coal in 12 hours after lighting the fires, against 24 to 36 hours in the old furnace.

The new or "open tank" glass furnace is built of fire-brick, and is of the subjoined modest proportions. The "tank," holding 6,000 pounds of glass, is 7 by 5 by 2 feet. Across one end of this space, and separated from it by a fire wall, is the furnace or fire box. This is simply a fireplace, 30 inches square, furnished wth grate bars, and not differing in appearance from the ordinary furnace under a steam boiler. To this fire box is led air from a rotary blower. This finds its way to the grate bars and through flues in the surrounding wall. In the latter instance this air becomes intensely hot before escaping through suitable openings and mingling with the products of the burning coal. So mingled, air, smoke, and gases blend in a flame of intense heat, and following the draught pour over the fire wall and down upon the tank, converting the "batch" into molten glass in the time stated. It should be added that the old style furnace, with its great mass of brickwork, requires two weeks of continuous firing to make ready for melting, and that skilled labor, "teasing," is necessary to properly preserve the pots from undue heat or cold.

The new furnace is the invention of Mr. Thomas Atterbury, of Pittsburg, and an inspection of the operation of the gas furnace warrants the supposition that the days of the old style and time honored furnace are numbered.

TREES IN CITIES.

An interesting paper has been recently read by Dr. Phené at Edinburgh on the benefits to be derived from planting trees in cities. Among the beneficial results to be attained are, he stated, the relief to the optic nerve through the eye resting on objects of a green color. Just that which is effected by the use of green or blue glasses in strengthening and sustaining the power of sight, is attained, or, at any rate, much aided, by the presence of green in nature; and in streets the only method to procure this result is by planting trees. It was pointed out by the author that wherever opportunity exists nature provides green and blue (the latter being the same color minus the presence of yellow), and that as the absence of color produces snow blindness, and in tropical calms, where the ocean presents only a white reflected light from a uniform glassy surface, reduced optical power soon follows a long continuance of the absence of blue color, which becomes immediately apparent on motion of the waves.

So in the streets, to the occupants of houses having a northern aspect, the glare of the reflected light is injurious; but the effect would be much modified by the coolness to the eye produced by the green of trees. In ancient surgery, persons having weak or declining sight were advised to look at the emerald. In the old style of building, the streets being narrow, were both cooler, from the sun not being able to penetrate them with direct rays, and less subject to noxious exhalations from the scouring and purifying effects of the searching air to which the narrow streets were subject, so that while there was no space for trees there was also less necessity. Wide streets, on the contrary, are hotter, and require the shade of trees to cool them; and, as in the case of London, which had so far done without trees in its streets, it was pointed out that not only are modern streets compulsorily wide, but that the enormous increase in metropolitan buildings render every sanitary question one of importance; and the chemical properties of trees as shown by experiment give them an important standing, irrespective of ornament or the pleasure they produce. Some of Dr. Phene's experiments on this subject have extended over a period of thirty years, and he it was who first tried the planting of trees in the streets of London. Since the reading of a former paper by him at Manchester, wherein the importance of the subject was pointed out, a number of streets in wealthy localities have been planted, and even Trafalgar Square, in the heart of the metropolis.

SINGULAR DISCOVERY IN CONNECTION WITH PHOSPHORESCENCE.

The property possessed by certain metallic sulphides and other phosphorescent bodies of absorbing light when exposed to its influence, and giving out the same when brought into a darkened room, has long been known to scientists, but it is only quite lately that efforts have been made to utilize such properties. Of these, the most striking consisted in spreading a sulphide of this nature upon a flat tablet and exposing it to strong light for a few seconds under an ordinary photographic negative. Upon removing the tablet thus impressed into a dark room, the picture on it will be found to be glowing in quite a mysterious and wonderful manner, and it will continue for some minutes to radiate the light which it absorbed.

It has occurred to an ingenious physicist, A. L. Henderson, to mix one of the most sensitive of these phosphorescent metallic sulphides with the bromide of silver, now so generally employed in the preparation of photographic dry plates, and, after emulsifying this mixture with gelatine, spreading it upon the surface of glass plates, and treating the same as ordinary ones except in so far as regards the exposure, which must be momentary. He appears to have reasoned in this way: With even the briefest exposure capable of being given, a certain modicum of change will be produced on the sensitive bromide of silver, although manifestly such as will be incapable of yielding a properly developed image. But the light also falls upon the atoms of the phosphorescent powder incorporated in the films: and as these in turn radiate such light, it follows that they will complete the imperfect exposure set up in the bromide by the direct action of the light.

This reasoning has been found correct, and the result at present stands that plates have been prepared having such exceeding sensitiveness as to be well impressed by what Mr. Henderson designates "the flash of a match."

Phosphorescent sulphides may easily be prepared by heating the carbonate of lime, of barytes, of strontia, or other carbonate found most suitable, in a covered crucible with half its weight of sulphur. After an hour's exposure to heat the preparation is complete and phosphori are obtained which, upon being briefly exposed to light and then withdrawn into a dark room, will be seen to glow brightly, the color of the light emitted depending upon the nature of the carbonate originally selected.

This application of a well recognized fact in phosphorescence is so novel, and calculated to be of so much use, that we have no doubt its progress toward development will be rapid.

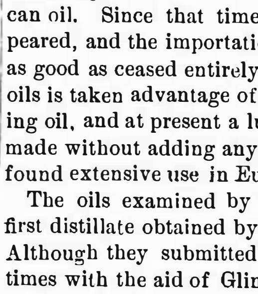
A DESCRIPTION OF CAUCASIAN PETROLEUM.

It has been known for years, if not for centuries, that combustible gases escaped from the earth at Baku, in the Caucasus, yet no one seems to have suspected that Baku was destined to become as famous for its oil springs as our own Pennsylvania. Recently, however, the production of Caucasian petroleum has been such as to interfere with the sale of American petroleum in Russia. Two of the foremost chemists of St. Petersburg, Messrs. Beilstein and Kurbatow, have subjected this oil to a critical examination, which is given in full in the *Berichte* of the German Chemical Society.

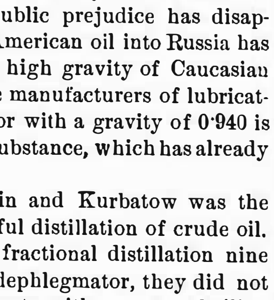
The peculiarity of this petroleum from Baku consists of its high specific gravity as compared with American petroleum of the same boiling point. For a long time this fact caused the consumers to be mistrustful of their own oil. Wilm and Biel, however, proved that the Russian oil gave ten per cent more light than the American, and Biel also found that the illuminating oil even of this high gravity was drawn up the wick to the flame more easily than the American oil. Since that time the public prejudice has disappeared, and the importation of American oil into Russia has as good as ceased entirely. The high gravity of Caucasian oils is taken advantage of by the manufacturers of lubricating oil, and at present a lubricator with a gravity of 0·940 is made without adding any solid substance, which has already found extensive use in Europe.

The oils examined by Beilstein and Kurbatow was the first distillate obtained by a careful distillation of crude oil. Although they submitted it to fractional distillation nine times with the aid of Glinsky's dephlegmator, they did not succeed in obtaining any products with constant boiling points. That which boiled below 176° Fah. had a specific gravity of 0·717, while American petroleum of like boiling point had a specific gravity of only 0·669. The portion distilling over between 200° and 212° had a density of 0·748, the American of 0·699. At first they were inclined to attribute this to the admixture of hydrocarbons of the aromatic series like benzol, C_6H_6; toluol, C_7H_8, etc. On shaking it with fuming sulphuric acid they were unable to detect a trace of any aromatic hydrocarbon. An ultimate analysis of that boiling about 185° corresponded nearly with the formula C_7H_{14}, while the American oil of 205° to 212° is nearly C_7H_{16}, showing that the Caucasian petroleum is *poorer* in hydrogen than the American. Yet it does not consist of homologues of ethylen (C_2H_4), because bromine did not act upon it until heated, when hydrobromic acid was copiously evolved, showing that substitution had not taken place. A farther study of these products convinced these investigators that they were dealing with the hydrogen addition products of aromatic hydrocarbons, such as hexahydrobenzol C_6H_{12}, hexahydrotoluol C_7H_{14}. The graphic formula of the former is given below:

BENZOL.



HEXAHYDROBENZOL.



A very unusual circumstance for a petroleum was the action of nitric acid (sp. gr. 1·38). When boiled until red fumes ceased the acid liquid contained acetic and succinic acids; the oily portion contained a liquid boiling at 410° to 420° Fah., and having the formula, $C_6H_{11}NO_2$. This may be either a nitrous ether, or a true nitro-compound, a very surprising fact in petroleums.

The different petroleum wells of the Caucasus yield oil of varying composition, according to their situations. Those examined came from the wells of Messrs. Von Benkendorff. Others will soon be examined by the same persons.

October 8, 1880. B. B.

Chemical Research by Means of Photography.

By the use of the electrical spark and a photographic apparatus the presence of very minute quantities of certain substances in certain liquids may be readily detected. The liquid to be examined is placed in a vessel, the sides of which are composed of quartz, which is one of the few purely transparent substances. If one part, by weight, of the coloring matter known as anthracene is mixed with fifty million times its weight of alcohol the presence of the color may be detected by a gelatine plate photograph taken as above, which will show the characteristic bands of the absorbed rays pertaining to anthracene.

ELECTRO-METALLURGY.

SILVER DEPOSITS.

For electro-silver plating the double salt of silver and potassium cyanide is almost universally employed. The baths are used either hot or cold. The latter method is generally adopted for articles which require great solidity. The hot process is used for small articles, and is preferable for steel, iron, zinc, lead, and tin, which have been previously electro-coppered. The hot baths are generally kept in enameled cast iron kettles, and the articles are either suspended or moved constantly about in them. A somewhat energetic current is needed, especially when the articles are moved about in order to operate rapidly. A gray or black deposit indicates too strong a current, and when the surface becomes covered with bubbles of gas the same thing is indicated. The anodes are plates of silver or heavy silver foil. The wooden tanks for the cold baths are similar to those used in plating with copper and nickel, but should be very thoroughly coated on the inside with gutta-percha.

THE BATH.

Water (soft)	1	gallon.
Cyanide of potassium (pure)	8	ounces.
Nitrate of silver	5¼	"

Dissolve the nitrate of silver in a sufficient quantity of pure water (soft), and add to it gradually, with constant stirring, hydrocyanic (prussic) acid until all the silver has been precipitated as cyanide, which may be known by the formation of no cloud in a portion of the clear liquid when a drop of the acid is added to it—avoid adding an excess of the acid. Throw the precipitate upon a fine cotton cloth filter, and as the liquid runs through wash the precipitate on the cloth several times with pure water. Dissolve the cyanide of potassium in the water, and stir in the cyanide of silver carefully removed from the cloth. If it does not dissolve in the liquid entirely, add more cyanide of potassium until it does, stirring continually. Let the impurities settle, and the bath is ready for use. Many electroplaters use a preliminary or silver "whitening" bath, which is the same composition, but contains less silver, more cyanide, and is worked with a somewhat stronger current.

The cleaned article in some cases is first dipped for a few moments in a solution of nitrate of mercury, one ounce in one gallon of water, and then in the whitening bath for a few minutes, and after brushing is transferred to the silver bath proper.

The vessels containing the cold bath are sufficiently high to allow about four inches of liquid above the immersed objects, whose distance from the bottom and sides should be nearly the same to give a regular deposit of metal at both ends of the object.

The upper ledge of the trough carries two brass rods all around, which do not touch one another, one above the other, so that other metallic rods placed transversely will rest upon the higher or lower series of rods only. The upper rods are connected with the zinc, the lower with the carbon or copper end of the battery, or with the corresponding poles of the dynamo-electric machine. The transverse rods resting upon the lower set support the silver anodes; those resting on the upper set, the work. The work suspended from an upper transverse is placed so as to face two anodes suspended from two lower transverse rods.

As the lower layers of the bath are apt to become denser (richer) than the upper, it is often necessary to reverse the articles during the operation to obtain a perfectly uniform thickness of deposit. For the same purpose small articles should be kept in motion as much as possible.

The deposit is finer and denser if obtained with a weak battery and long exposure than if a strong current is employed. A sufficient quantity of silver may be deposited in three or four hours, but it will be of much finer quality and more easily burnished if the work is left in the bath for twelve or fifteen hours with a few cells of battery.

When the articles, especially coppered iron, etc., have acquired a coherent film of silver, they are sometimes removed from the bath and thoroughly scratch-brushed, cleansed in alcohol, or preferably in a hot silvering bath, thence again passed through the mercurial solution and finished in the cold plating bath.

The first scratch-brushing, which is not always necessary, obviates the tendency of certain alloys to assume a crystalline appearance and corrects the imperfections of the cleansing in process.

Should the anodes become black during the passage of the current the solution contains too little cyanide. In this the deposit is adherent, but too slow; and the bath loses more silver than it can gain from the anodes.

If the anodes remain white during the passage of the current the bath contains an excess of cyanide, and the deposit does not properly adhere; correct by adding cyanide of silver until it dissolves with difficulty.

When in good working order the anodes present a gray appearance while the current is passing, becoming white when circuit is broken.