others of the Solanaceæ. The secretion of bile and saliva is increased, and there is a contraction of the entire intestinal tract. If the dose of nicotine be not sufficiently large to produce fatal result, secondary symptoms may appear months or even years after beginning the habitual use of the weed. These may be any of the following: granular inflammation of the fauces and pharynx; possibly from atrophy of the retina there will be loss or diminution of the power of sight, without any external appearance of the organ being affected; there may be various cardiac symptoms; the heart is dilated, and there is frequent pallor or a livid countenance; aberrations of the sense of sight with appearances of imaginary objects, a dry cardiac cough; pains as of angina pectoris are frequently present, shooting from the heart up to the shoulder and down the left arm or up into the neck; cold extremities, palpitations, feeble and irregular pulse, insomnia and diarrhoea alternating with constipation; facial neuralgia may exist, and the tongue will have habitually a thick whitish coating, and there may be marked irritation of the entire intestinal tract; chronic dyspepsia is frequently seen in tobacco users, caused by the waste of saliva which should be used in digestion.

Action.—Nicotine is very readily absorbed by the mucous and cutaneous surfaces, particularly if the continuity of either be broken. Its ready absorption is easily understood when it is known that fatal symptoms have developed from the mere inhalation of tobacco smoke, a condition in which but a small percentage of nicotine comes in actual contact with the mucous surface.

The primary action of the drug on the spinal cord is exciting, and, in fatal cases, death is due to a rapid paralysis of the respiratory center, without previous excitement, and never due to heart paralysis. Although the heart is markedly affected, the drug does not act on the cardiac muscular structure directly.

Large doses of nicotine cause convulsions, both tonic and clonic. The brain may be paralyzed, producing loss of consciousness or loss of voluntary movements after a more or less brief interval of excitement, followed by general paralysis, the spinal cord becoming insensible to irritation from affection of the gray matter of the anterior cornua.

Temperature.—The lowering of the superficial temperature is due to paralysis of the vaso-motor nerves.

Destruction.—It has not been definitely proved that nicotine is destroyed or diminished in any degree by the excretions, but it is supposed to be destroyed in part by the action of the kidneys and saliva.

Snuff.—Tobacco in this form is probably less productive of toxic effects than any other, whether inhaled into the nostrils or applied to the gums in "dipping," as small quantities are used in either case, and there is very little nicotine absorbed. Its use in this form causes redness and some swelling of the mucous membrane, and will, after continued use, result in a hypertrophy of the membrane, particularly if used in the nasal passages, and a consequent loss of activity of the olfactory sense.

Cigars and Pipes.—It is the use of cigars and plug tobacco, either for chewing or smoking, or the use of granulated tobacco in pipes, that produces the most toxic symptoms. In these cases the effect is produced by the absorption of the tobacco in solution, or the nicotine is absorbed from the smoke.

In cigars, the effect comes not only from the partial inhalation of smoke, but also from tobacco in solution, as the tip of the cigar is moistened by the saliva, and lies in contact with the mucous membrane of the mouth during smoking.

Cigarettes.—The use of these has been condemned as not only the most injurious form in which tobacco can be used, but by some is considered a vice parallel to the use of opium or cocaine. Now, while this is certainly an extreme view, there is no doubt that their habitual use occasionally leads to disastrous results.

In the use of cigarettes the effects are produced by the complete inhalation of the smoke, and in their use the adulterants have more effect than in any of the other forms of tobacco.

In the cheaper grades of cigarettes the lack of natural quality in the tobacco is made up by the use of the various adulterants mentioned; and where the indulgence is excessive, particularly in the growing young, the effects are most marked.

Some effect is produced, too, from the inhalation of the burning paper, particularly if poisonous bleaching agents have been used in its manufacture.

Toxic Dose.—This varies from the small amount absorbed by the individual who smokes his first cigar or takes his first chew to the quantities that have been taken with suicidal intent or administered for therapeutic or criminal purposes. There are very few cases of poisoning by the pure alkaloid. One is interesting, as it is the first instance in which a pure alkaloid was used for criminal purposes. This was the poisoning of M. Fougines by Count Bocarné and his wife. Another case is on record in which an individual took it for the purpose of suicide. The quantity used in either of these cases is unknown. The amount of nicotine necessary to produce the primary symptoms of poisoning in an individual using tobacco for the first time is, of course, small, and the degree of tolerance acquired by habitual users of the weed will vary according to the length of time they have been addicted to its use, the percentage of nicotine present in the particular brand of tobacco used, and the form in which they use it.

It is apparent that a chewer can acquire a greater degree of tolerance to nicotine than a smoker, as it is so much more readily absorbed when in solution with the saliva, and enters the system in greater quantities. In a smoker the effects are produced by the mere contact of the tobacco smoke with the mucous membrane by inhalation, which is partial when the smoke is only drawn into the mouth, and complete when drawn into the lungs, excepting in the case of the cigar smoker, where some of the tobacco is in solution from the contact of the cigar with the tongue and saliva. Nicotine is one of the most violent poisons known to chemistry, and in doses sufficiently large to act fatally, its action is very similar to that of hydrocyanic acid. On the lower mammalia its action is just as rapid and as surely fatal as prussic acid, and almost equally so in man.

The fatal results that have come from smoking tobacco are probably due to the inhalation of the smoke

and its consequent direct contact with the moist mucous lining of the lungs, by which the nicotine is readily absorbed. Death has followed the administration of a decoction of tobacco leaves in enema, either for therapeutic or criminal purposes, and also from its use as local application to the skin, thus showing that its application in solution is favorable to very rapid absorption.

The effect of nicotine is practically the same as that of tobacco in solution, merely differing in degree.

Dose.—Tobacco infusion has been administered in enema in doses of from $\frac{3}{4}$ ss to $\frac{3}{4}$ ij, but toxic symptoms have resulted from much less than this maximum. In many instances a dose of $\frac{3}{4}$ j would be sufficient to produce marked toxic symptoms. By the mouth five or six grains of tobacco are emetic, and anything more will be likely to prove toxic. The alkaloid is so rarely used in therapeutics that it is impossible to tell just what a fatal dose would be, but one-tenth of a grain or over would probably produce very severe symptoms.

Post-mortem Appearances.—None are known which can be directly attributed to nicotine or tobacco alone.

The signs of death from the action of the poison on the lungs have usually been observed. If tobacco has been swallowed in sufficient quantities to act fatally, there will exist some redness of the stomach and intestine. An analysis of the contents of the stomach would detect the presence of the alkaloid where it had been swallowed.

Antidote.—Strychnia, $\frac{1}{4}$ grain of the nitrate subcutaneously, or from 10 to 15 minims of tincture of nuxvomica by the mouth.—Hahnemannian Monthly.

A NEW FLUORESCENT SUBSTANCE.

By LÉON BERTRAND, M.D., Antwerp, Surgeon Steamship Southwark, Red Star Line.

I BEG to introduce to notice a new fluorescent chemical discovered by Dr. Edm. Van Melckebeke, of Antwerp, which is called double fluoride of uranyl and ammonium. I had the honor two weeks ago, at a meeting of the Société Médico-Chirurgicale of Antwerp, of demonstrating Edison's fluoroscope, which was very highly appreciated, indeed; but I have to confess impartially that it is equaled in every respect by Dr. Van Melckebeke's discovery, which I had the pleasure to experiment with myself. Moreover, this last has the advantage of being very cheap.

The following is the manner in which Dr. Van Melckebeke discovered his new chemical: First, recalling the fluorescent properties of the nitrate of uranium, he made a solution of that substance, and coated a piece of cardboard with it; but no fluorescence was obtained under the X rays. He then modified the method of impregnating the cardboard, and, instead of coating it with the solution, he fixed the nitrate of uranium on the cardboard through the medium of a gummy solution. The screen then became fluorescent under the X rays.

Dr. Van Melckebeke explains the failure of the first method to produce fluorescence by the fact that the solution impregnated the fiber of the cardboard, and after evaporation of the water the salt remained either in an amorphous state or in a state of confused crystallization. Fluorescence, like rotatory polarization, seems to require a state of perfect crystallization.

Among the chemicals which precipitate in a state of perfect crystallization are the double fluorides. Wurtz's Dictionary (vol. iii, p. 561) mentions a double fluoride of uranyl and ammonium with the formula: $U_2O_2F_2, NH_4F$.

If one drop of nitrate of uranium and a particle of fluoride of ammonium are brought together, they will produce regular octahedrons. But if larger quantities are used, five hundred and four parts of nitrate of uranium and one hundred and eleven parts of fluoride of ammonium, according to the formula of Wurtz and the equation:

no crystals are produced.

Dr. Van Melckebeke increased gradually the quantity of fluoride of ammonium in the proportion of about one part of fluoride of ammonium to two parts of nitrate of uranium. He obtained a crystalline deposit, which, examined under the microscope, presented all the characteristics required. After precipitation, the liquid had lost its color entirely.

In order to obtain this result, the proportions to be used seem to correspond approximately to the formula: $Ur_2O_2F_2, 4NH_4F$, according to the equation:

The deposit is put in a filter, is washed with cold water, and dried. It then appears as microscopic octahedral crystals, yellowish green by reflection, and colorless in thin coats by transmission; it becomes fluorescent while exposed to the violet rays. These crystals are not very soluble in cold water, but are more soluble in boiling water; hence they may be deposited on the surface of objects by simple cooling of a hot saturated solution.

As far as we know, the chemical is a new one. It is certainly different from the one mentioned by Wurtz, as much by its composition as by its crystallographical properties and by its smaller degree of solubility in water. It has some analogy to the double fluoride of uranyl and potassium, $Ur_2O_2F_2, 4KFl$, and to the double fluoride of uranyl and sodium, $Ur_2O_2F_2, 4NaFl$ (see Wurtz's Dictionary Supplement, vol. ii, p. 1628).

Oxyfluoride of uranium and ammonium can be spread on pieces of cardboard through the medium of different excipients, such as a solution of gelatine, oily varnishes, etc. This is the best way to proceed: On the bottom of a basin put a sheet of strong blotting paper and cover it with a boiling saturated solution of the oxyfluoride; let it cool, and when the paper is covered with a crystalline coating decant the liquid. Repeat the operation two or three times. In order to give some solidity to the deposit, cover it with a coat of gelatine. The fluorescent power of the chemical prepared in this way seems to vary according to the thickness of the coat of gelatine.

Dr. Henri Van Heurck, of Antwerp, has a good method of photographing the image thrown on these screens. He puts the screens in close contact with the film, and obtains a very good picture in a few moments.

Dr. Van Melckebeke's discovery dates from the beginning of March. The net cost of the double fluoride of uranyl and ammonium is, in Europe, twenty-seven cents an ounce.—Medical Record.

VANADIUM AND SOME OF ITS USES.

By JOHN M. TOBIN.

THE chief source of vanadium is vanadate of lead, which is usually found associated with magnetic iron, gold and silver. Vanadium is found in various places throughout the United States—Phoenix, Ariz.; Lincoln, Neb.; Texas, Mexico and Connecticut; the percentage varying from five to twenty, according to concentration of ore.

Its chief use is in the manufacture of ammonium vanadate, which is used entirely in the arts, in dyeing, ink making and photography. It has not been used to any extent in medicine, but lately it has been used as a test for the alkaloids.

Manufacture of Ammonium Vanadate.—The concentrated ore is fused with nitrate of potassium and dried carbonate of sodium in black lead crucibles. After cooling it is ground very fine, washed with boiling or hot water several times, solution concentrated, and saturated with ammonium chloride (free from iron), which precipitates ammonium vanadate in very fine powder. Filter and dry at room temperature. Wood and iron vessels must be avoided, as both discolor the salt; the former from acid tannic, the latter from the iron.

Further purification may be effected by repeated fusions with nitrate of potassium and sodium carbonate, etc., as above, and again precipitating with ammonium chloride.

The following formula produces a very satisfactory photographic developer:

Vanadium pentoxide	1 drachm
Sulphuric acid	2 "
Water	2 ounces

Add metallic zinc in excess; after effervescing has ceased, and solution is lavender colored, filter quickly and cork tightly. One drachm of the above solution to one pint of water makes a very good developer, and is intensified by dilute acetic acid.

The concentrated solution does not keep well, but can be quickly restored to activity by adding sulphuric acid and metallic zinc in excess, until lavender colored, as originally.

In attempting to make vanadium bronze from copper sulphate, ammonium chloride and vanadate, I added sulphuric acid and metallic zinc, and allowed the solution to remain over night in a pitcher, which latter I found the following morning coated with a deposit of brilliant metallic copper, resembling highly burnished copper. I have repeatedly tried to duplicate the experiment, but have not been able to do so.—Pharmaceutical Era.

COPPER FROM GREEN WATER.

ONE of the most interesting sights in the great mining town of Butte, says the Anaconda (Montana) Recorder, is the process by which copper is caught from the emerald-colored water that flows from the Anaconda and St. Lawrence mines. It is estimated that this water, which for four or five years went to waste, is now bringing the Anaconda Company \$30,000 a month, at a cost of about \$1,000 a month.

It is only within the present year that the company undertook to handle this water. Heretofore it was worked under lease. An old German named Mueller was the first man to save copper from the water.

During the last three years Thomas Ledford had a lease on the water. He paid a twenty-five per cent. royalty to the company. It is claimed that he realized at least \$100,000 a year from the water. Ledford is a pretty rich man to-day. Now that the company is operating the waters on its own account, it has discovered what a great money making enterprise it is.

At the present time several acres of ground are covered with wooden vats. These are filled with all the old scrap iron they can hold. It has proved a splendid scheme for disposing of the tons and tons of old iron the company has accumulated for years. Old hoisting cages, water pipe, wheelbarrows, railroad iron, in fact any old thing that consists of tin or iron, is appropriated to this service.

It is said, for every pound of iron put into a vat, a pound of copper is produced. Where the water first attacks the iron, the copper absorbs the iron completely within three weeks. After the precipitation is effected the water is drawn off and the slimy copper is transferred to another tank where the water is further drained off. These latter vats hold about fifteen tons of the copper, which now has the appearance of a clayish substance. This is sacked into packages of about one hundred pounds. When in this shape it is sent to the smelters. The product carries an average of eighty-six per cent. pure copper. The iron remaining in it makes a fine flux, and when mixed with other smelting ore, it is said to bring the ore up to a value of about \$300 a ton.

The water from the mines is the most profitable product of the Anaconda Copper Mining Company.

CRYPTOSCOPE SCREENS.

IN L'Eletticità there is given an account of a note presented by Prof. E. Salvioni to the Accademia Medico-Chirurgica of Perugia on the subject of the comparative value of various salts for the purpose of fluorescent screens for Roentgen ray work. The method of comparison adopted consisted essentially in varying the density of the radiation received by changing the angular direction of the screens, i. e., making the rays fall at a more or less oblique angle on the screen. When the two screens give an apparently equal illumination, the relative efficiency of the fluorescent salt is immediately determined by the angle between the screen and the direction of the ray. (This looks open to several errors, but it is stated that experience shows it to be