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.

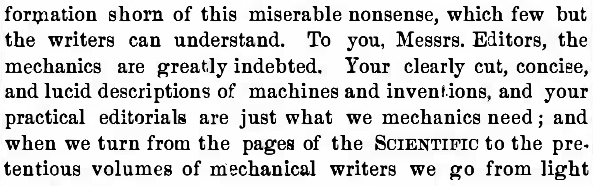
Boston, Mass.

[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 cotemporary 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