, down to the lowest order of living beings. Little fleas have other fleas to bite 'em, and so on *ad infinitum*.

Explosive Power of Nitro-Glycerin.

We condense from the *American Chemist* the following upon the above subject:

A measure containing one cubic foot will hold 796 ounces of blasting powder, and 997·1 ounces of water; or, in other words, the specific gravity of blasting powder, as it is used, is about 0·8. This, of course, takes in the interstices, which are filled with air, but as we do not use the powder in a solid lump, this is, for practical purposes, the specific gravity of blasting powder. Now the specific gravity of nitro-glycerin is 1·6. Therefore, bulk for bulk, if the explosive power were the same in a given mass, as prepared for blasting, the nitro-glycerin would have twice the power.

In reality the following are the volumes of gas generated by each respectively in explosion:

One volume of powder which is considered as most effective, produces:

Carbonic acid gas	221·4 vols.
Nitrogen	74·6 vols.
Therefore one volume becomes	296·0 vols.

Of another kind of powder, which explodes with the gases at a lower temperature, one volume produces:

Carbonic oxide	391 vols.
Nitrogen	66 vols.
One volume becomes	457 vols.

One volume of nitro-glycerin produces:

Carbonic acid gas	469 vols.
Water at 100° C	554 vols.
Oxygen	39 vols.
Nitrogen	236 vols.
One volume becomes	1,298 vols.

These volumes are given at the temperature 0 deg. C.; at the temperature of explosion, they will be about five times greater, or about 10,607 times the original volume of the explosive, or about ten times as large a production of mixed gases for the nitro-glycerin as for the gunpowder which produces mixed gases in largest amount.

Still thirteen times is claimed by the advocates of nitro-glycerin. If this is so, the discrepancy between the temperature of the explosion must be greater than here assumed.