C, forming, where they meet, a circular hole with serrated teeth for igniting the match.

In operation, the slide, B, is moved quickly toward either end of the safe, carrying with it—or, rather pushing before it—a match, which is ignited as seen and left with most of its length protruding from the jaws of the springs ready for the hand. This device was patented Oct. 29, 1867, by Adolph Roesler, who may be addressed for rights, etc., at Warsaw, Hancock county, Ill.

ANCIENT LOCKS AND KEYS.

If the time-honored maxim, "Love laughs at locksmiths," has, like the Spanish proverb, "held good in every age and clime," the muscles of Cupid's chubby face must have been relaxed toward that particular class of craftsmen, for a period not far short of forty centuries. The Egyptian locksmith, as he fashioned his curious contrivance out of the world-renowned Damascus steel, was probably the first to excite the sly god's mirth. Next in order came the fabricator of the "doore fastenings of dyverse colors made of brass and ivory," of ancient Rome; followed by the maker of the still more elaborate *Serrure de Tabernacle* in the medieval age, immortalized in early Christian Missals. The locksmith of the Celestial Empire then began to make his "strange instruments having wooden slides," the architecture of which was peculiarly adapted to the Summer House, in which the fair heroine of the "willow pattern" was kept in durance vile. Then the locksmith began to flourish in England; and by the time of good Queen Bess, the operations of the craft were so fully established in the towns of Staffordshire—to wit, Wolverhampton, Willenhall, and Wednesbury, that Cupid must have indulged in peals of laughter worthy of the immortal Comus; and after all the enterprise of later years, with its levers and wards, "detectors," and master keys, the Muse of Love is still able to chant, even in the hearing of Hobbs and Chubb:

"My father he has locked the door,
My mother keeps the key,
But neither bolts nor bars can part
My own true love and me."

The Egyptian lock, the rude carvings of which are said to have embellished the walls of ancient Karnak's temple and the Herculaneum, is thus described by Mr. E. Beckett Denison, Q. C.: "In this lock, three pins fall into a similar number of cavities in the bolt, and so hold it fast; they are raised again by putting in the key through the large key-hole in the bolt, and raising it a little, so that the locking pins are pushed by the key out of the bolt. The security afforded by this lock is very small, as it is easy to find the places of the pins by pushing in a piece of wood covered with clay or tallow, on which the holes will leave their impress, and the depth can easily be ascertained by trial." These locks were first introduced into England by the merchants of Phœnicia, who gave them to the Cornish miners in exchange for tin. Strangely enough locks of similar construction, but evidently "home made," are still to be found on the doors of many of the peasantry in Cornwall and Devon.

The locks of ancient Greece and Rome are quaintly described by the philosophers and poets of the time. Aratus compares the constellation of Cassiopeia to a Roman key, "having a curved stem," and a handle "shaped like the south stars" of the group. Curved stems were common in the keys of that age, and the poet Ariston applies to one of those articles the epithet, "deeply bent." Eustathius says that these ancient keys resembled sickles, and were sometimes so large as to be carried on the shoulder, as reapers bears their sickles to the harvest field. This statement is confirmed by Callimachus in his *Hymn to Ceres*, where he represents the priestess of Nicippe carrying a key on her shoulders. Homer's allusion to the lock and key on the wardrobe of the fair Penelope, will probably be better known. The passage is thus rendered by Pope:

" A brazen key she held, the handle turned,
With steel and polish'd ivory adorned.
The bolt, obedient to the silken string,
Forsakes the staple as she pulls the ring;
The wards respondent to the key, turn round,
The bars fly back, the flying valves resound;
Loud as a bull, makes hill and valley ring,
So roared the lock when it released the spring."

Eustathius, a Greek commentator on Homer, who flourished in the twelfth century, says that the key here referred to was very ancient, and was known as the "serpent key," from its resemblance of form. It was in use before the siege of Troy, although some writers persist in ascribing its invention to Theodore of Samos.

The medieval locks were, perhaps, among the most elaborate and artistic specimens of those articles ever produced. Beads, scrolls, or floral wreaths, exquisitely graven in steel, lined the edges. Angel forms, similarly wrought, surmounted the escutcheon, like the twin guardians of the fairies' grotto in the pantomime; while the surface of the lock presented as great a variety of leaves and flowers, all chased with the utmost skill, as Eugene Rimmel's beautiful bouquet. These locks were mostly found on the doors of the ancient continental cathedrals, or on the magnificent cabinets for which the middle ages were so famous; and Mr. Fairholt assures us, that, in either case, the lock constituted no mean part of the profuse decoration of the door to which it was affixed. The skill of continental locksmiths, after a considerable slumber, was revived in the seventeenth century, in the person of M. Reignier, a French artisan, who acquired great fame as the maker of "letter locks," with which the couriers' dispatch boxes were secured. A Dutch writer, Von Euse, passing over the claims of his own countrymen, ascribes to M. Reignier the invention of the letter lock, which is, in reality of Dutch origin, and was made a century before this French Chubb saw the light. An allusion to it is mad in Beaumont and Fletcher's play, "The Noble Gentleman," printed as early as the year 1615, which completely sets aside M. Reignier's claim to the invention:

"A cap case for your linen and your plate,
With a strange lock that opens with A. M. E. N.:"—

and Carew, in some verses written five years later, has this reference:

"As doeth a lock that goes
With letters, for till every one be known
The lock's as fast as though you had found none."

The latter quotation partly explains the construction of the letter lock, with which M. Reignier's name will always be connected as their most famous manufacturer. The letters of the alphabet were engraved on four parallel revolving rings, which by pre-arrangement on the part of the owner were made to spell a certain word, or number of words, before the lock could be opened. If even the owner chanced to forget the "open sesame" on which he had determined, like the luckless youth in the story of Ali Baba, the door would remain closed against him, till the magic watchword was recalled.

The ancient Chinese lock verifies one of the wise sayings of King Solomon—"Men have sought out many inventions. . . . . . . there is nothing new under the sun." The fact has lately been disclosed that locks, "having sliders and tumblers," have for centuries been made in China, on the identical principles of action which have been "re-invented" by English patentees at various periods during the last hundred years. Some of the very oldest locks made by Chinese workmen were constructed almost entirely of wood, and adorned with grotesque carvings of "Celestial scenes," such as those with which modern tea-caddies have made us so familiar.

Tradition assures us that locks were made in England as early as the reign of Alfred the Great, and some go so far as to say that the ingenious monarch himself, like Louis XVI., of France, was an amateur fabricator of those articles. It is true, no doubt, that even at so remote a period, ingenious blacksmiths were wont to construct clumsy locks and keys, together with other articles of domestic use, when occasion demanded; but lockmaking was not recognized as a distinct craft in England until the fourteenth century; and two hundred years followed before it assumed proportions at all equal to those attained in earlier times on the Continent, in China, and in ancient Egypt. The locks produced in England in the fifteenth century were massive and strong; but chiefly of simple construction. Almost the only specimen now remaining is to be found on the parish church of Snodland, in Kent. In the sixteenth century commenced the display of ingenuity on the part of English locksmiths which has been uninterruptedly maintained since that time, and which forms an interesting chapter in the Curiosities of Industry. During Queen Elizabeth's reign, the bows of keys were usually ornamented by the insertion of a cross, and the locks were frequently made of metal, sometimes imbedded in oak cases. Latch keys—the terror of Mistress Caudle—also came into use about this period. Lock were for the first time made with alarm bells and chimes during the same period.

Some of these bells rang so loudly in case of any unlawful tampering with the lock as to arouse the whole street. Bells with chimes warned the inmates and alarmed the burglar in a much more soothing way. No sooner was the skeleton key of the intruder applied to the lock than the latter began to chime such some plaintive air as—

"Home, sweet home,
Be it ever so humble,
There's no place like home:"

a sentiment with which the chagrined housebreaker would doubtless concur as he took his precipitate flight.—*The Ironmonger*.

Science Familiarly Illustrated.

HEAT AND COLD.

BY JOHN TYNDALL, ESQ., LL. D, F.R.S.

Lecture VI.--Concluded.

I have had occasion to say to you once or twice in these lectures that no body in nature is absolutely cold. All bodies are more or less hot. Even ice itself is a hot body compared with solid carbonic acid. In fact, ice would be quite competent to make a mixture of solid carbonic acid and ether boil, it being hot in comparison. All bodies are warm, and all bodies are emitting rays of heat. Here is a platinum wire in front of the table, such as we have already operated upon. At the present time that platinum wire is emitting rays of heat of a perfectly definite character. If I connect this wire with our battery you will observe our old experiment. You see the wire is heated to redness; it emits rays of heat, and also, to some extent, rays of light. Before the electric current passes the wire emits rays of heat which are incompetent to excite vision; but when I raise the temperature of the wire thus, by sending the electric current through it, what becomes of its old rays of heat which it emitted in this invisible state? They still maintain themselves, and they become much stronger, but they are still obscure. We mix, with the luminous rays of that wire, the obscure radiation that issued from it before the current made it incandescent. If I go on shortening the wire, as in an experiment we made in an early portion of these lectures, we find it gets brighter and brighter, but the rays it emitted before it became redhot at all are still mingled with the visible radiation. They exist, but they exist greatly intensified; so that the rays which issued from that wire before it became incandescent, are present, as well as the visible rays, but they are raised to a thousand times the intensity which they first possessed. They are still obscure, and have no power to excite vision, but they are, nevertheless, there with a thousand fold their first intensity. Now I must try to separate before you these luminous rays from the obscure rays; and I must endeavor to operate upon the obscure rays so as to show you some effects that they can produce. I think you will understand the process by which this can be done. I have here a small concave mirror, and this I will place behind the electric lamp. We shall have an image of the carbon points of the lamp produced in that way, and I will throw that image upon the screen. We have now thrown upon the screen an image of the carbon points, whence issues the electric light. If I take another mirror, and converge the rays by it, I can give you a larger image, which, perhaps, will be better seen. Here is now a large image of the carbon points produced in that way. The image is inverted. You see a considerable amount of light there, but Mr. Cottrell will now fill a vessel with an opaque liquid. The liquid which we use to obtain the opaque solution is called bisulphide of carbon: it is perfectly transparent; and here is the substance called iodine—very well known to many people. This bisulphide of carbon dissolves the iodine with great freedom, and the consequence is the production of this dark liquid, which is so wonderfully opaque that it would cut off the light of the sun at noonday. Strange to say, it is the quality and property of this wonderful substance to entirely cut away the luminous or visible rays upon which depend the colors you saw on the screen, whereas it allows all the rays of heat to pass through. The liquid is opaque to light, but perfectly transparent to radiant heat. Mr. Chapman will place a lens in front of the electric lamp; and thus we obtain this beautiful convergent beam or cone tracking its way through the dust of the room toward the thermo-electric pile, Mr. Chapman will, when I tell him, place the cell containing this opaque liquid in front of the electric light. That will cut off bodily all the light, but still the spot where the pile will be placed will remain very hot. [The cell and pile were then placed in position.] You see all light is cut away; but you observe that the needle at once marches away, thus proving that although the light is cut off, the heat rays are left behind.

I want now to try and make these heat rays more evident to you still, and for that purpose I have placed within this camera an electric lamp similar to what I have just used; and behind the electric lamp I have placed a silvered mirror. This mirror will reflect the rays of light from the electric lamp, and will cause them to issue through the window which you see in front. This window i

salt is exceedingly transparent to the rays of heat, and also to the rays of light; and it is for that reason that I use that substance. I now obtain a convergent beam from the electric lamp. You see a brilliant cone of rays. Mr. Cottrell will now place the opaque solution in front. There it is, cutting off all the light, so that you see nothing. But now I bring this piece of platinum opposite the dark liquid, and observe what occurs. The platinum is raised to a red heat, in perfectly dark air. If, instead of platinum, I take some dry paper, and hold it in the focus of the dark rays, you see I can ignite that paper. The paper is set on fire. This ignition is caused by the invisible rays of heat issuing from the electric lamp. I now take a thick piece of metal and hold it in the dark rays of heat: you see it is melted by the radiant heat, and drops down in liquid state. I will now burn a piece of zinc here. There, you see the zinc is actually set on fire in a place where there was perfect darkness. The air where this zinc is set on fire is perfectly unwarmed. Nothing would be easier than to ignite a cigar in this way in perfect darkness. For instance, here is one which I will ignite. You see it is instantly set alight in a place where there is absolutely no light. You might put your eye where that platinum was raised to red heat. I have cautiously approached my eye to that burning focus that you saw there, and allowed the rays bodily to enter the eye, and could neither see light nor feel heat. The retina was perfectly dead to those very powerful rays. Sometimes we obtain the combustion of magnesium by these rays. Here you see we have that beautiful metal set on fire in a place where there were no lights whatever—a space of utter darkness. I might set London on fire by means of these dark rays. I have here a glass jar containing oxygen gas, and into this jar I dip a piece of charcoal. I now bring the charcoal into the focus of the invisible rays of heat, and you see the charcoal is ignited by these dark rays, and burns brilliantly in this gas.

I want now to make one or two more experiments in connection with this subject. For this purpose I will take the same mirror which I have just used, and employ another camera which is at the end of the table. The mirror will be placed behind the light, and will reflect a beam of light along the table. Instead of allowing this beam to fall upon the audience, and annoying you, I will catch it upon another mirror just as I caught the ray of light by the mirror near the ceiling in an experiment early in the lecture. I dare say many of you see the intense reflection here. There is a focus which would burn your fingers most fearfully if you put them there. I dare say we shall be able to inflame paper at that focus. There you see the paper instantly set in a blaze; and this blaze is produced, not by the luminous rays, but by the dark ones. You might put a sensitive thermometer there and have no result. It is only when the heat falls upon this paper that the heat is produced. We can burn zinc here as I did in the dark rays. You see the zinc is set on fire and blazes up almost like a piece of paper. Here is a small vessel containing water, and I will place that in the focus of the rays. I now place another vessel of water in such a way that the light has to pass through it. This will intercept the dark rays which give the heat, though it does not sensibly interrupt the rays of light. At the present time the focus of rays falls upon the former vessel of water without any effect whatever being produced upon it. I will now withdraw the vessel of water through which the beam passes before it reaches the mirror, and so allow the heat rays to pass, and you see the water in the vessel at the focus of the rays immediately begins to boil. After a time this water will be thrown into a state of violent ebullition. It is already boiling. This action is due not to the rays of light, but entirely to the dark, invisible rays of heat of which I have been speaking.

I make these experiments for the purpose of bringing home to your minds the fact that we owe all our rivers, all our glaciers, and all our snow, entirely, or almost entirely, to these dark rays. The luminous or bright rays of the sun fall upon the tropical ocean, and pierce it to great depths: they are not absorbed; but the non-luminous rays—the heat rays of the sun—strike upon the tropical ocean, and they are absorbed very near its surface. It was by the absorption of the dark rays that the water was boiled in the last experiment. These dark rays of the sun, which strike upon the tropical ocean, and are then absorbed, heat the surface of the ocean, and thus it is that all the moisture or evaporation is produced.

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

Kerosene Lamps.

MESSRS. EDITORS:—Kerosene may stand the usual test, so as not to produce any vapor under 110° F., which vapor, when mixed with air and ignited, would explode. In this respect it may be perfectly safe. But when by upsetting the lamp, or other accident, some oil is spilled, and particularly, when the oil covers the hot exterior parts of the lamp and of the burner, it easily catches fire. The heat of the fire forces a greater quantity of oil out of the lamp, which very soon is enveloped in flames. When this occurs, it is like a bombshell filled with Greek fire. The burner being firmly screwed on, there is not sufficient escape for the gas, which the heat of the flame must produce, and the consequence is, that the lamp must burst and scatter the burning oil in all directions.

As an example of this kind, I would state a little incident which will illustrate the manner in which most of the kerosene accidents occur. On the evening of October 23, 1867, on board of the Harlem steamer *Sylvan Stream*, a kerosene lamp fell from its bearing upon a seat, and soon was enveloped in flames from the cause as above represented. It was then thrown off the seat and rolled upon the floor enveloped in flames, leaving a track of burning kerosene behind. Here I threw a hat upon the lamp, pushed it further away from the fire, and by pressing the brim of the hat closely down on the floor, I succeeded in smothering the fire around the lamp, which I then carried away. At this time the lamp was covered and dripping with oil, which still continued sputtering through the burner. In seeing it in this condition, I had a rare chance to obtain some idea how such a lamp would explode.

Concerning the inflammability of kerosene, any person can easily satisfy himself by pouring a small quantity of the oil on a piece of board, and trying to ignite it with a match. I have tried in this manner kerosene from various dealers, and always found it inflammable. I believe any person, who uses such oil, should take note of this.

The present kerosene lamps seem to be rather unsafe. To meet this point I venture to suggest some improvements, viz: The lamp should be provided at one side with a little mouth for filling, and this should not be closed by a screw cap, but simply by a little cork, which would serve as a safety valve in case the oil should tend to explode from any cause whatever. In this cork should be inserted a small brass tube for admitting the air, which is to replace the oil in the lamp as it is consumed in burning. The present practice of admitting the air through the burner for this purpose, seems to be rather dangerous. For greater safety, the lamp should be of brass. It should be inclosed in a brass case, and the space between the lamp and this case filled with some non-conductor of heat, so that if any such accident should occur, as above stated, the heat of the flame would not affect the oil in the lamp. For some kinds of lamps this case could be made in the shape of a globe, a little flattened at the bottom, and with some lead or a plate of iron attached inside as ballast, so that if the lamp be accidentally upset or thrown out of its place, it would erect itself automatically.

For ordinary use in private families, kerosene may always remain the best and cheapest means for obtaining a fine light, but on railroads and steamboats it seems to be in the wrong place. For such purposes it is not necessary to remain dependent on candles; the finest light can be obtained by any other kind of lamp oil, which is perfectly safe, and not so inflammable as kerosene, or any other distilled oil. The red, dim light, and the disagreeable odor produced by an old-fashioned oil lamp, is due only to an imperfect combustion, and to a low temperature of the flame. This can be remedied by the addition of a glass chimney, and by a properly constructed burner, by which the temperature of the flame is raised to a higher degree, so that the minute particles of solid carbon (the soot) in the flame will glow at a white heat, and thus produce the fine, white light.

Astoria, L. I. J. G. KONVALINKA.

About Text Books for Mechanics.

MESSRS. EDITORS:—Did it ever occur to you that writers ostensibly for the improvement of mechanics seem to vie with each other as to which shall make their pretended instructions the most muddled and difficult of understanding? I am over forty years old, a practical mechanic since I was seventeen, and although I have bought, borrowed, and—stolen books on mechanical subjects ever since that time, all I know about mechanics I have gained by hard knocks, and not from professed teachers who write books for mechanics. Why is it that when the simple branch of geography, as taught in our schools, is brought down to the apprehension of the dullest or least developed intellect, and even the "dry" and abstruse study of grammar may be made interesting and attractive, the comparatively simple although wonderfully useful subject of mechanics cannot be treated by those who profess to be teachers of mechanics in a similar way? The only reason I can assign is the desire on the part of these self-called teachers to exhibit their erudition and show their pedagoguism. I am tired of their nonsense. I am tired of purchasing books, at big prices, pretending to give me and my brother mechanics information, when they are filled with mathematical signs, which we have never had an opportunity to learn and which are simply Greek to us.

We workers have no opportunities to study mathematics; we have all we can do to work our task, to keep body and soul together, and to do our duty to our employers and ourselves. It is certain that these signs and symbols may be superseded by plain English, and that they are not so in our mechanical works is a very sufficient reason why the works of these pretended instructors do not have a greater sale and circulation among our mechanics.

It is pleasant to know that the SCIENTIFIC AMERICAN is popular enough and that its managers are thoughtful enough to discard the pedantry that rules our text-book manufacturers, and give our mechanics—some of them illiterate—information shorn of this miserable nonsense, which few but the writers can understand. To you, Messrs. Editors, the mechanics are greatly indebted. Your clearly cut, concise, and lucid descriptions of machines and inventions, and your practical editorials are just what we mechanics need; and when we turn from the pages of the SCIENTIFIC to the pretentious volumes of mechanical writers we go from light into the fog.

Will you use your influence to induce those who pretend to write for mechanics to write so that the least learned can understand what they read? J. G. B.

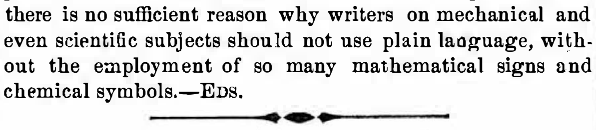
Boston, Mass.

[We recognize the difficulty our correspondent so forcibly presents. There is too much truth in his complaints; and there is no sufficient reason why writers on mechanical and even scientific subjects should not use plain language, without the employment of so many mathematical signs and chemical symbols.—EDS.

Improved Form of Drift.

MESSRS. EDITORS:—I herewith send you a model of a drift of my invention which you may illustrate and describe in your paper for the benefit of the public. This model I made in twenty minutes.

I first make the steel blank square, straight or tapering, as desired, then with a half-round file I begin at one corner of the end and file a groove obliquely across one side of the blank, then turn the blank toward me and in like manner file



a like groove on the next side and so on, forming a thread. I then begin at the opposite corner from where I first began and proceed as before, when I have two threads or a double right-handed thread. I then, in like manner, file two left-handed grooves, taking care that they intersect the right-handed ones at the corners of the tool. The grooves should be filed under, making the threads a little hooked toward the end. When the grooves are finished as described, each side of the tool shows a series of triangles, the planes of which are then filed back, care being taken not to lessen the lower corners and the tool is ready to harden and temper.

The main object of this invention is to make a drift that will give a good cut at the corners. The teeth running spirally around the tool can be filed back without injury to the corners. The chips or cuttings will not clog, but will either follow the grooves around the tool or zig-zag up its sides. The grooves being spiral do not make a checked place around the tool and weaken it as is the case with the ordinary drift. For light and fine work its great strength and the ease with which it cuts, will make this tool highly prized by all machinists. AMOS SHEPARD.

New Britain, Conn.

The City Flower Gardens of Paris.

At the ball given recently at the Hotel de Ville, seven thousand white and rose camelia trees were employed to decorate the apartments, which trees were sent from the city gardens. There are now two million camelia plants in the camelia houses, which cover a superficies of forty-eight thousand meters, which space being found insufficient for the supply required, underground houses are being constructed, the excavations for that purpose extending over thirty thousand square meters of ground. Four head gardeners superintend this vast flower manufactory—a word not wrongly applied, inasmuch as by their wonderful application of heat in forcing houses, they obtain a plant of some inches in hight in as many days. The sixteen hundred thousand plants which adorned the squares, public gardens and parks of Paris last summer, have been replaced by evergreen shrubs of every variety, so that the Parc Monceaux, the Champs Elysees gardens, etc., appear so green and flourishing that one scarcely misses the magnificent glow of color which contributed so much to the beauty of Paris a few months ago. The City Conservatories just now possess a splendid specimen of the Java pitcher plant, each goblet of sugary water being of unusual size.—*The Ruralist.*

SKETCHES FROM THE PARIS EXHIBITION.

Number II.

TUNGSTEN AND ITS PRODUCTS.

As early as 1781 the German chemist Scheele, a worthy contemporary of the unfortunate Lavoisier, established the constitution of the mineral tungsten. He showed that this mineral, before considered as a tin ore, consisted of lime and a peculiar acid. Three years afterward the brothers Du Luyart recognized in the latter a new metal, which they called wolfram (from the mineral of the same name), or tungsten. Malaguti, Berzelius, and Riche investigated these ores; they discovered the process of separating the tungstic acid, a yellowish insoluble powder, from the tungstate of lime, a mineral found also in this country. In digesting this ore with muriatic acid, it is decomposed, chloride of lime being formed and tungstic acid separated.

Wolfram was considered for a long time an iron ore. It occurs generally in the primitive rocks associated with tin ore, topaz, fluor, and apatite. Many analyses were made before it was found that it consisted of a varying mixture of tungstate of iron and manganese; it met, however, no application until quite recently, when Oxland published a mode of preparation of the tungstate of soda of mechanical value He gave at the same time to this product an application, in employing it as a mordant in dyeing, instead of the tin preparation. In immersing woolen fabrics in a slightly acidulated and hot solution of tungstate of soda, they become mordantized; in exposing them afterwards to a decoction of Campeachy wood they are dyed violet, which color becomes perfectly black upon exposure to air. This application has to our knowledge been entirely forgotten, although the crude material is now a great deal less expensive than formerly.

Tungstic acid may also be obtained as a beautiful yellow powder, forming an excellent paint. When it is digested with dilute hydrochloric acid and metallic zinc, it is converted into a very handsome blue color, called blue carmine, and if both yellow and blue are mixed together, we obtain a green of different shades, which is not poisonous and is a perfect substitute for Paris green. In adding a solution of yellow prussiate of potassa to tungstate of soda, a brown precipitate with metallic luster is obtained, very similar to umbre, and if a solution of chloride of zinc is added to a tungsten salt, we get a color similar to carbonate of baryta. If, again, one equivalent of tungstic acid is added to one equivalent of melting tungstate of soda and the thus formed product carefully heated with tin scraps, we obtain a slag which, upon being treated with a mineral acid, leaves fine orange crystalline spangles. In exposing them to heat, they assume a steel-blue color; in heating the potassic tungstate, a violet product of copper luster, similar to sublimed indigo, is obtained. These compounds may be employed either for bronzing or in printing wall papers.

Menier was the only one who had a collection of all these preparations. Barnell exhibited the tungstate of soda in large quantities, and Knapp, from Strasbourg, excelled in beautiful bronzes. Russia also proved that she explores her deposits in the Hartz mountains.

The Chemical Action of Light.

Professor Roscoe, F.R.S., of Manchester, Eng., has devised some very curious and interesting lecture experiments illustrative of the action of the chemical rays upon certain descriptions of common matter, one of which is the following: A bulb of very thin glass, about the size of a hen's egg, he fills in the dark, or by the aid of a yellow light, with a mixture of pure hydrogen and chlorine gases, the gases being produced by the decomposition of hydrochloric acid by the voltaic current. The room being darkened the bulb thus prepared is placed in a four-sided lantern provided with red and blue glasses. Now having covered with a cloth all the sides of the lantern except the one fitted with red glass, the lecturer places a long-stoppered glass jar filled with nitric oxide and bisulphide of carbon vapor in front of the exposed side and on applying a burning match to its mouth a brilliant flash of pale blue light, rich in chemical rays, is the result. But as red glass absorbs such rays, none can get through to the glass bulb which is fixed in the lantern. A second jar of the mixed vapors is next fired in front of the lantern's side fitted with blue glass, and as the latter transmits the chemical rays, the union of the hydrogen and chlorine gases is the result and the bulb is burst in the explosion which follows.

The Hugon Gas Engine.

The advantage of this over other gas engines consists in the dispensing of electricity, with its accompanying complicated arrangement of batteries and other encumbrances. By a simple arrangement the illuminating gas from the street mains, as soon as turned on, enters the cylinder mixed in its passage with about nine times its bulk of common air, forming a very explosive mixture. In starting the engine all that is necessary is to light two ordinary jets of gas, which in turn light two others, these last inflame the explosive mixture in the cylinder, and being extinguished by the explosion, are relit by the two jets fixed outside the cylinder. At the moment of explosion a very fine spray of water falling on the piston—the heat being then 1,200°—becomes steam, thus reducing the heat and equalizing the pressure throughout the stroke, so that the engine lubricates itself by its own action. It is entirely automatic in its working; no smoke; no supply of fuel need be kept on hand, and it neither requires skill to start it nor any attention during its action. A three-horse engine attracted great attention at the Paris Exposition