therefore a far greater uniformity is obtained in the product from that card.

As the previously mentioned lattice or apron which receives the lap operates at right angles to the film which is delivered from the doffer, it is evident that the filament must enter the feed rolls of the following card at right angles, or sidewise instead of endwise. Consequently the fibers are submitted to another course of disentanglement and rearranging while passing through the cylinders and rolls of the second card. If the same system is employed for conveying the wool from the second breaker to the finisher, a third disentanglement and rearrangement is effected. This continual working of the delicate fibers is not recommendable for yarns intended for use in the warp, or for yarns necessitating an excess of strength, elasticity and durability, for experience has shown that such excessive carding must necessarily produce a comparatively much larger number of "points" or miniature breaks, and similar defects in the staple, than the method of presenting the fibers to the following machines in substantially the same form they are taken from the doffer of the preceding one.—*Manufacturers' Gazette*.

OIL AND IRON STAINS IN COTTON CLOTH.

OIL stains in cotton cloths are an occurrence well known to every bleacher and dyer, and it is the general experience that their complete removal is effected in the keiring process. This is absolutely certain where the oil stains have been caused by animal or vegetable oils and greases, as in this case, under the circumstances obtaining in keirs, the saponification of these oils completely removes the stains. Not quite so simple is the case if the stains are caused by mineral oils. These are incapable of saponification, but as soap solutions (especially alkaline ones) dissolve considerable quantities of mineral oils, it is generally assumed that the resin soap employed in the process of keiring emulsifies, and eventually dissolves also these stains. This may be true as long as the stains are fresh, but it applies not to old stains, which through long exposure to the air have undergone oxidation. Cloth containing such mineral oil stains cannot be effectively dealt with in an open keir, although in a pressure keir, and conditional to a liberal supply of resin soap, the stains practically disappear, *i. e.*, they can no longer be seen; and in the process of printing or dyeing such cloth, nothing occurs that would indicate that these oil stains are still in existence. Iron stains, perhaps, occur not so often in cloth as oil stains, and may prove a great nuisance occasionally, but under ordinary circumstances their removal is easy enough. If the stains are few and far between, they are treated one by one with a moderately strong solution of oxalic acid, the piece being subsequently washed. If there are too many of these stains in a piece to apply this treatment, padding in a bath of oxalic acid at 5° Tw. or in bisulphite of soda at 7° Tw. will answer.

If, however, oil and iron stains appear in the same piece, forming as it were one single stain, the question of getting rid of these combined stains is in most cases a matter of very considerable difficulty, the oxidized oil retaining the iron stain even against concentrated solutions of oxalic acid or strong sulphurous acid; even the most powerful agent for removing iron stains, a solution of tin oxalates in hydrochloric acid, has not the slightest effect on these compound stains. I may at once say that I do not know of a case of these stains ever being found in gray cloth, or being produced in the course of the bleaching process, although the single oil or iron stains are common enough at this stage. But the compound stain inevitably forms when oil-stained cloth is dyed with an iron mordant. The faintest trace of an oil stain left in the cloth can be found out by treating a suspected sample in a bath of ferrous or ferric sulphate, and producing the well-known iron buff by afterward passing through weak soda carbonate.

As a rule the stain does not show in the buff, but after stripping the color in any suitable acid bath, a bright iron stain remains wherever the cloth retained the least trace of an oil stain. From this it is clear that in the majority of cases these compound stains will never be noticed, unless the cloth is stripped of its dye. Unfortunately the latter process is frequently necessary in the case of drab twills, which have at times, from some unaccountable reason, an awkward tendency to bleach in the folds, or to come up a wrong shade in dyeing. For the purpose of redyeing such pieces the color is stripped and then the oil stains become visible as bright iron stains. On redyeing these pieces in the manner generally used for this class of goods, by first giving two ends in a mixed bath of fustic, sumac, and annatto, and afterward fixing in a bath of ferrous sulphate, these iron stains do not disappear, but show as ugly olive patches. That these stains show only in the second dyeing is easily accounted for, as they now contain twice as much iron as the rest of the piece. It is therefore evident that, before redyeing pieces stained in this manner, it is absolutely necessary to first remove these stains. I have already mentioned the obstinacy with which these stains resist all ordinary agents, and the cause of this, no doubt, is that we have the iron here in the form of an iron soap. Taking this into consideration, there is no doubt that the iron stain will only yield if treated with an agent which at the same time loosens the oil stain. After a great many experiments I found that by padding such pieces in a hot solution of one part of soft soap, one part of glycerine, and three parts of water, taking through squeezing rollers, letting lie for 24 hours, then washing, the iron stains, together with the oil stains, are completely removed. The *rationale* of the process will be readily understood if we remember the great ease with which oils of every description dissolve in solutions of glycerine and soap, and also the capability of alkaline glycerine solutions to dissolve ferric oxide in large quantities. The price of the process amounts to about 3s. per 100 lb. of the cloth, and from this the price per piece may easily be calculated, the weight of a piece varying from 26 to about 80 lb.

The whole difficulty about these compound stains would of course best be dealt with by taking care to remove every trace of oil in the cloth in the keiring process, but as I have already remarked, this is a matter of considerable difficulty in the case of mineral oil stains, although pressure keirs are, as a rule, fairly efficient in this respect. From experiments carried

out on a large scale, it appears, however, that this difficulty can be overcome by deliberately increasing the mineral oil stain in the gray cloth, by adding a vegetable oil to it. Treatment even in an open keir is then quite sufficient to remove every trace of an oil stain.—*Weber in the Jour. Society of Chemical Industry*.

TOBACCO AND THE TOBACCO HABIT.

By M. JULES ROCHARD, of the French Academy of Medicine.

THE use of tobacco prevails throughout the whole world. Smokers alone are numbered by hundreds of millions. A million and a quarter acres of the earth are devoted to the cultivation of the plant, and the taxes on it alone in France amount to three hundred million francs (or sixty million dollars). A custom so general, a habit that has been maintained so long in the face of constant attacks upon it, should be considered seriously. It should be studied from every side, and the various elements of the question should be subjected to a complete analysis by the means of investigation now at our disposal, for it is a scientific problem of the first order. While it is of moral and philosophical interest, and its social consequences are within the province of economists, it is for science, physiology, and hygiene to furnish experimental data as the basis for their deductions.

A proper study of the subject should be made with an independence of prepossession which is not easy to find. Persons who have never smoked will talk of tobacco as the blind talk of colors; smokers have a fondness for their habit, while those who have been obliged to give it up are prejudiced on the other side. I am one of the reformed smokers. After having abused tobacco for about fifty years, I was compelled to abjure it. I fought my ground inch by inch, and yielded only to an absolute necessity. Knowing what the reformation cost me, I have not tried to make proselytes; but I intend to say what I believe is true upon a question which I have studied well, and on which I am not lacking in personal experience.

The tobacco plant belongs to the order *Solanaceæ*, and constitutes a genus (*Nicotiana*) named after Jean Nicot. It is cultivated through the whole world, and succeeds equally in the temperate zone and the inter-tropical regions. Two species are cultivated: common or large tobacco (*Nicotiana tabacum*) and small tobacco (*Nicotiana rustica*). The first species is the most widely diffused. It is a large and fine looking annual plant, growing to a height of about six feet. It bears large alternate leaves of a glaucous green color, and is tipped with a cluster of elegant flowers having a pale rose corolla and a persistent five-parted calyx. Small tobacco does not exceed twenty inches or two feet in height. Its leaves are thick, soft, dark green, and viscidly hairy. The terminal inflorescence comprises clusters of flowers composed of cymes. The pale yellow corolla, a little greenish, is supported by a campanulate calyx, covered with glandular hairs and terminating in uneven teeth. The genus *Nicotiana* includes some fifty other species, mostly natives of America, but some of Australia and the islands of the Pacific Ocean. Of these, some fifteen or twenty species are cultivated and give rise to different foreign tobaccos, the taste and properties of which are varied. A few species, remarkable for the richness of their colors and their graceful growth, are cultivated as ornamental plants in gardens.

Tobacco leaves contain principles common to all vegetable substances—such as starch, cellulose, sugar, organic acids, and salts—principles soluble in ether, nitrogenous substances, and a peculiar alkaloid to which the plant owes its special qualities, called *nicotine*. This alkaloid, discovered by Possett and Remann, was isolated by Vauquelin in 1809. It is an oily liquid, transparent and colorless, which becomes brown and thick in the air by absorbing oxygen. Its acid and virulent odor is like that of tobacco; it has a burning taste, and its vapor is so irritating that breathing is painful in a room where a drop of it has fallen. It is very hygroscopic, and soluble in water, alcohol, and ether. It combines directly with acids, with the evolution of heat. It is found as a malate in the leaves. The different kinds of tobacco do not contain the same quantities of it. The black, unctuous tobacco of the Antilles, the pronounced savor, ready burning, and white ash of which make it in demand among experienced smokers, contains much more nicotine than the light, fragrant tobacco of the Levant. The quantity of it increases with the development of the plant, and varies according to the thickness of the leaves. The thinner-leaved plants contain less of it. The fermentation to which tobacco is subjected in manufacturing volatilizes a part of the nicotine and substitutes ammonia for it. Consequently, there is less nicotine in tobacco prepared for consumption than there was in the dry leaves before the preparation. Combustion destroys about three-quarters of this. According to M. Pabst, the smoke of five grammes of tobacco yields about three milligrammes of nicotine; but it contains a number of other principles besides, the enumeration of which here would not be interesting. Nicotine is the active principle of tobacco, as atropine is of belladonna and morphine of opium; but there are other poisons among the substances united with it. The less volatile ones condense during combustion, and produce a brownish empyreumatic liquid, a kind of coal tar of tobacco, a part of which oozes through porous pipes, and the whole of which is retained in the water of nargilehs.

Among the volatile principles that pass into the smoke along with nicotine are hydrocyanic acid and carbonic oxide. Dr. Grehan has shown that a notable quantity of them is absorbed by rapid smokers swallowing the smoke, and the gas passes into the stream of the circulation. These facts are of considerable importance in view of practical consequences, and go far to explain the accidents that sometimes occur after one has passed several hours in a medium saturated with tobacco, even without smoking, and the phenomena of intoxication which are produced by eating food that has remained for a long time in a similar atmosphere.

Tobacco is a poison, as are most of the *Solanaceæ* and many plants which medicine daily utilizes. Its properties have been studied in our time with all the rigor of the experimental method, verified by clinical

observation. We can no more than present the principal results of the investigation here. The decoction of tobacco destroys animal life in a time short in proportion to the strength of the dose. The phenomena preceding death are like those produced by other toxic alkaloids, and are identical with those exhibited by man in a similar condition, which doctors have had too frequent occasion to observe. Sometimes convicts or sailors swallow their quids, or fools drink on a wagger glass or two of the empyreumatic juice that flows from old pipes, or the poison is swallowed by mistake, as when snuff is taken for coffee or tobacco leaves are mixed with orangeleaves. Cases of malicious poisoning are more rare; but the poet Santeuil died, according to Merat, in horrible suffering after having drunk a glass of wine in which Spanish tobacco leaves had been put. Mortal poisoning is, however, rarely brought about when tobacco is taken by the mouth, for it is nearly always rejected by vomiting before it can produce its worst effects; but the results of intestinal administration are different. The intoxication is then most usually the result of a medical error. The decoction of tobacco is still given sometimes as an injection in cases of asphyxia by submersion or of strangled hernia, and, if the dose is too large, death may result. Orfila cites four cases that were fatal in doses ranging from eight to sixty-four grammes. One patient died in fifteen minutes, and the one who held out longest at the end of two hours. Eight grammes do not form a toxic dose, but the case cited by Orfila was one of an infant. From fifteen to thirty grammes are required to kill an adult. Tobacco may also poison through the lungs. Cases are mentioned of persons who died from sleeping in a room filled with fermenting leaves; others, worthy rivals of the bettors just now spoken of, died after executing wagers that they could smoke an improbable number of pipes without intermission. The skin itself may serve as a channel for the introduction of the toxic principle. Accidents of this kind were not rare when diseases of the skin were treated with pomades or liniments of which tobacco was the base. Murray reports an observation of three infants who were taken with vomitings and vertigos, and died in convulsions within twenty-four hours after having their heads rubbed with a tobacco ointment. Cases are recorded of smugglers who died after having covered the bare skin of their bodies with tobacco leaves which they were trying to introduce fraudulently. Ferdinand Martin has related the case of a lady afflicted with lumbago who applied flannels dipped in a decoction of smoking tobacco to the ailing part. Her pains were promptly subdued, but she soon felt all the phenomena of intoxication by nicotine, and did not recover from it for three days. Poisoning by tobacco generally occurs by accident or mistake. It is rarely tried criminally, probably because the toxic properties of the drug are not reliable enough. Assassins prefer the alkaloid itself, the effects of which are much more prompt and more terrible than those of the plant. By whatever method it is administered in experiments, the animal is slain. Two drops are enough to kill a large dog; eight drops will kill a horse in four minutes. Under its effects he rages, prances, writhes, falls down, and dies in convulsions. "This alkaloid," says Claude Bernard, "is one of the most virulent poisons known, and a few drops of it on the cornea of an animal will kill it instantly. Nicotine, apparently sympathetic in its effects, in its action is very much like prussic acid." The action of this principle is so subtle that it cannot be analyzed unless the drug is administered in minute doses and very dilute solutions. There is then observed the phenomenon—which goes far to explain the facility with which one is habituated to the use of tobacco—of the rapid development of tolerance of gradually increasing doses. This has been demonstrated by Traube, who, with the twenty-fourth of a drop of nicotine subcutaneously injected, obtained very marked effects on the first day. The next day, on the same animal, it took a whole drop to reach the same result, and at the end of four days five drops were necessary. A similar tolerance is observed in man for hypodermic injections of morphine; but one does not get accustomed to digitaline or strychnine.

When nicotine is administered in doses weak enough to permit an analysis of its effects, almost the same phenomena are witnessed as with the whole plant. In the cases of poisoning already mentioned, there came on at the beginning extreme anguish and agitation, with sensations of burning heat in the pit of the stomach. Respiration was accelerated and the pulse was slackened; then came vomiting and purging, vertigo, and faintness. The face grew pale, the skin was covered with a cold sweat, the head was confused, and the patient fell into a deep stupor, with cries, general trembling, and convulsions. This agitation gives place to paralysis and insensibility; respiration is impeded, the pulse declines to a mere thread, and the patient dies in syncope.

When the patient resists the attack, as is most frequently the case, the evolution of the symptoms described above is arrested, and the sufferer comes out of his comatose condition with a violent headache, extreme weakness, and a gastric disturbance which it requires a considerable time to allay.

The effects produced by the habitual use of tobacco differ according to the way it is consumed. They have not been much observed except among smokers, who are most noticed because of their number. Then their habit is open; the smoke goes everywhere, and it causes inconvenience to others; while the more discreet snuff taker can hide his snuff box, and annoys with the smell of tobacco only those who come too near him.

Beginners at snuff taking require, like smokers, an apprenticeship. They begin by sneezing; then the mucous membrane of the nasal fossæ becomes accustomed to the drug, is palled, and even finds itself pleasantly tickled by the ammoniacal piquancy and nicotine perfume of the virulent powder. At last it becomes thick, and with intemperate snuff takers perceives odors only feebly. It becomes sometimes the seat of a chronic inflammation which extends to the pharynx and produces a slight dry and characteristic cough. Snuff takers are told of who have suffered from eruptions, ulcerations, and polypi; others have

* *Leçons sur les effets des substances toxiques et médicamenteuses*, Paris, 1857, p. 397.

become deaf; but such cases are so rare and their etiology is so doubtful that serious account need not be taken of them.

The only phenomenon peculiar to nicotine often observed among snuff takers is a rhythmic trembling of the hands, not like that of old men or that of drunkards, but which is observed likewise in excessive smokers. A single case is mentioned by Dr. Bean of *angina pectoris* in a patient who was addicted to an excessive use of snuff. But a solitary case is not important in the consideration of a habit so general, and there is no need of pursuing a fugitive enemy. Snuff taking is condemned by fashion, from whose decrees there is no appeal. Those of hygiene are not so imperative.

Smoking is charged by its opponents with injuring the health and debasing the mind. The former part of the charge has a measure of foundation. There is certainly nothing hygienic in the habit. All are acquainted with the troubles that ensue on the first effort to smoke. There are nausea, soon followed by vomiting, headache, vertigo, and a condition resembling sea sickness, and much like the earlier phenomena of acute poisoning by tobacco. These troubles soon pass away, and after a few succeeding efforts the smoker accustoms himself to the action of the smoke. When the habit is once acquired, smokers feel no further inconvenience; and there are some who are able to smoke just before sitting down at the table. Smoking generally dulls the appetite and gives relief against the pains of hunger. But after eating the desire to smoke becomes irresistible. This is the psychological moment; and the pleasure we feel then is more intense than at any other time in the day. The pipe or the cigar is a condition of good digestion for some smokers, but in others it produces gastric troubles. Nervous people, those who lead a too sedentary life, and office men, especially if they have the habit of smoking before meals, gradually lose their appetite, and acquire instead of it a painful anxiety and nausea. Others suffer from pyrosis. There are smokers who cannot light a cigar at some hours in the day without having the feeling of hot iron that marks that affection. Nearly all excessive smokers are dyspeptics; and the fact is explained by the excess of salivation and the diminution of the gastric juice and of the functional energy of the stomach. Next after the digestive troubles, the most common affections touch the respiratory organs and the heart. Granular pharyngitis is very common among persons who smoke to excess. The irritation of the pharynx is often communicated to the larynx, and there results a peculiar dry cough. Others feel a temporary oppression in the evening after having smoked during the day. A special form of asthma has been mentioned as caused by the abuse of tobacco; but cases of it must be very rare, for I have never observed it, though I have passed my life among smokers. Affections of the heart are more frequent. Some doctors assert that one-fourth of the smokers are afflicted with palpitations and irregularities of the pulse. I do not know where such observations have been made, but I have never seen any cases of the kind. I, as well as other doctors, have met cases of *angina pectoris*, chiefly among persons who passed their lives in an atmosphere saturated with tobacco, and among those who have swallowed the smoke of their cigars, and have not been surprised at them, because the smoke then enters into the lesser ramifications of the bronchial vessels, where it impresses directly the finest nervous threads of the lungs and the heart, and its action induces the spasms of suffocation that constitute that terrible disease. These symptoms are at first fleeting, and rarely mortal; but, if the patient does not abandon his habit, they occur more frequently, and become more grave till death ensues in one of them. Disasters from breathing an atmosphere saturated with tobacco smoke seem more liable to occur with children than with grown persons. Staying in smoking rooms, where the smoke is sometimes so thick that one can hardly see from one end of the room to the other, is dangerous to persons subject to palpitations, even though they do not smoke. Dr. Vallin has cited three facts conclusive as to this point, one of which relates to the case of a young officer who had given up tobacco three months before, and was attacked with a suffocation like *angina pectoris* after having passed several nights in his room, where his friends came to smoke for some hours every evening. Dr. Gelineau tells of an epidemic of *angina pectoris* among some sailors who were crowded in the between decks of a merchant vessel during a storm that made it necessary to close all the hatches, and who smoked to pass away the time. Those who did not join in the smoking suffered equally with the others, for they breathed the same toxic atmosphere.

Pipe smokers are in danger of epithelioma, or cancer of the lips and of the tongue. The former occurs chiefly among persons who smoke a very short-stemmed clay pipe. Smoker's cancer appears usually at the point where the hot pipe stem bears upon the lower lip, and on the side of the tongue at the point where the smoke touches at each aspiration. In some cases it begins with buccal *psoriasis*, a kind of thickening of the epithelium of the tongue, which becomes white, glossy, and horny. These two forms of a horrible malady are incontestably the most serious danger smokers incur; and the fear of it is the motive that has impelled the majority of conversions from the habit. The frequency of them should not, however, be exaggerated.

Tobacco has been accused of contributing to the depopulation of the country by enfeebling the reproductive powers of men and inducing miscarriages in women. The former part of the charge is founded on the very real fact that the smoking of tobacco, while its influence prevails, appeases all ardor; but its action is essentially temporary, and does not detract from the general powers of smokers. Their families are as numerous as those of other persons, and the peoples who smoke most are precisely those who have the most children. The Germans smoke twice as much as the French, and have five times as many children. The possibility of tobacco promoting abortions is more open to discussion, but it cannot exert any noticeable influence on the movement of population, for it concerns only a very limited class of women—those who work in tobacco factories. These establishments have borne a bad reputation in the past, and the effect of

life in them upon the operatives has been painted in very dark colors. All manufactures were until recently in a deplorable hygienic condition. Now the rooms are spacious and well ventilated, and all precautions are taken to preserve the health of the operatives.

But, whatever may be done, the vapors of nicotine cannot be got rid of in the shops where large quantities of tobacco are dried and fermented, or where it is stored in bales and casks. When the leaves are cleaned and mixed, in rasping and grinding, dust as active as the vapors is diffused around. Operatives who work in this atmosphere are in the situation of smokers, and become habituated to it after having suffered the same disorders in the beginning. Those who work in smaller and insufficiently ventilated rooms are often more seriously affected; but, as a rule, these workmen enjoy good health. Opinions as to the particular effect of this employment on women differ; but the prevalent result of the discussion appears to be that tobacco does not provoke abortion, and has no mischievous influence on the health of women operatives. Abortion is not more frequent among them than among other working women; and the weakness and mortality of their children are easily explained by the fact of their being left at home while their mothers are at the shop.

Among the maladies to which hardened smokers are exposed is nicotine amblyopia, which Sichel noticed first, and which has been well studied by modern ophthalmologists. It is a peculiar weakening of the sight, and is distinguished from other affections of the kind by the readiness with which it passes away when the patient gives up tobacco, and the promptitude with which it appears again when he resumes the practice. It is very rare. So is a paralysis which has been observed in Germany. Delirium tremens, convulsions, epilepsy, hallucinations, dementia, precocious senility, and melancholia have been mentioned as among the evils brought on by tobacco. No doubt smokers have them, and many other diseases. Tobacco will not save them from any of the ills with which mankind is afflicted.

Of all the accusations that have been made against tobacco, that of blunting the intellect is the most cruel to smokers. But the evidence in favor of it is not formidable. That most frequently encountered is obtained from statistics that show that in institutions for public instruction smokers stand lower in their classes than other pupils. Decaisne has shown this for the French lycées; MM. Bartillon, G. Dore, and Elie Joubert, for the pupils of the Polytechnic School; and Dr. Coustan, for the Normal and Naval Schools and the School of Bridges and Roads. The demonstration is hardly satisfactory. It seems reasonable to assume that the smoking pupils do not succeed so well as the others because they are idle and find in tobacco an auxiliary to their indolence and a relief from its consequent ennui. Probably, if the investigation had been pushed further, it would have been found that the same pupils are those whose general conduct leaves most to be desired, and who are most frequently punished. Discussion of this charge brings up an international comparison that is not favorable to its validity. There is a people north of the Rhine, whom I have already mentioned, and with whom the use of tobacco has almost become an institution. They consume a half more than we (the French), and yet we have to admit that these Germans are not as dull as they should be by the theory, that they do not cut a bad figure in the scientific world, and that they hold a preponderant position in Europe. A more specious argument than this is one which the detractors of tobacco draw from the enfeeblement of memory which many observers pretend to have remarked. This would be a serious matter if the charge were sustained; but it does not appear to me proved. Instances have been related in good faith, it is true, of persons who are supposed to have lost their memories through the use of tobacco; but my impression is that the loss can be more properly attributed to advancing age.

I have no thought of writing an apology for tobacco, or of asking for the erection of a statue of Jean Nicot. Smoking is a bad habit for everybody, especially for women and children. But because tobacco is a grand culprit is a reason why it should not be painted blacker than it is. If we exaggerate its faults and attribute imaginary ones to it, we run the risk of wholly missing our aim. In fact, children whom we are trying to preserve from it, when they see smokers around them able bodied and sparkling with wit, are disposed to think we are deceiving them when we hold up this bugbear before them, and will come to not believing the real evils of the bad habit against which we are trying to fortify them.

Last to be considered is the philosophical side of the question: What is the motive that impels so many persons to contract an inconvenient, expensive, and unhealthy habit? The problem is insoluble to persons who do not smoke. "I can never comprehend," lately said a professor of hygiene, "the enjoyment one can feel in converting his mouth into a chimney flue." Dupuytren called the habit of smoking the ignoble pleasure of poisoning one's self and others. This is not surprising; but it is more so that smokers themselves cannot account for the fact. The general opinion is that we begin to smoke to imitate others, and continue it by habit, as a distraction, or means of dispelling ennui. "The boy of fourteen or fifteen years, beginning to smoke," says M. Dumas, "does not seek a cerebral excitement in the new habit any more than one who is beginning to drink. He simply imitates the bearded persons whom he sees with the pipe or cigar in their mouths. It is to him one of the signs of the virility to which he aspires. It is the easiest way for him to make himself believe that he is already a man, and to make the public believe it." This is true, but few smokers can find any traces of this feeling in their recollections; but while the desire of affirming one's virility and doing like others may explain the first essays in the face of the pains that attend them, it does not account for the irresistible attraction of the habit once formed and the readiness with which it establishes itself. The customs and tastes of populations and the fashions change and give place to others that disappear in their turn, after having inspired the same infatuation in us; but the habit of smoking goes on increasing, over all obstacles. The earliest adepts of the practice braved anathemas and persecutions, and some of them punishments. The smokers of to-

day do not have to make the same struggles, but many of them endure troubles that compromise their health rather than abandon the practice, and among these are men of energy and intelligence, whatever else may be said of them.

There must, therefore, be in this passion something besides the satisfaction of a mechanical habit. "The particular intoxication caused by tobacco," says M. Dumas, "must have irresistible attractions for an intoxicant of so recent discovery, the initiation into which is so painful, to have overtaken wine, old as the world." The charm of tobacco intoxication is not easy to explain. It is in the soothing, says M. Fay; it is an anesthesia that has become necessary, says M. Richet; it is a state of torpor which conduces to revelry, say others. Tolstoi maintains that it is nothing of this kind, but the desire to stifle the voice of conscience; and, confounding tobacco with alcohol and opium, the Russian romancist envelops them both in the same anathema. In explanation of his view he has recourse to a theory known in physiology as that of duality, or human dynamism. During his conscious life, Tolstoi says, man has frequent occasion to recognize in himself two distinct beings: one blind and sensitive, the other enlightened and thinking. The former eats, drinks, rests, sleeps, reproduces, and moves, like a machine wound up for a certain time. The other, the thinking and enlightened, united with the sensitive one, does not act by itself, but only controls and appraises the conduct of the former one, helping it effectively if it approves, and remaining neutral in the contrary case. This spiritual but powerless being plays in human psychology the part of the compass of the ship, of which the other being is the helmsman. The last can follow the directions of the magnetic needle, or he can pay no attention to them; he is even able, when its warnings annoy him, to disarrange his compass. Weak and timorous persons have recourse to the last expedient. They stifle their conscience, and, in order to do so, use alcohol or tobacco.

Count Tolstoi's theory cannot be sustained. It has one particularly weak point in the similarity which the author assumes between the effects of tobacco and of alcohol. Not one of the personages whom the translator of his work consulted protested against this confusion, and still it is false and deceitful. The Russian's paradox may be applied, to a certain extent, to drunkenness. We do sometimes get drunk to forget to stupefy ourselves, and it is a detestable means. Rogues and criminals all do it; they drink often to give themselves heart, murderers especially; while there is not a case known, as M. Aurelian Scholl has observed, of a crime committed with pipe or cigar in the mouth. The author himself confesses that he dulled his conscience with tobacco for a long time. It had not, it is true, many reproaches to address to him. Sometimes it reproved him for idleness, or admonished him for a neglect, or a want of punctuality, or an excess of passion in which he had not measured his tone. To quench his remorse he lighted a cigar, and all was forgotten. If tobacco had never committed worse misdeeds, nobody, I believe, would have thought of quarreling with it.

Other modes of voluntary intoxication have the common characteristic of deranging the reason and the moral sense. Hashish produces hallucinations and delirium, and plunges persons into a condition like madness. Opium puts to sleep, and procures for some persons agreeable dreams; but one becomes quickly habituated to it, the doses have to be increased, all the functions flag, and the opium smoker falls into a condition of inanity, at times interrupted by fits of homicidal-furor. Morphinomaniacs do not suffer the same perversion of mind, but they become false, dissimulating, indifferent to all that is foreign to their passion, extending to family feeling and even to honor. Their health is injured more quickly than by opium smoking, and their life is shortened as much. Alcoholism is still worse. I have studied its effects in all their phases in another work, and will not repeat my conclusions now. It is sufficient to recollect that the ignoble and degrading vice attacks nations in all their vital forces; families in their honor, fortune, and prosperity; that it peoples hospitals, insane asylums, and prisons; and costs France a milliard and a half of francs a year.

Tobacco can be reproached with no such mischief. It has never led the reason astray, destroyed the will, or perverted the sensibility of any one. The most hardened smoker enjoys at all times the most perfect clearness of mind. Even at the moment when he is under the influence of nicotine he talks, reasons, studies, and works with a freedom of thought that proves that his intelligence has not received any harm. One might say that tobacco had disengaged him from physical impressions, and that, as Dr. Richet says, it mollifies the sensibility of the organs only to leave the psychological functions greater freedom of evolution.

There is another characteristic difference between tobacco and other voluntary poisons. A person can break up the habit of using tobacco, while alcoholism and morphinomania are almost incurable. At the end of my long career I cannot recollect having witnessed more than two or three cures from alcoholism, and I cannot affirm that they would have been permanent if the subjects had been exposed to new temptations. Morphinomaniacs are absolutely incurable unless they are interned. Smokers, on the other hand, can correct themselves when they wish to. They only need a firm will. We see persons every day who have done this; and since the troubles caused by tobacco have been more definitely known, we see many men giving it up of their own accord as they advance in age. The habit is so completely lost that after a few years the reformed victim can find himself in a company of smokers without feeling a desire to imitate them; and if he is moved to light a cigar, he will not find the pleasure of the old days in it.*

I might stop here; but I will not finish this article without giving my own explanation of the fascination of tobacco. It is probably no better than the others, and I will not try to impose it on any one.

Men have at all times eagerly sought for substances that would act on their nervous system. The tendency

* The translator of this article was an inveterate smoker till the summer of 1888. One evening he said to himself that he would not smoke that evening. That is all the resolution he ever took; but he has never smoked or desired to smoke since.

is general, and is exclusively human. To escape real life and the drudgery of daily occupations, to live in dream land, in an ideal world which the imagination can people at its will, and can embellish with its illusions, have irresistible charms to some minds. In obedience to this dangerous seduction they involuntarily seek the dreams of opium and hashish, the intoxication of ether and chloral, or the grosser drunkenness of alcohol. The weak yield unresistingly to their inclination, and pass into the degrading excesses which I have reviewed. Tobacco offers no such seductions and is attended with no such dangers. Its action on the nervous system is weak and wholly special. It does not put to sleep, but it calms and mollifies the sensibility of the organs. It causes an agreeable torpor, during which thought continues lucid, and the capacity for work is not diminished. Such is the attraction it exercises, and which causes it to be sought for by so many thinkers and students. Tobacco is to them a help in mental labor. When fatigue begins and the need of a moment's rest is felt; when the thought fails to present itself with the usual exactness, and the mind hesitates over the shape to give it, the student, writer, or investigator stops, lights his pipe, and soon, by favor of this pleasant narcotic, the thought appears clear and limpid through the bluish cloud in which the smoker has enveloped himself.

I should make a wrong impression if I left it to be believed that I thought tobacco necessary to mental labor. It becomes so only for those who have contracted the habit of using it, and they can divorce themselves from it without losing their capacity. As a whole, tobacco is harmless to the mind, but it may have a mischievous influence on the health, and may cause serious diseases. We should not advise any one to use it, and should try to keep women and children from doing so. In taking up this part of its programme, and in affiliating itself with teachers of all grades, the Society against the Abuse of Tobacco has performed real service; but it has tried to gain its end by exaggerations that can only compromise it. It is of no use, and would be labor lost, to try to convert adult smokers so long as they experience no inconvenience from the habit. As soon as they begin to feel some troubles, and have reached an age when the troubles may become grave, the dangers to which they are exposing themselves should be described to them without extenuating them, but without making the picture blacker. If dangerous affections are threatened, like *angina pectoris*, or injuries to the tongue and lips, a decisive course must be taken, and the immediate and complete abandonment of the cigarette and pipe insisted upon, for experience has taught that there can be no gradual leaving off.—Translated for *The Popular Science Monthly* from the *Revue des Deux Mondes*.

ALPINE GARDENS.*

THE first alpine gardens were suggested by the sight of torrents which, dried up during the summer, and rolling heavy rocks at the time of the melting of the snow, have their steep banks covered with a multitude of charming plants during the fine season. This idea should not be lost sight of by him who undertakes such a work, and the result will be so much the better in proportion as it more accurately reproduces the natural scenes observed. If he has the spirit and leisure for it, the artist should go to seek the combinations that satisfy the eye from all points, *in situ*, note the form and dimensions of each rock, the relative positions of the plants that cover or surround it, and fix each of these details by an accurate sketch or by photography. The art will afterward consist in grouping these different scenes, the union of which will form a perfect whole.

As picturesque effects are obtained by a skillful imitation of nature, it will be necessary to combine them with the exigencies of culture. The amateur should, therefore, possess taste and a certain amount of horticultural knowledge; otherwise, it will be well for him to ask advice of a landscape gardener. The first condition to be fulfilled is to give sufficient nourishment to the plants that are to embellish the rocks. In most cases failures are due to no other cause than an insufficient preparation of the soil. Although some species, like the orpines (*Sedum*), the house leeks (*Sempervivum*), the saxifrages, etc., live upon the bare rock, the great majority of alpine plants seek deep earth and develop roots therein several feet in length, such as the *Silene alpestris* and *acaulis*, the various pinks (*Dianthus alpinus* and others), the globe daisies (*Globularia cordifolia*), etc. Let us remark, by the way, that horizontal fissures, such as shown by No. 1 of Fig. 1, are not, as a general thing, favorable to the culture of alpine plants. When superposed rocks are used, it will be well to spread a good layer of suitable soil over each of them before placing the succeeding one, and to maintain the necessary spacing by fragments of hard stone, such as basalt or granite (No. 2). In most cases it will be preferable to form oblique or vertical fissures between the rocks, but care must be taken that the upper rocks do not overhang. A plant placed at the entrance of the fissure, H, as shown by No. 3, will receive the sun and the rain, while placed at K (No. 4), it will soon perish for want of light and moisture.

A satisfactory form for the establishment of ragged rocks is that shown by No. 5. The rain falls successively upon each stone and infiltrates into each fissure and reaches the bottom of it. For the same reason, it is well to cover the upper part of the work with earth and small stones (No. 6), to the exclusion of large rocks, unless, however, it is desired to produce a definite picturesque effect.

The vertical fissures, which are those best adapted to alpine plants, should, as far as possible, be narrower at the bottom than at the top. Were it otherwise the

case, the earth would leave the side walls through the effect of rain, and accumulate at the bottom. Care should be taken to place a few loose stones at the upper part of the fissure in order to prevent too rapid an evaporation.

As for the general arrangement of the rocks, one of the best is that offered by No. 7. Many alpine plants are particularly partial to narrow clefts that receive the sun for several hours, but that are protected from its rays until about noon by a line of higher rocks. In fact, a shelter against heat is still more necessary in the morning than in the afternoon. The plants exposed to the last are dried up at a very early date during the summer, while the dew remains until noon upon those that are exposed to the west (or to the north, and sheltered toward the east).

No. 8 of Fig. 1 shows how, in a western exposure, plants placed in the fissures, F F, are protected against

in order to increase the picturesque effect, a certain number of pockets are formed irregularly in the exterior for the reception of ferns, ivies, pinks, linarias, house leeks, etc.

In order to give variety to a rock garden, we may mingle with the blocks of stone, trunks of trees head downward, and raising in the air their variously twisted roots. In the natural pockets formed by such roots may be planted species of quick growth, such as certain campanulas and other plants that particularly prefer such a medium, as, for instance, the columbines, some of the large compositæ, some of the umbelliferae, etc. The whole may be interlaced with clematises and brambles, and ivies with foliage variegated with red, yellow and white, so as to form an *ensemble* most agreeable to the eye.

An opposition has often been made, and not without reason, to the use of such half-rotten roots, on the

FIG. 1.—ARRANGEMENT OF ROCKWORK IN ALPINE GARDENS.

the morning heat of the sun by the rocks, R R, forming a screen. Upon the whole, the exposures that should be selected for the culture of alpine plants are the western and northern ones, provided that, in the latter case, they are sheltered toward the east.

In certain cases, one will be led either to make use of some already existing wall, or to construct one, to sustain the earth. The following is at once a practical and picturesque manner of utilizing such a wall for the culture of alpine plants and especially of alpine shrubs, for many small species prefer to be grown upon the narrow sides of the rocks (No. 9).

A width of about 24 in. is given the base of this wall, and a height of 20 in. above the surface of the ground.

The two sides, which must be made of rubble, should have a space between to be filled in with carefully prepared earth. Finally, the whole is covered here and there with large blocks of stone to assure the stability of the structure.

The cement joints are suppressed here and there, and replaced by earth, and it is into these interstices that are introduced the roots of the alpine plants whose stems will cover the face of the wall. Finally,

ground that they decompose too rapidly, lose their original aspect, and become the refuge of slugs and woodlice. This second part of the criticism is very just, and we could not too strenuously recommend amateurs to wage bloody war on these enemies of pretty alpine plants; but, for the first criticism, there is, in our opinion, less foundation. In the beautiful alpine garden at Kew (Fig. 2), may be seen three trunks planted in 1882, and that have remained intact up to the present.

We have several times remarked that it is necessary to give the plants soil suited to their nature. The best process that can be employed consists in mixing, with the existing soil, vegetable mould, somewhat argillaceous, and compact. Such work will be truly necessary only in soils that are purely calcareous. In most cases, but few amendments will have to be made for the establishment of a rock garden, especially in clay, in which a number of alpine plants grow admirably. We are of the opinion that it will be better for one to devote his attention to digging deeply into the earth so that the roots may easily descend therein and find the moisture necessary for them during the heat of

FIG. 2.—ROCK GARDEN AT KEW—CASCADE AND AQUATIC PLANTS.

* The following is a list of plants that may be recommended for cultivation in alpine gardens: *Helleborus niger*, *H. purpureus*, *H. orientalis*, *H. niger* var. *angustifolia*, *H. punctatus*, *intermedius*; *Dianthus* s. *caesus*, *D. alpinus*; *Primula denticulata*; *Potentilla nitida*, *P. cruenta*; *Rubus arcticus*, *Veronica Hectorii*, *V. Traversii*, *V. pinguifolia*; *Hedera Helix*, *Hibernica*, *Meconopsis Wallachii*; *Ranunculus pyrenaicus*; *C. rufus canadensis*; *Cistus corbicularis*, *C. laurifolius*; *Saxifraga* *Rochetiana* var. *corymbosa*, *S. cochlearifolia* minor, *S. cristata*; *Geranium sanguineum*, *G. alanticum*; *Colostomeria* s. *C. rotundifolia*; *Adiantum Capillus Veneris*, *Nephrodium rigidum*; *Gentiana asclepiadea*, *G. acaulis*; *Calceolaria plantaginifolia*, *C. villosa*; *Dryas Drummondii*, *Hydrangea scandens*, *Helianthemum tomentosum*, *Scelopendrium officinale*; *Sedum latifolium*, *S. rupestre*, *S. spectabile*; *Sempervivum tectorum*, *S. montanum*, *S. calcareum*.