A

GENERAL SYSTEM

OF

TOXICOLOGY:

OR,

A TREATISE ON POISONS,

FOUND IN

THE MINERAL, VEGETABLE, AND ANIMAL KINGDOMS,

CONSIDERED IN THEIR RELATIONS

WITH

PHYSIOLOGY, PATHOLOGY, AND MEDICAL JURISPRUDENCE.

ABRIDGED AND PARTLY TRANSLATED FROM THE FRENCH OF

M. P. ORFILA, M. D. P.

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Dec. 1, 1817.

TO NATHANIEL CHAPMAN, M. D.

PROFESSOR OF THE INSTITUTES AND PRACTICE OF PHYSIC AND OF CLINICAL PRACTICE IN THE UNIVERSITY OF PENNSYLVANIA; PRESIDENT OF THE PHILADELPHIA MEDICAL SOCIETY, &c. &c.

SIR,

I BEG leave to inscribe the present volume to you who have so justly appreciated the value of ORFILA'S elaborate and extensive Work on Poisons. Encouraged by you, I have ventured to publish a condensed and cheaper edition, in which I have endeavoured to comprise whatever the original contained that appeared interesting to the practitioner. It is not the friendship with which you have honoured me, that designated the medium I have chosen, through which to present it to our profession. It is offered as an acknowledgment of your solicitude for the advancement of medical science, the honour of the profession, and the reputation of its members, whose success, I have learnt by many proofs, is a more immediate object of your ambition, than the fame of a Boerhaave, or the celebrity of a Cullen.

I am, Sir,

With great respect,

Your most humble and

Obedient servant,

JOSEPH G. NANCREDE.

Philadelphia, November, 1817.

PREFACE

OF THE AUTHOR.

OF all the branches of Medicine, the study of *Toxicology* is, without contradiction, that which excites the most general interest. Allied as it is by numberless relations to almost all the natural sciences, it has occupied the attention of all philosophers, who are zealous of contributing to the progress of human knowledge. The Naturalist, placed in the midst of a multitude of poisonous substances, attentively examines the varied forms which they present, their distinguishing characters and their mode of developement, and arrives easily at a method of pointing them out. The Physiologist, inflamed with the desire of unveiling the most secret mysteries of our organization, seeks to explain the mode of action of the most energetic poisons, the deleterious influence which they exert, and the immediate cause of the sudden death they occasion. The Medical Practitioner, aware of the fatal and instantaneous effects, produced by the poisons of the three kingdoms of Nature, constantly directs his attention to the search of means capable of destroying at once their fatal action, and of re-establishing the different functions of the animal economy in their natural order. The Chemist, shocked at the horrid crime of homicide, brings to perfection the process necessary for establishing the case of poi-

soning, in order to expose the crime, and to enlighten the Magistrate whose duty it is to punish the guilty. The private individual, sensible of the misfortunes of his fellow-creatures, is fond of discoursing on the fatal properties of poisonous substances, and of the astonishing phenomena they give rise to: alarmed at their destructive consequences, he never ceases to deplore the fate of those who are the victims of negligence or mistake, and to feel for the misfortune of the unhappy wretches whom despair has hurried on to suicide. Incensed at the most cowardly of crimes, he regards with horror the execrable assassin; and loudly demands the punishment of a monster, the more dangerous, as he always commits his ravages in silence, and often even upon his benefactors.

Having given myself up for a long time to the pursuit of this beautiful part of natural history, it appeared to me a useful undertaking to collect into one work, and that not very voluminous, the most prominent objects that belong to it. Such a work is altogether wanting to Science; I may affirm more; a very considerable number of the facts which should serve for its basis, are still unknown, or badly studied.

The Treatises on Toxicology by Plenck and Franck, which were published a long time since, are no longer on a level with the present state of knowledge, and can only be considered as very imperfect sketches of this important Science. The treatises written particularly on arsenic, sublimate, copper, lead, nitric acid, prussic acid, opium, &c. furnish only the solution of certain problems in Toxicology, and ought only to be regarded as so many separate tracts, fit for furnishing excellent materials to the arrangement of some of the articles of a work of this nature.

I must confess I have been often discouraged by the

blanks I had to fill up, and would several times have abandoned my undertaking, had I not been convinced that it is always useful to attempt to clear the path, even when imperfectly marked out.

This Treatise, consisting of two volumes, 8vo. will be divided into two sections, preceded by an introduction, in which will be pointed out in a succinct manner, the end of Toxicology, its relations with the other Sciences, and the means to be pursued for bringing the study to perfection; lastly, the division of poisons into six principal classes. The Corrosive, the Astringent, the Acrid, the Narcotic, the Narcotico-acrid, and the Stupifying.

The first section will contain the particular history of the different poisonous substances, found in the three kingdoms of Nature, and considered in their relations with Chemistry, Physiology, Pathology, and Medical Jurisprudence.

In giving this history, we shall begin by establishing some general principles in each of the six classes. For instance, the action of corrosives upon the animal economy will be explained, with the different causes of the death which they produce, the general symptoms they exhibit, the wounds of texture they occasion, finally, the treatment proper to be pursued in order to relieve the symptoms to which they give rise. Then each of the Poisons will be separately treated of; attending more particularly, to those which present the greatest interest. Their history will be comprised in the six following paragraphs.

1*st. An Explanation of their Chemical Properties, and of their external Characters.*

This part, which has been neglected by all the writers on Toxicology and Medical Jurisprudence, will be laid

down with the greatest care. Among the different characters proper for recognizing these substances, those will be selected which are the most constant, and the easiest to verify. The precipitates furnished by the mineral poisons, when mixed with the different Chemical Agents, will be particularly attended to: their colour, their nature, and the mode of analysing them, will be explained. The theory of the formation of those precipitates, being alone able to enlighten the Juridical Physician on the poison he is desirous of being acquainted with, care will be taken to explain it after having laid down the phenomena which they present; by this means, the person called on to decide, far from proceeding empirically, will judge always with a knowledge of the cause, and thus arrive at sure results. The botanical and zoological characters of the different vegetable and animal poisons, will be laid down according to the principles of the two Sciences to which they belong.

2nd. Their Physiological Action.

In this paragraph will be determined, the effects of poisonous substances when administered in doses capable of producing serious accidents: the experiments will be reported, which have been made upon living animals, with the intention of ascertaining the phenomena they produce when introduced into the stomach, when injected into the veins, or when externally applied. By the help of the phenomena resulting from these kind of researches, it will be explained, as far as the present state of Physiology will allow, by what mechanism death supervenes in the animals poisoned.

3rd. Their General Symptoms.

The enumeration of these symptoms will be preceded by some cases and observations on the kind of poisoning.

These observations, which will be drawn from the works of Dioscorides, Paré, Manget, Morgagni, Hoffman, Sydenham, De Haen, &c. will enlighten the practitioner on the diagnosis, and on the mode of treatment which he ought to pursue.

4th. The Lesions of Texture which they produce.

The nature of the alterations produced by the poison, their situation, their extent and intensity, will form the subject of this paragraph; in which it will be attempted to demonstrate, from the appearances on dissection, that it is impossible to be able to recognize, by the simple inspections of lesions of this description, the poisonous substance which has produced them.

5th. The application of the Facts established in the four preceding paragraphs, to the different Cases of Medical Jurisprudence.

1st. The course which the person called upon ought to pursue when the patient poisoned is living, and that the rest of the poison whether solid or liquid is found, whether alone or mixed with aliments and medicines.

2nd. The means he ought to employ should the patient be alive, the whole of the poison swallowed, and the matter vomited can be examined.

3rd. The conduct he ought to pursue in case the whole of the poison has been swallowed, and that it is impossible to procure the matter vomited, the patient being still alive.

4th. The mode of analysis which must be had recourse to, when the patient is dead.

6th. The Treatment of Poisoning.

As it is of the utmost importance that the practitioner

should be acquainted with the different counter-poisons, and beside that a multitude of re-agents have been extolled, which do not in any manner deserve the name of *Antidote*, we shall begin by resolving the following problem.

Is there any substance which possesses the properties required to act as an antidote ?

The numberless experiments which have been made upon living animals, with the design of throwing light upon this question, will be here reported. It will be made to appear that it is useless, and often dangerous, to have recourse to a very considerable number of those things which have been extolled ; and others will be substituted in their room, the employment of which does not present any inconvenience, and may be followed with success; which we shall demonstrate by some facts peculiar to ourselves.

After having thus fixed the respective value of the substances considered as counter-poisons, the course which the Physician ought to pursue in order to relieve the symptoms developed by the poison will be pointed out, in making the different means understood, which he may employ according to the nature and violence of the symptoms.

The second section will comprise all that relates to poisoning generally considered. This section will contain two chapters.

In the first, the means proper for ascertaining the existence of poison in a person while living, will be treated of.

The first article of this chapter will be set apart for the purpose of making known those symptoms, which distinguish acute poisoning from several other diseases ; such as the *cholera morbus*, the *melæna*, &c. : of explaining the variations of those symptoms, according as vomiting may.

or may not have taken place : lastly, of determining the degree of confidence which ought to be attached to the experiments, in which animals are made to swallow the matter vomited by the patient suspected of being poisoned.

In the second article, an important question will be treated of, namely, to what class the poison belongs ; and if it be a Corrosive Poison, what is its peculiar nature, and consequently, what is the mode of analysis that should be employed for discovering it ; what are the precautions that ought to be taken in this important operation ; in what order the re-agents ought to be employed, when the poison happens to be in a very small quantity ; in what manner, proceeding on from a known to an unknown point, we may at length be able to decide upon its composition.

In the third article will be given the history of slow poisoning ; cases will be communicated, which prove how difficult the diagnosis is ; and the different means will be pointed out, by the aid of which, the Juridical Physician may be able to pronounce a judgment that is certain, and beyond the reach of all reproach.

In the second chapter, whatever relates to the examination of the dead body of a person poisoned, will be treated of.

The first article of this chapter will have for its object, the manner of proceeding in the opening of bodies ; the importance that the Juridical Physician ought to attribute to the lesions of texture produced by the different classes of poisons ; the different states of these lesions in bodies already corrupted, and in those examined shortly after death ; whether the poison has been taken during the life of the person, or has been introduced after his decease.

The second article will comprise all the researches proper for establishing a distinction between sudden deaths

produced by an internal cause, and those which are the result of the agency of poisons. The lesions of texture exhibited by the dead bodies under these two circumstances, which are altogether different, will likewise be compared.

PREFACE.

"I HAVE long been of opinion," said one of the fathers of the Medical School of Paris, "that, in the present state of medical science, one of the most essential services which could be rendered the practice of medicine, would be the publishing of a good treatise on poisons." The truth of no sentiments, on subjects relating to the healing art, has been more fully confirmed, by my own observation and experience. I have often been compelled to deplore the want of such a treatise in all our medical libraries, and have looked forward, and with a longing desire, that some experimental and philosophical practitioner, with a mind to conceive, and industry to collect materials for a work, so indispensable to the student, as well as all active practitioners, would supply the lamented deficiency.

These reflections are not to be predicated alone of this country; it is a fact not more honourable to the European medical history of our time; for with the exception of the works of Fontana, Adams, and perhaps one or two treatises on Toxicology by the Germans, nothing has been written, calculated to guide the practitioner in the selection of his means, for rescuing the lives of those exposed to the action of deleterious substances, the sources of which are so abundant in nature, and which the industry and arts of civilized life have rendered still more numerous.

It is a fact, humiliating to the pretensions of the medical corps, that the Aborigines who roam the wild forests,

are more familiar with the antidotes that grow under their footsteps, which nature has supplied to counteract the effect of poison, than are many of the most renowned teachers in medical schools. Were the practitioners in the United States, to throw into one register, the fatal cases by poison for one year, what an awful reproach would it cast upon the deficiency of practice in this particular! The most industrious, as well as the most intelligent, cannot be prepared to visit one dying from the effects of poison. The treatment of persons who have been poisoned, in many cases, is merely conjectural: few physicians go to the bed-side of a man, supposed to be poisoned, without a consciousness that he is hailed as a deliverer; yet, how afflicting the thought that he has the treatment to learn—and while engaged in conjectural efforts, the patient dies! In all such cases, the ablest practitioner must repeat his visits, with the countenance of gloomy uncertainty—not a beam of hope is reflected from it. "An incendiary is in the tabernacle, veiled in mystery, invisible, intangible! Legions cannot expel him; and presently the proud fabric is consumed!"

These reflections, which have much more of fact than of feverish melancholy, to press them upon the attention of every humane physician, are enhanced by the state of society in which we live. How frequently are the industrious cultivators of our vastly spreading country, far removed from the usual auxiliaries of our profession, obliged to become their own physicians? They study to fortify themselves against the invasion of the diseases incidental to the climate, by consulting popular books, published for this purpose. But when the invader is armed with poison, their stock of experience and self-cultivation must surrender to his summons.

Ingenious, learned, profound, and many; and long, elaborate yet futile are the essays and dissertations with which we have of late years been inundated, on the most unimportant functions of animal economy. Voluminous and expensive works on the anatomy of dogs, frogs, and spiders, have been published. It has been ascertained to the hundredth part of a second, how long it will require the absorbent vessels to convey certain injections into the fluids. Every physiological and chemical question, however futile, or practically useless, has engaged the attention, nay become the mania of European physiologists, the English and French, as well as the Italians and Germans; but, until lately, none had devoted their attention to the numerous affections produced by poison. And it is a fact greatly to be deplored, and for the existence of which I may appeal to the profession, that many learned practitioners are at this day unacquainted, or, perhaps, it would be better observed, are slightly informed of the properties of a great number of deleterious substances, the swallowing of, or contact with, which destroys the life of man. In spite of the melancholy admonitions of daily experience on this subject, the practice, without adequate guides, is left to conjecture, to a mere routine of prescription, or to the indefinite hints and scattered facts to be gleaned from medical books, for the rules of expelling or counteracting poisons. No analytical system, no classification of poisonous substances, were to be found; no experiments to ascertain their action on the animal economy had been made, nor any approved treatment, to avert their baneful effects proposed.

If then, on a subject so overwhelming in its consequences, the resources of learned, experienced, and intelligent physicians be so scanty, what must be the confusion, em-

barrassment, and distress of a young practitioner, often called on to exert a skill not to be acquired from any accessible source, to tender assistance not afforded by experience?

However provident may be our medical seminaries, which, in this and many other particulars, yield in no degrees to the European; and however judicious and solidly learned may be their professors, it has not hitherto been practicable for students, to study the pathological and therapeutic relations of poisons, while pursuing a course of the medical sciences. Nor is the attainment of this branch, however useful and essential to the complete education of a physician, compatible with the established plan of medical instruction throughout the world, unless it be assigned to a distinct department; because the subject seems to demand a provision for an exclusive course. Of this, whosoever shall read the following volume, must be fully convinced, and on the ground of this conviction rest its merit and utility.

If then the pathology, physiology, and therapeutics of poisons require so much time, labour, science, and research, what department, let it be asked, can be charged with them, without incumbering the course of instruction, already too limited to embrace the details of the new forms, observations, and discoveries, in the various branches which are accurately classified and regularly taught? Let the experience and observation of every member of that growing and distinguished institution speak; and they will fully testify that, such is the solicitude of the present professors, to perfect their respective courses, that they would cheerfully exhaust perennial sessions, for the benefit of their classes, without turning aside, to discuss in detail a branch of medical science of indefinite classification.

To what chain does the pathology and therapeutics of poisons belong? and which of our able professors is charged to teach them? It may be answered, that chairs of medical jurisprudence are established:—If chairs of medical jurisprudence, where they have been established, have so assumed the duties of teaching them, that the medical students, from every quarter of the United States, may return, as perfect in their attainment as in the attainment of any other branch, these remarks have been anticipated. Nothing remains to be added to the present system.

But if the duties of those chairs of medical jurisprudence should be confined to abstract and speculative questions, relative to the operation of poisonous substances, or to the observations of physicians on the appearances of persons supposed to have died by poison, omitting wholly, or noticing partially the elementary and experimental instruction, essential to the thorough understanding of the cause, and the right treatment of the disease produced by it; if they only glance at the operation of the poisonous substance, while it is yet possible to counteract its effects, it is evident that the friends of humanity and of the profession, have yet the enterprize to accomplish.

In Europe, where custom is inveterate; where private too frequently predominates over the public interest; where improvements are innovations, and cannot be proposed without support, without the aid of a potent arm, without patronage, a man would be thought visionary who would hazard these remarks. It would require no ordinary courage, even to defend their propriety. But in our country where the tyranny of custom ever yields to the force of reason; where well-defined freedom pervades every class of society, the good of the community, not the private interest of individuals, is uniformly the object of public in-

stitutions. In this country, where the preference and approbation of an enlightened people, ultimately are bestowed on men of solid talents, uninfluenced by the caprice of family, rank, or parentage, I can have no dread that the liberty I use in throwing out these reflections, for public consideration, will subject me to the charge of presumption. Were I influenced by such an apprehension, I would plead the interest excited by the work of Dr. Orfila with the professors of the University of Pennsylvania, and shield myself under the recommendation of the gentleman, who so ably and so usefully fills the practical chair, at whose instance this treatise was prepared. This egis is sufficient to protect me, and his countenance is all that is required, to introduce this volume to the serious perusal of every member of our profession.

Undoubtedly the publication and dissemination of this treatise on poisons may, in a great measure, serve to lessen the evils we have noticed, and obviate the necessity for provision being made in the University for such a course of instruction. Physicians already established will profit by its stock of information; and probably add to it by a prosecution of the experiments it details. But this will be only negative good. Demonstration and experiments being necessary to students in medicine, who, while prosecuting their studies, cannot add information to precept, it is believed they have a deep interest in the establishment of a department, in which they may be taught, by demonstration and experiments, the pathology and treatment of cases proceeding from poison. Have they not a right to expect as great facilities of instruction in these cases, as in any other of equal importance in medical science? nay more, from the greater difficulty of obtaining it, in the sphere of practice to which they return? They leave their homes

with the full conviction that the Philadelphia school will initiate them into the most minute parts of the study of their profession; and that, whatever may be the character of similar establishments abroad, this will always afford the requisite information:—they should not be disappointed.

Let it not be objected that the European schools have never made it a distinct establishment, have never paid to the subject of this volume more attention than our own; and that it is vain to pretend to excel them in this particular. We already possess advantages of which they are deprived. Because they are oppressed by the tyranny of custom, which might be justified by the state of science, when it was established, it does not follow, that we, who have attended the progress of experience, should go back to the time whence they emerged. As well might we say that, because Hippocrates was ignorant of the circulation of the blood, we must not profit by that inestimable discovery.

It becomes us to avail ourselves of all the improvements in European schools, reject their errors, above all things reject their prejudices, and add to our establishments whatever we may deem advantageous to the greater dissemination of knowledge, without regarding whether it be in conformity with customs or precedents. We did not consult the nations of Europe when we resolved to become a free people. Our success has excited their admiration. Why should we be the willing slaves of their customs and precedents in our scientific establishments?

Our literary and scientific establishments are for us, not for them. They emerged from a state of barbarism; they were ignorant: we are civilized; we are learned. It becomes us therefore to adapt our establishments to the present state of science, to the peculiar time and place we

enjoy, that our success and advancement may correspond with the superiority of our means. It is our good fortune to enjoy all the benefits and privileges of manhood, while we are yet in infancy. Our advancement in science is not to be limited by that of Europeans, because we have availed ourselves of their progress.

I beg to be permitted, while on this subject, to express my astonishment at the composition of some of our periodical medical works, which consist principally of European extracts, to the exclusion of almost every paper or communication of American origin. And when I do this, I trust I shall not be understood as wishing to reject European communications, which I esteem of the utmost importance. I only wish to express a regret at the studied rejection of every American composition; because, by inducing foreigners to imagine that we are unable to observe and to describe our own cases, we may so far discourage American physicians, as to persuade them of their everlasting dependance on Europeans, for their medical knowledge and instruction. I am the more averse from this partiality, as I cherish the idea that we are fully adequate to the furnishing materials for a periodical work of this nature, wholly American; and that this national publication, by a fair exhibition of our progress in the medical sciences, would encourage American physicians of talent to support the Philadelphia, or rather the American school, which, I fondly anticipate, is destined, one day, to rival and surpass all others.

But to return to medical instruction, in cases resulting from poison.

It appears, from its manifest importance, greatly increased by the particular situation of the population of this country in relation to the progress of the science and practice of

medicine, that the study of the pathology and therapeutics of cases of poisoning has a fair claim to the attention of the public medical schools, and more particularly that of Philadelphia, which, by common consent, has contracted the implied obligation of supplying every source of instruction necessary to the students, repairing from every part of the union.

This claim is the stronger and more imperative, because this knowledge, not being, like many others, attainable by private application, is a proper subject of public instruction.

Such a course of study or instruction could not be prosecuted in the depth of our forests, where a proper chemical apparatus could not be procured, where no collection of the various poisonous substances natural to the climate, has been formed, and where physicians and chemists could not be expected to unite in conducting the experiments; yet there may be, and doubtless there are, in such wildernesses, valuable lives to be saved.

If the end of therapeutics be, as it doubtless is, to restore the sick to health, what case, what possible occurrence in a man's life, has a stronger claim upon the exercise of all the talents, knowledge, skill, and attention of a physician, than the condition of an individual, and sometimes of a whole family, who, whether by accident or premeditation, have, in an instant, passed from perfect health to the verge of death by poison, and whose existence may be prolonged or destroyed, by the interposition of a qualified or an unqualified physician?

Contemplate, for a moment, the ready submission of an unfortunate being in this situation, and the acquiescence of all the friends around him, to the judgment of a physician! They believe, and their fears fortify the belief, that he is

qualified to administer all the relief which medicine can afford; and such is their confidence in his skill, that if the patient die, they feel satisfied, that every thing was done that could be done, but that it was not in the power of man to save him.

I tremble to think of the awful responsibility of that physician, who is called to a person supposed to have been poisoned, and who, however conscious of his inability, is obliged, being the only one at hand, to undertake the treatment. In attempting to pourtray his feelings, I want terms to exhibit any thing like a faithful representation.

I believe it may be safely affirmed, that, from the deficiency alluded to in our public medical establishments, the American medical students, who have, in other respects, such abundant sources of instruction offered them, are deprived of every mean for qualifying themselves for the treatment of cases from poison; and that while this particular instruction is more necessary, it is less accessible in the United States, than in many other countries.

I have been the more particular on this subject, because I am persuaded that, when well understood, the American faculty, who have, amidst a multitude of difficulties, brought medicine to its present flourishing state, will doubtless remove whatever obstacles might be found in the way of this provision being made. American genius is too active, not to be stimulated, instead of being discouraged by its magnitude; and the Philadelphia school is too solicitous for the extension of medical progress, and too proud of the eminence this solicitude has acquired it, not to wish to preserve it by a continuation of the same liberality.

The work of Dr. Orfila, my Friend and Master, of which the present volume is an abridgment, is considered of more importance to the physicians of the United States than it can

be to those of any other country, because we are less capable of producing such a work than almost any other nation, older than ourselves. We have not, nor, for a long time to come, can we have, such populous cities; and having fewer paupers, and no great military establishment, we have not the same number of crowded hospitals, the great focus of medical experience; we have, comparatively speaking, no manufactories, where the deleterious substances are used in large quantities, and where the fatal accidents they produce are numerous; we are exempt, and I trust we ever shall be, from that degree of misery, so prevalent, and which so often leads to acts of desperation by poison: we cannot, therefore, have the same means of collecting the great number of facts which is the property of past ages. Our medical schools are resorted to by students, who, having no time to throw away, have calculated, before they left their homes, the time and money they must devote, at the universities, in acquiring solid knowledge,—not by medical *virtuosi*, who perambulate from school to school, to exhibit medical feats, of curiosity or of learning; because useful knowledge, not a brilliant exhibition of it, is our object. Nor can chemistry, however generally cultivated, as it is in the United States, be made to contribute towards the completion of such a work, so liberally as it does in Europe, where it is more familiarly understood by professional men. For these, and many other obvious reasons, this work is a more valuable acquisition to the American practitioner than most of the medical publications we receive from Europe.

It was originally published in two large octavo volumes, containing upwards of 1300 pages of close letter press, and which could not, therefore, be reduced by a still smaller type. But it was too voluminous for a practical treatise.

A great book is a great evil in the hands of a practitioner. It was thought advisable to abridge it of all the matter judged to be of relative importance; of such, for instance, as the redundant cases, a sufficient number being retained to elucidate the action of poisonous substances on the animal economy. The very copious collection of experiments, made to ascertain the properties and effects of these deleterious substances,—the long botanical and chemical histories and analyses of these substances, have likewise been abridged; and some redundant observations have been expunged. But all the articles contained in the original, with their description, and the analytical treatment best calculated to rescue man from their fatal effects, have been scrupulously retained. J. G. N.

P. S. To the improvements contemplated in the forming of this practical work, it was judged useful to add an index.

For that part of the translation which was taken from the English edition of the whole work, it is unnecessary for me to offer any apology, the translator having given the following—

"His chief endeavour has been to give the reader a faithful and literal translation, and, as nearly as possible, in the very words of the accurate author of this work; in doing which, he has employed terms not generally used by English writers on the same subject, yet such as are easy to be understood. Dr. Orfila has every where adopted the latest chemical nomenclature of the French school, and the translator has judged it most prudent to preserve his language, as far as it is intelligible to an English reader, conceiving it to be the only method of giving a just specimen of his work. So also in the various departments of science of which he treats, he every where employs the most modern technical phraseology; so that, in many instances, a close translation would be almost unintelligible: in these instances, therefore, the translator has been under the necessity of adhering to the language most usually received in this country. Conceiving that, in a work of this description, accuracy was of more importance than elegance of style, the utmost diligence has been employed to adhere closely to the text; and it is hoped, that the want of elegance will be sufficiently compensated by the accuracy of translation. In the botanical department of this work, the translator has been frequently embarrassed, and put to great difficulties, from the author's having given only the common French name, and frequently a provincial one, to a great number of plants, without adding the Linnæan, or any other scientific appellation. The same difficulties have frequently occurred in the zoological descriptions, and have caused him considerable trouble to identify with certainty the species of plant or animal intended by the author."

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REPORT

made to the Institute of France, Class of Physical and Mathematical Sciences, upon a Manuscript entitled Toxicologie Générale, *presented by* M. Orfila.

THE Class has charged us, M. M. Pinel, Percy, and myself, to examine a Manuscript, entitled *Toxicologie Générale*, which had been presented to it, by Dr. Orfila.

This work is to consist of three volumes*, the two first of which will comprise the mineral poisons, and the third the vegetable and animal poisons.

Medicine and medical jurisprudence felt the want of a complete Treatise on this subject; those we already possess are either incomplete or incorrect: in some we look in vain for the means to understand the nature of poisons; in others, no description is found of the organic lesions produced by poisonous matters; and even the combination of all the particular information on this subject would be far from forming a collection that would be sufficient for all cases.

It was necessary then, in order to compose a work on this subject, such as the present state of knowledge may allow, to institute a series of researches, very numerous and extremely delicate: this is precisely what Dr. Orfila has had the courage to undertake, and what he proposes to pursue to the highest degree of perfection which he can possibly attain.

He carefully describes in the first place the physical and tangible characters of poisons in their natural state; he next explains the chemical properties of these substances, noting with great precision the phenomena they present, when exposed to the action of the greatest possible number of chemical tests.

* That is to say, two volumes in 8vo, each of which will be divided into two parts.

But what renders this part of his labours the more interesting is, that he describes the differences which the poison, when mixed with alimentary substances of different kinds, presents with the same tests.

The poisons mixing in such manner in the stomach and intestines with various liquids which conceal their properties, whether by combining with them, or decomposing them, the preceding researches of the author would have been insufficient to arrive at the end proposed, if he had not studied in a particular manner the modifications which the bile, the saliva, the gastric juice, &c., are capable of producing on them.

In making these experiments, M. Orfila has varied the quantities of the poisons, from the smallest dose which would be incapable of poisoning, to that which would be much more than sufficient; circumstances which frequently occasion differences in the effects produced by the tests.

When the author has well understood the characters of the poison in its natural state, and has followed them well up, through all their mixtures or combinations with the alimentary substances, as well as with the humours they may meet with in the stomach and intestines, he endeavours to conjecture in what manner they act upon the animal economy, and the effects resulting from it: this is his physiological part. Sometimes the inspection of the organs affected justified the prediction; but often too the mode of action of the greatest number of poisons eludes our knowledge: fortunately however this is not the most important part of Toxicology.

That which most concerns us is the art of preventing, arresting, or curing, the deleterious effects of the poisons; for which reason M. Orfila, has sought out with great care, all that Physicians have hitherto asserted with regard to antidotes, he has submitted those proposed to fresh trials, and often observing the little confidence to be placed in them, he has entered on fresh investigations, which have sometimes been attended with the most fortunate success.

The first part of the work is as perfect as the present state of chemical science will allow: and we can certify, that the particu-

lar researches of the author have corrected a great number of former errors, and added many truths useful to medical men, who are often called to give assistance to persons poisoned; to the jurors entrusted by the tribunals to ascertain whether poisoning has taken place, and in that case, by what substance it has been produced; and finally, that it is very useful to mankind at large. But, it is not to be expected, that the part which is to treat of vegetable and animal poisons, should be so complete, because the nature of these poisons not being so well known as that of minerals, their manner of acting on the organs is consequently more obscure, and the means of remedying their effects much more difficult: it is, however, an important acquisition to science, to have made such progress, to have traced the course, and pointed out the means by which the end can be obtained. It is to be hoped that time and experience will by degrees bring to perfection this important part of Toxicology.

Dr. Orfila considers the work which he submits to the class, only as the basis of more extensive labours which he proposes to continue. His intention is shortly to proceed on the comparison of the effects of the poisonous plants of Africa and the South of Europe, with those obtained in our climate. He is collecting materials for a work, the principal object of which is, to determine the cases in which the fluids of living animals, undergo alterations and become poisonous, as well as the diseases they produce. Finally he proposes to compare the diseases produced by different poisons, with those to which man is habitually liable; ever endeavouring to cure the former, and when he shall have found analogous cases in the human species, he proposes to ascertain whether the same mode of treatment cannot be pursued.

For the completion of the last part of his work, Dr. Orfila has made more than eight hundred experiments: he has been sedulously engaged on this very arduous work for three years; he has often been under the necessity of sitting up whole nights, in watching the animals submitted to his trials, and it has required no small degree of courage, to overcome the disgust which accompanies so painful a task; finally he has spent considerable

sums in the purchase of animals, and the preparations of poisons, the effects of which he has demonstrated. The first part of this interesting publication has obtained the greatest success in Germany, England, and Italy: these nations have confirmed the judgment pronounced by the Institute, as may be seen by consulting the scientific journals that have mentioned it.

We trust that the last part, not less interesting, and which has required more sagacity and care, will meet with as favourable a reception from the literati, and increase the esteem which its author deserves.

We propose therefore to the class to approve the work of Dr. Orfila, and to permit it to be published with its approbation.

Signed,

PERCY,
PINEL.
VAUQUELIN, *Reporter.*

The report is approved by the class, and its conclusions adopted.

Signed,

The Perpetual Secretary, Counsellor of State, Knight of the Legion of Honour,

G. CUVIER.

A

GENERAL SYSTEM

OF

TOXICOLOGY.

INTRODUCTION.

THE science, which relates to the investigation of poisons, has received the name of Toxicology, derived from the Greek words τοξικὸν (poison), and λογος (a discourse).

The name of poison is given to any substance, which, taken inwardly, in a very small dose, or applied in any kind of manner to a living body, impairs health, or destroys life.

It is not possible to investigate thoroughly any poisonous substance, without taking into consideration its relations with Chemistry, Natural History, Physiology, Pathology, and Morbid Anatomy. In short, how can we expect to distinguish the different poisons drawn from the mineral kingdom, without a knowledge of the chemical properties which characterize them in their natural state; or, when that state has been destroyed by their combination with aliments, whether vegetable or animal? Are we not indebted to Natural History for the exclusive privilege of becoming acquainted with the immense series of poisons, from the *organic* kingdom, which unfortunately elude the most rigorous analytical research? Can the corrosive or narcotic effects of these mischievous substances, which derange the different functions of the Animal Eco-

nomy, after having destroyed the harmony of the powers of life, be explained without the light of the soundest Physiology? Is it not the province of Pathology to attend carefully to the treatment of the diseases originating from poisons, whether in using means already known, or in seeking out new remedies capable of destroying or annihilating their deleterious effects? In short, is it not by Morbid Anatomy that the knowledge of these substances is brought to perfection, which makes us acquainted, by the examination of the different organs, with the multiplied injuries resulting from their action? There remains no doubt of the necessity of having recourse to each of these sciences, and to interrogate them, at first separately, to be able the better afterwards to lay hold of their mutual dependencies, and the relief which they can afford.

Chemical researches, carefully conducted on the different poisons of the mineral kingdom; an attentive observation of the characters furnished by the various poisons of the organized creation; experiments made upon living animals, with the design of ascertaining the derangement of their functions, and the varied causes of a dissolution so sudden; clinical facts, collected with exactness, and enriched by dissections; in fine, trials made on living animals, in order to fix our ideas with respect to counter-poisons: these are, in fact, the only means to enrich the science of Toxicology, and to raise it from the state of imperfection in which it at present lies. The utility of this mode of proceeding has been felt by learned men; in consequence of which we have, for some time past, witnessed the appearance of several excellent successive treatises on *Arsenic*, *Corrosive Sublimate*, Copper, Nitric, and Prussic Acids, &c. These tracts are, unfortunately, very few in number, and the objects are not considered in them, under all their relations. The chemical part, and that part of medical jurisprudence, which relates to poisoning, are particularly neglected. We have observed, for the most part, that these authors have selected the least prominent features of the poisonous substances, exposed them often in erroneous points of view, and, consequently, rendered the resolution of a problem extremely difficult of itself, and which possesses the greatest interest, impossible. In vain does

the professor of Medical Jurisprudence, when called upon by the magistrate, look to their writings; all he can extract from them is vague and unsatisfactory.

It may hence be seen how important it is to pay particular attention to this part of Toxicology, in order to get rid of a multitude of characteristics of little value; to rectify those badly described, and substitute in their stead others, exact, and easy to be ascertained. Such an undertaking presents the greatest difficulties, as well from the prodigious number of poisons, which it must necessarily embrace, as from the various decompositions which many of them are capable of undergoing. It must be confessed, that this science, already very complicated by its numberless relations with Physiology, Pathology, and Morbid Anatomy, is rendered more difficult by this branch of Medical Jurisprudence. It is only by adopting a rigorous method in the exposition of facts, carefully collected, keeping at a distance all explications found to be inconsistent with sound logic, that we can hope to surmount the obstacles which this study presents.

Can any real advantage be obtained to the study of Toxicology by a classification of the poisons already known? or would it be better to describe them in alphabetical order? This question I have often heard agitated. I do not hesitate a moment in deciding in favour of the classification, especially when founded upon incontrovertible physiological facts; there is then no doubt but that it simplifies the study of this science. In bringing together into one group those poisons which exercise a similar action on the animal economy; in describing accurately all the alterations they produce on our organs, and consequently on their functions; in a word, by generalizing the symptoms to which they give rise, it may be perceived how much the particular history of each may be the easier laid hold of by the Pathologist. On the other hand, of what use to the man of science can be a description alphabetically arranged? The separation of substances, which ought to be united in consequence of their intimate connexion with each other, together with tedious repetitions in the details, are the inconveniences attached to this unscientific method, of which every scientific man perceives the defect.

Amongst the classifications hitherto proposed, we give the preference to that published by M. Fodéré, in the fourth volume of his *Médécine Légale* (2nd edition). It appears to us the most natural, and the most conformable to the ideas of Physiology.

CLASS I.

CORROSIVE; OR, ESCHAROTIC POISONS.

SPECIES I. *Mercurial Preparations.*

Var. 1st. Corrosive sublimate.
2nd. Red oxyde of mercury.
3d. Turbith mineral, or sulphate of mercury.
4th. The nitrates of mercury.
5th. All the other preparations of mercury, except mercur. dulc.
6th. Mercurial vapours, and mercury extremely divided.

SPEC. II. *Arsenical Preparations.*

Var. 1st. Arsenious acid.
2nd. Arsenites.
3d. Arsenic acid.
4th. Arseniates.
5th. Sulphur of arsenic, yellow.
6th. ————————, red.
7th. Black oxyde of arsenic, fly powder.

SPEC. III. *Antimonial Preparations.*

Var. 1st. Tartar emetic.
2nd. Oxyde of antimony.
3d. Kermes mineral.
4th. Muriate, and sub-muriate of antimony.
5th. Antimonial wine.
6th. Other antimonial preparations.

SPEC. IV. *Preparations of Copper.*

Var. 1st. Verdegris.
2nd. Acetate of copper.

Var. 3d. Sulphate of copper.
4th. Nitrate of copper.
5th. Muriate of copper.
6th. Ammoniacal copper.
7th. Oxyde of copper.
8th. Coppery *savonnules*, or copper dissolved by grease.
9th. Coppery wine and vinegar.

SPEC. V. *Preparations of Tin.*

Var. Muriate of tin.

SPEC. IV. *Preparations of Zinc.*

Var. 1st. Oxyde of zinc sublimated.
2nd. Sulphate of zinc.

SPEC. VII. *Preparations of Silver.*

Var. Nitrate of silver.

SPEC. VIII. *Preparations of Gold.*

Var. Muriate of gold.

SPEC. IX. *Preparations of Bismuth.*

Var. 1st. *Blanc de fard*, or sub-nitrate of bismuth.
2nd. The other preparations of bismuth.

SPEC. X. The concentrated acids, sulphuric, nitric, phosphoric, muriatic, &c.

SPEC. XI. *The Caustic Alkalies; pure or carbonated.*

Var. 1st. Potash.
2nd. Soda.
3d. Ammonia.

SPEC. XII. Caustic alkaline earths, lime barytes.
XIII. Muriate and carbonate of barytes.
XIV. Glass and enamel, in powder.
XV. Cantharides.

CLASS II.

ASTRINGENT POISONS.

SPECIES I. *Preparations of Lead.*

Var. 1st Acetate, or sugar of lead.
2nd. Carbonate, red oxyde of lead, and litharge.
3d. Cerusa.
4th. Wine, sweetened by lead.
5th. Water, impregnated with lead.
6th. Provisions cooked in vessels containing lead.
7th. Syrups and brandy clarified with acetate of lead.
8th. Saturnine emanations.

CLASS III.

ACRID POISONS.

SPECIES. 1st. Oxygenated muriatic gas; simple muriatic gas; sulphureous and nitrous acid; nitro-muriatic acid.
——— 2nd. Jatropa Manihot.
——— 3d. Indian ricine, or Molucca wood.
——— 4th. Convolvolus scammonia; scammony.
——— 5th. Gum gutta.
——— 6th. Seeds of Ricine, or Palma Christa.
——— 7th. Elaterium.
——— 8th. The apple of the Colocynth.
——— 9th. The whole plant, and especially the root of white Hellebore.
——— 10th. The root of black Hellebore.
——— 11th. The seeds of Stavesacre and of Sebadille.
——— 12th. The wood and fruit of the "Ahovai," of Brazil and of the Indies.
——— 13th. All the plant of the Rhododendron Chrysantum.
——— 14th. The bulbs of the Colchicum, gathered in summer and in autumn.
——— 15th. The milk of the Convolvolus Arvensis, or little Bindweed.

——— 16th. The whole of the plant of the Swallow Wort, and *Fly-Catcher*, with herbaceous flowers.

——— 17th. The whole plant of the hairy Asclepias, and the Asclepias Vincetoxicum.

——— 18th. The Ænanthe Fistulosa Water Dropwort.

——— 19th. The Ænanthe Crocata.

[These two species are poisons equally violent for dogs and cattle, especially their roots.]

——— 20th. The Clematis, large-leaved.

———————, climbing.

———————, strait.

———————, flaming. The whole plant.

——— 21st. The whole plant of the *Anemone Pulsatilla.*

——————————— Anemone of the woods, and that with yellow flowers.

——— 22nd. The Marsh Marigold.

——— 23d. Sometimes the old roots of Parsnips.

——— 24th. The root of the Aconitum Napellus.

——————— Aconite *(Wolf's-bane).*

——— 25th. The fresh roots of the spotted Arum.

——— 26th. The berries and the bark of the Daphne Mezereon; and, in general, all the varieties of the Spurge Laurel.

——— 27th. The whole plant, as well as the emanations of the Rhus-toxicodendron, and of the Rhus-vernix, or Rhonx.

——— 28th. The whole plant of the Euphorbium Officinale, and of all the species and varieties of that family, as well as the *Tithymalus.*

——— 29th. The whole plant of the *Ranunculus* of meadows and gardens, of mountains, and marshes. This last particularly (called Sceleratus) is the most poisonous of the whole. In general, all the *Ranunculi* are more or less poisonous, even to cattle.

——— 30th. The Nitrate of Potash, in a large dose, sometimes.

——— 31st. Muscles, and other shell-fish, sometimes.

CLASS IV.

STUPIFYING, AND NARCOTIC POISONS.

SPECIES 1st. Pure Hydrogen Gas; Azotic Gas; Gas of the Oxyde of Azote.

——— 2nd. White Oriental Poppy, the white or party-coloured Poppy of the gardens of Europe, and the opium prepared from them.

——— 3d. The roots of the Physalis Somnifera, or Solanum Somniferum, Alkekenge, or Coqueret.

——— 4th. The berries and the leaves of the "Solanum Nigrum," the black Morell, or Nightshade.

——— 5th. Those of the Nightshade with yellow fruit.

——— 6th. The roots and leaves of the Atropa Mandragora, or Mandragore.

——— 7th. The stalks, leaves, and fruit of the Datura Stramonium, or Thorn Apple.

——— 8th. The whole plant of the Henbane, both of the black and white, which last is always less strong than the black.

——— 9th. The whole plant of the Lactuca Virosa, or strong-scented Lettuce, and of the wild prickly Lettuce.

——— 10th. The whole plant and berries of the Paris Quadrifolia, or Fox Grape.

——— 11th. The whole plant of the Cherry-tree Laurel.

——— 12th. The berries of the Yew.

——— 13th. The seeds of the Fitch, or Vetch.

——— 14th. The seeds of the Lathrus Cicera, a sort of Vetch.

——— 15th. The distilled water of black Cherry-stones, when concentrated, and that of Peach-stones; and, perhaps, likewise, of their leaves, when these waters are concentrated.

——— 16th. The effluvia, or emanations from these plants, or their *Aroma*.

CLASS V.

NARCOTICO-ACRID POISONS.

SPECIES 1st. Carbonic Acid Gas; the gas exhaling from lime-kilns.

——— 2nd. The Manchineal Apple and Tree.

——— 3d. The Bean of St. Ignatius.

——— 4th. The exhalations and juice of every part of the tree called the Poison Tree of Macassar.

——— 5th. The *Ticunas*.

——— 6th. Certain species of the Strychnos (Nux Vomica.)

——— 7th. The whole plant of the Rose Laurel.

——— 8th. The leaves and berries of the Belladonna.

——— 9th. The Nicotiana, or Tobacco.

——— 10th. The Nicotiana Glutinosa.

——— 11th. The root of the white Bryony, with berries, red or black.

——— 12th. The roots of the wild Chervil.

——— 13th. The whole plant of the Conium Maculatum, or Great Hemlock.

——— 14th. The roots and herb of the lesser Hemlock.

——— 15th. The roots of the Cicuta Aquatica.

——— 16th. The Anagallis Arvensis.

——— 17th. The Mercurialis Perennis, or Mountain Mercury.

——— 18th. The Digitalis Purpurea.

——— 19th. The distilled waters of these different plants concentrated, and their essential ethereal, empyreumatic oils.

——— 20th. The odorous principle of all these plants, and the same odours of different flowers and fruits, although pleasant, shut up in a close room.

——— 21st. Bearded Rye and Darnel.

——— 22nd. Wheat, Barley, Oats, &c. when musty, rotten, or mildewed, often.

——— 23d. The Potatoe, Solanum Tuberosum, sometimes.

——— 24th. The Apple of Love, Solanum Lycopersicum, sometimes.

——— 25th. "Solanum Melongena," sometimes.

——— 26th. The Puff-ball, truffle.

——— 27th. Bad Mushrooms.

CLASS VI.

SEPTIC, OR PUTREFYING POISONS.

Species 1st. Contagious Miasmata, emanating from pestiferous bodies, or bales of merchandize coming from a place infected with the plague.

Idem. Emanations from a confined space, where a number of persons are shut up, receiving the air only through small apertures.

Idem. Emanations from living bodies attacked by putrid fevers, or with large wounds in a state of suppuration, or gangrene, or with dysentery.

Species 2nd. Exhalations from burying-grounds, hospitals, prisons, ships, privies, marshes, putrid vegetables, and stagnant water.

——— 3d. Sulphurated Hydrogen Gas.

——— 4th. The poison of the Viper, and certain reptiles.

SECTION I.

OF POISONS IN PARTICULAR, THEIR CHEMICAL PROPERTIES, THEIR PHYSIOLOGICAL ACTION, THE SYMPTOMS TO WHICH THEY GIVE RISE, THE LESIONS OF CONTEXTURE WHICH THEY PRODUCE, AND THE TREATMENT OF POISONED PERSONS.

CHAP. I.

CLASS I. OF CORROSIVE POISONS.

CORROSIVE poisons, are so called, because, in the general way, they irritate, inflame, and corrode the texture of the parts with which they come in contact. The energy with which they produce all these effects, varies remarkably, according to the dose in which they are taken, and as they may be in a liquid or solid form; and, lastly, as they may have been administered internally, or applied externally.

In general their action is more brisk and formidable than that of other poisons.

All the acids, and all the alkalies, almost all metallic preparations, many earthy and alkaline salts, cantharides, &c. form a part of this important class. We shall first consider all that can be said of them generally, before entering upon a particular examination of each.

GENERAL ACTION OF CORROSIVE POISONS.

WHENEVER the smallest quantity of any of these bodies is employed internally, various changes may be observed to take place in the exercise of the functions. At one time they produce a momentary, or durable, excitement of the brain and of the heart; at another, they act as sedatives on these organs; very often they in-

crease the customary secretions ; sometimes, on the contrary, they diminish them.

Given in large doses they are productive of dreadful accidents, followed very often by a sudden and terrific dissolution, the cause of which is not always the same. In certain cases, the poison is absorbed, and carries its fatal action to the brain, the heart, and other organs. In some instances it is the corroded membranes of the stomach which act by sympathy on these organs, and suspend their functions, without any absorption taking place. Lastly, in other circumstances, which very rarely occur, death is the consequence of inflammation of the stomach, irritated by these poisonous substances. We purpose investigating this subject in detail, by treating particularly of each of these poisons.

GENERAL SYMPTOMS PRODUCED BY THE CORROSIVE POISONS.

The general symptoms produced by these corrosive substances, depend almost all upon the lesions of the alimentary canal, of the nervous system, and of the organs of the circulation ; which ideas are perfectly consonant with the general physiological notions we have just laid down. These symptoms are, a heat and constriction of the mouth, tongue, œsophagus, stomach, and intestines ; excruciating pains throughout the whole extent of the alimentary canal, principally in the stomach and œsophagus ; singultus, frequent nausea, painful and obstinate vomitings, sometimes accompanied with blood, and which threaten suffocation ; bloody stools, with or without tenesmus ; pulse small, hard, and frequent, often imperceptible, with an icy coldness. Sometimes, however, the heat is intense, the thirst inextinguishable, dysuria, strangury, ischuria, and cold sweat. Purple spots over the whole body, and often a miliary eruption. A sudden decomposition of the features of the countenance ensues, loss of sight, risus sardonicus, convulsions, and horrible contortions, with depravation of the intellectual faculties.

LESIONS OF CONTEXTURE PRODUCED BY THE CORROSIVE POISONS.

Amongst the secondary means to which the Professor of Medical Jurisprudence has recourse, with the greatest success, to substantiate the act of poisoning, the anatomical inspection of the body necessarily occupies the first place. In general, all those who have fallen victims to this kind of disease, exhibit in their contexture alterations more or less considerable, and which vary according to the nature of the poison administered, and the time which it has had to produce its effects. The corrosive poisons, which form the subject of these general investigations, frequently leave behind traces of their passage over our organs, and it is of importance to know them thoroughly.

1st. Inflammation of the first passages, constrictions of the intestinal canal, gangrene, sphacelus, perforation of the parts, constitute the first character of these kinds of lesions. We could bring forward, in support of this proposition, the results of dissections of several animals which we have poisoned with different substances of this nature. We shall, however, confine ourselves to the details of two dissections made by Hoffman and M. Tartra. The first of these authors says*, that a man of twenty-six years of age was poisoned by some soup containing arsenious acid. He died thirty hours after. The stomach was found inflamed near its left orifice, the mucous membrane abraded, and in some measure twisted and curled up. M. Tartra details the history of a woman poisoned by the nitric acid, and whose death only happened four-and-twenty hours after having taken the poison. The symptoms preceding it denoted already a gangrene in some portion of the alimentary canal. On dissection three openings were discovered at the bottom of the stomach, near to one another, of the size of a half-crown piece, with edges extremely thin, and worn or rather dissolved. It was very thick and exceedingly shrivelled over all the rest of its substance. The orifice of the pylorus exhibited several gangrenous spots. The duodenum was attacked

* Frederic Hoffmanni Op. Omnia Physico-Medica, tom. iii. sect. ii. cap. viii. Observatio iii. p. 171.

with gangrene at its two curvatures through the whole thickness of its coats*.

2nd. The mucous coat detaches itself easily from the muscular, in such manner that it and the serous coat remain perfectly isolated. Hebenstreit and Mahon regard this appearance as an infallible proof of poison. The latter of these authors observes, "I believe, even with Hebenstreit, that the most infallible sign of "poison, is the separation of the velvet coat of the stomach.

"In short, if we suppose a person officially called upon to ex- "amine the body of a man who has died after a violent vomiting "of blood, accompanied with other suspicious symptoms, it is evi- "dent, that if this vomiting proceeds from any internal or natural "cause, no other traces of lesion will be found in the stomach than "the blood-vessels dilated, or burst, appearances of inflammation, "gangrenous spots, &c. But if the interior surface of this viscus, "should be found to be, as it were flayed, if fragments of its velvet "coat should be met with amongst the matter contained in it, it "seems natural enough to conclude, that such a separation could "only have taken place from the introduction of some burning or "corrosive substance into the cavity of the stomach. It is hardly "possible to suppose that putrefaction alone could produce upon "this velvet surface, the same effects as it produces upon the *epi-* "*dermis* of the dead body; since the rugosities or folds of this "interior coat of the stomach do not admit of so sudden a separa- "tion: moreover, in the course of a very frequent examination of "the human stomach, I have never met with an instance of the velvet "coat, separated by putrefaction, even when this putrefaction was "very considerably advanced. These observations, confirmed "by those of Hebenstreit, appear to me to warrant the person "employed to conduct the investigation, to look upon this sign as "the most positive; although on the other hand, it is possible to "conceive, that on the crisis of certain atrabiliary diseases, those "who have been long afflicted with the black jaundice, may some- "times be in a situation to present appearances analogous to the "above. If, however, this circumstance (which is very rarely

* Dissert. Inaugural. Essaie sur l'Empoisonnement par l'Acide Nitrique.

" met with) should occur, the existence of the atrabiliary affection " might be proved, by the vestiges of it which would be found in " the stomach, or by taking into consideration the temperament of " the patient, and his antecedent diseases*."

3dly. Frequently the corrosive action of these poisons is extended to the other viscera, and the skin becomes covered with black spots, resembling gangrene. Morgagni makes mention of a woman poisoned with arsenic, whose body, after death, was entirely black on its posterior surface, from head to foot; the lungs were gangrenous, and the stomach and duodenum eaten through†.

The characters which we have just been describing are, however, sometimes wanting in cases of poison by corrosive substances, and the dead body exhibits no alterations. When we shall have occasion to treat, in the last section of this work, on the duties of a medical man in a legal capacity, when called upon by the magistrate, we shall point out the line of conduct which he ought to observe in these cases, rarely free from difficulties. We shall likewise defer to that section the exposition of the general rules to be observed for conducting properly the dissection of the dead bodies of poisoned persons.

GENERAL TREATMENT OF PATIENTS POISONED BY CORROSIVE SUBSTANCES.

The practitioners employed in this branch of the healing art, have adopted various methods to counteract the mischief produced by corrosive poisons. At one time blinded by the results of chemical operations performed in their laboratories, they have extolled a multitude of substances which ought to decompose these poisons in the stomach, and consequently prevent their fatal effects. At another time, rejecting this mode of proceeding, they have been contented to administer, in the first instance, evacuating medicines, strong or mild, according to circumstances; with the intention of having recourse afterwards to anodynes, antiphlogis-

* Mahon, Médécine Légale, l. ii. p. 289.

† De Causis et Sedibus Morborum, Ep. LIX. art. iii. p. 244.

tics, antispasmodics, &c. To evacuate the poison, and to relieve the symptoms which have already appeared, has been the end which they have proposed to themselves to attain. And finally, there have been others who have combined in their treatment all the means we have just described.

The first of these, confining themselves to the use of antidotes, have run into serious errors. Many of the substances which they have given for the purpose of decomposing the poisons, have exerted no action whatever upon them in the stomach; and not unfrequently, when the decomposition has been effected, the new compound has been found to be endued with the most active poisonous qualities. We shall relate hereafter experiments which will leave no doubt on this subject, and enable us to set a just value on these antidotes.

The evacuant, antiphlogistic, and antispasmodic method, wisely employed in these days by our best physicians, appear to us to merit the preference over all others. Without exposing the patient to the danger to which a chemical decomposition might subject him, it offers the double advantage of getting rid of the poison by simple means, within the reach of every body, and at the same time of re-establishing the functions in their natural state.

ARTICLE I.

Species I. *Mercurial Poisons.*

Var. 1st. Corrosive sublimate, or muriate of mercury, at the maximum of oxydation.

2d. Red oxyde of mercury (precipitate *per se*, red precipitate).

3d. Turbith mineral, or sulphate of mercury.

4th. The nitrates of mercury at maximum, at minimum, acid, or with excess of base.

5th. All the other mercurial preparations, except the mercurius dulcis.

6th. Mercurial vapours, or mercury extremely divided.

The study of mercurial poisons demands, on the part of the physician, the most scrupulous attention. Every day's experience

confirms the greatness of the advantages to be derived from them by the man of science, who understands correctly their mode of acting; whilst the empiric, on the other hand, furnishes us with too many irrefragable evidences of their deleterious effect. Without the slightest knowledge of the nature of these bodies, or of their powerful and instantaneous action on the animal economy; without the least regard to the constitution of the patients, whose confidence he has usurped, pretending even that there is no danger whatever in the exhibition of these substances; he dares to introduce into our organs tremendous doses of mercurial preparations, which never fail to produce the most fatal effects, as we shall have occasion to notice when treating of slow poisoning.—A thorough study of these substances can alone serve to direct us in the use which should be made of them.

It is more particularly important, that the proficient in medical jurisprudence should be perfectly acquainted with the properties of the preparations which form the subject of this article. Almost all vegetable and animal substances are altered and decomposed by our organs themselves. In vain should we seek, in the general way, for corrosive sublimate in the liquids vomited; neither are the contents of the stomach more calculated to discover its presence. The decomposition which it has undergone by its union with other substances, has rendered it insoluble. It is in the solids, in the tissue itself of our organs, that it must be sought for. It is only by rigorous scrutiny, founded upon sure chemical principles, that we can hope to find it. Such being the case, does it not become indispensably necessary to determine, what are the changes which the aliments most commonly employed, effect in these poisonous substances, and consequently, ought we not to commence their history, by a complete investigation of their chemical properties?

OF MERCURY.

Mercury is a liquid metal, shining, of a white colour, slightly inclining to blue. Its specific gravity is 13.568. On being heated, it becomes volatile. At the temperature of 350° (th. c.) it enters on ebullition in such a manner, that the fixed bodies with

which it is sometimes found united, can easily be separated from it.

Mercury combines with sulphur, and forms sulphurets of a black or red colour, in which the proportions of sulphur and of mercury are not the same. This metal, by various processes, can be combined with oxygen, and gives birth to two oxydes ; one of a blackish gray, at the minimum of oxydation ; the other yellow or red, at the maximum.

OF MERCURIUS DULCIS.

The mercurius dulcis, or muriate of mercury, at minimum, is formed by the muriatic acid, and the oxyde at minimum. It is white : but it becomes blackish by a long exposure to the light. On being heated, it sublimates and furnishes crystals, consisting of tetraedral prisms by four-sided pyramids.

If a paste be made with this salt, of charcoal and a little water, and exposed to the action of caloric in a close vessel, there will be obtained, metallic mercury, carbonic acid gas, muriatic acid gas, and oxygen gas.

OF CORROSIVE SUBLIMATE.

The corrosive sublimate is a metallic acid salt, formed of muriatic acid and oxyde of mercury, at the maximum of oxydation. That which is met with in commerce, generally contains muriate of iron. This salt is likewise known by the names of " muriate of " mercury at the maximum of oxydation," of " oxymuriate of " mercury," of " superoxygenated muriate of mercury," and of " muriate of the second oxyde of mercury," or deuto-muriate of mercury.

The corrosive sublimate has a taste peculiarly acrid and caustic ; it occasions a sensation of metallic astringency, very powerful, and very disagreeable, and a kind of obstruction of the throat, which continues for some time. Its specific gravity is very considerable. Muchenbröeck states it as high as 8.000, but by more recent experiments it has been ascertained to be 5.1398.

ACTION OF CORROSIVE SUBLIMATE TAKEN INTERNALLY.

The corrosive sublimate administered internally, in a very small dose, for instance, the eighth of a grain, produces a temporary excitement of the alimentary canal, of the organs concerned in the circulation, and in several of the secretions. The local phenomena it produces are not very evident, if we except a sense of heat, and, as it were, a nipping in the stomach.

If the dose of this salt be a little stronger, and especially if the use of it has been too long continued, it gives rise to cholic and vomitings. The salivary glands inflame, and become very painful. The saliva, which is secreted in too great quantity, becomes acrid, corrosive, and of an infectious smell; the tongue and gums swell, and present spreading ulcers, extremely painful; the teeth begin to grow black, and loose, they fall out, and their loss is sometimes followed by that of the bones of the palate, or maxillæ; the breath becomes fetid; the face and the whole head swelled; which renders deglutition and respiration difficult; the voice is suppressed, or else resembles a lowing. Cardialgia, dyspepsia, diarrhœa, dysentery, various inflammations, dyspnœa, hœmoptysis, phthisis pulmonalis; very violent pains in the muscles, tendons, or joints; tremors of the limbs, paralysis, tetanus, mania, and death, may possibly be the result of the improper use of this substance. In this case the corrosive sublimate is absorbed, and it is possible that it may even change its nature, in such manner as to appear under the form of globules, in the large cavities of the body, in the viscera, in the joints, in the bones, in the sheaths of the tendons; as has been proved by a number of authentic facts.

When administered in a large dose, it acts as a violent poison, gives rise to the most serious accidents, and produces death in a very short space of time. In what manner does this poisonous substance produce its effects; and which of our organs first feels its fatal operation?

Amongst the authors who have attempted to resolve these difficult questions, the first deserving our attention are Dr. Lavort, physician of the *Ecole de Paris*, and Mr. Brodie, an English phy-

siologist. We shall give the result of their labours, adhering principally to those of Mr. Brodie, which appear to us the most decisive*.

This physiologist is of opinion, that the sublimate introduced into the stomach, exerts a corrosive action on that viscus; that this action is extended, by sympathy, to the heart and the brain, and that death is the result of the suspension of the functions of these two organs, so essentially necessary to life.

Mr. Brodie concludes, from his experiments, Firstly, that the sublimate being dissolved and introduced into the stomach, corrodes the portion of membrane upon which it rests. Secondly, that the brain and heart are affected; which explains the convulsions, the immobility, the state of the pulse, and the sudden cessation of the motion of this latter viscus. Thirdly, that the lungs are no way interested; since the blood on the left side of the heart preserves its scarlet colour.

The English physiologist does not hesitate to conclude, that the lesions of these two essential organs are the immediate cause of death; because the inflammation of the stomach could not produce it so suddenly. He is of opinion, that these two organs, connected by such numerous nervous ramifications with the stomach, are affected by sympathy. It appears to him impossible, considering the state in which the mucous membrane of the stomach is found, to conceive that the poison should be absorbed and carried into the circulation.

M. Lavort, rejecting all idea of the absorption of corrosive sublimate, had already given some opinions on this subject. "Supposing," says he, "part of the oxygenated muriate of mercury to "have passed into the channels of the circulation, and calculating "the effects which this salt ought to produce on the fluids with "which it mixes, by the action it exerts upon the solids which come "under its influence, it will appear how sudden the death ought to

* Considerations Medicales sur le Muriate de Mercurie sur Oxygène, These soutenue le 22 Thermidor, an. 10 (1802).

Further Experiments and Observations on the action of Poisons on the animal systems, by B. C. Brodie, read February 27th, 1812. (Philosophical Transactions).

"be which would succeed such an inoculation. In short, it was "easy to demonstrate by daily observation and experiments made "upon living animals, that the smallest quantity of an acrid fluid, "or even of a fluid slightly acid, introduced into the vessels of an "animal, induces death with an extreme celerity. But it is neces- "sary to note, particularly in these instances, that the symptoms "which precede and which produce death, are not at all like those "induced by the oxygenated muriate of mercury, when externally "applied. Many animals that I have witnessed submitted to these "experiments, have never survived beyond a few minutes from "the injection of the fluid. In some, death has succeeded so sud- "denly, that we have not been able to lay hold of any of the symp- "toms which preceded it. Almost all of them have passed from "life to death in a manner so little sensible, that though they were "under our eyes, we had great difficulty in distinguishing the "change. Immediately after the operation, the animal fell into a "state of torpor, the eyes closed, the breathing gradually subsided, "the motion of the heart became imperceptible, and it expired "without shewing the slightest signs of pain."

"If this species of death, be compared with that resulting from "the external application of oxygenated muriate of mercury; if "the accidents, which in both cases precede and produce death, "be examined together, we cannot avoid being struck with the "little analogy that exists between them. In the first kind of death, "sensibility appears extinct, the animal goes off without giving "any sign of pain. In the second, sensibility is increased to the "very highest degree, and the animal expires in the most excru- "ciating torments. On one hand we see, spasms, convulsions, "cold sweats, delirium, and all that long series of symptoms which "characterize lesions of the nervous system. The other state is "conspicuous for coma, torpor, insensibility; and we may affirm, "that if in both instances there exists a lesion of the nervous sys- "tem, it is at least in a manner diametrically opposite to one ano- "ther."

SYMPTOMS PECULIAR TO THE ACTION OF CORROSIVE SUBLIMATE.

We shall commence by giving a report of some observations on poisoning by this salt, in order to be the better able to trace the general symptoms.

CASE I.

M. B. a merchant of Liege, aged thirty years, of a bilious temperament, robust constitution, who had never felt any indisposition, came to Paris to settle some business with M. D., at whose house he lodged. On the 6th of August, 1813, he was attacked, without any apparent cause, with a looseness, which continued three days, and which was successfully treated with ipecacuanha. On the 13th of the same month he appeared perfectly recovered. On that day the heat was very great, and M. B. being very thirsty, about three o'clock in the afternoon, returning to his lodgings, took a quantity of a certain spirituous and limpid liquor, contained in a bottle without any label*. The disagreeable flavour of this drink produced in M. B. so great a fear of the imminent danger into which he had brought himself, that he instantly left off drinking, spit out all that remained in his mouth, and broke the bottle in pieces, in which there still remained a small portion of the fluid. Unfortunately M. B. had swallowed part of it. A constriction of the throat, and excruciating pains in the epigastric region, were the first symptoms which made their appearance. I was instantly sent for, and arrived at fifty minutes after four. I was told that he had vomited a great quantity of a greenish matter, bitter, but not at all bloody; and that he had had three stools. I found him in the following condition.

Lying on the back, face red, swelled, and animated; the eyes were sparkling, and possessed of great mobility, the pupils contracted, the conjunctiva slightly injected, the lips dry, chapped, and

* I assured myself that this bottle contained corrosive sublimate dissolved in alcohol, the remains of a composition Mr. D———, his friend, had employed some days before for a venereal affection. Mr. B—— had no knowledge of the nature of this composition.

of a natural colour, the tongue slightly moist, and covered with a yellowish coat. The excruciating pains extended themselves over the whole course of the alimentary canal, and were particularly severe in the pharynx; the abdomen was tumefied and painful, especially when pressed. The vomiting had ceased for some moments, but the alvine discharge continued; the stools were not very copious, and of a bilious appearance; the pulse regular, small, and tight, beat a hundred and twelve strokes in the minute; the heat of skin was intense and pungent, especially on the forehead; respiration difficult; urine scanty, rendered with difficulty, and of a red appearance. His answers were given slowly, and with difficulty, great tendency to fainting from time to time, convulsive motions of the muscles of the face, arms, and legs, and continual cramps in all the limbs. ("Six pints of water beat up with whites of eggs, given by a glass at a time, at short intervals, twenty leeches to the epigastric region, which were applied at five o'clock precisely, and two cooling emollient glysters.")

At half past five, evidently better. He had taken the whole quantity of drink prescribed; had vomited much, and had four stools. ("Four pints of decoction of linseed, given a glass at a time. Impossible to apply fomentation, on account of the great soreness of the belly.")

At six o'clock fresh vomitings, cessation of cramps and of evacuations; pulse only a hundred, and of the same character as before; other symptoms as before; great desire to talk of all that had happened to him. At nine o'clock a very imperfect sleep. At twelve complained of a smarting sensation near the bottom of the rectum. Stools abundant and bloody; sharp pains in the arch of the colon; pulse still, small, and tight; beats a hundred and fifteen. ("Ten leeches on the course of the descending portion of the colon, three pints of water saturated with gum, two emollient glyters prepared with half a drachm of laudanum.") Fresh vomitings, four stools much less bloody, an almost sudden cessation of the pain; evidently better; inclination to sleep.

The 14th, at eight in the morning, (second day of the disease,) abdomen little swelled, and less painful; tongue moist; no inclination for stools or vomiting; anus slightly painful; pulse ex-

panding a little, and beats only at ninety-six; skin cooler; face less red; limbs a little stiff; no convulsive movement; senses and intellectual faculties perfect. ("An anti-spasmodic draught made with two ounces of orange flower-water, two ounces of peppermint-water, thirty drops of the anodyne mineral liquor, and an ounce and a half of syrup of orange-rind, four pints of decoctions of linseed, to take in the course of the day; three emollient and narcotic glysters, at the intervals of two hours.") Fresh vomiting, fresh alvine evacuations, without blood, which have greatly relieved the patient. In the evening an exacerbation, pulse an hundred and six, greater heat of skin, without increase of the pains. ("Gum water, oily julep, emollient and narcotic glister.") The 15th, in the morning (third day of the disease); the patient feels himself much better, has slept during part of the night; he no longer despairs; he takes pleasure in talking of the danger he was in; asked for food; tongue moist, pains diminished, great debility, pulse nearly in its natural state. ("Barley-water, soup, anti-spasmodic draught, emollient fomentations.") The evening, in the same condition. The 16th, in the morning, (fourth day of the disease,) the patient has slept tolerably well, and only complains of slight pains, and of no long continuance, in the epigastric region; appetite good. ("Barley-water and soup.") The 17th and 18th in the same condition. The 19th the pains nearly gone; he has been allowed soup twice. The 21st and 22d, convalescent. The 30th, he is in very good health, and sets out for his own country.

Whoever pays the least attention to the commencement of this disease, will perceive how easy it would be to confound it in the first instance with cholera morbus. In fact, the temperament of the patient, the bilious affection with which he had been attacked a few days before, the bilious vomiting and stools, free from blood, the convulsions, and the cramps in the limbs, whilst the heat of the atmosphere was very great; all these things might have induced a belief that such a disease existed. However, this narrative of the case, the chemical analysis of the fluids vomited, and the avowal of the patient himself, prove to a demonstration the existence of poison. The disease with which Mr. B. was attacked was a real phlegmasia of the mucous membrane of the intestines, and of the

peritoneum, complicated with a bilious affection, the developement of which was owing to the presence of the corrosive sublimate, and particularly to the predisposition of the patient.

It is of the utmost importance that the medical practitioner should never lose sight of the analogy, I might even venture to say, the perfect similarity that exists between the symptoms produced by certain poisons, and those which constitute several spontaneous diseases. Ignorance of this part of medicine may lead the person called on to determine in cases of poison, into the most serious errors.

Case II.

A man, tolerably robust, and of a sanguine temperament, 40 years of age, about ten o'clock at night, took, no one knows why, the remainder of some corrosive sublimate which he had in the house for the purpose of destroying rats. The dose was not small. He dissolved this poison in some beer. The moment he had swallowed it, the mouth, œsophagus, and stomach, experienced its caustic effects. In a short time, inflammation of the mouth, an acrid and burning heat at the region of the stomach, with rending pains, succeeded to the first impression of the corrosive sublimate, and extended rapidly to the whole of the intestinal canal, with pains equally horrible as those at the stomach. Soon after the face swelled greatly, and became of a deep crimson. The eyes were sparkling, and the breathing very difficult. He felt great anxiety of the præcordiæ, with inquietude and continual tossings. The pulse was small, and indicated fever. Six grains of emetic tartar were given at first in a glass of water : little vomiting resulted from it, but the pains were greatly increased. In this state of perplexity a drachm of theriaca was administered to the patient, which produced no calm. The poison was making rapid progress, and M. Dumonceau was sent for without delay, who, on sight of the case, prescribed hastily a drachm of the salt of wormwood in a glass of water, in order to decompose the two metallic salts, especially the corrosive sublimate ; to this he added incrassating and inspissating medicines. I was called in, and could not but approve the medicines prescribed by my colleague Mr. Du-

monceau, and we agreed to persist in them. The excruciating pains, however, returned at intervals with great violence, and seemed to announce a corrosion of the internal membrane of the stomach and bowels. It had, in fact, taken place. The patient was passing bloody stools. Nevertheless, by the use of the " sal. absinth." two drachms at a dose, dissolved in the decoct. incrassant. of Fuller, (after having taken a drachm, at twice, at the interval of a few instants,) he found a very evident relief. Although the pains returned again from time to time with great violence, they nevertheless, subsided by degrees, insomuch, that the next morning a calm had succeeded to the storm. All the alarming symptoms had subsided, but there remained a painful sensation along the whole of the intestinal canal, and a general sense of weakness of the body which had sustained so rude a shock.

Plenck speaks of a lady who died miserably, from having applied upon her body a plaster, into the composition of which the corrosive sublimate entered. The symptoms preceding death, were great pains, convulsions, swelling of the throat, and salivation.

The head of a little girl, which had been anointed with a pomatum containing corrosive sublimate, for the destruction of vermin, became so much swelled, that great fear was apprehended for her life. She received relief from ley of ashes; her hair fell off, and she recovered.

Degner reports a case of this kind of poisoning in which death was preceded by still more alarming symptoms.

On considering the different symptoms observed in the patients, who form the subject of the preceding observations, we perceive that they can be reduced to the following: an acrid, astringent, metallic taste in the mouth: a sensation of stricture and burning heat in the throat; anxiety and rending pains in the stomach, and in the whole of the intestinal canal; nausea, frequent vomitings of a fluid, sometimes bloody, accompanied with violent efforts; diarrhea, sometimes dysentery; pulse small, tight, and frequent; lypothimia, general debility, difficulty of breathing, cold sweats, cramps in all the limbs, general insensibility, convulsions, death.

The imprudent and continued use of this salt in small doses, produces all the symptoms of which we have spoken, in our examination of the action of the compositions of mercury on the animal economy.

LESIONS ATTRIBUTED ESPECIALLY TO THE CORROSIVE SUBLIMATE.

Are the different alterations of contexture, which result from the action of poisons, sufficiently well known; or do they present characters sufficiently specific, that it may be ascertained on inspection which poisonous substance has produced them?

By experiments made upon animals, and a collection of cases of poisoning, stated with great care, it is proved, in a manner incontestable—1st, that a general inflammation of the alimentary canal, as well as its perforation, can be produced by all the corrosives. 2dly, That the mucous membrane of the stomach may be detached by a number of these poisons. 3dly, That the gangrenous scaling of the integuments may equally belong to all the poisons which act with great activity.

We are under the necessity of acknowledging, that it appears to us impossible, in the present state of science, to point out in a precise manner, the seat, extent, and character, of the lesions produced by corrosive sublimate.

APPLICATION OF ALL THAT HAS BEEN SAID TO THE VARIOUS CASES OF POISONING BY CORROSIVE SUBLIMATE.

All the ideas, whether chemical, physiological, or pathological, which we have already considered in the different articles on corrosive sublimate, ought to be taken advantage of by the scientific practitioner, who finds himself under the necessity of deciding, whether poison by corrosive sublimate has taken place or not. Whether called to the assistance of the patient, or required to instruct the magistrate, it is to these principles he must have recourse, to avoid compromising the lives of persons committed to

his care, or his own reputation, and that of persons who may be unjustly accused of so horrible a crime.

We shall in this article point out the line of conduct, which the physician ought to pursue in these instances ; and in order to leave nothing undone in this particular, we shall investigate in succession all the cases which can possibly present themselves.

1st, The physician may be called in, whilst the patient is still living, and the remains of the poison are found upon him, or in his house, whether in a liquid or a solid state, alone, or mixed with some plaster.

2nd, A second case which may occur, is that in which the patient is tormented with stools and vomitings, the matter of which has been preserved, without being able to procure the poison, the whole of which has been swallowed.

3d, The patient still living; no possibility of procuring the vomitings or stools.

4th, He may be dead.

FIRST CASE.

The Person is living; the Remainder of the Poison can be procured.

The situation of the patient; the information he can furnish respecting what has passed: the report of the assistants: and above all the chemical examination of the substance, with which he is supposed to be poisoned. These are the numerous resources which the person called on to determine, has in his hands.

If this substance be liquid, and in very small quantity, a few drops of it should be taken up in the end of a quill, cut for the purpose, or in a small glass tube, and dropped upon some paper of tournesol, or on a plate of copper, perfectly freed from impurities. It should be tried successively in the concentrated solutions of hydro-sulphuret of ammonia, nitrate of silver, caustic potash, or carbonate of potash, of ammonia, of prussiate of potash, and syrup of violets. If, however, after having made all these experiments, there should still remain a small portion of this solution, it should be mixed with potash, and evaporated to dryness in a

small capsule of procelain; the dry residue should be detached, and put into a small glass tube before described, and gradually heated to redness. Metallic mercury in globules, would be quickly obtained. The potash must not be neglected to be added before beginning the evaporation: without that, a part of the sublimate would be volatilized and lost. Lastly, if the quantity of the liquid would permit the making another experiment, it should be brought in contact with a plate of zinc, which would decompose it.

If this liquid substance be mixed with milk, soup, tea, wine, syrups, &c. it may happen that these mixtures may be a little turbid, without offering a very distinct sediment. They may, on the other hand, be extremely clear, and present a sediment collected together at the bottom: these effects depend, as we have shown above, upon the quantity of sublimate employed. In that case it happens, either that the fluid will present the phenomena we have just described with the agents, or its precipitates will be modified by its mixture with these different substances. If there be a precipitate, metallic mercury may be obtained by calcining it in a small glass tube, after having dried it upon a filter, or in a capsule of porcelain.

If this salt be in a solid state, the examination should be begun by observing whether it appears under any of the forms pointed out, and afterwards a portion of it should be heated in a glass tube with potash. In the space of five minutes, globules of metallic mercury would be obtained: in the place of potash, metallic antimony may be employed; and the remainder may be afterwards dissolved in distilled water, filtered, and brought into contact with all the tests of which we have spoken. If, however, the quantity of the salt be extremely small, it will be better to make a solution of the whole.

If the salt be in a state of solidity, and form part of a plaster, it will be best to cut it up in small pieces, and boil them a quarter of an hour in distilled water; this fluid, after standing a while, should be filtered, and examined as we have pointed out; it is clear, that if the corrosive sublimate is neither decomposed, nor strongly retained by the materials which compose the plaster, it ought to be found in solution in the liquids, the nature of which would be dis-

covered by the tests above enumerated. If the distilled water does not contain a particle of this salt, then the whole solid portion should be dried in a capsule, or mixed with potash: after this it should be put into a glass retort, to which should be adapted a receiver with a long neck, and made red hot, taking care to increase the heat gradually: by this means will be obtained metallic mercury in globules, adhering to the sides of the neck of the retort, mixed with a thick blackish oil. It may probably happen that the quantity of metallic mercury obtained, is so small, and divided over so large a surface, that it escapes the most attentive search, especially when the inside of the neck of the retort is blackened by the oil and charcoal: in this case it must be broken into small fragments, which are to be cleaned with nitric acid perfectly pure, at about 24 degrees. This acid will dissolve the whole of the mercury, and reduce it to the state of nitrate at minimum, which is easily to be ascertained by the red, white, and black precipitates formed by the chromate of potash, muriatic acid, ammonia, and the hydro-sulphurets. The existence of metallic mercury, easily established by these means, does not, however, strictly prove the plaster contains corrosive sublimate, since in order to prove that, it will be necessary to obtain the muriatic acid. It is nevertheless of no consequence, the physician can always safely affirm that the symptoms have been produced by a mercurial poison, which may be an oxyde, a nitrate, a muriate, &c. Otherwise by submitting the plaster to the action of caloric, it will be easy to demonstrate the existence of the muriatic acid it may contain.

SECOND CASE.

The Patient is living: all the Poison has been swallowed: the Matter vomited can be examined.

This case, much more difficult than the preceding, is one of those which most commonly occur in this kind of poisoning: it is necessary therefore to pay particular attention to it.

If the matter vomited is liquid, without any mixture of aliments, not very thick, and with the tests mentioned, it affords the precipitates there described, it may be concluded that it

contains sublimate. But if some of these precipitates should be wanting, or present themselves under a different colour, they should be mixed with caustic potash, and evaporated in a capsule of porcelain unto perfect dryness: it should then be detached, and made red-hot, in a small glass retort, to which a balloon is adapted: if then metallic mercury is obtained in the neck of the retort, it may be decided that a mercurial poison has been used. The same thing might be determined, where no globules were perceived, provided that the fragments in the neck of the retort, being treated without heat by the nitric acid at 24°, give out a liquid containing nitrate of mercury at minimum, which may easily be ascertained. This is the only good method of analysing the fluid vomited.

If any one should confine himself to the use of the tests we have mentioned, he might be led into error. In short, it is most unusual to obtain gray precipitates more or less dark, instead of those white, yellow, &c. The fluid is often coloured, and turbid to such a degree, that it is impossible to decide whether there is any precipitate, much more to determine the colour of it. Sometimes these precipitates take place with great difficulty: this effect depends at the same time on the great quantity of the vehicle in which the poison may be diffused, and the union it may have contracted with the different substances contained in the stomach, such as wine, soup, bile, &c.

If the matter vomited is at the same time both fluid and solid, it must be expressed through a piece of fine linen, and the solid part must be preserved in alcohol, to keep it from putrefaction: after which the fluid part must be examined in the manner we have pointed out; and if the existence of the mercurial poison cannot be ascertained, the solid part must be submitted to examination by drying and calcining it in a retort, in order to obtain the metallic mercury,

By recollecting with what facility albumine, milk, soup, and other alimentary substances, convert the sublimate into the muriate of mercury at minimum, it will readily be seen, why, under certain circumstances, it is impossible to discover this salt in the fluid substances.

Mr. Chaussier perfectly understood this remarkable fact; for, in speaking of the decompositions of which the sublimate is susceptible, he points out the process necessary to be pursued when it is no longer to be found in the fluid, and has been transformed into mercurius dulcis. " If the decomposition, says he, were less advanced, if the salt be reduced only to the state of a sub-muriate, or calomel, it may still be known by its insolubility in water, and the blackish colour which it would contract by the affusion of lime-water.

Such are the means this philosopher recommends to be put in practice in order to resolve this important problem. Those which we have proposed appear preferable. In short, it may happen, 1st. that the solid matter vomited, may be of a blackish colour : in this case no change will take place on the affusion of lime water : 2nd. that the solid matter vomited may be of a white colour, and preserve this colour even when left for several hours in this alkali. I made a paste of bread, boiled French beans, soup, and corrosive sublimate : this salt was instantly decomposed, and formed into a muriate at minimum: on being allowed to remain quiet, an abundant precipitate was collected : this was carefully washed and preserved in alcohol for eight days : at the end of this time it was of a beautiful white colour ; the alcohol was separated and decanted, and a great quantity of lime-water was poured upon the mass : four and twenty hours afterwards, the colour had not at all changed. I made a dog eat the same aliments ; five minutes afterwards, I introduced into his stomach twenty grains of corrosive sublimate dissolved ; the animal immediately vomited all he had taken.

The solid matter vomited, perfectly cleansed and put into lime-water, preserved its white colour, even at the end of four and twenty hours. Nevertheless, in both these experiments, these pastes, treated in the manner I have pointed out, have furnished me metallic mercury in globules, or nitrate of mercury at minimum ; which proves that they contain a mercurial substance. In another instance, another paste made with whites of eggs, meat, soup, and herb soup, roasted apples, tea, sugar, and sublimate, furnished a grayish white substance, which was carefully washed ; and on which lime-water being left forty-eight hours, produced

only a slight change of colour, causing it to become somewhat deeper.

It appears then, that the muriate of mercury at minimum, is capable of forming a strong union with alimentary substances; and that lime-water, at the ordinary temperature, cannot decompose it. Potash is equally incapable of effecting it; neither of these pastes became black on coming in contact with this alkali, although their colour became a little deeper; but after boiling them a little time, the whole compound became black. Even when, from the affusion of lime-water, the insoluble paste becomes extremely black; we cannot be sure that this effect is the result of the decomposition of the muriate at minimum. A simple change of colour is too vague an appearance, to enable any one in consequence of it, to pronounce with certainty, that poisoning has taken place. If, added to this appearance, the matter so blackened, on being treated with cold nitric acid at 24°, should give out to this acid the black oxyde of mercury which produced its colour, and that a nitrate at minimum should be formed colourless, and yielding a black precipitate to the hydro-sulphurets, a red to the chromate of potash, a white to the muriatic acid, and a black to the ammonia; then indeed, it would possess all the characters necessary to warrant an assurance, that the corrosive sublimate had been reduced to the state of mercurius dulcis.

Before concluding this article, I believe it will be well to give the experiments which I had occasion to make on the matter vomited in the case before mentioned, of M. B., who was poisoned by the corrosive sublimate, and whom I attended.

The quantity of the fluid on which I had the opportunity of trying the experiments, was about six pints; it contained some aliments greatly changed, and scarcely recognizable; the liquid part was greenish, turbid, of very little consistence, and acid. Being decanted and filtered, it furnished no precipitate properly characterized, with the tests which act powerfully on the corrosive sublimate, the hydro-sulphuret of ammonia alone deepened a little its colour, which made me presume that it might contain some mercurial salt. I added about a drachm of potash of commerce, and evaporated the whole to dryness in a capsule of porcelain:

the product obtained was blackish, and was found to weigh about five ounces, two drachms. I introduced it into a tubulated glass retort, to which I adapted a receiver: the retort was heated to redness for about half an hour, which produced the decomposition of the animal matter. When the whole was cooled, I broke the glass, in order to discover if there were any mercurial globules; I could not possibly perceive any, but I observed that many of the fragments were crusted with a coat extremely tarnished, and whitish, which I afterwards recognized for metallic mercury extremely divided. All these fragments, bedaubed as they were with carbonated oil, I caused to be digested in nitric acid perfectly pure, and obtained a liquid slightly coloured, which gave a black precipitate with the hydro-sulphuret of ammonia, a red one with the chromic acid and the chromate of potash, white with the muriatic acid, and black with ammonia. These facts proved to me incontestably that M. B. had taken a mercurial poison*.

THIRD CASE.

The Patient is living: the whole of the Poison has been swallowed: the Matter vomited cannot be examined.

Here chemistry affords no resources; consequently it becomes impossible to affirm that poison has been taken. Nevertheless the situation of the patient, his temperament, his age, his profession, his way of life; the manner in which the disease made its attack, its progress, intensity and duration; the season, the character of the prevailing diseases, &c. may furnish some data capable of enlightening the physician in the diagnosis of so difficult a case.

* The nitrate of silver likewise gives a white precipitate with the muriatic acid, reddish with the chromic acid; and black with the hydro-sulphurets. On the first inspection, one might be likely to confound this salt with the nitrate of mercury at minimum, obtained in the analysis in question. But we should take notice, Firstly, that the ammonia does not precipitate the nitrate of silver, whilst it gives a black precipitate with the nitrate of mercury. Secondly, That the nitrate of mercury in question, has been prepared with a metal obtained in the neck of the retort, and consequently volatile at no great temperature; which circumstance entirely excludes the idea of the silver, a metal which only becomes volatile at a considerable degree of heat.

FOURTH CASE.

The Patient is dead.

We suppose that there is nothing remaining of the poison, nor of the matter vomited. The only means to which the physician can in this case resort, are the dissection of the body, and a chemical analysis of the contents of the alimentary canal, and of the coats of that canal. I shall, in a separate article, point out all the steps to be taken, in order to examine properly a body suspected to be poisoned. I shall content myself here by observing, that it is indispensably necessary to make tight ligatures on the middle part of the œsophagus, on the rectum, and on the vessels found on the intestinal surface of the liver, in order to be able to remove the whole alimentary canal, without spilling any of its contents. This canal being thus removed, should be opened throughout its whole extent, and the fluids and solids contained in it should be collected in proper vessels; the whole internal surface should then be washed with distilled water, which should likewise be preserved: the lesions throughout its whole extent should be noted, and all the inflamed portions detached with a scalpel, likewise the eschars, gangrenous portions, &c. If there are any perforations, the parts round the holes should be taken out, and all the solid portions preserved in alcohol.

Having collected the different substances, we proceed to their analysis; and first observe if there be any fragments of corrosive sublimate. If any, they must be tried by the means pointed out; if none, the fluid must be examined in the manner laid down; lastly, if the sublimate has been transformed into insoluble muriate at minimum, and is combined with the alimentary mass, metallic mercury will be obtained from this mass, by drying it and exposing it to the action of caloric. If all these means fail, the portions of the alimentary canal preserved in the alcohol, must be analysed. After drying them, they should be mixed with a little potash, in order to calcine them in a retort, to obtain the metallic mercury. The following are the experiments I have made in order to establish the possibility of recognizing the poison when combined with the human texture. 1st. A portion of the intestine of a cock was

perfectly washed and put into a solution of corrosive sublimate. At the expiration of three days, the fluid was turbid, and became milky ; the animal matter acquired a greater degree of hardness, and lost its coherence without presenting any sign of putrefaction. It was boiled in water in order to clear it from excess of corrosive sublimate : in this state it was dried in a capsule of porcelain, and afterwards calcined in a retort. Globules of mercury were soon afterwards seen condensed in the neck of the retort. 2nd. Into the stomach of a rabbit, which had been two hours dead, a drachm of sublimate, dissolved in two ounces of water, was injected. Three days afterwards this viscus was opened, the mucous coat was found strongly corroded, and was very easily torn. It was then taken out and washed in water to cleanse it from the excess of sublimate, when it was dried and submitted to the experiments just related, and metallic mercury was obtained. It is unnecessary to remark, that in these experiments, the alimentary canal acts upon the sublimate like all other animal substances: muriatic acid is disengaged, and muriate of mercury at minimum formed, which combines with the substance of the viscus. It may be objected, that this chemical action does not take place in the living animal, that our texture, while endued with the vital principle, is not subservient to the same laws as inorganic substances. I am not ignorant of the extent to which this objection is well founded ; but, admitting the justice of it, the conclusion is not less true, that if the stomach contains corrosive sublimate at the moment of death, this body will, from that moment, act on the texture of the viscus itself, in the manner we have seen take place in that of the cock and the rabbit. The effects of this action will be scarcely sensible, if the stomach contains a great quantity of aliments; but, on the contrary, they will be very easy to ascertain, if this viscus is empty, and especially if the examination of the body takes place several days after death.

TREATMENT OF POISONING BY CORROSIVE SUBLIMATE.

Before entering upon the means which should be employed in the cure of this kind of poisoning, we shall resolve the following question, which appears to us to be extremely interesting.

"Is any counter-poison to corrosive sublimate known?"

Navier, in his work on counter-poisons, determines in the affirmative, and points out several substances which he looks upon as antidotes to this salt: for instance, the alkaline salts and earths, the sulphurets of potash and of lime, the martial alkaline tinctures, and the Spa waters. I have undertaken a series of experiments in order to establish the utility of these agents, considered as antidotes, and the results I have obtained annul the assertion of Navier. This circumstance arises from the different manner in which each of us have considered the matter.

The physician of Châlons draws his conclusions from facts purely chemical; mine result from a number of experiments made on living animals.

Before going into the detail of these counter-poisons, I think it best to make known the qualities which any chemical agent ought to possess, in order to act as such.

1st. It ought to be such as may be taken in a large dose without any danger.

2nd. It ought to act upon the poison, whether it be in a fluid or solid state, at a temperature equal, or inferior to that of the human body.

3d. Its action ought to be prompt.

4th. It ought to be capable of combining with the poisons, in the midst of the gastric liquor, mucous, bilious, and other fluids, which may be contained in the stomach.

5th. Lastly, in acting upon the poison, it ought to deprive it of all its deleterious properties.

M. Renault, in a dissertation on the antidotes to the arsenious acid, after having pointed out all these qualities, insists upon the necessity of trying upon living animals the different agents proposed as counter-poisons, and of obliging them to remain in the sto-

mach with the poisonous substance, to the end that nothing may be expelled by vomiting. In short, how can we be assured that an animal, which has taken a strong dose of poison, owes his preservation to a counter-poison given him, if both one and the other are thrown up?

ANTIDOTES TO CORROSIVE SUBLIMATE PROPOSED BY M. NAVIER.

Alkaline salts and earths, recommended by this author, ought to act in the stomach by decomposing the corrosive sublimate; and by setting at liberty the oxyde of mercury at minimum; consequently, if this oxyde is a poison, these alkalies will be of no kind of use.

Experiment.—Four grains of corrosive sublimate dissolved in an ounce of distilled water, were precipitated by an excess of carbonated potash of commerce (salt of tartar).

The yellow oxyde precipitated was perfectly washed and cleared from the muriate of potash: it was then given, in distilled water, to a dog of a middling size. Two minutes after a vomiting came on of a thick yellowish matter, in which was perceived a portion of the oxyde. There was no appearance of any pain. Ten minutes after, extreme debility was observed, the animal was motionless, fresh vomitings of a white frothy matter succeeded, mixed with inspissated saliva, which was rendered with difficulty. These vomitings continued during an hour, with general insensibility. Eighteen minutes after, death took place, preceded by a trembling of the voluntary muscles. The stomach contained only a part of the oxyde administered, with a very small quantity of fluid. The mucous coat was inflamed throughout its whole extent, without exhibiting any gangrenous spots: the intestines and the other organs were sound.

The same quantity of sublimate, mixed with potash, was given to another dog, and the results were the same. The soda and the lime acted in the same manner as the salt of tartar. We must, then, conclude, that the alkalies cannot be the antidotes of the sublimate, since the yellow oxyde of mercury, in a very small dose,

acts as a poison, even when the animal shall have vomited a part of it.

Navier himself does not seem to attach much importance to these agents, as he says, in speaking of the oxyde of mercury, "Now this precipitate is not entirely exempt from corrosion; therefore, the method of correcting the deleterious action of alkaline salts being insufficient, it will be prudent to adopt some other, more efficacious, if possible.

The carbonate of potash of commerce, and the sulphurets of lime and of potash were tried, and the result of all these experiments proves, that the chemical agents, recommended by Navier, are of no use in cases of poisoning by corrosive sublimate in a fluid state. They must consequently be still less so if this salt has been swallowed in a solid form; for the force of cohesion opposes a strong resistance to the chemical action, which ought to take place between the poison and its antidote.

RESULTS FROM EXPERIMENTS MADE WITH ALBUMINE.

It appears from experiments which I purposely omit, that the triple body composed of albumine, muriatic acid, and the oxyde of mercury at minimum, may be taken in a large dose without danger:—that when a large quantity of the white of an egg is given, previously mixed with the corrosive sublimate, the deleterious action of this poison is hardly felt:—that dogs after swallowing twelve or fifteen grains of sublimate, and which have vomited, seldom perish when albumine has been given them; which circumstance is solely dependent upon the power of albumine for decomposing the sublimate which it may find in the stomach;—that all animals which do not take a sufficient quantity of the white of eggs, die in the course of three or four hours, when they have only taken twelve grains of sublimate;—that the corrosive sublimate mixed with a moderate quantity of albumine produces a fluid in which sublimate still remains, and which consequently ought to exert its poisonous qualities;—that of all the substances hitherto proposed as antidotes to corrosive sublimate, albumine swallowed in sufficient quantity is the only one useful, because it can be taken in

any quantity with impunity; because it forms with the poison a substance by no means deleterious; and lastly, because it is within the reach of every body, and may be employed immediately after the swallowing of the poison.

We shall now point out the steps, the physician ought to pursue in this kind of poisoning.

From the first appearance of the symptoms denoting it, the patient should be made to swallow several glasses of white of egg beat up with water: if this substance cannot be procured, a decoction of Linseed, of Marshmallow, or Mallow-leaves, may be given; or rice-water, sugared-water, gelatinous broths, or even common water at the temperature of 25° to 30°: by these means the energy of the sublimate will be weakened, and the stomach filled with liquids. The fulness of this viscus will determine vomiting, and consequently the evacuation of part of the poison. The patient should be made to drink copiously, so long as the vomitings continue, and until the symptoms are considerably relieved. If the patient be so organized that he cannot vomit, or if he be affected with *Trismus*, we must then be obliged to have recourse to the method proposed by Boerhaave, and brought to perfection by M. M. Dupuytren and Renault, which consists in mechanically evacuating the stomach by means of an elastic gum catheter, armed with a syringe. "The elastic gum catheter," says Mr. Renault, "should be so long, that one of its extremities may be "plunged into the bottom of the stomach, and of a sufficient capaci- "ty to admit the soft substances, such as those which are half di- "gested, to pass through: it ought to have two terminal orifices, and "lastly, it should be mounted with a ferule of metal at its exterior "extremity, which should be received into the pipe of a syringe. "Things being thus prepared, the catheter should be introduced "by the mouth, or the nostrils, the syringe adapted, and a certain "quantity of fluid should be gently injected, in order to dilute, "suspend, or dissolve the poison. The piston should then be "withdrawn, the machine emptied, and a certain quantity of the "matter contained in the stomach drawn out. When this opera- "tion has been several times performed, this viscus will be well "washed, and the whole of the poison extracted without any vio-

" lence, almost without pain ; and in a very short space of time. " Whenever the poison has not passed the pylorus, and it is not in " large pieces, the possibility of extracting it by those means, is " evident to all those who know any thing of physics. When " experiments upon men shall have proved its efficacy, the em- " ployment of it may become extremely extensive : until such " experiments shall have decided it, I shall offer the following, " which I have made upon living animals. I injected eight " ounces of water into the stomach of several small dogs, and have " always succeeded in drawing it all off by these means. It cannot " indeed fail to succeed if we consider how effectually similar " means have been employed for emptying the bladder of coagu- " lated blood."

I shall report an observation communicated to me by M. Cullerier, which proves to a demonstration, how advantageous it is in the cases of poisoning here considered, to gorge the patient with quantities of fluids.

About twelve years ago, the apothecary, who was charged with the preparation of the solution of corrosive sublimate, employed in the Hospital for venereal patients, by mistake made use of a larger quantity of sublimate than was proper for preparing the medicine. Two hundred patients under treatment for venereal complaints, took a portion of this liquid, and were poisoned by it. Rending pains at the stomach, and over the whole abdomen, copious vomitings, and a tightness about the throat, were the symptoms which first announced the action of the poison. M. Cullerier, principal Surgeon to this Hospital, being informed of the circumstance, had recourse instantly to mucilaginous drinks. He ordered milk, decoction of linseed, and warm water. He gave to each patient about ten pints of liquids, in the space of six or seven hours ; and at the end of this time, the symptoms had nearly all vanished ; ten or twelve only of the patients, still felt pains of the stomach for twelve or fifteen days ; but none of them died. It was a curious circumstance, that the pains were more severe, in proportion as the stomach was empty ; and it was hardly felt immediately after the drinking the liquids. M. Cullerier is ignorant of the dose of corrosive sublimate which might have

been given to these patients; but he is of opinion, that the least was two or three grains*.

Copious and mucilaginous drinks ought to be preferred to any other emetics, in order to excite, or encourage vomiting, in cases of poison by corrosive sublimate. Indeed these kinds of drink have the triple advantage, of being administered with promptitude, of expelling the poison, and of moderating the irritation already produced.

It is necessary to keep in mind, in administering these kinds of drink, that their value depends upon their quantity; and that consequently, they should be administered to the patient, even when he feels no inclination to drink.

Oils, and greasy substances in general, are of no kind of use, and ought to be laid aside, because they act in opposition to the real solvents.

The treatment of this kind of poisoning, ought to be still more active, if the organs of the abdomen are in a state of inflammation. For neither is it uncommon to witness Gastritis, Enteritis, or even Peritonitis, as the consequences of this accident. These cases, generally fatal, require, on the part of the physician, the greatest attention: if the inflammation is only incipient, general and local bleedings should be had recourse to; by applying in the latter case, ten, twelve, fifteen, or twenty leeches on the parts in pain. These means have perfectly succeeded with me in the case of the patient who is the subject of the first observation; and I am convinced it may be turned to great advantage. If the patent is strong and vigorous, there can be no fear of one or two bleedings from the arm, in order to counteract, as much as possible, the violent inflammations produced by this poison. The use of emollient and anodyne glysters, in these cases, affords unquestionable advantages. They may be prepared with a decoction of marshmallow-root, linseed, and laudanum.

It is essentially necessary not to neglect the application of emollient fomentations over the whole of the abdomen; they ought

* The ancients had already noticed the advantages resulting from vomiting in cases of poison; Dioscorides, in his book on poisons, recommends water, oil, and butter, as vomitives.

never to be omitted, except in cases where the pain is so violent as to render the weight of these applications insupportable. The *Pediluvium*, and even the warm bath ought to be employed; the patient may remain in it several hours, provided that the temperature of the water be always nearly the same. In fine, the lowest diet must be prescribed, and the patient allowed nothing but a little broth.

If the inflammation has already arrived at a certain height, or if it has gone through its several stages, bleeding must be laid aside; for there will be reason to apprehend gangrene: the treatment in this case, must be the same as in internal inflammations.

Antispasmodics, and even Narcotics, ought to be employed, in cases where there are any alarming nervous symptoms, such as spasms and convulsions.

When the symptoms are relieved, and the patient is entering on a state of convalescence, he ought to be supported with a farinaceous diet, and softening drinks, such as milk, rice, cream, oatmeal gruel, panada, and broths prepared from the flesh of young animals.

If the poison should be taken by a person already sick, it is evident that regard must be had to the complication in the course of the treatment; and the means must be varied according to the nature of the existing disease.

Of the Red Precipitate, and Precipitate per se.

These two bodies are nothing else but the oxyde of mercury, at the maximum of oxydation; the former, however, almost always contains a little nitric acid.

Their colour is red; when heated in a glass tube, they become decomposed, and give out volatile metallic mercury, adhering to the sides of the tube, and oxygen gas, which is disengaged.

These two preparations ought to be considered (especially the red precipitate) as violent poisons. Plouquet reports, that a man who had been tormented with a violent head-ache, swallowed by accident some red precipitate. He immediately experienced violent colics, copious vomitings, a trembling of all his limbs, and cold perspiration.

OF TURBITH MINERAL.

Tubith mineral is a salt formed of a great portion of oxyde of mercury at maximum, and a small quantity of sulphuric acid ; for which reason it is likewise known by the name of sub-sulphate of mercury at maximum, or sub-deuto-sulphate of mercury. It is in the form of a yellow powder, the shade of which varies greatly, according to the manner in which it is prepared.

On being heated in a small glass tube, it becomes decomposed, and gives out metallic mercury, which condenses on the sides of the tube ; and oxygen gas and sulphuric acid gas, which are set at liberty : it is almost insoluble in water.

OF OTHER MERCURIAL SALTS.

The nitrates and sulphates of mercury at maximum and minimum, the ammoniaco-mercurial muriates, &c. ought to be equally considered as poisons ; their history is contained in what we have said in the preceding articles.

MERCURIAL VAPOURS, AND MERCURY IN A STATE OF EXTREME DIVISION.

Mercury reduced to the state of vapour ought to be considered as a poison. Fernel, Swediaur, Fourcroy, and others, have given reports of cases, which prove how much the workmen employed in mercurial mines, gilders, silverers of looking-glasses, constructors of barometers, &c. are subject to serious accidents from their calling. The author of the *Système des Connaissances Chimiques*, gives us a striking instance of the evils which these vapours are capable of producing, in the history of two persons with whom he was acquainted.

In examining the effects produced in persons exposed to the action of mercurial vapours, we may reduce them to the following: trembling and paralysis of the limbs, vertigo, loss of memory, and of the other intellectual faculties ; salivation, and ulceration of the mouth ; colic, asphyxia, asthma, hœmoptysis, atrophy, apoplexy, death.

We cannot refuse to ascribe to these vapours a powerful action upon the organs of sense and motion; but this action does not appear to us to differ sufficiently from that which other mercurial preparations exercise on the nervous system, to warrant us, after the example of M. Fodéré, in arranging, in a separate class, the vapours in question.

Ought metallic mercury to be considered as a poison? This question appears to me to have been badly understood hitherto. There are authors who affirm that mercury is endowed with the most mischievous qualities; while others, on the contrary, maintain, that there is no kind of danger in taking a strong dose of this substance.

It appears to me that metallic mercury acts as a poison whenever it remains sufficiently long in the alimentary canal to undergo a considerable degree of division, or to be absorbed. It is well known that moisture and grease are capable of attenuating exceedingly the molecules of this metal, to such a degree that they become black.

OF ARTIFICIAL CONNABAR OR SULPHURET OF MERCURY.

Thirty-six grains or one drachm of this substance occasions death in the course of two, three, or four days, when it is applied to the internal part of the thigh: the stomach and intestinal tube present traces of evident inflammation, sometimes ulcerations and even gangrenous spots. The heart and brain do not appear affected; the lungs are sometimes engorged.

ARTICLE THE SECOND.

SPECIES II.—ARSENICAL POISONS.

Var. 1st. Arsenious Acid, or white oxyde of arsenic.
—— 2nd. *Arsenites*, or combinations of that acid with salifiable bases.
—— 3d. Arsenic Acid.
—— 4th. *Arseniates*, or combinations of the *arsenic acid* with the bases.

—— 5th. Yellow sulphuret of arsenic.
—— 6th. Red sulphuret of arsenic.
—— 7th. Black oxyde of arsenic *(fly powder)*.
—— 8th. Arsenical vapours.

The preparations of arsenic are, of all the poisonous substances in the mineral kingdom, the most fatal; and are those, the properties of which the physician ought to be best acquainted with. Being of considerable use in the arts, disposed of in commerce for the purpose of destroying noxious animals, administered and applied every day under various forms, for the cure of several species of diseases, frequently the instrument of crime and suicide, it is not to be wondered at, that they should furnish, more frequently than any others, the opportunity of exercising the talents of professional men.

Fortunately the history of these, has been brought, by several learned men, to a greater degree of precision than that of any other poison. Experiments, beyond the reach of all criticism, have fixed our ideas with respect to the antidote of the arsenious acid, a deleterious substance which it most concerns us to be acquainted with. Many excellent medical observations have thrown great light on the nature and order of the symptoms resulting from its action: in fine, many ingenious chemical proceedings, proposed at different periods, for discovering the atoms of this substance, have greatly enriched this department of medical jurisprudence. We propose laying down here whatever has been ascertained on this subject, adding, at the same time, many chemical facts neglected by authors, and which will serve to complete whatever is necessary to be known with respect to this poison.

The order in which we intend to present these facts will be precisely the same as that adopted in treating of mercurial poisons. We shall begin by describing the principal chemical properties of metallic arsenic, the knowledge of which, it appears to us, ought to serve as the basis of all that we have to say on this article.

OF ARSENIC.

Arsenic is a solid metal, of a gray colour, like steel, and shining when first prepared. Its texture is grained and sometimes

scaly, its hardness not very considerable, and its fragility very great. According to Bergman, its specific gravity is 8.308.

Being exposed to the action of caloric, in a closed vessel, arsenic sublimes and crystallizes in *tetraedral* figures, without melting or experiencing any alteration.

At the ordinary temperature, arsenic, exposed to the atmosphere for some time, loses its brilliancy, becomes tarnished, grows black, and is converted into a black oxyde of arsenic at minimum. This fact proves that arsenic is capable of combining easily with oxygen.

If it be heated in contact with the air, it then diffuses white vapours extremely dangerous to respire, and of a smell similar to that of garlic or of phosphorus. These vapours, when collected, are nothing else than the white oxyde of arsenic at maximum *(arsenious acid)*, formed at the expense of the oxygen of the atmosphere, decomposed by the metal. We shall presently explain a third combination of this metal with oxygen, in which the latter principle is very abundant, and which is known by the name of *arsenic acid.*

Arsenic does not appear to be a poison. Bayen has given to dogs as much as a drachm of this metal, recently prepared, without producing any perceptible alteration in their health. M. Renault has given to these animals two drachms of *mispickel* (an alloy formed of arsenic and iron): they never experienced either nausea or vomitings, nor has there been any derangement in their functions. This fact appears to confirm the results of Bayen's experiment, but it is not sufficient to prove the innoxious quality of metallic arsenic; for in many experiments it has happened, that the administration of this substance has caused the death of the animals to whom it was given. This effect probably depends upon the facility with which it was converted into an oxyde.

OF ARSENIOUS ACID.

The arsenious acid, known under the name of *arsenic*, and *the white oxyde of arsenic*, is generally found in the form of white masses, opaque on their exterior surface, yellow, transparent, and, as it were, vitrified within; its taste is acrid and corrosive; when

reduced to powder, it bears some resemblance to sugar. Its specific gravity is 5.000.

When exposed on burning coals, it volatilizes, diffusing white vapours, very dense, and of a smell resembling garlic. The same thing takes place if it is dropped upon a plate of copper or iron previously heated to redness. A plate of copper placed above these vapours becomes covered with a coat of a very beautiful white, and not of a blackish white, as has been improperly pointed out. This coat is nothing else than the arsenious acid, volatilized and attached to the plate: it can be easily scratched off with the finger, when the copper regains its natural colour.

ACTION OF ARSENIOUS ACID, UPON THE ANIMAL ECONOMY.

This acid, whether administered internally, or applied externally, acts with a great degree of energy, and destroys life usually in a very short space of time. What is the kind of action produced by this substance, and in what manner does death happen from it?—Mr. Brodie has published a work, the intention of which is to resolve these two questions. We will give an account of the conclusions to which he arrived.

The most generally received opinion is, that the arsenious acid being brought into contact with the stomach, produces a local inflammation, which ought to be considered as the cause of death. The English physiologist rejects, with reason, this explanation, in order to make way for another, which does not appear to us better founded. He asserts, that the arsenious acid, whether administered internally, or applied externally, begins by entering into the stream of the circulation; that it exerts its action upon the nervous system, the organs of the circulation, and the alimentary canal; and that death is the immediate result of the suspension of the functions of the heart and brain.

According to this author, the various symptoms observed in the animals submitted to the action of this acid, may be reduced to the three principal which follow. 1st. Those depending on the nervous system, such as paralysis, first of the lower extremities, and afterwards of all the other parts of the body; convulsions, dilata-

tion of the pupils, and general insensibility. 2nd. Those which indicate a derangement in the organs of the circulation: for example, the pulse weak, slow, and intermitting; the weakness of the contractions of the heart after death; and the impossibility of prolonging them by the assistance of artificial respiration. 3rd. Lastly, those which belong to the lesion of the alimentary canal, such as pains in the abdomen, nausea, and vomitings in such animals as could vomit.

At one time it is the nervous system which is most seriously affected; at another, the organs of the circulation. According to these details, it appears that inflammation of the stomach and intestines, ought not to be considered as the cause of death, in the greatest number of cases of poisoning by the arsenious acid. Nevertheless, if the animal does not sink under the first symptoms occasioned by the poison, if the inflammation has time to develope itself, there is not the least doubt that it is capable of destroying life. M. Earl relates, that a woman who had taken arsenic, resisted the alarming symptoms which first declared themselves, but died on the fourth day. On opening the body, the mucous tunic of the stomach and intestines was found ulcerated to a very great extent*.

SYMPTOMS OF POISONING BY THE ARSENIOUS ACID.

Case I.

M. Tonnelier was called to the house of Madame L * * *, to give assistance to her daughter, aged nineteen years, who was reported to be in a cruel situation. He found her, in fact, in a state of extreme faintness, kneeling down on the floor of her room, with her head resting on the arms of her brother, being unable to support herself. Her face was unequally red, and covered with sweat; her eyes were half open, red, and suffused with tears; round her eye-lids was a border of a bright red; her voice was nearly gone; her breathing short, frequent, and plaintive: she experienced hor-

* Philosophical Transactions, Memoir of Mr. Brodie, 1812.

rible pains in the stomach, like those which would have been produced by fire; and she made efforts to vomit, which were extremely distressing: she had been four hours in this situation. The patient, on being interrogated by M. Tonnelier, acknowledged that she had taken arsenic *(arsenious acid)* in the morning. It is thought that she took this poison about eleven o'clock in the morning, in some broth which she had made for her breakfast. Nevertheless, no symptom, of a very distressing nature, had made its appearance till the evening: during the day she had been observed often to change colour in the face, and shewed some other signs of suffering and anxiety; but she was obliged to conceal her pain, and to appear with a serene countenance. She ate a very good dinner at two o'clock. At seven in the evening the vomiting came on with great violence: at eight she had a slight convulsion, which lasted several minutes, after which the vomitings returned with the same violence as before. As she had refused to drink, the matter vomited amounted to very little: it was composed of a part of her dinner, of a viscous matter, sometimes colourless, sometimes of a pale yellow; together with some frothy saliva with some streaks of blood. The patient was put to bed, by the advice of M. Tonnelier. Her pulse was small, unequal, irregular, and very frequent. The epigastrium possessed an excessive degree of sensibility, and there were also very excruciating pains in the intestinal canal. Her swallowing was already extremely difficult; nevertheless they succeeded in making her drink copiously. By this means she vomited more easily and without interruption for a whole hour. The vomitings then ceased for about ten minutes. The patient rested herself upon her pillow, and appeared to sleep; she was even heard to snore: but, in a short time, the motions of the stomach awoke her, and the vomitings were repeated until two o'clock. Her situation became more and more distressing.

At a quarter past two, a second appearance of sleep for eight minutes; snoring, respiration slower, hiccup, vomitings for a quarter of an hour, coldness of the face, hands, and fore-arms; she uttered cries from time to time; agitation extreme; contortion of all the limbs; a spontaneous stool, which was the second since the invasion of the symptoms.

At three o'clock a little calm ; she begged of the attendants not to speak of her misfortune. The breathing became still slower, the coldness increased ; fresh signs of agitation, frightful dreams ; the pulse became insensible. At four o'clock she opened her eyes, and complained that she could not see the light : she lamented her fate : her arms became dead. At five o'clock her countenance was like ice, her nose and lips of a violet colour, the beating of her heart could scarcely be felt ; to this succeeded a rattling in the throat, and death.

This young person, tormented by disappointment, had already tried twice to destroy herself by poison.

Nine months before, M. Tonnelier being called to her asssistance, found her in a situation very similar to that we have just described ; but the symptoms had a much less degree of intensity, doubtless, because the dose of poison had been very small. The patient then quickly recovered by the assistance of mucilaginous drinks ; there remained only a pain in the lower part of the right side of the stomach, which she constantly afterwards felt. As to the second poisoning, it was much less severe than the first.

Appearances on Dissection.

Externally : contraction of the muscles of the face, insurmountable stiffness of the limbs ; a violet colour, more or less deep, over the legs, thighs, loins, and back ; countenance pale ; lips violet ; a very sensible heat of the body twenty-six hours after death.

Intemally : the lungs were extraordinarily distended with blood, through two-thirds of their bulk, and especially in their posterior part. The incisions made in them shewed their texture compact and tolerably firm ; from these oozed out, on the slightest pressure, blood, without any appearance of air bubbles, from a multitude of minute points. The anterior part of the lungs was red on the surface, and for the rest, tolerably elastic, and filled with air.

Both ventricles of the heart contained very black blood. The left ventricle contained more than the other.

The stomach was greatly distended by the fluid with which it was filled ; on its external surface was seen an infinity of small vessels injected with blood. The intestinal canal exhibited the same

appearance, as well on its external as internal surface, in some parts of its extent. The liver and spleen were likewise very much choaked with blood.

The stomach having been emptied, and laid open throughout its whole extent, presented a surface apparently grained, which appearance was caused by the increased bulk of the mucous glands, the colour of which was blackish ; whilst the stomach itself was red, more or less dark, and sprinkled here and there, especially towards the pyloric orifice, with extremely black spots.

The epidermis of the mucous membrane was entirely removed. Near the cardiac orifice was seen a line of demarcation, which, rising higher than its natural state above the level of the surface of the stomach, proved clearly this removal of the epidermis. There was beside no deep erosion. Two days after the opening of the body the red colour had entirely disappeared, and the black was changed into a dark red.

There was found in the fluid taken out of the stomach a cyst, formed, according to Professor Dupuytren, by an expansion of the mucous membrane of the stomach, in which some vestiges of the vessels could still be perceived. It was about an inch and a half long, eight lines in diameter, and its sides were about half a line in thickness. From the interior surface of this cyst, were given out very thin partitions of a cellular texture ; and which contained, in distinct cells, unequal fragments of a crystalline matter, which being submitted to several experiments, by M. Dupuytren and M. Vauquelin, presented all the characteristics of *arsenic* (arsenious acid). The learned surgeon, whom we have just quoted, is of opinion, that the production of this cyst belonged to the two poisonings anterior to that which terminated the existence of the patient. This opinion appeared to him to be strongly supported by the circumstance, that the patient complained of continual pains, in the part of the stomach corresponding to that where the cyst was found.

The symptoms produced by the arsenious acid, generally considered, may be reduced to the following :

An astringent taste, fetid mouth, frequent ptyalism, continual spitting, constriction of the pharynx and œsophagus, the teeth set

on edge, hiccup, nausea, vomiting of a matter sometimes brown, sometimes bloody; anxiety, frequent faintings, heat of the *præcordia*, inflammation of the lips, tongue, palate, throat, and œsophagus; the stomach painful to such a degree as not to be able to support the most emollient drink; the alvine discharges blackish, and of a horrible fœtor; the pulse small, frequent, concentrated, and irregular; sometimes slow and unequal; palpitation of the heart, syncope, unquenchable thirst, pungent heat all over the body, sensation as of a devouring fire; sometimes an icy coldness; breathing difficult; cold sweats, urine scanty, red, and bloody; change of the features of the countenance; a livid circle round the eyelids; swelling and itching over the whole body, which is covered with livid spots, and sometimes with a miliary eruption; prostration of strength; loss of feeling, particularly in the feet and hands; delirum, convulsions, often accompanied with an insupportable priapism, falling off of the hair, detachment of the epidermis; and lastly, death.

It is rare to see all these symptoms united in the same person; sometimes almost all of them are wanting, as is proved by the following fact reported by M. Chaussier.

A robust middle aged man, swallowed a quantity of arsenious acid in large lumps, and died without discovering any other symptoms, than slight syncope. On opening the stomach, it was found to contain the arsenious acid, almost in the state in which it had been swallowed.

In the second section of this work, when speaking of slow poisoning, we shall assert, that it may happen that the symptoms produced by this poison are not so fatal, whether because the quantity taken be not considerable, or because a portion has been thrown up by vomiting; or lastly, because assistance has been given before its whole effect be produced. We shall not, till then, lay down the method of appreciating properly, the importance of the different symptoms, and the advantage which the physician in a legal capacity can draw from them, when called upon to decide.

LESION OF TEXTURE ATTRIBUTED ESPECIALLY TO THE ARSENIOUS ACID.

In this kind of poisoning, as well as that by the corrosive sublimate, Sallin maintains, that the changes visible in the dead body, resulting from the action exercised by the arsenious acid, possess a character which is peculiar to themselves; for which reason, when he wishes to establish a difference between the sublimate and the arsenic he says, "the arsenic produces, in truth, "effects very analogous to those of sublimate. There are, how-"ever, very remarkable differences: in that it sometimes perfo-"rates, and renders the stomach gangrenous throughout; in that "it exerts its action upon the whole of this viscus, upon the "mouth, and the whole extent of the œsophagus; and that it ex-"cites an eruption on the skin."

We cannot admit the assertion of Sallin: when an object of such great interest is discussing, all general propositions require, in order to be admitted, a multitude of facts, often difficult to collect, and which our author appears to be deficient in.

It is certain that there are many cases of poisoning by arsenious acid introduced into the stomach, in which the viscus and the intestines are perfectly sound. In the fact reported by M. Chaussier, it was not possible to discover the slightest appearance of erosion or inflammation in the alimentary tube. Etmuller speaks of a young girl poisoned by arsenic, in whom neither the stomach nor intestines presented any signs of inflammation, or gangrene; nevertheless, the arsenic was found in this viscus. M. Marc relates, that in a case of poisoning by the oxyde of arsenic (arsenious acid), far from finding the membranes of the stomach eroded, they were found thickened. Sallin himself says, "at the "opening of a man who died from poison, and in whose stomach "was discovered a drachm of arsenic in powder, nothing pre-"ternatural was found in the mouth or œsophagus."

It may however in general be said, that the mouth, œsophagus, stomach, and intestines, are inflamed; that the stomach and duodenum sometimes present gangrenous spots, sloughs, perforations of their coats; that the velvet lining of the stomach is as

it were destroyed, and reduced to a paste of a reddish brown colour; lastly, that all the other viscera are more or less inflamed.

I believe these remarks are sufficient to enable the physician to perceive, that the existence or non-existence of lesions in the dead body: the extent and the seat of these alterations are never sufficient to decide, whether poisoning has, or has not taken place; and that they can only serve at most, to corroborate the conclusions drawn from the chemical analysis of the materials.

M. Brodie has made a series of interesting observations on the lesions of the stomach, of several animals poisoned by the arsenious acid. We shall report them, as they appear to us to throw some light on the subject of which we are treating.

In many cases the inflammation of this viscus is extremely slight; in general, it begins to develope itself immediately after swallowing the poison; and it is so much the more intense, as death takes place later after the accident: it is less in granivorous, than in carnivorous animals: it never extends to the œsophagus or pharynx: its intensity and the rapidity with which it takes place, are much greater when the arsenious acid is applied to an ulcerated surface, than when it is introduced into the stomach. Messrs. Home and Hunter, had already made this remark. The inflamed parts are generally red throughout their whole extent; sometimes the redness is only observed in patches; the principal vessels of the stomach are distended with blood; but the inflammation is usually confined to the mucous membrane of this viscus. This membrane, of a vermillion red colour, softens into a kind of pulp, and separates with ease from the muscular coat, which preserves the character proper to its texture. Sometimes small portions of extravasated blood are observed on the surface of the mucous coat, or in the space between it and the muscular coat. Ulceration, or sloughing of the stomach and intestines, is never found when the animal dies in a short time; but if death is late in taking place, either of these terminations may happen. On this subject, the author observes, that anatomists are very often mistaken as to the true nature of sloughs. On opening the stomach of a dog, which had swallowed a strong dose of arse-

nious acid, he observed a dark spot about an inch in diameter, having all the appearance of a slough. However, a closer examination proved, that this spot was nothing more than a very thin coat of coagulated blood of a very dark colour, and strongly adhering to the mucous coat. The stomach of a man poisoned by arsenic, preserved in Hunter's museum, furnished M. Brodie a fresh proof in favour of his opinion ; in fact, this anatomical preparation, preserved on purpose to show a slough produced by this poison, presents simply a coat of coagulated blood, similar to that we have just described.

APPLICATION OF ALL THAT HAS BEEN SAID TO THE VARIOUS CASES OF POISONING BY ARSENIOUS ACID.

We ought to examine carefully the various proceedings, by the assistance of which, the person has to decide definitively, that poisoning by the arsenious acid has taken place. The impossibility of effecting the decomposition of this acid by any alimentary substances, whether vegetable or animal, at the ordinary temperature; the multiplicity of the means furnished by chemistry, to distinguish it from other substances ; lastly, the facility with which the metallic arsenic can be extracted ; are so many conditions which render the solution of this problem much more easy, than that of the poisons which we have hitherto considered. This will be put beyond a doubt by the details which we are now about to enter into.

FIRST CASE.

The Patient is living : the Remainder of the Poison can be procured.

An attentive examination of the symptoms of the patient, the recapitulation, and the chemical analysis of the poisonous substance, are sufficient to inform the medical investigator in this case, which is by no means difficult.

If the substance to be investigated is solid, and in the form of a powder, about half a grain of it may be dissolved in about half an

ounce of distilled water, the temperature of which should be raised to 80°. This solution, brought in contact with the sulphate of ammoniacal copper, or the syrup of violets, will produce a green colour. With the hydro-sulphureted water, and the red solution of mineral cameleon; yellow. In contact with the hydro-sulphurets, no effects whatever will be produced, unless a few drops of nitric acid be added; and then it will be of a golden yellow. The nitrate of silver will turn it white, and yellowish if there be a sufficient quantity. Another part of the powder should be mixed with its bulk of charcoal finely powdered, and potash of commerce (salt of tartar). The mixture being exposed for some minutes to the action of caloric in a glass tube, will furnish metallic arsenic extremely brilliant, adhering to the sides of the tube; diffusing vapours of a smell resembling garlick, if put upon the fire; and giving a green precipitate with the sulphate of ammoniacal copper. I have often discovered even the eighth of a grain of arsenious acid, by following this very simple process. These characters, which may be easily demonstrated upon a quantity of arsenious acid not exceeding a grain, are sufficient for the person officially employed, to pronounce decidedly on the nature of this body.

It may happen, that the quantity of metallic arsenic obtained, is so small, that it cannot be detached from the tube; it sometimes is no more than a very slight coat of a tarnished gray powder, which covers the sides of this instrument. In this case, having carefully collected all the fragments of glass coated with this dust; a part of them should be put into the sulphate of ammoniacal copper, the remainder should be placed on burning charcoal. The phenomena produced by the arsenious acid, will appear in the same manner as if the metallic arsenic was by itself. After making these experiments in order to obtain a greater degree of certainty, the solution of arsenious acid may be submitted to the action of a current of the galvanic fluid; the metallic arsenic will attach itself after a certain time to the negative wire, terminated by gold or copper. This characteristic may very well be dispensed with, by those who may not have a galvanic pile.

If the arsenious acid be in a lump, we should begin by ascertaining whether it possesses the physical properties assigned to it;

then it should be reduced to powder, to submit it to the experiments we have just pointed out.

Suppose a case in which this acid forms part of a plaster, or some other external application : after cutting, or dividing in any manner, this preparation, a part of it should be treated with six or seven times its weight of distilled water, boiling; the filtered solution should then be brought in contact with the tests we have just enumerated; and it may be decided, that it contains arsenious acid, if it acts with them in the manner we have stated ; and if metallic arsenic is obtained by calcining the other portion with an equal bulk of pounded charcoal and potash of commerce. The transformation of this plaster, or external application, into metallic arsenic, becomes especially, a test of the utmost necessity, where some of the other agents employed, may have furnished precipitates very feebly marked, or that have undergone some change in their colour ; a circumstance very likely to occur, when these preparations are composed of several substances, both mineral, vegetable, or even animal.

If after half an hour's boiling, the distilled water exhibits no trace of arsenious acid, all the solid pieces should be mixed with charcoal and potash, and calcined, in order to obtain metallic arsenic, which should be brilliant, and possessed of the properties of which we have several times spoken. The presence of the metal thus obtained, removes every doubt as to the nature of the poison.

SECOND CASE.

The Patient is living : the whole of the Poison has been swallowed : the Matter vomited may be submitted to Experiment.

1st. If the matter vomited be liquid, a portion of it should be filtered, and submitted to the tests pointed out; if these menstrua furnish the precipitates which are ordinarily given by the arsenious acid, the remaining portion should be evaporated to dryness, after having added about half an ounce of potash, and then mixed with charcoal, in order to be calcined in a glass tube, drawn to the lamp by its open extremity. If metallic arsenic be obtained, shining and adhering to the sides of the tube, it may be safely affirmed, that the

liquids vomited contained arsenious acid. If the tests employed should act differently to what they would do in a solution of arsenious acid, the matter should then be evaporated, in order to proceed to the reduction, as we have just now explained; for it is not until metallic arsenic cannot be procured, that we can pronounce decidedly, that these liquids do not contain arsenious acid.

2ndly. If the matter vomited be both liquid and solid, the liquid part should be submitted to the action of the tests above enumerated, and the solid portion should be examined, to see if it contain any white, hard particles, similar to the arsenious acid; in which case, they must be carefully separated and analysed. If, however, all attempts to find out the poison prove ineffectual, the solid portion must be divided into two parts: one of which should be treated with twelve or fifteen times its weight of boiling distilled water, and the other calcined with potash and charcoal. The nature of the solution obtained, when submitted to the tests pointed out, and the revivification of the metallic arsenic, will leave no doubt as to the presence of the arsenious acid. It may happen that the quantity of solid matter vomited, is so great as not to allow of the revival being effected in a small glass tube: in that case a retort of stone should be procured, coated with a lute of clay and sand. The mixture should then be introduced into a retort, with a balloon fitted to it, and heated to redness; the metallic arsenic will sublime into the neck of the retort.

3dly. If the matter vomited, which is liquid and very abundant, gives a yellow precipitate with the sulphureted hydrogen; it should be mixed with an excess of hydro-sulphuret of ammonia, and a little muriatic acid: by this means the whole of the arsenious acid will be decomposed, and transformed into a yellow sulphuret: it should then be filtered, and this sulphuret will remain on the filter. This must be dried and calcined with a little potash in a glass tube: it is clear that by the action of heat, the potash will lay hold of the sulphur, with which it is capable of forming a fixed body; whilst the metallic arsenic being volatile, will be set at liberty, and attach itself to the sides of the vessel. This method is preferable to that of evaporation, when a great quantity of fluid is to be acted upon.

THIRD CASE.

The Patient is living: the whole of the Poison has been swallowed: the Vomitings cannot be procured.

An attentive observation of the symptoms experienced by the patient; an examination of the multiplied causes which could give rise to them; the information furnished by the attendants, respecting the mode of life of the patient: such are the resources from which the physician must draw his conclusions in this case, at all times difficult, and which demands on the part of the practitioner, the most profound sagacity.

FOURTH CASE.

The Patient is dead.

Many learned men of Germany have laboured at the solution of the problem which is now before us: this subject has always appeared to them to deserve the greatest attention, as it ought to throw a light upon medical jurisprudence. Without detailing here the several processes of Hahnemann, of Rose, of Roloff, and of Fischer, we will simply present that which appears the most positive.

A Method for discovering the Arsenious Acid, after the Death of a Patient poisoned by this Substance.

After having detached the alimentary canal, the contents of the stomach, liquid or solid, should be collected. If any portions of arsenious acid are perceived in them, they should be separated and analysed by the methods shown before; if these materials, however, do not contain any, the liquid part should be strained through fine linen, and examined in the manner we have pointed out when speaking of the matter vomited. Lastly, if, after all attempts, the poison should not be discovered, the solid materials must be operated upon: but the lesions of the texture of the alimentary canal should be previously noticed, and the stomach detached, and cut into small pieces, which should be kept in alcohol, to preserve them from putrefaction.

The solid parts should then be made to boil in ten or twelve times their weight of distilled water, which should be renewed as fast as a portion of it flies off in vapour: this liquor should be cooled and decanted, in order to put a few drops of it into the solutions of the sulphate of ammoniacal copper, of lime-water, of the hydro-sulphuret of ammonia, of nitrate of silver, and of the mineral cameleon. If the precipitates furnished by these tests induce a belief that the solution contains arsenious acid, it should be mixed with potash, evaporated, and the product obtained calcined with charcoal, to extract from it the metallic arsenic. If, on the contrary, the fluid offers no indication of poison, the mass exhausted by water should be treated with potash and nitric acid, as recommended by Rose. When, by this means, a fluid has been obtained of a clear yellow colour, the excess of acid should be saturated with potash, and an arsenite of potash is thus formed, if there really exists any arsenious acid in the mass. This liquor should then be examined by the tests we have spoken of, which are capable of discovering the most minute atoms of the arsenious acid, or of the arsenite. If the precipitates they furnish be of a nature to induce a suspicion of the existence of this poison, it should be precipitated by the hydro-sulphuret of ammonia, and by a few drops of nitric acid: a yellow sulphuret of arsenic is by this means procured, from which the whole of the metal may be obtained, by drying it upon a filter, mixing it with an equal bulk of potash, and melting it in a small glass tube.

If, after having thus treated the solid matter, the arsenious acid should not be discovered, the same attempts should be made upon the stomach itself.

The plan we have just laid down differs from that of Rose, only by the employment of the hydro-sulphuret of ammonia, which precipitates the poison in the state of sulphuret of arsenic, whilst this philosopher transforms it into arsenite of lime: now, the sulphureted hydrogen is a test much more sensible, and deserves the preference.

The line of conduct we have just marked out, will require to be modified in such cases where the patient may have already

swallowed sulphurets or hydro-sulphurets for the purpose of decomposing the poison, or of preventing the developement of the symptoms which usually result from it. In fact, if the arsenious acid has been decomposed by these kinds of tests, it will have been transformed into a yellow sulphuret of arsenic, the properties of which differ from those of this acid. In that case it will be necessary to have recourse to the following method.

1st. If the stomach only contains alimentary matters in a liquid state, they must be collected and allowed to deposit all the yellow parts insoluble in water, which should be dried upon a filter, and a portion of them put upon burning charcoal; there will be instantly disengaged a smell mixed with the sulphurous acid (a smell of burning brimstone), and of the arsenious acid (a smell of garlic).

A part of this body, perfectly pulverized, should be washed with an equal bulk of potash of commerce dried, and the mixture should be heated in a glass tube with the mouth approached to the lamp; the metallic arsenic will speedily sublime, and sulphate of potash will be obtained at the bottom of the tube. These characters are sufficient to determine that the powder submitted to the analysis is sulphuret of arsenic. The writers on medical jurisprudence advise the digesting the sulphuret in muriatic acid, to which a little nitric acid is added; in this case a yellow powder is obtained, which is only sulphur and a solution of muriate of arsenic. The metallic arsenic in this case is oxydized by a part of the oxygen contained in the nitric acid, and converted into a muriate by its combination with the muriatic acid. This property appears to us a little complicated, and difficult to ascertain with certainty; for it sometimes happens that there is no residue, the whole of the sulphur being transformed into sulphuric acid, at the expense of a portion of the oxygen of the nitric acid: this phenomenon takes place when a little too much of this acid has been employed, and especially when it is very concentrated. Even when this yellow powder is obtained, it is necessary to analyze it, in order to discover if it is really formed by sulphur, or by a portion of the yellow sulphuret of arsenic not acted upon.

Lastly, that the operation may be complete, it is necessary that the metallic arsenic be separated, by mixing the solution of muriate of arsenic with alcohol, and bringing the mixture in contact with a plate of zinc.

2nd. If solid matter in the stomach be found mixed with some particles of yellow sulphuret of arsenic, two drachms of potash of commerce must be added, and it must be evaporated in a capsule of porcelain; the mass obtained must then be detached, pulverized, and calcined in a glass tube, as above directed, in order to obtain the metallic arsenic, which will be volatilized, and attach itself to the sides of the tube. If the whole quantity cannot be contained in the tube, the revivification may be effected in a retort of stone coated with a lute, to which a *bitubulated* recipient should be adapted, to the end that the gas proceeding from the decomposition of the animal matter, may escape by one of the tubes.

Before finishing our remarks on the chemical researches necessary to detect the presence of the arsenious acid, we ought to observe, that it may happen after the death of any person poisoned by this acid, that we cannot arrive at the demonstration of the existence of the poison, whatever care may be taken in the analysis of the matter contained in the stomach. M. M. Thomas, Jones, and Wikely report, in the London Medical Journal, that a young woman died after having swallowed a certain quantity of arsenious acid mixed with sand: the stomach contained about half a pint of fluid of a reddish brown colour; the mucous membrane of this viscus, inflamed and destroyed, was partly adhering to the other coats, and partly detached. The adhering portions were of an ash-colour, hard to the touch, as though they had been cauterized, and presented to the naked eye a white powder, which was nothing but sand. The œsophagus and the mucous lining of the intestines were inflamed, the rest of the viscera were in a sound state. Nevertheless, all the chemical attempts to demonstrate the existence of the poison were ineffectual. It is probable that the patient, to whom great quantities of warm water had been given, had thrown up the arsenious acid by vomiting. I have satisfied myself, that all the animals that had taken this

poison dissolved in water, and had abundant vomitings before death, do not exhibit the least trace of arsenic, when the contents of the stomach are submitted to chemical analysis. M. Brodie has observed the same fact. In cases like these, it becomes necessary to have recourse to the analysis of the matter vomited, and to proceed as has been said.

TREATMENT OF PERSONS POISONED BY THE ARSENIOUS ACID.

We shall observe the same method in the treatment of this kind of poisoning, as that we have adopted when speaking of the means for remedying the symptoms resulting from the use of corrosive sublimate.

Is there any antidote to the arsenious acid? M. Renault (in the work before quoted) has instituted a series of experiments to determine the value of several chemical tests; such as the alkaline, or ferruginous sulphurets, the acetic acid, and sulphureted hydrogen, which have been proposed as antidotes to this substance. The very interesting results obtained from these experiments are as follows.

1st. That the alkaline sulphurets, in cases of poisoning by the arsenious acid, are useless. In fact the animals subjected to the experiments, die in as short a time and even shorter when this pretended antidote, is administered than when they take the arsenious acid by itself.

2nd. That sulphureted hydrogen having also been the subject of investigation, has furnished results full as satisfactory as the sulphurets.

3d. That acetic acid is not capable of dissolving this acid at a low temperature, and that the salt resulting from its solution in boiling water (an acetate of arsenic) is as caustic as the arsenious acid.

We may conclude from these experiments, that the new body, formed by the sulphureted hydrogen and the arsenious acid, in a liquid state, may be taken with impunity in tolerably strong doses. But the hydrosulphureted water may be taken in a large dose, without inconvenience; it acts upon liquid arsenious acid at a

temperature below that of the human body ; and promptly, therefore, it is the antidote to the arsenious acid in a liquid state.

These experiments prove, that the agents hitherto recommended as antidotes to the arsenious acid, when employed, as it almost always happens, in a solid state, do not deserve that title ; they ought consequently to be rejected from practice in this kind of poisoning, in order to have recourse to other substances, whose operation is more certain and easy.

The first care of a physician called to the assistance of a patient poisoned by arsenic, is to favour the expulsion of the poison by vomiting. The means to be made use of, are nearly the same as those we have laid down whilst speaking of the article of corrosive sublimate ; and which consist in administering great quantities of warm water, milk, water sweetened with sugar or honey, decoctions of linseed, marsh-mallows, mallows, &c. &c. The tickling the throat with a feather, or with the finger, ought not to be neglected ; it often enough happens that this treatment alone is sufficient to calm the symptoms.

M. Marcelin Duval reports, that having been called to a man who had taken some arsenical powder, he found him in a violent state of agitation, complaining of tearing pains of the stomach, a burning thirst, and constriction of the throat. He caused him to drink, at different times, two pints of sugared water. Frequent vomitings came on, and all the symptoms became calm. The same kind of drink was continued during the night, and two glysters of the same nature were prescribed for him : the next day he was in a state to go about his ordinary employment. In another instance, M. Duval introduced into the stomach of a dog, twenty-four grains of arsenious acid dissolved in six ounces of water : half an hour after the animal was tormented by a vomiting of a frothy matter, and excessive agitation. Water sweetened with honey was injected from one quarter of an hour to another, until all the symptoms disappeared, which happened immediately after the eighth and last injection. On the third day he was perfectly well.

I have often repeated this experiment, substituting warm water for the water sweetened with honey, or sometimes broth, or some

mucilaginous decoction; and I have always obtained the same results.

The celebrated author of the *Nosographie Philosophique*, reports the case of a woman who had taken arsenic with the intent of killing herself.

" Having been relieved in time, by the copious use of milk, mu-
" cilaginous drinks, veal broth, chicken broth, and fomentations,
" she escaped death; but her existence is still the most distressing
" and the most painful. The symptoms she experiences are anxie-
" ties, an irregular febrile state, dryness of the skin, an avidity of
" the tongue and throat, a very ardent thirst, painful respiration,
" deep-seated pain in the region of the stomach, tension of the ab-
" domen, obstinate constipation, spasmodic constriction of the ex-
" tremities, wandering pains in the pudenda. I have insisted
" much on the use of drinks sweetened with sugar or honey or
" even sugar in substance, and this treatment has been followed
" with very evident relief; but is it in the power of medicine
" to repair the disorders produced in the texture and structure of
" any of the viscera by a poisonous substance?"

We would quote, in support of the treatment we have just described, a fact generally known, and which is, that the symptoms arising from the use of arsenious acid, and, in general, from all the corrosives, are so much the less severe, as the stomach happens to be filled with a greater quantity of solid or liquid matter; the poison, in that case, being disseminated over a greater extent of surface, and especially the vomitings being more easy. The following facts will put this truth beyond all doubt.

A number of persons being at a feast, there was served up at the desert, a dish, into which arsenic had been put instead of flour. Such of the guests as had, till then, eaten but little, died of it instantly; while those, on the contrary, who had the stomach full, were saved by vomiting.

Three children, one of which was a male of two years of age, and two adult girls, ate of a pottage in which there was arsenic. The boy, who took only two spoonfuls, had no vomiting, and died; the girls, who ate all the rest, vomited, and were saved.

Mauritius Hoffman speaks of a quack, on whom twelve grains of arsenious acid produced little or no inconvenience, because he drank before it a great quantity of milk, which was quickly vomited, together with the poison.

In case the patient can no longer vomit, it will be necessary to have recourse to the elastic gum catheter, or tube, which we have described. These means ought always to be preferred to the use of violent emetics, such as tartarized antimony and the sulphate of zinc, which never fail to increase the irritation produced by the poison.

Fat substances, such as oils, butter, cream, grease, &c. are of no kind of use; they are even dangerous. This fact was first announced by Fourcroy, and Renault verified the correctness of it by direct experiments. All the animals to whom he gave the arsenious acid in butter or grease, have died sooner than if they had swallowed the poison alone, or mixed with any other substance.

Lime-water with milk, recommended by Navier, offers no particular advantage in cases of poisoning by the arsenious acid taken in a solid form. All the animals to which I gave it, died in the course of a few hours. The same thing, however, does not happen, if the arsenious acid was in a liquid state; in this case there is formed an insoluble arsenite of lime, which acts very feebly. I have given to small dogs, as much as four grains of this poison in a liquid state, and have made them swallow lime-water: they were not incommoded by it. The difference evidently depends on the fact, that in the first case, the lime unites difficultly with the arsenious acid in a solid form; whilst, in the second case, these two substances, meeting in a state of fluidity, combine easily, and form an insoluble body, which does not appear to act as a poison. But, as it is generally in a solid form that the arsenious acid is swallowed, the utility of the lime-water becomes null.

The theriaca, boasted of formerly as an excellent remedy in this kind of poisoning, ought to be rejected as uselsss and dangerous. Navier reports a case of six persons poisoned by eating broth in which was arsenious acid; a great quantity of theriaca was administered as their first remedy: they all died in eight days time, except one, who did not die till two months after, because she had

eaten very little of the poisoned broth. On opening their bodies, the coats of the stomach and intestines were found to be destroyed, by the falling of the sloughs which the poison had produced.

The infusion of the cinchona *calissaya*, of nutgalls, of fir barks, of the Pomegranate, of the *myrobolan (Indian nut)*, &c. &c. recommended by M. Chausarel, are only useful in consequence of the vehicle which forms a part of them; they do not exert sufficient energy upon the arsenious acid, to be considered as antidotes; and it is consequently preferable to have recourse to warm water, which has the advantage of being administered instantly, and in great quantity.

Leeches, bleedings, baths, tepid demi-baths, fomentations, emollient glysters, antispasmodics, and narcotics, are all so many means which ought to be had recourse to, in cases where inflammation of the abdomen has taken place, and where the patient is a prey to alarming nervous symptoms.

It must never be forgotten, that the success of the treatment, depends in a great measure on the sort of regimen the patient observes during his convalescence, which is commonly long and painful. He ought to be principally nourished with milk, gruel, and rice-creams, and he should be made to take nourishing broths.

OF THE ARSENITES.

The arsenites are combinations of the arsenious acid with salifiable bases: those of potash, soda, and ammonia, are soluble in water, and act as violent poisons: that formed of potash merits our particular attention, because it forms part of the solution of Fowler, employed in certain cases of intermittent fever.

The arsenite of potash is generally met with in a fluid state; when dried and put on burning coals, it becomes decomposed, diffuses a smoke, and a smell of garlic, and leaves for a residue, potash more or less carbonated.

OF THE ARSENIC ACID.

The arsenic acid in a solid state is white, not crystallizable; of a sharp, metallic, and caustic taste: its specific gravity is 3.391.

Exposed to the action of heat in a closed vessel, it does not become volatile, but melts and vitrifies.

Thrown on burning charcoal, it swells out, loses all its moisture, and becomes opaque; if in this state the heat is continued, it gives out white vapours, which exhale a smell of garlic. These phenomena are the consequence of its decomposition by the charcoal, and its transformation into arsenious acid; for which reason it disappears altogether. A plate of copper held over these vapours becomes white, precisely in the same manner as with the arsenious acid.

The arsenic acid dissolves exceedingly well in water; it is even deliquescent: therefore, in solution it strongly reddens the tincture of tournesol, and the syrup of violets; it is colourless and sapid.

The arsenic acid ought to be considered as a poison, still more violent than the arsenious acid. According to M. Brodie, it is absorbed, and occasions death by acting upon the brain and the heart.

OF THE ARSENIATES.

The arseniates of potash, soda, and ammonia, are poisonous: they may be easily known: 1st. by the decomposition which burning charcoal effects upon them, and by the smell of garlic which accompanies this decomposition; 2nd. by the rose-coloured precipitate which they furnish with the muriate of cobalt: this precipitate, which is formed by virtue of a double decomposition, dissolving easily in an excess of acid, would not take place in a very acid solution of the muriate of cobalt; 3rd, because they are not disturbed by the addition of muriatic acid, whilst the arsenites are precipitated; 4th. by the nitrate of silver, which will throw down a brick-coloured precipitate, consisting of the arseniate of silver; 5th. by the bluish white precipitates, formed by the salts of copper; 6th. lastly, by the facility with which the metallic arsenic is separated from them, when calcined with charcoal.

OF THE YELLOW AND RED SULPHURETS OF ARSENIC.

The yellow artificial sulphuret of arsenic, ought to be considered as a poison, according to the experiments of M. Renault.

The native orpiment (yellow sulphuret of arsenic) presents phenomena different from those we have been speaking of; it may be taken in a large dose, without occasioning the slightest derangement. M. Renault gave as much as two drachms of this substance, to dogs of different sizes, that felt no inconvenience from them. Hoffman had already proved by experience the innocence of this substance.

The native red sulphuret of arsenic, can also be internally administered without any inconvenience resulting from it. M. Renault has given as much as two drachms to dogs, who did not appear to experience any uneasiness from it: it is by no means the same with that produced by art. All the animals to which it has been given, even in doses of a few grains, have died within different spaces of time. A woman died in the course of a few hours, after having experienced violent gripings in consequence of eating cabbages, with which a certain quantity of this substance had been mixed.

My friend and pupil, Dr. Smith, has made experiments whence it results; that when applied to wounds, the native sulphurets produce death. One or two drachms of the native yellow sulphuret applied to the cellular substance, of the internal part of the thigh of a dog, occasioned death in the course of two days. The stomach was evidently inflamed, and the small intestines contained red wrinkles.

The native yellow sulphuret, has also occasioned death in the course of a few days.

OF THE BLACK OXYDE OF ARSENIC.

This oxyde is very easily known; keeping in mind all we have said respecting metallic arsenic. In fact, these two bodies possess nearly the same properties; their external appearance alone differs. The colour of this oxyde is a blackish gray, sometimes

black; it is dull, without any brightness, not very hard, but extremely friable. Its poisonous action is put beyond all doubt, by Mr. Renault's experiments.

OF CHARCOAL, CONSIDERED AS AN ANTIDOTE OF ARSENIC AND CORROSIVE SUBLIMATE.

Some experiments have very lately been published, by Dr. Bertrand, a graduate of the Faculty of Paris, residing at Pont du Chateau; from which he is induced to believe, that the charcoal of wood, is capable of preventing the deleterious action of corrosive sublimate and arsenious acid.

In the month of February, 1811, Dr. B. gave to a dog six months old, six grains of corrosive sublimate combined with eight of powdered charcoal of wood. The whole was contained in a portion of the intestine of a fowl, tied at both extremities. It produced no effect whatever.

About twenty days after, the same dog having swallowed six grains of superoxygenated muriate of mercury; was seized with vomitings which soon brought up blood. The agitation became very great, and was accompanied with symptoms of tetanus. At this time, charcoal water sweetened with honey was poured down his throat, and the efforts to vomit, were evidently influenced by it; in the course of a short time a second dose, was administered, and the next day the animal was restored to health.

Dr. B. repeated the experiment, upon himself, by taking four grains of corrosive sublimate, in a cup of a strong decoction of charcoal. Its effects were very slight, only occasioning a little pain, and some oppression: two hours after, he breakfasted with much appetite.

Similar experiments having been performed with arsenious acid, and with similar results, Dr. B. has supposed that charcoal might be considered as an antidote, both to corrosive sublimate and arsenious acid. But having hastened to repeat the same experiments, having previously tried the œsophagus of the dogs, we have obtained results, which warrant us in affirming, *that neither charcoal nor the water of charcoal, are antidotes to corrosive sublimate, or arsenious acid.*

We wish to recal to mind that we have established as an axiom, from a multitude of experiments of our own; that any results respecting antidotes can be of no avail, unless the œsophagus of the animal that is the subject of the experiment, be tied.

Our experiments are so far from establishing the fact, that charcoal is an antidote, that if this was the case we should have to admit, that clay, sand, and many other substances, which are powdered and insoluble, are likewise antidotes; moreover is it evident that the effects produced by either one or the other of these substances cannot take place, unless when they are administered with the poison, which they cover and divide. It will be useless to attempt to diminish, or arrest the action of these poisons by administering, after they have been swallowed, either charcoal or any other powdered substance.

OF HYDROGENATED SULPHURET OF POTASH.

(*Liver of Sulphur dissolved in Water*).

Navier and several other respectable physicians have greatly extolled the solution of liver of sulphur, as an antidote in cases of poisoning by corrosive sublimate, arsenious acid, salts of copper, and the preparations of lead. We have demonstrated in the course of this work, that this substance does not prevent the effects of these poisons; and experiments that we have performed with the utmost care lead us to affirm, that so far from considering it as an antidote, it must be classed among the most energetic corrosive poisons.

We are therefore authorised to conclude, 1st. that the hydrogenated sulphuret of potash introduced into the stomach occasions death by acting upon the nervous system, and by strongly corroding the membranes of the stomach; 2nd. that the corrosion is more light in proportion, as the dose of the sulphuret administered is larger, the nervous phenomena being in this case much more severe; and 3d. that the hydrogenated sulphuret of potash, introduced into the stream of circulation, produces death by its particular action upon the nervous system.

OF FLY POWDER.

Fly powder differs very little from the black oxyde of arsenic; it is nothing else than metallic arsenic a little oxydated, and is seen in the form of cakes, composed of layers irregularly arranged; from which it follows that, in order to recognise it, the same means must be employed which we have just now recommended for the black oxyde.

Facts prove that this powder acts as a violent poison.

OF ARSENICAL VAPOURS.

The arsenious acid reduced to the state of vapour, and inspired into the lungs, produces serious accidents, sometimes followed by death. Tachenius reports, that Hippocrates was attacked by a considerable cough, a great difficulty of breathing, severe colics, bloody urine, convulsions, &c. from having been for some time exposed to the vapours arising from an apparatus in which arsenic was subliming. The use of milk, and of oily substances, dispersed these symptoms; but there remained, for a long time after, a dry cough, and a kind of hectic fever. The use of cooling drinks, and cabbages for diet, put an end to these symptoms.

"The arsenical vapours," says Mahon in his *Médecine Légale*, "when drawn into the lungs in great quantity, render the mouth "and throat dry, parched, and inflamed: they first produce "sneezing, then suffocation, asthma, dry cough, anxiety, vomit- "ing, vertigo, pains of the head and limbs, tremblings: and when "they do not produce death, they lead to *pthisis pulmonalis*."

ARTICLE THE THIRD.

SPECIES III.—ANTIMONIAL POISONS.

Var. 1st. Tartar emetic, or antimoniated tartrate of potash.

—— 2nd. The oxyde of antimony, either by calcination, or by decomposition by the nitric acid, or the nitrates.

—— 3d. Kermes mineral, *golden sulphur of antimony*, beyond the medical doses.

—— 4th. The muriate and submuriate of antimony.

—— 5th. Antimoniated wine.

—— 6th. Other antimonial preparations.

—— 7th. Antimonial vapours.

The preparations of antimony, banished formerly from the materia medica by all such as formed exaggerated ideas of their hurtful qualities, were in the end sought after, and submitted to a rigorous examination by more enlightened practitioners. At this day, when their virtues are substantiated by the most severe observation, and by the experience of several ages, we see some of these preparations occupying the first rank among the noblest medicines, and the most employed on account of their utility and their constant manner of acting. Their administration, nevertheless, requires, on the part of the practitioner, a great degree of circumspection; like all substances endued with energetic properties, they are capable of becoming fatal if inconsiderately employed. The most useful among them, the tartar emetic, too often, in the hands of empirics, may, under certain circumstances, produce the most unfortunate accidents, which may be followed with death. The case is the same with regard to the kermes, the golden sulphur, the glass of antimony, &c. as we shall show in the sequel. These general considerations are sufficient to impress the importance of the study of this species of poisons.

OF ANTIMONY.

Antimony is a solid metal, of a bluish white colour, brilliant, resembling silver or tin, and tarnishes very little in the air: its texture is lamellated, its hardness middling, nearly like that of tin. It is extremely fragile, and easy to powder. Rubbed between the fingers, it imparts to them a sensible smell. Its specific gravity is 6.7021.

Exposed to the action of caloric, it enters into fusion at a little below a red heat; and if left to cool slowly, it forms a cake at the bottom of the vessel, the surface of which presents a crystallization, which has been compared to the leaves of the fern: it is not volatile, at least in any sensible manner.

Amongst the combinations which this metal is capable of form-

ing with oxygen, there are two, the knowledge of which is useful to medical jurisprudence. One of these contains 20 parts of oxygen in 100, the other contains 30; both are of a white colour. Being heated with charcoal in an earthen crucible, they are decomposed; the metal is revived, and carbonic acid gas is liberated.

Antimony, proscribed by the present practice, is regarded by authors as a violent poison. Plenck asserts, that when it is inconsiderately taken, it produces vomiting, copious stools, intolerable gripes, anxiety, agitation, hæmorrhage, convulsions, inflammation of the stomach and intestines, erosion, gangrene, and death.

It is probable that all these effects depend upon a small quantity of oxygen with which the metal combines when in the stomach.

OF TARTAR EMETIC.

The emetic tartar, known under the names of *antimoniated tartrate of potash*, of *stibiated tartar*, &c. is composed of tartaric acid, of oxyde of antimony at 20, p. 100, of oxygen, and of potash. According to the analysis made by M. Thenard, 100 parts consist of,

Tartrate of potash	34
Tartrate of antimony	54
Water	8
Lost	4
	100

The tartar emetic crystallizes in regular tetraedrals, or in triangular pyramids, or elongated octaedrals. It is of a white colour; its taste is slightly metallic, and tart.

ACTION OF THE ANTIMONIATED TARTRATE OF POTASH UPON THE ANIMAL ECONOMY.

Ought this salt to be considered as a poison, capable of producing death?

Such is the question which we are about to examine, before seeking to determine what are the organs upon which it principally exerts its action. M. Magendie, in his excellent memoir on tartar emetic, after having collected a number of interesting facts, concludes " that this salt, given in a large dose, can produce " very serious symptoms, and even death ; that if, in cases which " frequently occur, men and animals swallow, without inconve- " nience, very strong doses of tartar emetic, that happens because " the salt is rejected wholly in the first efforts of vomiting."

We read in Morgagni, and in the transactions of the *Curiosi Naturæ*, many cases in support of the innocence of tartar emetic under certain circumstances. M. Lebreton, one of the most distinguished accoucheurs in this capital, reports a case of this nature, perhaps the most extraordinary. Being called to attend the daughter of a grocer, who had just swallowed six drachms of tartar emetic, he caused her to drink a large glass of oil : she vomited immediately after, and most probably threw up the whole of the salt she had swallowed. The vomitings a short time after ceased, and this girl was completely cured.

If the tartar emetic does act as a poison, in what matter does death happen, and what are the organs effected ? M. Magendie has made it appear, that the deleterious action of tartar emetic, shews itself principally upon the pulmonary texture, and the mucous membrane which lines the intestinal canal, from the cardia, to the inferior extremity of the rectum.

M. Magendie wished to know, what was the influence exercised by the nerves of the eighth pair, on the inflammation which takes place in the lungs, subsequent to the injection of a certain quantity of tartar emetic into the veins ?

Experiment. 1st. Twelve grains of tartar emetic injected into the jugular veins of several dogs, in which the nerves of the eighth pair were cut, did not produce death till after two hours ; whereas the animals in which this section has not been made, die in half an hour after the injection.

Experiment 2nd. The same dose injected into the jugular vein of several dogs in which the two *pneumo-gastric* nerves have been cut, does not produce death till after four hours.

Experiment 3rd. If three dogs about the same weight and age are taken, and twelve grains of tartar emetic injected into their veins, it will be observed that the first who dies, will be the one in which the section of the eighth pair of nerves has not been made; the second will be that in which one of the *pneumo gastric* nerves has been divided; and that in which both have been separated, will die the last. So that the life of an animal poisoned by a very strong dose of emetic tartar may be prolonged, by dividing the nerves of the eighth pair.

SYMPTOMS OF POISONING BY THE ANTIMONIATED TARTRATE OF POTASH.

Before describing the general symptoms of this species of poisoning, we shall relate some cases on certain individuals, in whom the tartar emetic has produced alarming symptoms, followed sometimes by death.

CASE.

A man of about fifty years of age, of a strong constitution, had suffered domestic troubles, and conceived the idea of poisoning himself: he procured forty grains of tartar emetic, and took them one Saturday morning in a small quantity of some vehicle: it was not long before he began to have vomitings, frequent stools *(super-purgation)*, and convulsions. He was received into the Hotel Dieu on Sunday evening.

On Monday morning he complained of violent pains in the epigastrium, which was distended; he could with difficulty move his tongue; he was, in fact, in such a state, that he might be taken for a drunken man; he just spoke; his pulse was imperceptible. During the day, his belly became inflated, the epigastrium was considerably tumefied, and became more painful: in the afternoon delirium came on. On Thursday all the symptoms increased; in the evening furious delirium; convulsions supervened, and he died in the night.

Appearances on Dissection.

The limbs extremely stiff, and half bent; a viscous and white liquor flowing from the mouth; when the body is moved, the head inclines to the left side.

Towards the anterior part of the hemisphere of the brain, on the same side, ossification of the *Dura Mater* in a circular form, of about an inch and a half in diameter; increased thickness of the arachnoid membrane; a uniform redness; recent inflammation of the portion of that membrane which covers the anterior lobes of the brain, more apparent on the right side. Anfractuosities filled with a serous liquor tinged red, and collected in still greater quantity in the basis of the cranium; cerebral substance softer than usual; the left ventrical contained four or five spoonsful of a serous fluid, transparent and colourless; the right contained less of the same liquid.

Thorax sound.

The peritoneum presented generally a brick coloured appearance: the stomach and intestines distended by gas.

The mucous membrane of the stomach sound in its great curvature; but red, tumefied, and covered with a viscous coat, easy to remove, throughout the most part of it: that of the duodenum was in the same state; the other intestines did not present any alteration, they did not contain the smallest quantity of excrementitious matter.

The general symptoms of poisoning by tartar emetic, may be reduced to the following: rough metallic taste, nausea, copious vomitings, frequent hiccup, cardialgia, burning heat in the epigastric region, pains of the stomach, abdominal colics, inflation, copious stools, syncopes, small concentrated and accelerated pulse, skin cold, sometimes intense heat, breathing difficult, vertigoes, loss of sense, convulsive movements, very painful cramps in the legs, prostration of strength, death.

Sometimes to these symptoms, is joined a great difficulty of swallowing; deglutition may be suspended for some time: the vomitings and alvine excretions do not always take place, which circumstance generally increases the violence of the other symptoms.

LESIONS OF TEXTURE PRODUCED BY THE TARTAR EMETIC.

The conclusions suggested by the experiments of M. Magendie on living animals, ought already to induce the presumption, that the lesions produced by the antimoniated tartrate of potash consist principally in alterations of the lungs and stomach.

The dogs which died from the action of the tartar emetic injected into the veins, or introduced into the stomach, exhibited after death an inflammation more or less extensive of the lungs, and mucous membrane of the digestive canal.

Hoffman relates, that a woman experienced the most grievous symptoms a short time after having taken the tartar emetic, and that she died. On opening the body, a part of the stomach was found sphacelated: the spleen, the diaphragm, the lungs, and parts adjacent to the affected portion of the stomach were gangrenous.

M. J. Cloquet has communicated to me the following case.

Ponseron, aged fifty years, on the 24th of February, 1813, had an attack of apoplexy, of which he died on the first of March. During the five days of his illness, about forty grains of tartar emetic were administered to him, without exciting either nausea or vomiting: he had only a few stools. On opening the body, they found the brain injected, and containing a great quantity of serous fluid. The *thalamus nervorum opticorum* on the right side, exhibited on its inferior part, an oblong body, the size of an olive, consisting of a clear greenish pulp, and appearing to be in a state of suppuration on its surface. The whole of this body was easily detached from the cerebral substance. It is evident that these lesions were the cause of death; but the alimentary canal presented likewise alterations which manifestly depended upon the action excited by the tartar emetic. The stomach was extremely red, inflamed, and filled with mucosities and bile. The inflammation appeared to be confined to the mucous membrane of this viscus, on which irregular spots were perceived of a cherry red colour, on a ground of reddish violet: it shewed no signs of ulceration. There were likewise a few of these spots at the end of the second and third curvatures of the duodenum. The small intestines, which were of a rose colour, did not appear very much

inflamed ; they contained some mucosities and bile. Towards the end of the jejunum a small white tubercle was observed, the size of a pea, filled with a whitish pus, situated between the serous and muscular membranes of that intestine. The cœcum exhibited three spots of a deep red colour; there were likewise several such in the colon, but they were of a less lively red ; the rectum was sound. In the lungs were observed blackish spots, very irregular, which extended more or less deep into the parenchyma of the lungs.

APPLICATION OF ALL THAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISONING BY THE TARTAR EMETIC.

If it be recollected, that in general the antimoniated tartrate of potash does not produce any grievous symptoms, except when it is not expelled by vomiting, it will be readily conceived why this salt is so seldom the object of investigation in medical jurisprudence. In fact, being endued with a high degree of emetic virtue, it is for the most part thrown up before it has been absorbed in sufficient quantity to exert its deleterious action on the pulmonary organs and the stomach. Nevertheless, since death may be occasioned by its use, we think it necessary to point out in detail, the steps which the person called on to decide, ought to follow in this species of poisoning.

FIRST CASE.

The Patient is living : the rest of the Poison can be procured.

If the poison be in a solid state, and in powder, a little of it should be heated in an earthen crucible, and if the powder is observed to exhale the odour of burnt vegetable substances ; if it grows black, and afterwards resumes afresh its white colour ; lastly, if it leaves in the crucible, metallic antimony, it may be presumed that it is tartar emetic ; and, in order to be certain of it, a portion of it should be dissolved in fifteen times its weight of boiling distilled water ; the solution ought to redden the tincture of tournesol, and afford a reddish yellow precipitate with the hydrosulphurets, a dirty white, with the tincture of nutgalls, and a white with sulphuric and nitric acids, and with lime-water. The cal-

cination would be sufficient to decide, if we could be assured that the poison was without mixture. In fact, of all the powders furnished by the preparations of antimony, there is only the tartar emetic which contains any vegetable substance, and consequently which presents, during its decomposition by heat, the phenomena which we have just described.

If the suspected substance be in a fluid state, a drop of it should be let fall into each of the tests enumerated, and if the precipitates obtained, be of such a nature as to cause a suspicion of the presence of tartar emetic, the rest should be evaporated to dryness, in a capsule of porcelain: the product should then be detached, and calcined, in a crucible, in order to obtain the metallic antimony. This revival will be effected in twelve or fifteen minutes, provided the sides of the crucible are thin, and the heat sufficiently strong to raise the whole to redness.

SECOND CASE.

The Patient is living: the whole of the Poison has been swallowed: the Matter vomited can be procured.

This case, much more common than the preceding, and in appearance very complicated, presents but little difficulty. In fact, without producing any sensible action on most alimentary substances, tartar emetic undergoes scarcely any decomposition, and, being expelled quickly by the efforts of vomiting, it is most frequently found unaltered in the fluids vomited; so that it is sufficient to pass them through a piece of fine linen, and submit them to the trials we have just described. If from the mixture of this salt with bile, wine, &c. some of the precipitates pointed out should appear under a colour little favourable to its discovery, we ought then to depend upon the test of calcination, and we may decide that poisoning has taken place from some antimonial preparation, if the metallic antimony be obtained. It is clear, that in this case we cannot decide that this preparation is the tartar emetic, for all other poisons of this species, mixed with animal fluids, and decomposed by heat, furnish the same products. We might, on a rigorous analysis, extract the tartaric acid; but it is useless

to have recourse to an operation attended with great difficulties, where there is but a small quantity to act upon.

It may however happen, that all these attempts are fruitless. Some vegetable infusions or decoctions, administered before or after the ingestion of the tartar emetic, may have decomposed it, and converted it into an insoluble body, which would be sought for in vain, except amongst the solid contents of the stomach. The decoction of bark, recommended as an antidote to this salt, ought necessarily to produce this effect. In this case the solid materials must be taken, dried in a capsule of porcelain, and calcined in a crucible, with an equal weight of black flux (a mixture of charcoal and sub-carbonate of potash :) a few minutes of a red heat are sufficient to furnish the metallic antimony. It may be conceived, that by the means of potash and charcoal, the reduction ought to take place, in whatever state the antimony may chance to be.

THIRD CASE.

The Patient is living : the whole of the Poison has been swallowed : the Matter vomited cannot be produced.

This case, the prognosis of which is in general unfavourable, can only be elucidated by a retrospective view of the past symptoms, and an examination into those still existing. Chemistry is here of no avail.

FOURTH CASE.

The Patient is dead.

The nature of the symptoms experienced by the patient, the chemical analysis of the substances contained in the alimentary canal, and lastly, the lesions of texture of the different parts ; such are the numerous means of which the practitioner may avail himself under these circumstances.

After having detached the digestive canal, the contents of the stomach, both liquid and solid, should be collected, and their analysis undertaken in the manner we have indicated, when explain-

ing the second case. The presence of the metallic antimony will suffice to determine that poisoning has taken place, whatever may be the state of the mucous lining of the intestinal canal.

If, in spite of all the essays we have indicated, the poisonous substance be not discovered, before deciding that no poisoning has taken place, all the circumstances proper to throw a light upon the case ought to be examined and compared. It may indeed be conceived, that the tartar emetic, not producing death until after it has been absorbed, it is possible that the patient may have died after a small dose, and there is no more of it remaining in the digestive canal.

TREATMENT OF POISONING BY THE ANTIMONIATED TARTRATE OF POTASH.

In this species of poisoning, the practitioner ought to pay a particular attention to the action exerted by the tartar emetic upon the person who has swallowed it. If this salt has produced copious vomitings, a short time after being taken, if the patient does not complain of sharp pains, if he has no convulsive movements, warm water, taken in great quantity, will be sufficient to restore health. In fact, this fluid will induce vomiting, after having dissolved a portion of the emetic tartar contained in the stomach. This method is to be preferred to that, in which neutralizing substances are employed, such as infusions of cinchona, nut-galls, &c. Whatever may be the energy with which these vegetable drinks decompose the tartar emetic in the stomach, the advantages procured by them cannot equal that of expelling at once from the stomach the deleterious substance.

If the person poisoned has had no vomitings, even after having swallowed thirty or forty grains of this salt, in this case recourse should be had immediately to titillation of the uvula, or of the throat, and lastly, warm water should be given in great quantities: oil, copiously administered, sometimes favours vomiting, and may consequently be useful. If, notwithstanding the employment of these means, vomiting cannot be brought about within a very short space of time, the decoction of bark at the temperature of from 30 to 40° should be administered in great quantity without

delay. This medicine, proposed by Berthollet, has often been attended with advantage. Luchtmans has succeeded in causing tartar emetic to be taken in very strong doses without the least inconvenience, when he combined it with a sufficient quantity of decoction of bark, to decompose it entirely. He has observed, that this decomposition is more complete when the yellow bark is employed in place of the red, the precipitate obtained with this species of cinchona containing much less antimony than that formed by the yellow bark.

The decoction of tea, of nutgalls, with the addition of a little milk, that of the woods, of astringent roots and barks, may be employed in case of a deficiency of cinchona.

The earths, the alkalies, the alkaline sulphurets, and sulphureted hydrogen, ought to be rejected, being medicines, which, in this case, are without efficacy, and increase the irritation produced by the poison.

Opium ought to be employed in excessive vomitings, especially in persons of a nervous temperament.

Leeches, and even general blood-letting, are of great service, where a constriction of the pharynx, or when any inflammation of the œsophagus, lungs, or stomach, has come on. These cases, generally serious, require the treatment of the *mucous* or *parenchymatous Phlegmasiæ*.

OF THE OXYDE OF ANTIMONY AND THE GLASS OF ANTIMONY.

The oxyde of antimony obtained by calcining the metallic antimony; or by heating this metal with the nitric acid, is of a white colour, and easily revives, when heated with charcoal in an earthen crucible; it is insoluble in nitric acid; when brought in contact with the muriatic acid, it dissolves and furnishes a muriate which gives a white precipitate to water, and a red one more or less deep to the hydro-sulphurets. These marks, which we have more fully detailed when speaking of metallic antimony, are sufficient to distinguish this oxyde from all the bodies with which it appears to be confounded. Its poisonous properties are extremely powerful, since two or three grains are sufficient to produce death.

The glass of antimony is formed of antimony, oxygen, sulphur, and silex. It is likewise known by the name of vitreous sulphureted oxyde of antimony. It is transparent, and of the colour of the hyacinth. When heated in a crucible, with its bulk of charcoal, it is de-oxydated, and furnishes metallic antimony.

The glass of antimony, in the dose of seven or eight grains, acts as a violent poison.

OF THE KERMES MINERAL, AND THE GOLDEN SULPHUR OF ANTIMONY.

The kermes, known also under the name of the brown hydro-sulphureted oxyde of antimony, is a compound of antimony, oxygen, hydrogen, and sulphur, in which the oxyde of antimony predominates. Its brown red colour is so much the deeper, *cæteris paribus*, as it is better preserved from the contact of light.

When mixed with an equal bulk of charcoal, and heated to redness in a crucible, it decomposes, and gives out metallic antimony, water, carbonic acid gas, and sulphureous acid gas.

The golden sulphur of antimony, composed of oxygen, antimony, hydrogen, and sulphur, contains less of the oxyde of antimony, and more of the sulphur, than the kermes: its colour is not so deep, and, on being heated with charcoal, it gives out metallic antimony. We will not dwell any longer on the properties of this body, since it is very little employed in medicine.

These two preparations, especially the latter, are hurtful, when incautiously administered. The golden sulphur of antimony has been known to produce copious vomitings, abundant stools, and inflammation of a portion of the digestive canal.

OF MURIATE AND SUB-MURIATE OF ANTIMONY.

The muriate of antimony, may either be liquid, solid, or of the consistence of a thick oil; in this last case, it bears the name of *butter of antimony*.

When it is mixed with potash, and the mixture calcined with

charcoal, there is obtained, muriate of potash, fixed metallic antimony, and carbonic acid gas.

The sub-muriate of antimony is composed of oxyde of antimony and a little muriatic acid. It is known under the names of *powder of algaroth*, and *mercury of life;* its colour is white, slightly inclining to yellow.

Of all the antimonial preparations, there is none that possesses at the same time an emetic and drastic property to so high a degree as the salt we have just been tracing the characters of.

OF ANTIMONIATED WINE.

The antimoniated wine bears also the name of *emetic wine*. Its composition varies according to the mode of preparing it: it is commonly obtained by digesting, during ten or twelve days, four ounces of sulphureted semi-vitreous oxyde of antimony (glass of antimony) in two pints of Malaga wine, or any other white wine. The tartaric, malic, and acetic acids contained in the wine, dissolve a certain portion of the oxyde of antimony, to which this medicine owes its principal virtue.

The antimoniated wine possesses the most energetic deleterious properties: for which reason it is only employed in medicine in the form of glysters, in doses from two drachms to four ounces. We shall report a case of poisoning by this fluid, mixed with a certain quantity of glass of antimony.

Case.

Mangent relates, that a woman digested a few grains of glass of antimony in some white wine, for about an hour; and the next morning she swallowed the fluid, together with the portion of glass of antimony, which remained undissolved. The poison did not at first produce any bad symptoms; but it gave rise in the end to copious vomitings, so violent, that not being able longer to support herself, she fell to the ground. In this situation she was found by her husband, with the limbs cold and stiff, as if she was dead; he employed various exciting methods to restore her, and at last succeeded in bringing back respiration, by throwing a little cold water in her face. When

she had recovered the use of her senses, she did not cease, however, from vomiting, and was agitated by convulsive motions, until a copious drinking of broth had overcome the violent action of this poison; but she remained very weak for a long time.

When she began to recover her strength, she was attacked with a very sharp pain in the right foot; the next day it was affected with gangrene, and the limb was amputated about six inches below the knee. She was nearly recovered from the consequences of the amputation, when, at the distance of seventeen days from the poisoning, a suffocating catarrh made its appearance, of which she died shortly after.

On opening the body, the lungs were found closely adhering to the pleura, principally on the right side; they were spotted; the bronchia were filled, throughout their whole extent, with a frothy mucus. The cavities of the chest contained a great quantity of water in those parts where the lungs were at liberty. The heart contained polypous concretions. The stomach was distended. The liver, which was of a yellow colour, a little variegated, was adhering to the diaphragm in several places. The spleen was of a greater bulk than ordinary.

OF THE OTHER PREPARATIONS OF ANTIMONY.

The diaphoretic antimony, washed, and not washed (oxyde of antimony combined with potash), the *materia perlata* of Kerkringius (oxyde of antimony, at maximum), the liver of antimony (a mixture of oxyde of antimony, sulphur, and sulphate of potash), the *Crocus* Metallorum (sulphureted oxyde of antimony), &c., are so many poisonous preparations.

OF ANTIMONIAL VAPOURS.

Persons subjected to the action of antimonial vapours experience a great difficulty of breathing, a tightness of the chest, accompanied by a dry cough, which often is the forerunner of an hæmoptysis; they are subject to gripings and looseness. Fourcroy relates, that he has seen fifty persons, in whom all these symptoms made their appearance, ten or twelve hours after having

respired the vapours of sulphuret of antimony, which had been detonated with nitre. There is not the least doubt that the prolonged action of these vapours is capable of giving rise to serious accidents, followed by death.

ARTICLE THE FOURTH.

SPECIES IV.—POISONS OF COPPER.

Var. 1st. Brown Oxyde of Copper.
—— 2nd. Verdegris.
—— 3rd. Acetate of Copper, Crystals of Venus.
—— 4th. Sulphate of Copper.
—— 5th. Sulphate of Ammoniacal Copper.
—— 6th. Nitrate of Copper.
—— 7th. Muriate of Copper.
—— 8th. Ammoniacal Copper.
—— 9th. Coppery wine and vinegar.
—— 10th. Coppery Savonnules, or copper dissolved by grease.

It may be asserted that the case of poisoning by the preparations of copper, is one of the most common; and the most important to be acquainted with: for which reason we see that the attention of physicians and chemists, has at all times been directed towards the knowledge of those means, which are capable of bringing to perfection the history of all the objects connected with it. The daily use of utensils of copper, the facility with which it combines with oxygen, the deleterious action which this oxyde exerts upon the animal economy, are so many causes, which account for the frequency of this kind of poisoning, and justify the importance which learned men have attached to the study of these poisonous substances. Rarely, indeed, have the preparations of copper been employed as the instruments of crime, as their fatal intentions would have been detected by the colours which they present; but how many times, by the inadvertence, I might even say, by the inexcusable negligence, of persons who make use of vessels formed of this metal, which have been not at all, or very badly tinned, have they been productive of accidents, so much the more terrible, as they have exerted their

action on a great number of persons at once? The annals of medicine unfortunately furnish too many examples in support of this assertion, to render it necessary to insist more upon it here.

After taking this hasty sketch of the subject, we shall now proceed to detail the various properties of the preparations of copper, beginning with the history of metallic copper, without which we shall not be able to fix the characters of the poisonous substance, which forms the object of this article.

OF COPPER.

Copper is a metal of a beautiful yellowish red colour: although it is brilliant, malleable, and ductile, it only possesses those properties in an inferior degree to the precious metals. Being endued with a strength of adhesion less than that of iron, it is more sonorous than this metal, or than all the other metallic substances. Its specific gravity is 8.895 when melted.

Copper combines with sulphur, and gives a black sulphuret.

Copper dissolves in the principal mineral acids, provided that their temperature be raised to the point of ebullition. The solutions, which it furnishes, exhibit in general a blue, or green colour. This is one of the characters from which the juridical physician may derive advantage.

Metallic copper perfectly pure does not possess any deleterious property. *Thomas Bartholin*, *Amatus Lusitanus*, *Lamotte*, *Hevin*, &c. relate cases of persons who have swallowed pieces of copper without experiencing the smallest inconvenience. These extraneous bodies have been expelled either by vomiting or by stools at the end of a space of time which is variable. Professor Dubois saw a young child that had swallowed a copper buckle for some time. It suffered no pain; its excrements only were greenish, and resembled in colour the *baume tranquille*. Analysis proved, that there was not an atom of the metal, the presence of which was suspected. The buckle, covered over with a slight oxyde of a brown colour, was expelled five or six weeks after being swallowed.

These facts are sufficient to prove the innocence of metallic

copper in masses; but is the case the same when this substance is extremely divided? The results of the experiments made by M. Drouard prove, that there is no danger in swallowing this metal pure, whatever may be its state of division. This physician has given as much as an ounce of it, in a very fine powder, to a dozen of dogs, of different ages and different sizes, and none of them experienced any inconvenience. The day after, the metallic molecules, which were tarnished, were expelled with their excrements.

It has been long maintained, that milk heated, or allowed to remain in vessels of copper not oxydated, dissolved a portion of this metal, and acted as a poison. Eller, a philosopher of Berlin, has proved that this idea is not correct.

The phenomena are different, if instead of pure water we substitute that which contains a certain quantity of muriate of soda. Eller has demonstrated the presence of a very small quantity of copper in water, which contained $\frac{1}{20}$th of its weight of muriate of soda, and which had been boiled in a brass kettle.

If, instead of heating in copper kettles a simple solution of muriate of soda, it be previously mixed with beef, bacon, and fish, the fluid resulting from it does not contain an atom of copper. However astonishing this fact may appear, it is correct; M. Eller was the first to announce it, and I have several times ascertained the truth of it.

OF THE OXYDE OF COPPER, AND THE CARBONATE OF COPPER.

The oxyde of copper, which is of a blackish brown colour, may be easily known, 1st. by the facility with which charcoal and fat bodies de-oxydize it at an elevated temperature; 2nd. by its solubility, without effervescence in the sulphuric acid, weak, and at the ordinary temperature; 3d. by the properties of the solution resulting from it (see hereafter *Sulphate of Copper*); 4th. by the change of colour which it produces in ammonia: this alkali will dissolve it instantly, and assume a beautiful blue colour; 5th. lastly, by its insolubility in water.

The green carbonate of copper (natural verdegris), spontane-

ously formed on the surface of copper or brass vessels, pieces of coin, &c. when treated with charcoal, ammonia, or water, acts in the same manner as the oxyde, of which we have just been speaking; but it differs from it by its green colour, and by its effervescence when dissolved in diluted sulphuric acid; which evidently depends upon the liberation of the carbonic acid gas, which enters into its composition.

The oxyde and the carbonate of copper are poisonous.

M. Drouard is of opinion that the gastric juices dissolve the oxyde of copper, and give a polish to the surface of the pieces; but that the sulphureted hydrogen, which is disengaged in the stomach, or in the intestines, renews the brown colour, and converts it into a sulphuret.

It is known, that many persons have experienced colics and vomitings, in consequence of having swallowed pieces of copper that were oxydated.

The oxyde and carbonate of copper which are frequently found on the surface of utensils made of this metal, dissolve easily by the assistance of heat in several acid substances; such as certain aliments, the juice of sorrel, preserved apples, quinces, gooseberries, &c. Whence it follows, that all preparations of this kind made in vessels of copper that have undergone these changes, contain a greater or less quantity of coppery salts, which are capable of occasioning serious accidents.

It often happens that these acid preparations, when heated in copper vessels which are perfectly clean, dissolve a portion of this metal. This phenomenon only happens in those cases where the aliments cool, and remain a sufficient long time in these kind of vessels, for the copper to pass into the state of an oxyde, at the expense of the oxygen of the air. M. Proust ascertained to a certainty, that none of these substances, when poured out immediately after being heated in clean copper vessels, did contain the least vestige of this metal.

CHEMICAL HISTORY OF VERDEGRIS.

Verdegris is formed of the acetate and sub-acetate of copper, of carbonate of copper, and copper partly in a metallic state,

and partly in the state of an oxyde. It contains likewise the stalks of grapes and other extraneous bodies. The analysis of it may be made, 1st. by treating it with boiling distilled water, which dissolves all the acetate of copper; 2nd. by pouring on the mass exhausted by the water, diluted sulphuric acid at the ordinary temperature. This acid dissolves all the oxyde and the carbonate of copper, and carbonic acid gas is disengaged, which may be collected; 3d. lastly, by adding to the residue, weak nitric acid, which dissolves only the metallic copper.

Verdegris is generally found in commerce in the form of masses of a bluish green colour, composed of a multitude of minute crystals, which are silvery, and fine, like silk.

ACTION OF VERDEGRIS ON THE ANIMAL ECONOMY.

Almost the whole of the animals to whom a few grains of verdegris has been given, died in a very short space of time. What is the cause of this death? On what organs does this poison exert its deleterious properties?

M. Drouard is of opinion, that this poisonous substance acts immediately on the digestive canal, and principally on the intestinal tube, in which it excites inflammation, without being taken up into the circulation, by the lymphatic vessels.

I have had frequent opportunities of administering verdegris and the acetate of copper to dogs of different sizes, and I have constantly observed, that when the dose of acetate of copper introduced into the stomach was stronger than from twelve to fifteen grains, the animals died in less than three quarters of an hour; they could very seldom resist the action of the poison for an hour. The symptoms which preceded death were, a copious vomiting of a bluish matter, evidently coloured by a portion of the acetate of copper; fruitles efforts to vomit after the whole of the aliments contained in the stomach were thrown up; plaintive cries; an extreme difficulty of breathing, irregularity and frequency of pulse; frequently a general insensibility: the animal lay down and appeared to be dead; convulsive movements almost always took place; and a few moments before death a universal

stiffness came on, with some spasmodic twitchings, and a great quantity of foam from the mouth.

On examining the bodies after death, it was observed, that the muscles shewed no sign of contractibility; the mucous membrane of the stomach was covered with a bluish coat containing a portion of the matter thrown in; this coat was hard, and as it were horny: when scraped off, the mucous membrane was perceived underneath of a rose colour. The trachea and bronchia were filled with a white foam. The lungs were crepitating, and presented a few rose-coloured spots on a pale ground. The heart had ceased to beat.

The injection of a grain of the acetate of copper in half an ounce of water, into the jugular vein, occasions death commonly in the space of from ten to twelve minutes: the animal instantly makes motions, as if masticating and swallowing, which are followed by vomitings attended with painful efforts: the animal becomes agitated with very violent convulsive motions, lies down instantly, becomes insensible, the rattling in the throat comes on, and he dies.

On opening the body, nothing remarkable is perceived about the organs of digestion: the contractile power of the muscles appears destroyed, the lungs present no alteration, and the heart is deprived of motion.

Let us take notice, 1st. that all the animals which die under the action of the acetate of copper, present a series of nervous symptoms extremely well marked: such as convulsive movements, succussions resembling tetanus, general insensibility, and paralysis of the posterior extremities: 2d. that death quickly supervenes, when this poison is introduced into the stomach, and more especially when it is injected into the veins: 3d. lastly, that the coats of the stomach and digestive canal are scarcely altered. Are not these facts of a nature to warrant the presumption, that this salt, being absorbed, is carried into the torrent of the circulation, and produces death in consequence of its action on the nervous system? I confess, such would be my opinion, if one could be warranted to draw conclusions from a very small number of experiments. It is certain, however, that death is not the

immediate result of the action of this poison on the digestive canal, as M. Drouard has affirmed.

SYMPTOMS OF POISONING BY VERDEGRIS.

Case.

On the 3rd of July, 1778, M. Jeanroy, one of the most celebrated practitioners of the capital, was called in, to see a man named By, and his wife, fruit-sellers, who had eaten, both at dinner and supper, some veal, which had been kept in an earthen pot, on which was placed a copper lid. As there was a great quantity of the meat, it was pressed down by the lid, and became impregnated with verdegris. A person named Duval, and his wife, living in the same house, had likewise eaten some of it for dinner the same day. The first who experienced any bad symptoms, was the above-mentioned Duval. On the Thursday morning, at two o'clock, he was awoke by colics at the stomach, which were followed by vomitings. His wife, a few hours after, complained of shooting and painful colics. The repeated use of milk, and mucilaginous glysters proved sufficient for their cure.

The man named By, experienced the same day, about seven o'clock in the morning, severe pains at the stomach, nausea, and frequent vomitings. He perceived from time to time alarming colics, followed by contractions of all the limbs, and accompanied by profuse sweats. His wife experienced the same symptoms, with the exception of the colics, which were neither so violent nor so frequent: she complained much of her head. The pulse of both of them were small, unequal, and sometimes convulsive. Mucilaginous glysters, and milk, had been administered to them as to the two first. M. Jeanroy objected to the continuation of the milk; and as their tongues were very much loaded, and there could be no hope of relief but by clearing the stomach, he ordered for them a solution of emetic (*tartar*), in the dose of six grains to a pint and half of water. The husband took two grains, and the wife three. This method procured vomitings of a greenish bile, with lumps of coagulated milk, and

the patients then experienced a decided relief. The woman felt no other complaint than slight pains at the stomach, and the husband than colics, which were borne for three days.

After having fulfilled the first indication by the emetic, M. Jeanroy ordered to be given to the said By and his wife, for ordinary drink, a strong decoction of marsh-mallows root: beside which they took every half hour two spoonfuls of a mixture made with six ounces of oil of sweet almonds, two ounces of syrup of marsh-mallows, and an ounce of the syrup of *diacodium*;* every two hours likewise were given glysters made with linseed, to which was added olive oil: in the evening a theriac bolus, and every four hours, some fat broth. By the use of these different means, the patients were in a short time out of danger.

The symptoms of poisoning from verdegris may be reduced to the following:

An acrid, styptic, coppery taste in the mouth; parched and dry tongue; a sense of strangulation in the throat; coppery eructations, continual spitting, nausea, copious vomitings, or vain efforts to vomit: shooting pains in the stomach, which are often very severe; horrible gripes; very frequent alvine evacuations, sometimes bloody and blackish, with tenesmus and debility: the abdomen puffed up, and painful; the pulse small, irregular, tight and frequent; syncope; heat of skin; ardent thirst; difficulty of breathing, anxiety of the præcordia, cold sweats, scanty urine; violent head-ache, vertigoes, faintness, weakness in the limbs, cramps, convulsions, and lastly, death.

It is rare that all these symptoms occur in the same individual: in general, the vomitings and the colics, are the most constant. It sometimes happens that gangrene seizes on the intestines: this

* The syrup Diacode is a favourite mode of administering opium, with the French Physicians. Being very mild, it is an excellent preparation for children, and is almost universally used. The dose is from two to eight drachms. Its composition is as follows:

℞. Heads of poppies, dry and ripe, separated from their seeds	lbi.
Boiling Water. - - -	lbviii.
Loaf Sugar - - - -	lbiv.

J. G. N.

state, always fatal, is announced by the sudden cessation of the pain; by the smallness, and excessive weakness of the pulse, which is almost imperceptible; by singultus more or less frequent, and by cold sweats.

LESIONS OF TEXTURE PRODUCED BY VERDEGRIS.

The seat of these lesions is principally the digestive canal. When death takes place a few hours after taking the poison, the mucous lining of the stomach and intestines is found to be inflamed and gangrenous. Sometimes the inflammation is communicated to all the coats of these viscera, and sloughs are formed, which are quickly detached, and leave openings, through which their contents pass out, and are effused into the cavity of the abdomen.

M. Laporte, a surgeon of Paris, has known a man to be killed in the course of a few hours, by a little ball of wax loaded with verdegris, which he inadvertently swallowed: in his stomach was seen a very considerable slough.

APPLICATION OF ALL THAT HAS BEEN SAID TO THE DIFFERENT CASES OF POISONING BY VERDEGRIS.

FIRST CASE.

The Patient is living: the rest of the Poison can be examined.

A. If the substance to be examined be in a solid form, and of a bluish-green colour, a small quantity of it should be put into an earthen crucible, which should be heated to redness. If, by the action of heat, this substance becomes decomposed, grows black, and furnishes, in the space of a few minutes, metallic copper, it may be presumed, that it consists of verdegris, the certainty of which may be acquired by the following means: 1st. The concentrated sulphuric acid, poured on a portion of this powder, will set at liberty vapours of acetic acid, which may be known by their

smell. 2nd. Boiling distilled water will only partially dissolve it, and the solution, which is of a blue colour inclining to green, will give a brown precipitate to the prussiate of potash, a clear blue to the ammonia (this precipitate will re-dissolve entirely in an excess of alkali), a blackish brown to the sulphurated hydrogen, hydro-sulphureted water, or the hydro-sulphuret of potash; lastly, phosphorus and iron, being plunged into this solution, will be covered with a coat of metallic copper.

If the verdegris be solid, and adhering to vessels of copper not tinned, or badly tinned, we should begin by scraping such parts of the utensils as present green points, and collecting the powder; which should be examined by the means we have just pointed out. If the quantity to be examined be very inconsiderable, it should be brought into contact with sulphuric acid and boiling water, and the character furnished by calcination may be neglected. In fact, these two re-agents are sufficient to demonstrate the presence of the acetic acid and of the oxyde of copper.

The inconvenience which would attend the calcination of so small a quantity of matter, arises from the difficulty of separating a sufficient quantity of copper to render it visible, and more especially from the impossibility there would be, of deciding on the existence of the acetic acid.

It may happen that the copper vessels, so scraped, furnish a greenish powder, insoluble in water, and which dissolve with effervescence in sulphuric acid, without disengaging any acetic acid. This phenomenon ought necessarily to take place, whenever the powder examined consists of natural verdegris (carbonate of copper). In these cases, which are not uncommon, it will be necessary to bring a portion of it in contact with the acetic acid, concentrated, and at the ordinary temperature, which will quickly dissolve it, and furnish the acetate of copper of a greenish blue colour, the properties of which are very striking, and easy to ascertain with certainty. Another portion ought to be calcined with charcoal in an earthen crucible, in order to obtain metallic copper.

If the verdegris has been diluted with cold water, the substance on which the practitioner has to act, will be partly in a liquid, and

partly in a solid form. The liquid portion, which will be of a bluish colour, will be turbid ; it will contain acetate and sub-acetate of copper ; it must be decanted, and treated by the prussiate of potash, ammonia, and other tests which we have directed. The undissolved portion, which will be of a colour more or less dark, must be dried and calcined with charcoal. If metallic copper be by these means obtained, and the fluid portion beside shall have exhibited the same phenomena as the solution of the acetate of copper, it may be decided that the substance examined is verdegris.

In such cases where the fluid, by reason of its mixture with wines, broth, &c. may furnish with the tests, precipitates which are of a different colour from those furnished by the solution of verdegris, it will be necessary to have recourse to evaporation. If the dried mass should give out with the sulphuric acid, vapours of acetic acid, and by calcination with charcoal it should furnish metallic copper, it may be decided, that it contains acetate of copper. In case the sulphuric acid should not disengage any vapours, the calcination alone would be sufficient to determine, that the liquor contained a preparation of copper.

In these kinds of investigations, we should always bear in mind, that the solution of verdegris in water is of a blue colour whilst free from mixture ; but that it may present different colours according to the nature of the fluids with which it is combined.

If the acetate of copper forms part of an ointment or any other fat substance, a part of the mixture must be calcined in order to obtain the metallic copper, and the rest submitted to the action of boiling water : if the solution obtained possesses the properties of acetate of copper, it is evident that this salt forms part of the composition of the fat body. If the water should be colourless, and not contain a particle of the coppery salt, whilst however by calcination, the mixture furnishes metallic copper, we may presume that this metal does exist in it in the state of oxyde or carbonate of copper (natural verdegris). In this case the practitioner, without seeking to decide upon the nature of the preparation of copper, ought to pronounce, that it does exist in the composition, and

consequently is capable of being the cause of the symptoms which have made their appearance. It would not, however, be difficult to investigate whether it were the oxyde or carbonate of copper, which forms part of this poisonous preparation.

SECOND CASE.

The Patient is living: the whole of the Poison has been swallowed: the Matter vomited may be examined.

Of all the poisonous substances we have hitherto examined, there is none which imparts a colour to the matter vomited in so striking a manner, as the verdegris and other salts of copper. But, in truth, these colours are not always the same; they are most commonly blue, the shades of which are various; sometimes they are green, yellow, &c.; differences which depend upon the different liquids and solids with which the verdegris has chanced to be mixed in the stomach. The circumstance then of the colour, ought not to be regarded as a characteristic of the first importance, in recognizing salts of copper in the matter vomited. In fact, how often has it happened that persons poisoned by the nitric acid have thrown up matter extremely green, the colouring of which has been attributed at first sight to verdegris, but which did not contain an atom of it. I have already witnessed two different cases of schirrus of the pylorus, in which the matter vomited was of a bluish-green colour, in every respect similar to what the animals poisoned by verdegris generally throw up; it has nevertheless been impossible to discover the smallest trace of this coppery salt. M. Guersent mentions his having opened the body of a patient, who had died of some organic affection of the stomach; in whom, the liquids contained in that organ, presented a blue colour, analogous to that furnished by the prussiates with the salts of iron, without however containing any metallic substances (*Dictionnaire des Sciences Medicales*, *tom.* vii, *pag.* 564). These facts are sufficient to make the juridical physician perceive the errors he might commit, if he attached a greater degree of importance to the colour of the matters vomited, than they deserve.

If the matter vomited be liquid and transparent, its colour must be observed, and it must be treated by the tests proper for discovering the particles of verdegris; such as the prussiate of potash, arsenite of potash, hydro sulphureted water, the hydro-sulphurets, phosphorus, iron, and ammonia. If the precipitates obtained be of such a nature as to excite a suspicion of this species of poison, the whole should be evaporated to dryness in a capsule of porcelain, and all the solid portion should be detached, in order to calcine it in a crucible, and to obtain the metallic copper. It is clear that by the action of heat, all the vegetable and animal principles, which can form a part of the liquor vomited, will be decomposed and converted into several volatile productions, and into charcoal; this combustible body will decompose the oxyde of copper, and reduce it to its metallic state. It is not uncommon to see the iron remain several hours, and even several days, before precipitating the metallic copper from the solutions of verdegris when mixed with animal matters. Phosphorus constantly produces this precipitation in a much shorter space of time.

If the fluids vomited be too much diluted, and should not furnish any distinct precipitate with the tests, it will be necessary to concentrate them by evaporation, and afterwards to make the experiments which we have just pointed out.

It may happen, that certain liquids vomited, which consist of several fluids both animal and vegetable, and of verdegris, do not furnish any precipitate with the re-agents of which we have just spoken; or that the precipitates, which they do furnish, are of a colour different from that which they would have presented, if the experiments had been instituted upon the acetate of copper without any mixture: this phenomenon very frequently occurs when the ammonia is employed to discover verdegris in animal fluids which contain wine. In this case we must adhere to the character furnished by calcination, and not decide that poisoning has taken place by a preparation of copper, until we have obtained the metallic copper.

If the matter vomited be at the same time both solid and liquid, it must be passed through a piece of fine linen, and the liquid portion acted upon in the manner we have just pointed out.

If the poison cannot there be discovered, the solid portions are to be tried at a temperature not much elevated, and to be treated by boiling distilled water, in order to dissolve the acetate of copper with which these substances may be mixed ; this solution should be examined in the manner we have pointed out in treating of the *first case:* if it does not furnish a particle of copper, all the parts, which the boiling water has not dissolved, must be calcined in an earthen crucible ; and if metallic copper be obtained, it may be decided that poisoning has taken place by a preparation of copper.

It is sometimes difficult to perceive the metal which is dispersed in small quantity amongst an infinity of molecules of charcoal, proceeding from the decomposition of animal substances ; in this case the product of the calcination must be put into water: in a short time the copper, being endued with a specific gravity much more considerable than that of the charcoal, subsides, whilst the black particles remain suspended.

It would be still better, in a similar case, to pour upon the product of the calcination nitric acid, at 25° ; which would convert the copper into the blue nitrate of copper: this should be filtered, and it will be easily recognized by the proceedings which we shall point out hereafter, when treating of the nitrate of copper.

THIRD CASE.

The Patient is living : the whole of the Poison has been swallowed : the Vomitings cannot be procured.

Chemistry cannot enable us to throw any light on this difficult and embarrassing case.

FOURTH CASE.

The Patient is dead.

The details which we have just gone into in the explanation of the first and second cases render it necessary to point out afresh the experiments which should be made in order to discover the

most minute quantity of verdegris, when mixed and combined with the liquids or the solids.

The mode of analysis is precisely the same as that which we have just recommended for the matters vomited.

It must however be remarked that, in certain cases no vestige of the poison is found in these substances, having been expelled almost entirely during life: in that case the lesions of texture must be noted, the mucous membrane of the stomach and of the intestines must be scraped off, dried, and submitted to the action of a strong heat in a crucible. I have twice obtained metallic copper, by calcining in this manner a portion of the membranes of the stomach of two dogs that I had poisoned with verdegris. This effect particularly takes place when the mucous membrane is of a bluish colour, hard, and strongly adhering to the substance of the stomach.

TREATMENT OF POISONING BY VERDEGRIS.

Is there any antidote to verdegris?

Navier, in his work on counter-poisons, extols the hydrogenated sulphurets of potash, of lime, and of iron, as substances which ought to decompose the verdegris, and to transform it into an insoluble sulphuret of copper. M. Drouard has tried some experiments, the results of which destroy the assertion of Navier.

"These sulphurets, which are of themselves too irritating, add "to the dangers which we want to combat; and although they ac- "tually produce the decomposition expected from them, the preci- "pitate still preserves enough of poisonous properties to produce "the most serious accidents, and even death."

Of all the substances proposed as antidotes to verdegris, up to the present day; none appeared so efficacious as sugar. M. Marcelin Duval, after collecting many facts, concludes that sugar and its preparations are specifics against verdegris.

Having repeated experiments, in order to ascertain in what manner sugar operated upon the verdegris; we discovered that it was only at the boiling temperature, that it could decompose this poison. It became therefore difficult, to conceive how this decomposition could take place in the stomach. In order to ascer-

tain this fact, new experiments were instituted, whence it results, that no such decomposition does take place, and consequently that sugar ought not to be considered as an antidote. It is however, useful to calm the irritation produced by this poison, when the latter has been previously vomited.

The various cases of cures, performed by sugar, are explained, by remarking, that the verdegris had either been vomited, or swallowed in a very small quantity.

The advantages which we had derived from the use of albumine, in opposition to the effects of corrosive sublimate, and the facility with which verdegris is decomposed by this animal substance, even at the usual temperature, induced us to try new experiments, which have proved very successful. The poison was uniformly decomposed by albumine, and transformed into a new body, incapable of producing bad effects. This is then one of its antidotes.

The prussiate of potash and iron, which also enjoys the property of decomposing the preparations of copper immediately, was also investigated : the results were similar to those presented by albumine ; but as this salt is not always to be procured ; and as, if administered in a strong dose, it might occasion vertigo ; we give the preference to the white of eggs beat up with water.

If it happened, therefore, that an individual had swallowed a strong dose of a soluble coppery salt*, it would be necessary immediately to attempt to neutralise it with albumine. In case the quantity of poison swallowed was very small, and there were reasons to believe it had been entirely expulsed by vomiting ; sugar and its preparations should be resorted to.

I wished to determine what is the kind of action which sugar exerted upon the acetate of copper: if a mixture be made of twenty parts of water saturated with sugar, and one part of a solution of verdegris, neither turbidness nor any change of colour are perceived ; and the liquid gives a brown precipitate with the prussiate of potash, a black with the hydro-sulphurets, and a blue with ammonia : from which it must be concluded that it contains a coppery salt.

* All the soluble salts of copper are decomposed by this animal substance

If however sugar cannot be easily procured, the patient must be gorged with warm water, or even cold water, or with emollient decoctions, broth, or other liquids of the same nature ; the throat should at the same time be irritated with the finger, or with a feather. If, notwithstanding these means, vomiting does not take place, a solution of tartar emetic may be had recourse to ; provided the pains of the stomach be not extremely violent: for in that case, it would be imprudent to introduce any irritating medicine. M. Jeanroy has employed this preparation with success, in the patients which formed the subject of the third observation. This remedy ought more particularly to be had recourse to, when there are any symptoms of oppression of the stomach.

If the poison has been some time swallowed, if it has already entered the intestinal canal, if the patient has vomited considerably, and been labouring under violent colics, we must carefully abstain from provoking the vomiting afresh, which will be useless, and even dangerous; emollient glysters, cooling, mucilaginous, and oily drinks ought to be employed and continued, until the principal symptoms be relieved. Milk ought to hold the first rank among the medicines of this class, notwithstanding the opinion of M. Drouard, who pretends that it ought to be rejected, because it quickly becomes decomposed in the stomach, and forms a solid and irritating coagulum. It is difficult to conceive that this mass should acquire a sufficient degree of hardness to act as an irritating substance, or that it would not be dissolved by the juices of the stomach.

Leeches, bleeding, warm baths, emollient fomentations, &c. are the means to which the practitioner ought to have recourse, in cases where inflammation of the viscera shall have made its appearance. Narcotics and antispasmodics ought to be employed, in order to remedy the different nervous symptoms which may occur, such as spasms and convulsions.

OF THE ACETATE OF COPPER.

(CRYSTALS OF VENUS.)

This salt is of a deep blue colour; its taste is strong and styptic; it crystallizes in rhomboidal figures; is efflorescent and easily soluble in water, without leaving any residue, which distinguishes it from verdegris; for the rest, when dissolved in this liquid, it possesses the same properties we have just described when speaking of verdegris.

M. Drouard has ascertained by a great number of experiments, that this salt acts with greater energy than verdegris. The animals which took a few grains of acetate of copper, died two or three hours afterwards; whilst others did not die till after many hours by the same dose of verdegris. On opening their bodies, the stomach is found to be inflamed, and of a brown red colour.

OF THE SULPHATE OF COPPER.

This salt, known also by the name of blue vitriol, is composed of the sulphuric acid, and the oxyde of copper at maximum (deut. oxyde of copper). Its taste is acrid, metallic, styptic, and almost caustic; it crystallizes in rhomboids, or prisms, with four sides.

Being heated in a crucible, it loses its water of crystallization, swells, and becomes white; which proves that the blue colour, which it commonly presents, depends on its union with water.

The sulphate of copper pulverized and mixed with an equal bulk of charcoal, and heated to redness in an earthen crucible, becomes decomposed, and gives out metallic copper, which is fixed; and sulphureous acid gas, and carbonic acid gas, which escape.

OF THE SULPHATE OF AMMONIACAL COPPER.

(AMMONIA, SULPHATE OF COPPER).

The sulphate of ammoniacal copper is of a beautiful blue colour. It may be distinguished from the sulphate of copper,

1st, by the smell of ammonia which it exhales ; 2nd, by the property it possesses of turning the syrup of violets green ; 3d, by the green precipitate, which it furnishes with the arsenious acid in solution. This precipitate, which consists of arsenite of copper, is in great abundance, and appears instantly ; whilst this acid, when brought in contact with the sulphate of copper, does not produce any distinct precipitate till after the expiration of twenty, or five and twenty minutes.

OF THE NITRATE OF COPPER.

The nitrate of copper is of a beautiful blue colour: its taste is acrid, and extremely caustic; it crystallizes in elongated *parallelipipedes*, or in fine prisms like needles.

When put on burning coals, it dries and detonates with scintillation. If heated in a crucible it becomes decomposed, gives out oxygen gas, red nitrous vapours (nitrous acid gas), and brown oxyde of copper. If it be mixed with charcoal, and submitted to the action of caloric, its decomposition is more complete, and it leaves for residue metallic copper.

The nitrate of copper dissolves extremely well in water.

The hydro-sulphurets, the prussiate of potash, ammonia, and the arsenite of copper, act with this solution as with that of the acetate of copper.

OF THE MURIATE OF COPPER.

The muriate of copper at the maximum of oxydation, is of a green colour, when in a solid form.

When heated in an earthen crucible with its bulk of charcoal and alcoholized potash, it is decomposed, and gives out carbonic acid gas, together with a fixed product, consisting of muriate of potash and metallic copper.

If it has been introduced into the stomach in small quantity, it is almost impossible to ascertain its existence. In fact, in treating the matters contained in this viscus by water, a solution is obtained, which contains, beside this muriate, all those which formed part of the aliments, whether solid or liquid ; so that it becomes extremely difficult to decide whether the muriatic acid found

in this solution, proceeds from the muriate of copper, or from the other muriates. In these kind of cases the practitioner should confine himself, to demonstrating the presence of a preparation of copper, without any regard to the nature of the acid which may enter into its composition.

OF AMMONIACAL COPPER.

Ammoniacal copper is a combination of the oxyde of copper and ammonia. It is of a beautiful blue colour, so much the deeper as it is more concentrated ; it possesses a sharp, penetrating ammoniacal smell.

The presence of copper may be demonstrated in it by the tests which we have already enumerated. Hydro-sulphureted water, the hydro-sulphurets, the prussiate of potash, &c.

OF COPPERY WINE AND VINEGAR.

If it be remembered with what facility the acetic acid dissolves the oxyde of copper, it will not appear astonishing that acid wines, which remain long in vessels of copper encrusted with verdegris, should hold in solution a certain quantity of that substance.

Of all the means proper for demonstrating the existence of a preparation of copper in liquors of this kind, the preference ought to be given to that, which consists in evaporating it to dryness, and calcining the residue with charcoal, in order to obtain metallic copper. If we confine ourselves to the employment of chemical tests, we may be led into error. Indeed, in consequence of its mixture with wine and vinegar, verdegris no longer furnishes the same precipitates as when it is alone.

OF COPPERY SOAPS.

However complicated may be the composition of coppery soaps and *Savonnules*, the metallic copper may always be obtained by calcination. The details into which we have already entered, in giving the history of the different preparations of copper, render it unnecessary to dwell any longer on this subject, which is of little importance.

ARTICLE THE FIFTH.

Species 5th. *The preparations of Tin.*

Var. 1st. The muriates of tin.
2nd. The oxydes of tin.

It is of importance to draw the attention of practitioners to the preparations of tin; the anthelmintic properties lately ascribed to the muriate of this metal, the great use made of it in France these late years, with the same intention; lastly, the frequent use of this salt in the art of dying, are so many considerations which have induced us to make known its fatal consequences. Before giving the history of the muriates of tin, we are of opinion that it will be best to give an account of the principal properties of the metal which enters into their composition.

OF TIN.

Tin is a solid metal, the colour of which very much resembles that of silver. Its specific gravity is 7.251. It is sufficiently malleable to allow of very thin plates being formed out of it; but it draws out badly in wire. When twisted in different directions, it gives out a peculiar kind of crackling sound; which is called the *cry of the Tin.*

Exposed to the action of caloric, it easily enters into a state of fusion: it is not however volatile.

Oxygen is capable of entering into combination with this metal, and gives rise to three oxydes, the properties of which differ in proportion to the quantities of oxygen which enter into their composition: they are all, however, capable of being decomposed, when calcined in a crucible with charcoal: this combustible body lays hold of the oxygen which they contain, passes into the state of carbonic acid gas, or of carbonic oxide gas, and the tin is set at liberty.

This metal possesses no poisonous property whatever, as any one may convince himself by consulting the memoirs published by Bayen and Charlard, and by M. Proust.

OF THE MURIATE OF TIN.

The muriate of tin which now occupies our attention is that employed in commerce. Analysis has proved to me, that it almost always consists of a great proportion of the muriate at minimum (proto-muriate), and of a certain quantity of muriate at maximum, with excess of base (sub-deuto-muriate); it contains beside, a ferruginous salt.

The muriate of tin of commerce, is generally met with in the form of small needles, united by *fascia*, of a yellowish white colour. It has a very strong styptic taste, attracting the moisture of the atmosphere; and reddens the infusion of tournesol.

THE ACTION OF THE MURIATE OF TIN ON THE ANIMAL ECONOMY.

When a small quantity of the muriate of tin is injected into the veins, or introduced into the stomach of a dog, death quickly succeeds, and is preceded by very severe symptoms. What is the cause of the symptoms produced by this salt? What are the organs on which it acts? I have attempted a great number of experiments in order to resolve this important problem.

Experiment 1st. At twenty-five minutes past nine, three quarters of a grain of muriate of tin dissolved in two drachms, and thirty-six grains of distilled water, was injected into the jugular vein of a little dog, a year and a half old. The animal did not

PROTO-MURIATE.

With sulphuric acid it is precipitated and forms a milky white deposit inclining to yellow: with corrosive sublimate a white precipitate; with deuto-muriate of gold, there is formed a purple precipitate; with tea a clear yellow is formed—a few drops of milk will convert it into thick curds. The hydro-sulphurets precipitate it of a chocolate colour, and the prussiate of potash of a white, slightly inclining to yellow. Being calcined with potash and charcoal, it yields metallic tin.

DEUTO-MURIATE.

The solution of this salt undergoes no alteration from the sulphuric acid, nor from that of the deuto-muriates of mercury, or of gold; the hydro-sulphurets throw down with it a yellow precipitate. Being dried and calcined with charcoal and potash, it furnishes metallic tin.

experience any sensible inconvenience during the three first hours after the injection. At one o'clock he appeared oppressed, sorrowful, fatigued, and much less active than before the operation; he refused to eat. At five he had become insensible; he might be pinched or pricked without shewing the least sign of pain; and when made to take any position, he preserved it in such a manner, that one would have thought he was immoveable, and at the same time presented to us a case of very singular catalepsy; nevertheless, when pushed, he made two or three steps, staggered, and fell on one side or the other. The posterior limbs, although pliable, were much less so than the anterior; his breathing was nearly free, and he uttered no plaintive cry. At seven o'clock his breathing was very much accelerated, and extremely difficult, his pulse frequent, and the animal could not stand on his legs for a moment, just as if he were dead. The muscles of the extremities and of the neck, being laid open, did not contract, and it was with difficulty some few movements could be excited by pricking them strongly with the point of a knife: these punctures however did not recal the sensibility. All these symptoms acquiring fresh strength, the animal expired at half past nine in the evening.

Appearances on Dissection.

The two middle lobes of the lungs were found of a red colour inclining to violet, not at all crepitating, of a close texture, gorged with blood, and did not float in water: the other lobes were in a natural state. The mucous membrane of the stomach and duodenum was rather redder than common.

If it be considered, that a very small quantity of the muriate of tin, introduced into the torrent of the circulation, occasions death in the course of a few minutes; and that from the symptoms and organic lesions it may be inferred, that life becomes extinct only in consequence of the injury sustained by the nervous system, and perhaps by the lungs; we shall be forced to conclude that this salt has scarcely been at all absorbed in any of the experiments. Death, on the contrary, appears to have been the consequence of the corrosion and inflammation of the organs, with which the poison has come in contact. In another experiment,

only the brain appears to have been affected by sympathy, on account of the numerous nervous ramifications, by which it is connected with the mucous membrane of the stomach. Several corrosive poisons act in a manner analogous to that I have been speaking of, which induces me to believe *that the same poisonous substance may exercise its fatal action on this or that organ, according to the point with which it has been brought in contact.*

SYMPTOMS OF POISONING BY THE MURIATE OF TIN.

Case.

A manufacturer of sulphuric acid, in the neighbourhood of Rouen, had brought from town, a small parcel of the muriate of tin, which he wanted for trying some experiments he had proposed making, and had laid this parcel upon the chimney-piece. The cook, who had been asking for some salt, which she was in want of, opened the paper, and thought it was some white salt; she accordingly employed it for the boiler on the fire, and to put in the salt-cellars for the table. The master of the house had on that day company to dinner. Soup was served up, which proved to be bad, and the greatest part of the guests did not eat any; the boiled meat appeared still more disagreeable; but two or three of the guests, pressed by hunger, thought to have covered the disagreeable taste of the meat by adding salt to it, and accordingly employed the muriate of tin which was in the salt-cellars: they swallowed several mouthfuls; but were soon obliged to abandon this dish on account of its insupportable flavour. The master of the house interrogated the cook: the source of the error was discovered, and milk and sugared water, was given to those who had swallowed any of the boiled meat: nevertheless, all the guests who had eaten a few spoonfuls of the soup, although they had made a good dinner afterwards, were seized with the colic: it was much the strongest in those who had eaten the boiled meat salted: in two individuals it continued two days, and was accompanied with diarrhæa. I think I recollect that none of

the patients experienced any vomiting: copious mucilaginous drinks and glysters were sufficient to put an end to the symptoms.

An astringent, metallic intolerable taste; a sensation of constriction in the throat, nausea, repeated vomitings; a sharp pain in the epigastric region, which in a short time extends to all the other regions of the abdomen; copious evacuations of the bowels, slight difficulty of breathing; pulse small, tight, and frequent; convulsive motions of the muscles of the extremities, and of the face; sometimes paralysis: these are the terrible symptoms to which the muriate of tin gives rise; they are mostly followed by death.

LESIONS OF TEXTURE PRODUCED BY THE MURIATE OF TIN, INTRODUCED INTO THE STOMACH.

The lesions exhibited by this salt, greatly resemble those produced by the other corrosives, especially the deuto-muriate of mercury. The mucous membrane of the stomach, and of the first portions of the small intestines, is commonly of a deep red colour, hard, contracted, tanned, difficult to remove, ulcerated in places: sometimes of a bloody red. The muscular coat is frequently of a vermillion colour. I have likewise observed small black spots occasioned by the extravasation of venous blood, between these two coats, which proceeded from the rupture of some small vessels by the violence of the inflammation.

It is needless to say, that it is impossible to discover, by the simple examination of these lesions, the nature of the poison taken into the stomach.

APPLICATION OF ALL THAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISONING BY MURIATE OF TIN.

If the patient is living, and the rest of the poison in a solid form can be procured, a small quantity should be dissolved in distilled water, and the solution examined, whether it present the characters we have detailed; a portion of the solid salt should

then be mixed with charcoal, and the whole should be heated in a crucible, with caustic potash (*Lapis infernalis*); the crucible should be covered with two or three pieces of charcoal, in order to prevent in some measure the volatilization of the muriate of tin: in the course of twenty, or five and twenty minutes, metallic tin, and muriate of potash, will be obtained, which may be separated by water. If the poison be dissolved, after having treated it by the same re-agents, the remainder should be evaporated and calcined in the same manner.

If it be attempted to discover the poisonous substance in the matter vomited, it will be necessary likewise to begin with the tests described; and although all the menstrua should furnish precipitates such as we have described, it will be indispensable, in order to pronounce with certainty, to extract from it the metallic tin, by drying the liquid, and calcining it in a crucible with potash.

When the poison, on account of having been rendered insoluble by its union with the alimentary matter, cannot be discovered in the fluids vomited; it will suffice as well, to dry and calcine the whole mass with potash: the presence of the revived metallic tin, will leave no doubt of the existence of a preparation of tin.

The same steps as we have just pointed out are necessary to be taken, in the case where the death of the patient allows of the fluids and solids contained in the digestive canal to be examined. In like manner the mucous membrane, and all the parts affected, should be submitted to calcination.

TREATMENT OF POISONING BY THE MURIATE OF TIN.

Is there any antidote to the muriate of tin?

In reflecting on the different substances which possess the faculty of suddenly decomposing the poison we are treating of, it appears to me that milk ought to unite the greatest number of advantages to oppose the destructive effects of this corrosive salt. I have consequently instituted a number of experiments, which have been followed by the most complete success.

From those experiments it follows, that milk does not act by the water which it contains, but because it exerts on the muriate of tin, a chemical action.

Guided by these facts, the physician called to the assistance of persons poisoned by this salt, will have immediate recourse to milk in very great quantity; in case of a deficiency of this article, he will inundate the patients with broth, warm water, or sweet and mucilaginous decoctions: by these means the poison will be found diluted and decomposed, and will be soon expelled, on account of the fulness of the viscus, which contains it. In the case where, in consequence of the rapid and energetic action of this poisonous substance, symptoms of inflammation of one or more of the organs of the abdominal cavity, should make their appearance, general and local bleedings will become necessary, with fomentations, and emollient and narcotic glysters. If the patient should fall a prey to alarming nervous symptoms, opiates and the least irritating antispasmodics should not be neglected.

Of the Oxyde of Tin.

I caused dogs of different sizes, to swallow varied doses of the protoxyde and deutoxyde of tin; these animals experienced the same symptoms as those mentioned in the preceding article. The ingestion of one or two drachms of these substances, has constantly killed them, producing similar lesions to those occasioned by all the corrosives.

ARTICLE THE SIXTH.

Species 6th. *Preparations of Zinc.*
Var. 1st. Sulphate of zinc.
2nd. Oxyde of zinc.

The preparations of zinc being much employed in medicine and in the arts, and their inconsiderate use being capable of occasioning serious accidents, we think it a duty to explain whatever relates to the kind of poisoning they may give rise to.

OF ZINC.

Zinc is a solid metal, of a bluish-white colour, and lamellated structure ; its specific gravity is 7.1.

When strongly heated in a crucible, it quickly goes into fusion : it absorbs all the oxygen of the atmosphere, and burns with a beautiful white flame, inclining to green, and extremely brilliant. The oxyde of zinc formed, is diffused through the atmosphere, and is there condensed into extremely light flakes of a beautiful white colour. This oxyde formerly bore the names of *Flowers of Zinc*, *nihil album*, *lana philosophica ;* &c. The metal may be extracted afresh, if collected, and calcined strongly with charcoal.

CHEMICAL HISTORY OF THE SULPHATE OF ZINC (WHITE VITRIOL).

The sulphate of zinc of commerce contains always sulphate of iron, and sometimes sulphate of copper. It is in the form of white masses, grained like sugar, often spotted with yellow. It has a pretty strong acrid, styptic, metallic taste ; and is soluble in twice and a half its weight of water, at 15°.

Thus dissolved it reddens the tincture of tournesol.

Potash and ammonia precipitate from it an oxyde of a greenish white colour, easily soluble in an excess of the latter of these alkalies. The oxyde obtained by potash, being washed, dried, and calcined with charcoal, is revived, provided the temperature be very much elevated.

ACTION OF SULPHATE OF ZINC ON THE ANIMAL ECONOMY.

The sulphate of zinc is, without dispute, of all the metallic salts, that which produces the fewest serious accidents. Being possessed of a high degree of emetic virtue, it is quickly expelled by vomiting, whenever introduced into the stomach. I might quote many cases in support of this fact.

If, instead of leaving an animal the power to vomit, the œsophagus should be tied after introducing into the stomach a sufficient quantity of sulphate of zinc, or if this salt be injected into the veins, life is destroyed at the end of a time that is variable.

To ascertain what are the organs on which this substance exerts its action, a number of experiments were made, and one in particular, whence it appears that the concentrated solution of the sulphate of zinc, introduced into the veins, acts by stupifying the brain; that it exerts also its action upon the lungs; but the quick recovery of the animal experimented upon, creates a belief that the pulmonic symptoms were purely symptomatic of the nervous affection under which he would have sunk, had he not been sufficiently strong to resist the first attack of the poison.

SYMPTOMS OF POISONING BY THE SULPHATE OF ZINC.

CASE.

" A young lady, pressed by ardent thirst, drank off at a draught " half a pint of a liquor which she took for lemonade, and which " unfortunately proved to be a solution of two ounces of white " vitriol: she only found out her error at the last mouthful, which " she threw away.

" An excessively astringent taste was perceived, and her throat " appeared contracted to such a degree as to cause an apprehen- " sion of strangulation. She had instantly recourse to milk and " oil, both alike nearly useless in a case like this.

" On my arrival, I found the lady in a dreadful situation, her " countenance pale and sunk, the extremities cold, the eyes dim, " and the pulse convulsive. Being informed of the cause of the " accident, I hastened to procure the remedies which I consider- " ed the most effective. Knowing that white vitriol was, before " the discovery of tartarized antimony and ipecacuanha, the " emetic most commonly employed by the ancients, I informed her " that it would soon act as such. In short, vomiting soon took " place; and I kept it up by giving warm water.

" Being certain that this method had caused the evacuation of a " great part of the poison, I set about decomposing the rest by " means of the fixed alkali diluted with sugared water. From " that moment the vomiting ceased. The burning heat which " the lady experienced at the stomach, subsided by degrees, and " in less than two hours yielded entirely to the use of the alkaline " solution. I ordered her to use a gargle of a little more concen- " trated solution of alkali, in order to decompose the vitriolic par- " ticles adhering to the throat and mouth, and which continued to " act upon those organs.

" The pulse being perfectly restored, I recommended for the " rest of the day, milk, broth, and linseed tea. I ordered likewise " the employment of glysters and warm baths, in order to calm " the degree of heat, which had now extended itself to the extre- " mities, as well as the irritation of the nervous system."

An astringent taste, sense of strangulation, nausea, copious vomitings, frequent stools, pains in the epigastric region, extending afterwards over the whole of the abdomen, difficulty of breathing, frequency of pulse, paleness of the countenance, and coldness of the extremities ; such are the symptoms which the saline substance we are describing gives rise to.

LESIONS OF TEXTURE PRODUCED BY THE SULPHATE OF ZINC.

It will be readily conceived, that the derangements produced by this salt cannot be very considerable, if it be remembered how confined its corrosive properties are. Neither do we find after the death of animals which have fallen victims to very strong doses of the sulphate of zinc (their œsophagus having been tied) any thing more than an inflammation, not very severe, of the membrane with which it had come in immediate contact : sometimes, some black blood is observed to be extravasated upon the muscular coat of the stomach and intestines. Mr. Smith has proved that the action of this salt, when applied to the exterior, is not constant. A dose of 36 grains has killed some animals ; 2 drachms have produced on others of the same size, nothing else but vomiting, and other accidents, which disappeared in the course of a few days.

APPLICATION OF ALL THAT HAS BEEN SAID TO THE DIFFERENT CASES OF POISONING BY THE SULPHATE OF ZINC.

The practitioner called upon to determine a case of poisoning produced by this salt, will act according to the rules laid down. If the poisonous substance has not been wholly swallowed, he will submit it to the action of the tests which are capable of recognizing it: in such cases where the salt is to be sought for in the matter vomited, or in that contained in the digestive canal, the analysis of this matter by the same menstrua, and above all the reduction of the sulphate of zinc to the metallic state, are the only means capable of enabling him to decide with certainty. This reduction, which is difficult to effect, will always take place by heating to redness in a crucible, strongly, and for a long time, the masses of the salt evaporated, dried, and mixed with caustic potash.

TREATMENT OF POISONING PRODUCED BY THE SULPHATE OF ZINC.

The physician called to the assistance of persons who have swallowed too strong a dose of sulphate of zinc, should always keep in view, how strong an emetic property it possesses; he will consequently endeavour to promote the vomiting, by giving to the patient a great quantity of warm water and emollient drinks, amongst which the preference should be given to milk, which possesses likewise the power of effecting the decomposition of the saline substance: this animal fluid ought to be preferred to alkaline solutions, which are generally of too irritating a nature. Emollient glysters frequently repeated, will also give great relief, especially when the poison has passed the pylorus, and is found in the intestinal canal. General bleedings, leeches, and warm baths are the means which should be had recourse to when inflammation of the abdomen is threatened, or when it shall have already appeared. If the patient should be endued with an excessive degree of nervous irritability, and be attacked with obstinate vomiting, so that there should be reason to believe that the whole of the poison

has been expelled, this alarming symptom alone should then be attended to, and opiates administered without delay.

OF THE OXYDE OF ZINC.

The oxyde of zinc is white, extremely light, and soft to the touch; it easily dissolves in the sulphuric acid, and gives rise to the sulphate of which we have just been giving the chemical history: these characters, added to those we have before described in speaking of metallic zinc, are sufficient for recognizing it. I have given this oxyde to small and weak dogs, in the dose of from three to six drachms. They were attacked with vomitings, without suffering much; and their health was soon re-established.

ARTICLE THE SEVENTH.

SPECIES VII.—PREPARATIONS OF SILVER.

VAR. *Nitrate of Silver.*

The nitrate of silver is a powerful corrosive poison; we are of opinion that the attention of physicians should be called to a substance employed for a long time past as a hydragogue cathartic, and which is at this day recommended by able practitioners in the epilepsy.

OF SILVER.

Silver is solid, of a beautiful white colour, extremely brilliant. Its ductility is very great. Its specific gravity is as 10.4743.

Pure silver is not poisonous.

OF THE NITRATE OF SILVER.

This salt crystallizes in thin plates, very broad, of a beautiful white colour, the forms of which are extremely various. Its taste is bitter, acrid, and very caustic.

When thrown on burning charcoal, it enlivens its combustion, swells, puffs up, and goes into decomposition, with a disengagement of vapours of nitrous acid gas of an orange yellow colour:

the metallic silver remains upon the charcoal with all its usual lustre.

Potash, soda, and lime water, produce a precipitate of the oxyde of silver of a deep brown: whilst the nitric acid is united to the base employed.

It is not disturbed by ammonia, which depends upon the solubility of the nitrate of ammoniacal silver thus formed.

OF THE LAPIS INFERNALIS (LUNAR CAUSTIC).

The lunar caustic is nothing else than the neutral nitrate of silver cast.

It is usually seen in the shape of small cylinders of a blackish brown outside, presenting radiated lines on fracture.

When placed on burning charcoal, it causes it to burn with greater intensity (a character belonging to all the nitrates), swells, bubbles up, becomes decomposed, and leave metallic silver easy to be known, especially when rubbed with a hard body in order to make it acquire its peculiar lustre and brilliancy.

ACTION OF THE NITRATE OF SILVER ON THE ANIMAL ECONOMY.

When injected into the veins, this salt gives rise to the most alarming symptoms, even when employed in a very small dose; it almost always occasions death; its action is much less powerful when introduced into the stomach. What are the organs which first receive so fatal an impression? I have undertaken a series of experiments in order to throw light upon this question.

After repeating them with much care, we are of opinion that the nitrate of silver, when introduced into the stomach, induces death by corroding the texture where it may come into contact, and by producing an inflammation more or less considerable. It is probable, that if, instead of exhibiting thirty-six grains of this salt, three or four drachms had been employed, life would be destroyed in a few hours: the stomach in that case, being strongly irritated and inflamed, would have produced a re-action upon the

brain, by means of the numerous nervous ramifications which connect those two organs together.

SYMPTOMS OF POISONING PRODUCED BY THE NITRATE OF SILVER.

Boerhaave relates, that a student in pharmacy swallowed some lunar caustic, and serious symptoms resulted from it: excruciating pains, gangrene, and sphacelus of the first passages, were the speedy effects of this poison.

The nitrate of silver exhibits the same symptoms as those of which we have already given an account several times, when speaking of *corrosives:* for which reason we shall confine ourselves to this simple description. It may sometimes happen that the borders of the lips and the space round the chin be covered with purple spots, particularly when this salt has been taken in a fluid state. It is, moreover very probable, that in this kind of poisoning, the mucous membrane which lines the inside of the mouth may sometimes present eschars of a grayish white, similar to those produced by a cylinder of the lunar caustic on a wound.

LESIONS OF TEXTURE PRODUCED BY THE INGESTION OF THE NITRATE OF SILVER.

When the action of this salt has not been sufficiently powerful to reduce the mucous membrane of the stomach to a state like boiled meat, a redness of this membrane is perceived, more or less intense, and more or less general: several points of its texture are, as it were, scarified, and the colour of the eschars is of a grayish white, or of a very deep black. This remarkable change takes place principally when the nitrate of silver has been taken in a solid form. If the mucous membrane be destroyed, the muscular coat of the stomach is found very much inflamed, of a bright red colour, and scarified in various places; sometimes its action has been carried to such a length that one or several perforations are perceived. It is easy to conceive, that the œsophagus, the pharynx, and the inside of the mouth, may, under certain circumstances, be the seat of similar morbid alterations.

If it should be necessary to discover the nitrate of silver amongst the fluids vomited, or those contained in the stomach of a person deceased, they must be filtered and essayed by the reagents proper for discovering this salt, paying attention always to the changes of colour which the different kinds of aliments and drinks may produce in the precipitates. This first examination being terminated, the fluids should be evaporated and calcined, to obtain the metallic silver.

If these trials should prove insufficient, the poison must be sought for in the solid matter vomited, in the parts that have been scarified, and lastly, in the alimentary matter contained in the stomach. By desiccation and calcination of these substances, the metallic silver will be easily separated, the characters of which we have described.

TREATMENT OF POISONING BY THE NITRATE OF SILVER.

Is there any antidote to the nitrate of silver? I have attempted to resolve this problem by submitting a number of animals poisoned by this salt, to the action of certain chemical tests.

Experiment 1st. The œsophagus of a small dog was detached and perforated; thirty-six grains of the nitrate of silver dissolved in an ounce of distilled water were introduced into the stomach, being previously mixed with two drachms of muriate of soda dissolved in two ounces of water: the œsophagus was then tied below the opening to prevent vomiting. An hour afterwards the animal appeared a little dejected, and made slight efforts to vomit. He died at the end of the fourth day, without shewing any other symptoms than dejection.

Appearances on Dissection.—The mucous membrane of the digestive canal was in its natural state, and *presented no eschar*.

Another animal was submitted to the same experiment, excepting that the two fluids were introduced into the stomach separately, and one immediately after the other. Death supervened on the fifth day, without discovering the smallest eschar either in the stomach or intestines.

We do not hesitate to conclude from these facts, that the muriate of soda dissolved in water "is an antidote to the nitrate of silver;" it is in truth necessary that it be administered a very short time after the ingestion of the poisonous substance, the rapid action of which gives rise to lesions, which when once produced, can by no means be cured by the salt which we recommend.

The physician called in to the assistance of persons who may be poisoned by this salt, should have recourse to copious draughts of water, slightly salted, without being at all afraid of the developement of heat, which might be the consequence of the administration of this medicine. The advantages resulting from neutralizing the deleterious salt by efficacious means, do not allow of hesitation in so urgent a case. Emollient, mucilaginous, and sweet drinks may be afterwards employed to calm the irritation produced by the poison. In those cases where inflammation of the abdomen is indicated by the symptoms which characterize it; general and local bleedings, warm baths, emollient fomentations, and glysters must be had recourse to.

ARTICLE THE EIGHTH.

SPECIES VIII.—PREPARATIONS OF GOLD.

VAR. 1. *Muriate of Gold.*
2. *Fulminating Gold.*

Gold, which has been long banished from the materia medica, possesses, when dissolved in the muriatic acid, properties extremely energetic, which might render it a medicine of great utility in certain syphilitic affections; for which reasons the practitioners of our days do not hesitate to employ it in such affections, taking always the necessary precautions to prevent danger. The symptoms which result from the introduction of a ninth of a grain of the muriate of gold into the stomach, induced me to conjecture that it was possessed of mischievous qualities, and experience has not failed to convince me, that it may be justly ranked amongst the poisonous substances. I shall prefix to its chem-

ical history some ideas on the metal which enters into its composition.

OF GOLD.

Gold is a solid metal; of a very brilliant yellow colour, the most ductile, and the most malleable of all bodies; its specific gravity is as 19.257.

When exposed to the action of caloric in the open air, it fuses only above a red heat, without absorbing the smallest quantity possible of oxygen: there are, however, two oxydes of gold of a brown colour capable of being decomposed by the simple action of heat or of light, and of yielding pure metal.

In its metallic state, gold possesses no poisonous property.

OF THE DEUTO-MURIATE OF GOLD.

The deuto-muriate of gold crystallizes in needles of a deep yellow colour, and of a strong styptic taste.

When thrown on burning charcoal, it becomes decomposed, and converted into metallic gold, muriatic acid gas (hydro muriatic gas), and oxygenated muriatic gas (chlore).

It strongly attracts the moisture of the atmosphere, and dissolves very well in water. The solution, which is of a yellow colour, variable, reddens the tincture of tournesol, and stains the skin purple.

ACTION OF THE DEUTO-MURIATE OF GOLD UPON THE ANIMAL ECONOMY.

M. Chretien, in a work entitled, *Methode Iatraleptique* asserts, "that the muriate of gold is infinitely more active than the corro-"sive sublimate, but that it is less irritating to the gums; admin-"istered in the dose of a tenth part of a grain daily, it occasioned "in one instance a strong fever. The excitement produced by "this salt, if restrained within due bounds, is never accompanied "with any notable or even sensible lesion of the functions. The "mouth is in a proper state, the tongue moist; the appetite does "not fail, nor do the alvine discharges undergo any derangement; "there is generally only an increase of the urine, or perspiration;

"but in pushing the dose too far, there is a risk of producing a "general irritation of the system, inflammation of one or other "of the organs, according to the disposition of the person; the "fever is announced by an unusual and continued heat of the "skin." (2nd edition, pp. 398 and 399.)

Several experiments, tried upon dogs, have proved to me that this salt acts with much less strength than the corrosive sublimate, when introduced into the stomach; the same thing however does not occur, when it is injected into the veins: its action is then most murderous.

These experiments prove incontestably that the muriate of gold, when injected into the veins, produces death, by acting upon the lungs.

It follows also, that the deuto-muriate of gold, introduced into the stomach, acts as a corrosive, and that the animals sink under the inflammation which it produces, in the coats of the digestive canal.

We are not acquainted with any case of poisoning by this salt; we are consequently obliged to refer our readers to the preceding article for the history of the symptoms and organic lesions.

APPLICATION OF ALL THAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISONING BY THE DEUTO-MURIATE OF GOLD.

The chemical properties explained above will suffice to recognise this salt when it is unmixed. If it should be necessary to seek for it in the matter vomited, or in that which may be in the stomach after death; it must be filtered in order to obtain the liquid part, and tried by the tests necessary for determining the existence of this saline solution, relying principally on the separating of the metallic gold by means of evaporation and calcination: a few minutes of a red heat will suffice to effect the reduction of that salt. In those cases where the menstrua may furnish, with the solution of muriate of gold, precipitates of a different colour to those we have mentioned, or that they produce no disturbance in the fluid, it will be indispensable to have recourse to calcination, in order to obtain the metal, which is easily recognised by its yel-

low colour, and divers other characters. This case will occur as often as the aliments and fluids of the stomach shall have altered or decomposed the deuto-muriate of gold.

TREATMENT OF POISONING PRODUCED BY THE DEUTO-MURIATE OF GOLD.

To favour the vomiting, by gorging the patient with demulcent and mucilaginous drinks, to prevent, or to stop the progress of the inflammation of the abdomen, by the use of general and local bleedings, warm baths, glysters, and emollient fomentations; such are the means to which the man of science will have recourse, in order to re-establish the different functions, which have been affected by this poisonous substance. This treatment, similar to those we have mentioned at length in the article of different corrosives, presents no particular indication.

OF FULMINATING GOLD.

Fulminating gold is composed of ammonia, and deut-oxyde of gold: it is solid, insipid, without smell, of a yellow colour, and is heavier than water.

When placed in a very small quantity upon the blade of a knife, and exposed to the flame of a candle, it detonates strongly in the space of two or three minutes, producing a report nearly as loud as that of a pistol. The same phenomenon takes place when it is suddenly rubbed, or when it is exposed to the focus of a burning lens.

A child of six months old, was made to take six grains of fulminating gold in powder, with the intention of relieving the violent gripings, with which it was affected. Shortly after, its extremities became cold, it was agitated with convulsive movements; and it died in a state of anxiety and extreme uneasiness.

Rivinus mentions, having found holes in the intestines of a child poisoned with fulminating gold.

ARTICLE THE NINTH.

SPECIES IX.—PREPARATIONS OF BISMUTH.

VAR. 1st. *Nitrate of Bismuth.*

2nd. *Subnitrate of Bismuth (Blanc de fard).*

The preparations of bismuth have been greatly extolled of late, for correcting certain spasmodic affections: it appears incontestable that their employment has been sometimes attended with advantage. Nevertheless, M. Odier, who has had frequent opportunities of administering these kinds of preparations, has witnessed, that, under certain circumstances, they occasioned vomitings, diarrhæa, or constipation, an unpleasant heat in the breast, wandering shiverings, vertigoes, and drowsiness. M. Guersent has also seen the oxyde of bismuth produce colics, and anxiety, but without any evacuation*. The experiments we have tried with these compositions upon living animals, leave no doubt of their poisonous qualities: therefore we do not hesitate, after the example of Plenck, Foderé, &c. to rank them amongst the poisons of the mineral kingdom. We shall prefix to their chemical history, some general notions concerning the metal which forms their base.

OF BISMUTH.

BISMUTH is a solid metal, of a yellowish white colour, extremely brittle, exhibiting a texture of bright and large lamina. Its specific gravity is as 9.822.

* This substance has of late been employed in this country with success; whatever opinion may have been entertained of its efficacy, by the French practitioners. Its use appears to be limited to the treatment of gastrodynia, pyrosis, and other affections connected with debility of the digestive organs. It is given in doses of two and three grains, repeated twice and even three times a day. Dr. Samuel W. Moore, of New-York, has written an inaugural dissertation on this subject; and Dr. Thatcher, in his American New Dispensatory, second edition, also speaks very highly of it.

J. G. N.

Bismuth dissolves extremely well in the nitric acid; the solution, properly evaporated, furnishes prismatic crystals of rather a large bulk, known by the name of *nitrate of bismuth.*

OF THE NITRATE OF BISMUTH.

This nitrate, when crystallized, may be divided by distilled water into two very distinct parts: one soluble; the other insoluble.

The soluble portion, *(acid nitrate)* which is colourless, reddens the tincture of tournesol, and is possessed of a syptic, caustic, disagreeable flavour.

When brought into contact with a great quantity of water, it presents nothing remarkable, the instant the mixture is made; but after some time it is found decomposed, becomes milky, and precipitates a small quantity of *sub-nitrate of bismuth* of a white colour: there remains in the fluid, nitrate of bismuth, still more acid than that we have described.

PROPERTIES OF THE SUB-NITRATE OF BISMUTH *(BLANC DE FARD).*

The sub-nitrate of bismuth is generally seen in the shape of white flakes, or of little lumps like mother of pearl. It is insoluble in water.

The *blanc de fard*, when strongly calcined with charcoal, loses its nitric acid, and the oxygen which partly constituted it; and the bismuth is set at liberty.

ACTION OF THE NITRATE OF BISMUTH ON THE ANIMAL ECONOMY.

The preparations of bismuth which contain oxygen, are possessed of poisonous properties sufficiently energetic: if injected into the veins, or introduced into the stomach, they are capable of producing death in a very short time. I have attempted to ascertain what is their mode of acting.

And there is no doubt, from my experiments, that the nitrate of bismuth, injected into the veins, exerts its principal action upon the nervous system.

It follows also from experiments, that the nitrate and sub-nitrate of bismuth, when introduced into the stomach, corrode that viscus, and act at the same time upon the lungs. It does not appear at all doubtful, that the nervous system, being excited by sympathy, is the principal cause of death, especially where life is destroyed in a very short space of time.

SYMPTOMS AND LESIONS OF TEXTURE PRODUCED BY THE NITRATE OF BISMUTH.

Anguish, with very alarming anxieties, nausea, vomitings, diarrhœa, or constipation, colics, an uncomfortable heat in the breast, wandering shiverings, vertigoes, and faintings, are the symptoms which the use of this salt has produced on the human frame. Our experiments on living animals, have shewn us that it is capable of rendering the respiration extremely difficult, and that death was sometimes preceded by convulsions. The want of instances of this kind of poisoning, prevents us from giving a more extensive view of the subject.

APPLICATION OF WHAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISONING BY THE NITRATE OF BISMUTH.

If the salt be free from mixture, it must be treated by boiling distilled water, which will dissolve only a part of it: the portion dissolved will act with the tests in the manner we have described. The insoluble residue, when treated by the nitric acid by heat, furnishes the acid nitrate of bismuth, the characters of which we have laid down. If the first experiments induce a belief that the compound under examination is either the nitrate or sub-nitrate of bismuth, the certainty of the fact may be ascertained by calcining it with charcoal in a crucible, and extracting the revived metal.

Camerarius mentions an adulteration of wine, by bismuth oxydized and dissolved in some acid. Should the practitioner be called on to detect this fraud, he will attend to separating the metallic bismuth by evaporating the fluid, and calcining it in a crucible with charcoal.

The bakers have sometimes made use of the oxyde and sub-nitrate of bismuth, in order to render their bread heavier and whiter. It is chiefly in England that flour has been thus adulterated. (Vide *Gazette de Santé, by Manning*). If the mixture be calcined in a crucible at a very high temperature, the vegeto-animal parts of the bread and flour will be soon decomposed, giving rise to several volatile productions, and to charcoal, which remains in the crucible, and revives the oxyde. If the metal obtained by this process possesses the properties described; the practitioner may rest assured that it formed part of some preparation of bismuth.

When neither the fluids vomited, nor those found in the stomach after death, furnish by chemical examination any of the signs necessary for pronouncing with certainty on the case of poisoning, by the nitrate or sub-nitrate of bismuth, we must then endeavour to discover whether the salts have not been decomposed by the food with which they are combined, perhaps intimately; to this end, after having dried all the alimentary parts that are solid, membranous, &c.; they must be calcined in a crucible, in order to obtain from them the metal.

TREATMENT OF POISONING BY THE NITRATE OR SUB-NITRATE OF BISMUTH.

The different experiments we have made upon living animals, enable us to affirm, that of all the articles of medicine, milk, and sweet mucilaginous drinks, deserve the preference in the treatment now under consideration. Leeches, general bleedings, glysters, and fomentations, ought to be employed, when the symptoms give reason to apprehend the existence of inflammation of one or more organs.

ARTICLE THE TENTH.

SPECIES X.—THE CONCENTRATED ACIDS.

VARIETIES. *The Sulphuric, Nitric, Muriatic, Phosphoric, &c. &c. Acids.*

OF THE SULPHURIC ACID.

IT would hardly be thought, at a first view of the subject, that sulphuric acid would ever be employed by the unfortunate for the purpose of *suicide*. The horrible taste which it possesses, the energy with which it corrodes almost all bodies, whether organized or unorganized, would appear to cause it to be rejected by the numerous class of mechanics, to whom these properties are perfectly well known. Unfortunately, experience proves that this powerful caustic has been had recourse to more than once, the activity of which has been thought to be modified by introducing it by the anus: death has generally quickly followed its ingestion. How often too have we seen, by a fatal carelessness, this acid produce the most terrible accidents!

These general considerations are sufficient to exhibit the importance of describing minutely whatever relates to this kind of poisoning.

CHEMICAL HISTORY OF THE SULPHURIC ACID (OIL OF VITRIOL).

The sulphuric acid is composed of

Sulphur, about	42 parts
Oxygen,	58
	100

Pure sulphuric acid is found in the form of a colourless fluid, void of smell, and of an oily consistence; it possesses an extremely strong acid taste, and its specific gravity is greater than that of water, the most concentrated weighs about 1,85. It reddens all the vegetable colours which are susceptible of it; a sin-

gle drop is sufficient to give a red colour to a very great quantity of the infusion of tournesol ; it blackens, and reduces to a pulp, all animal and vegetable substances.

ACTION OF THE SULPHURIC ACID ON THE ANIMAL ECONOMY.

A small quantity of this powerful caustic is sufficient to produce the most serious accidents, succeeded almost always by death, and this occurs, whether it be injected into the veins, or taken into the stomach, or even applied to the external surface of the body.—In what manner does this acid produce death ?

We must conclude. 1st. That the sulphuric acid injected into the veins, destroys life, because it coagulates the blood, by exercising upon it a true chemical action, so much the more powerful as the quantity injected is more considerable. 2ndly. That when introduced into the stomach, it produces a speedy death, by inducing inflammation and disorganization of that viscus, which quickly re-acts upon the brain, by means of the numerous nervous ramifications. 3dly. That when applied externally, the animal sinks under the first effects of the burning it occasions, or else the copious suppuration which succeeds.

SYMPTOMS OF POISONING BY THE SULPHURIC ACID.

Observation 1st.

Joseph Parangue, a soldier, about the end of January, 1798, between seven and eight o'clock in the morning, swallowed, precipitately, and by mistake, instead of brandy, a full glass of sulphuric acid (oil of vitriol); he drank it off at once, with his head held back, and pouring it from a distance above his mouth, by which means he did not discover his mistake until he recovered his breath. He was instantly conveyed to the hospital: being informed of the accident, I arrived there at the same time as the patient. Excessive vomitings had already taken place, as well as convulsive agitations of the muscles of the face and lips, being the first effects of the excessive pains he complained of

throughout the whole extent of the parts with which the poison had been in contact. He said that he felt cramps excessively painful in the breast, and an acrid, burning heat in the throat, along the œsophagus, and in the stomach. An icy coldness extended over the body: I found the pulse small, concentrated, irregular: I will say more, almost convulsive, tremulous, at one time very quick, at another slow and suspended; his breathing was difficult, and the whole epigastric region painful; but what I more particularly paid attention to, was the extreme melancholy state of the patient. It is difficult to give an account of his state of terror; he considered himself altogether without a chance of recovery; his eyes were dim, and he performed only some feeble motions. I instantly told him of a certain antidote, of a counter-poison which has never failed in its effect; I raised by this his courage, and gave him a draught composed of half a glass of simple water, with which a drachm and a half of carbonate of magnesia had been mixed; his eyes became a little animated, and his weakness appeared rather less; the idea of a speedy and real cure suspended for a moment the formidable train of moral symptoms, which were of themselves capable of conducting the patient to the tomb. Half a quarter of an hour after, he vomited again, but less, and with less exertion and fatigue. I gave him half a drachm more of the carbonate of magnesia, and he complained then only of nausea; his internal pains were less acute. I continued the remedy in the dose of a scruple every half hour, and caused him to take in the intervals, a few glasses of a solution of gum arabic sugared. Before noon the symptoms had diminished sensibly in violence; his breathing was more free, the anxieties of the præcordia had nearly ceased, the internal sensation of tearing very much weakened; the pulse rose, unfolded itself, and became regular; a genial heat was diffused over the whole body.

I had succeeded in checking the destructive and deleterious effects of the caustic fluid; but there remained still to remedy the disorders which its immediate contact in the interior had occasioned.

A copious bleeding from the arm at one o'clock; emollient fo-

mentations to the stomach and the whole of the abdomen during the rest of the day, and an opiated and camphorated liniment during the night; a drink of linseed tea with gum arabic and syrup of marshmallows, taken warm and copiously, &c. &c. prevented those consecutive accidents which an event of this nature would give reason to dread; a glyster with honey, given in the evening, produced bilious evacuations tolerably abundant, and six drachms of the syrup of diacodium added to a glass of ptisan, procured rest during the night; his sleep was however light, and was often interrupted by pains which the patient felt at his stomach, and still more, and in a stronger degree, in the throat. The next day at my morning visit, I examined this last part with attention; almost the whole of the mouth was excoriated; the *velum palati*, its anterior and even its posterior columns, the *amygdalæ*, and the uvula, were covered with white, and seemingly superficial eschars on the sides, and with black and deeper ones on the soft appendage of the palate. The whole of the fauces appeared to be strongly burnt. Fortunately deglutition was not prevented; it was not even painful or laborious, compared to the accompanying symptoms. A lenitive and mucilaginous drink was administered, with a white linctus taken frequently by a spoonful at a time, two glysters in the twenty-four hours, emollient fomentations upon the abdomen, during the day, and the lenitive was continued during the night: every kind of food was forbidden. On the third day the patient complained greatly of his throat, and a fresh panic seized him; he thought himself threatened with suffocation, and the danger appeared to him to be imminent. The tumefaction of the burnt parts had increased, and the root of the tongue was elevated and corroded, the epiglottis also partook of the disease: all these parts were burning with a violent and consuming heat: the uvula elongated and covered with sloughs, the *amygdalæ*, already in a gangrenous condition on their anterior surface, and grayish, or aphthous spots scattered here and there over the fauces, presented the appearance of a gangrenous sore throat of the worst kind. The voice too had undergone a considerable alteration.

On the fourth day, a soft and fleshy portion, which became

detached from the uvula, by elongating it, tormented the patient in a most grievous manner in the throat, by producing an irritation, and exciting a cough which was both fatiguing and annoying on account of its frequency. His breathing became more difficult, and sometimes interrupted, sometimes attended with a hissing noise, especially during inspiration; and his voice assumed the peculiar character of that which occurs in the species of quinsy known by the name of the *Croup*.

The mucilaginous drinks, the white linctus, or one made of spermaceti, oil of sweet almonds, yolk of egg, and syrup of marshmallows, served at the same time for drink, gargle, and nourishment. I touched the diseased parts several times in the day with lint dipped in a mixture of honey of roses, and tincture of myrrh: I afterwards added the collyrium of Lanfranc, sharpening the whole with an equal quantity of decoction of agrimony. External anodyne applications were not neglected, as well as cataplasms of bread boiled in a decoction of camomile and melilot. As fast as I could seize hold of the loose sloughs with the forceps, I cut them away, in order to free the throat quickly from them.

On the fifth day I beat up a yolk of an egg, with a glass of ptisan, which was taken at two different times, in order to lubricate and cover the parts of the fauces which were excoriated, and to prepare them for taking a little nourishment; otherwise the same medicines were continued.

On the sixth: a similar treatment, and the yolk of egg, morning and evening. The external swelling of the throat almost dissipated altogether, the tumefaction within also greatly diminished, the sloughs in a great measure fallen off, and many of the ulcers quite clean.

On the seventh; still better: from this day all danger may be considered to have disappeared: the quantity of medicine and attentions have been diminished in proportion as food has been had recourse to.

I forgot to mention, that a drop of the sulphuric acid had fallen upon the upper lip at the moment of the accident, and produced a slough which made a long resistance. For a still longer period

this soldier retained a redness and painful sensibility in the throat, as well as a painful sensation at the stomach, especially when he ate hastily, or food that was indigestible.

The following are the symptoms of poisoning by the sulphuric acid: an austere, acid, styptic, and very disagreeable taste; an acrid and burning heat in the throat, along the œsophagus and in the stomach; an acute pain in the throat, an intolerable fœtor of the breath, nausea, and excessive vomitings. The fluid vomited, is at one time black as ink, at another time reddened by arterial or venous blood, and produces in the mouth a sensation of bitterness and stypticity quite intolerable; it effervesces on falling on the pavement; constipation, or sometimes bloody stools; gripes and excruciating pains over the abdomen, which part will not bear the slightest pressure; pains of the breast; difficulty of breathing; anxiety, anguish; the pulse frequent, small, concentrated, and irregular; a constant sense of coldness of the skin, horripilations; extreme dejection, great restlessness and agitation; the countenance not much altered at first, but afterward undergoing a great change; convulsive startings of the muscles of the face and lips, free exercise of the intellectual faculties, and sometimes an eruption of pimples upon the skin. Frequently the uvula, amygdalæ, *velum palati*, &c. covered with sloughs either white or black, which, on becoming detached, torment and irritate the patient, and produce a fatiguing cough; the voice in that case becomes altered, and similar to what is heard in the croup.

LESIONS OF TEXTURE PRODUCED BY THE SULPHURIC ACID.

If the sulphuric acid has been swallowed without mixture with any other substance, there are seen after death alterations more or less profound in the texture of the parts with which it has come in contact: at one time, there is only a redness of the pharynx and stomach; at another, these parts are wholly or in part ulcerated, or gangrenous, or reduced to a black jelly. The phenomena observed in the dead body will be somewhat different when this acid contains indigo in solution. This preparation, known under the

name of *blue composition*, is employed in dying, and is often used by persons to destroy themselves. We consider it necessary to call the attention of physicians to the condition of the bodies of persons who have died in consequence of the use of this mixture.

APPLICATION OF ALL THAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISONING BY THE SULPHURIC ACID.

If this acid is without mixture, it is easily known by its specific gravity, by its action, when united with cold water, on the salt of barytes, on straw, matches, &c.: lastly, by the decomposition it undergoes when boiled with mercury.

When the sulphuric acid is combined with wine or vinegar, the practitioner will easily determine its presence by operating as directed.

If it should be necessary to decide upon the existence of this acid in the *blue composition*, it will be easily affected by paying attention to the following directions. 1st. This liquor is of an excessively deep colour; it is thicker than the sulphuric acid, and its consistence is extremely oily. 2ndly. It reddens the tincture of tournesol, and raises the temperature of water, when a small quantity of it is combined with this liquor. 3dly. If evaporated to dryness it gives out very thick white vapours, of a very poignant smell, which depends upon the volatilization of part of the sulphuric acid; there remains in the capsule some shining charcoal. 4thly. When heated with mercury, it is decomposed, and gives out sulphureous acid gas, easy to be distinguished by its poignant smell, similar to that of burning brimstone. 5thly. Lastly; if the sulphuric acid be saturated by a solution of caustic potash, it changes to a green colour; if it be evaporated in this state, dried, and calcined, during a quarter of an hour, it leaves a charcoal proceding from the decomposed indigo and sulphate of potash. This salt may be dissolved in water, and converted into an insoluble sulphate of barytes, by means of a sufficient quantity of some soluble salt of barytes. It will be much better to precipitate the sulphuric acid thus, when the indigo has been

decomposed by fire, than to put a salt of barytes into the *blue composition* itself, diluted with water.

If the acid should be found amongst the fluids vomited, or those contained in the stomach, a portion of this matter should be boiled with metallic mercury, in order to obtain the sulphurous acid gas: another portion should be saturated with carbonate of lime, and the sulphate of lime formed should be treated in the following manner. In order to demonstrate the existence of sulphuric acid, in this precipitate, we should begin; 1st. by dissolving a portion of it, in boiling distilled water; the solution being filtered, and in contact with the water, or muriate of barytes, will furnish a precipitate of sulphate of barytes insoluble in water, and in nitric acid; 2nd. the other portion should be mixed and calcined, with one fourth of its weight of charcoal finely powdered, at a high temperature; a decomposition will ensue, and the sulphuret of lime be formed, which may easily be recognized. The water and salts of barytes would be of no utility, without taking the precautions we have pointed out; because a certain quantity of sulphates may be found in the stomach.

TREATMENT OF POISONING BY SULPHURIC ACID.

Is there any antidote to the sulphuric acid?

In examining with attention the different chemical re-agents capable of arresting the fatal action of this poison, I have been of opinion that the calcined magnesia, proposed by Peltier, and employed in the case of a man, by M. Desgranges, is the medicinal substance which might be administered with the greatest success.

From experiments made we may draw the following conclusions. 1st. That magnesia administered a very short time after the injection of the sulphuric acid, does not prevent the poisoning of animals whose œsophagis have been tied, even when employed in a dose double what is necessary for the neutralization of the acid. 2nd. The dogs to whom it was given, nevertheless suffered much less than those who had taken nothing but water; they lived longer, and the texture of their organs was less

corroded. It is probable that if, instead of tying their œsophagus, they were left at full liberty to vomit, and the medicine had been repeated to them several different times, all the portions of the sulphuric acid concealed in the foldings of the mucous membrane, would have been neutralized, and the force of the poison greatly diminished; and, perhaps, by these means the health of the animal might be restored. 3dly. That practitioners ought not to flatter themselves with the hope of arresting the mischief produced by the sulphuric acid, by the use of this remedy, only when it can be given in a very short time after the accident has taken place, and repeated several different times.

From these considerations it follows, that the physician ought, without losing an instant of time, to ply the patient with copious drinks, containing magnesia in suspension. If this cannot be procured, soap and water may be administered with advantage, mucilaginous drinks, milk, and even warm or cold water, ought to be thrown in in great abundance, until the medicine we have spoken of can be procured. It must never be lost sight of, that success in this case depends upon the activity of the practitioner: a few moments delay will completely change the fate of the patient, as the sulphuric acid destroys the texture of the organs with a fearful celerity. After having neutralized the caustic we must endeavour to remedy the mischief it has produced. If the symptoms, notwithstanding the degree of abdominal inflammation, do not already announce the corrosion of the digestive organs, general and local bleedings should be employed, and emollient glysters, continuing the use of sweet and mucilaginous drinks. The mischief produced in the mouth by this acid, ought to be considered as a local disease, and to be treated by the method which succeeded so well in the case which forms the subject of the case stated.

OF THE NITRIC ACID *(AQUA FORTIS)*.

A slight glance over the numerous cases of poisoning collected up to the present time, is sufficient, to become convinced, that of all the mineral poisons, the nitric acid is that which has been the most frequently employed for the purpose of suicide, and

the effects of which have been the most fatal; this two-fold consideration induces us to enter minutely into the details of its history.

PHYSICAL AND CHEMICAL PROPERTIES OF THE NITRIC ACID.

Pure nitric acid is in the form of a colourless fluid; it is possessed of an odour, and acid taste so acrid and caustic, that it burns and destroys organized matter; its specific gravity is as 1.554. A single drop of this acid reddens a great quantity of infusion of tournesol. It instantly colours the skin or other parts of animals, giving to them a tinge more or less yellow.

ACTION OF THE NITRIC ACID UPON THE ANIMAL ECONOMY.

This poisonous substance, possessed of a corrosive property extremely energetic, acts upon the animal economy with a tremendous rapidity, producing the most serious symptoms, succeeded almost constantly by death. A number of experiments place this truth beyond all doubt.

1st. Twenty-six grains of nitric acid of commerce, mixed with ten grains of distilled water, were injected into the jugular vein of a robust dog, above the middle size. Immediately after, the animal experienced a great degree of agitation in his limbs; he uttered plaintive moans, and died in the space of two minutes. He was opened immediately: the flesh was palpitating; the beating of the heart was hardly sensible, the blood contained in the left ventricle consisted of great clots of a gelatinous appearance, of a blackish red colour, floating in a small quantity of fluid blood of the same colour: the arteries also of the thorax contained blood not coagulated. The lungs were of a rose colour, and but little crepitating.

2nd. Nitric acid was introduced into the stomach of several dogs whose œsophagi were tied in order to prevent vomiting. They died at the expiration of two, three, or four hours, with the same symptoms as those we have described in giving the history of sulphuric acid.

On opening them, the stomach was found corroded, and disorganized in some points, without however our being able ever to detect any shades of yellow. The duodenum presented a lining of *yellow matter* proceeding from the decomposition of a portion of the bile.

These facts evidently prove that the nitric and sulphuric acids occasion death by an action in every respect similar.

M. Tartra, in his beautiful work on the nitric acid, has related a great number of experiments upon dead bodies, the results of which deserve to be explained here, as completing the solution of the problem which we are upon.

1st. Two ounces of nitric acid were introduced into an empty stomach, isolated from the body, and still attached to the œsophagus—it was left there during twelve hours: there were disengaged, a great quantity of nitrous gas, afterwards azotic gas, and carbonic acid: the great body of the viscus and its long curvature exhibited very broad spots, which, at the same instant, appeared white on the exterior surface of the organ, and shortly after became yellow. At the end of several hours the extent of these spots was greatly augmented; the coats of the stomach, which were become very yellow within and without, had a greasy appearance; within this viscus was found about two ounces of a liquid substance extremely thick, of a beautiful yellow colour, formed almost entirely of the nitric acid weakened. When the acid was allowed to remain in the stomach for four days, this viscus was in some measure dissolved; it went to pieces on the slightest touch; it could easily be reduced into a kind of greasy paste of a very beautiful yellow colour, capable of producing a speedy oxydation on iron and copper by its contact.

2nd. A quantity of pure water, wine, brandy, milk, broth, &c. were introduced into the stomach; after which were added two ounces of nitric acid: this corrosive, remarkably weakened, exerted an action much less energetic, as it was diffused over a greater number of points; almost the whole of the internal coat appeared to be affected: it had acquired a yellow tinge, appeared to be slightly thickened; felt unctuous under the finger, and separated easily from the external membranes.

3rd. Before introducing the nitric acid into the stomach, it was filled with solid substances resembling food: the action of the acid was divided between the solid alimentary matter, and the coats of the stomach: sometimes even it has exerted the greatest action upon the extraneous substances, and frequently it has produced upon this organ only a little yellow spot, and that sometimes confined to the mucous membrane.

Other experiments tried upon living animals, have led M. Tartra to conclude, 1st, that the nitric acid introduced in small quantity into the alimentary tube, combines immediately and entirely with the animal texture; 2dly, that in a stronger dose, it acts in the same manner, at the moment of the first contact, but remains for the most part in the stomach, where it is then without combination, and becomes weakened. 3rdly. That in this last case, it continues to act till it completely disappears, which happens insensibly in the course of a few hours; always with more rapidity than in the dead body, on account of the very remarkable influence of the living state of the gastric organs, and particularly of the property of accelerating the animal heat.

SYMPTOMS OF POISONING BY THE NITRIC ACID.

Case.

Aubry, a woman of five and thirty years of age, swallowed, for the purpose of destroying herself, two ounces of aqua fortis. No assistance was given her in the first instance, and it was not till some hours afterwards that she was brought in the evening to the hospital.

The principal symptoms observed were, a countenance expressing a morose sadness, a state of continual anxiety, a shivering all over the body, a small and almost imperceptible pulse, dull pains in the throat, and especially at the stomach; in the epigastric region they were extremely severe on the slightest touch; repeated retchings, and vomitings from time to time. *(White linctus. Solution of gum arabic with milk.)*

The surface of the body, and particularly the limbs, soon became cold; a greasy and icy sweat collected in large drops upon the surface of the breast; the patient expired about twenty-four hours after her admission to the hospital.

The interior of the mouth was remarkable for the injury sustained by the mucous membrane, which was thickened, and appeared white, in some places slightly yellow, and came away easily in small pieces. The epidermis in the same manner separated from the edges of the lips, in a semilunar space, which was tinged with yellow, the line of which exhibited the print of the glass from which this unfortunate wretch had drank the poison. The tongue, the roof of the mouth, and the *velum palati* might easily be deprived of the whole of their mucous membrane, which was already detached in several places. Underneath this no remarkable alteration could be detected, unless perhaps an unusual dryness. The throat presented the same appearances as the mouth, but in a much higher degree.

The œsophagus in its interior exhibited a grained lining, apparently cretaceous, or rather greasy, of a fine orange colour, and having a dry surface totally destitute of mucosity. This crust of the œsophagus, on which was drawn a kind of folds, or furrows in a vertical direction, and which formed a sort of case introduced within the canal of the œsophagus, adhering very little to it, except in a few points, was no other than the mucous membrane itself, which had been changed in a remarkable manner by the nitric acid; this cylinder, which appeared of an albuminous nature, being removed, the rest of the coats of the œsophagus appeared to be nearly in their natural state, only a little brown. The peritonæum, the intestinal canal, and the other parts, exhibited a dirty yellow colour.

The stomach was greatly distended, and covered with black spots; it contained a great quantity of gas, which was not fetid, and a turbid, yellow, flaky, and greasy fluid, one part of which, more dense than the rest, seemed attached to the internal surface of the stomach, and formed a kind of grained coat of various thickness, and of a greenish yellow colour. In the bottom of the stomach, opposite the cardiac orifice, were observed several irre-

gular black spots, with such a morbid puffiness of the texture of the organ, that it resembled an animal substance strongly cauterized and burnt. Similar spots, but somewhat smaller, were found in the neighbourhood of the pylorus.

The interior of the duodenum and of the jejunum were lined with a very thick, yellow, and seemingly greasy coat, in every respect similar to that in the stomach.

We cannot better trace out the symptoms of poisoning by the nitric acid, than by borrowing the description given of them by M. Tartra, in his excellent dissertation, which we have already quoted several times.

Instantly on drinking the nitric acid, a burning heat is felt in the mouth, œsophagus, and stomach, with an acute pain, disengagement of gas, and abundant eructations, retchings, hiccups, increasing pains in the throat, and in the epigastric region. In a short time repeated and excessive vomitings of a liquid, and sometimes a solid matter, which produces a kind of effervescence or boiling upon the ground. The peculiar smell and taste of the matter vomited, extremely perceptible to the patient, and to the observer; this smell and taste continue during the intervals of the vomiting, and even when it has altogether ceased, or from any cause has not taken place; tumefaction of the abdomen, considerable tension and exquisite sensibility, when touched ever so lightly; sensation of cold on the surface of the body, horripilations from time to time; the limbs sometimes of an icy coldness, particularly the legs and thighs; pulse small, tight, sometimes very frequent, and, under certain circumstances, tremulous; horrible anxiety, continual agitation, contortions of every kind, inexpressible anguish, the weight of the bed-clothes insupportable, prolonged watchfulness, epigastric region swelled, and hard to the touch, excessive thirst; painful sensation every time the patient takes the smallest quantity of drink, pain often excruciating, a sense of corrosion, sometimes simple gripes; in some certain cases the pains obtuse, and very slight, with little or no agitation; this is a deceitful calm, either the effect of moral constraint, or of the high degree of internal disorganization, and is an illusory appearance of amelioration.

Deglutition difficult, tenesmus, obstinate constipation, desire to pass urine without the power of satisfying it; features remarkably altered when the pains are excessive, bearing the impression of the most acute sufferings, and of the deepest affection of the mind; paleness, weakness; breath extremely fetid; in some instances the face of a lead colour; cold sweats, which are adhesive, unctuous and greasy, collected in large drops; frequently a kind of obstruction, or of obliteration of the throat; interior of the mouth and fauces of a dull white colour; the internal membrane thickened, and as it were burnt; surface of the tongue very white, and, in some instances, of an orange colour; teeth sometimes vacillating, their *coronæ* grown yellow; impatience in throwing the arms out of bed, and sometimes wanting to get up.

At the end of three or four days, a partial detachment, or total exfoliation of the mucous membrane; rags of it hanging in the interior of the pharynx, impeding respiration and deglutition; altering the sound of the voice; the edge of each of the lips almost always marked with a curved line, which from the first moment presents a white, or slightly citron colour; sometimes yellow spots on the chin, fingers, &c. &c. The pulse becomes feeble, sinking, irregular, unequal, at times intermittent: the wretched patient for the most part falls a speedy victim.

The pains in the belly are a sign that the poison has descended into the intestines, or is diffused into the abdominal cavity, by perforations effected in some part of the alimentary tube. M. Tartra thinks he is able to draw this conclusion from the facts he has observed, that when a small quantity of the nitric acid has been taken, the pain is in general very severe, and that when a great quantity has been swallowed, it is less intense. In the first case the caustic appears to act only according to the breadth of the space it occupies, and cauterizes only the thickness of the mucous membrane; the branches of the nerves are only injured in part, and they are violently irritated. In the second case, on the contrary, the whole is struck with death; the nerves are destroyed, and disorganized. From these considerations it follows that the absence of the pains is a bad sign.

The *vomitings* are exceedingly frequent, when the pains are severe; for then, the stomach being highly irritated, endeavours to disencumber itself of its contents, and puts on a continual spasmodic movement. If this viscus is perforated with holes, so that the patient complains of no pain, no vomiting take place; both liquids and solids pass through the stomach, now perforated, and deprived of vitality, and are effused into the cavity of the abdomen.

The *sensation of cold* is a phenomenon which takes place in several kinds of poisoning, but is particularly remarkable in that of which we are now treating. It continues a very long time, and is generally found, in whatever way the disease may terminate.

This disease may terminate, 1st, by a speedy death in the course of a few hours: 2nd, by a death which does not take place till some time after the poisoning: the patient goes off insensibly; he vomits at different times, membranous portions, which sometimes retain the form of the stomach or œsophagus: these exhale an insupportably fetid smell: digestion becomes particularly painful, and constipation is prolonged for months together. 3rd. The patients drag on a miserable existence during the remainder of their life, experiencing from time to time, pains and burnings intolerable. In speaking of these persons, Zacchias has said: *Venena nisi occidant, relinquunt semper aliquam noxam, et morbos diuturnos.* 4th. By a complete cure.

LESIONS OF TEXTURE PRODUCED BY THE NITRIC ACID.

When persons die a short time after the ingestion of this acid, the following appearances will be observed: a colour more or less orange, of the epidermis of the edge of the lips, which has the appearance of being burnt, and is very easily detached; internal membrane of the mouth of a white colour, frequently citron; the teeth are generally loose, exhibiting on their *corona* a very distinct yellow tinge; inflammation of the mucous membrane of the fauces and pharynx; on the surface of the œsophagus, a coat of yellow matter, greasy to the touch, which appears to be formed both of concrete albumen, and of the mucous membrane itself, but

altered in a very peculiar manner; inflammation more or less violent of the stomach, more particularly towards the pylorus, and the beginning of the duodenum; sometimes gangrenous spots in the coats of these organs, which likewise exhibit a net-work of blood-vessels, apparently multiplied, dilated, and filled with black and coagulated blood; they are worn thin, as if dissolved, and are ready to tear on the slightest touch; a thick grained coat, like a paste, of a greenish yellow colour, lines the interior of these viscera, which contain a great quantity of a yellow matter, of the consistence of a thick soup, in which there are flakes resembling tallow; the folds of the stomach are very brown, and reduced to mucilage; the pylorus very much contracted; the coats of the duodenum and jejunum spotted with yellow, sometimes inclining to green: these injuries of the parts diminish in proportion to the distance from the stomach; the great intestines generally filled with fœces very hard and moulded; peritonæum, thickened, hard, of a dirty red colour, covered with albuminous concretions, which unite all the viscera together, by very numerous adhesions; in some intances, very considerable distention of the stomach; in others, this viscus is reduced to a very small bulk, which generally is the case, where it has been perforated; then, a considerable effusion takes place into the abdomen, of a thick, yellow, and flaky fluid; inflammation more or less considerable and general, of all the abdominal viscera, as well as those of the thorax; sometimes yellow spots upon the hands or other parts: these are produced by a small quantity of nitric acid being dropped from the vessel, out of which the poison had been drank.

All that relates to lesions of texture produced by the nitric acid, in those persons who have not died till a long time after taking this poisonous substance, we shall refer to the history of slow poisoning.

APPLICATION OF ALL THAT HAS BEEN SAID TO THE DIFFERENT CASES OF POISONING BY THE NITRIC ACID.

FIRST CASE.

The Patient is dead: the Remainder of the Poison can be procured.

If the nitric acid is without mixture, a few drops of it are sufficient to distinguish it from all other corrosive substances. We should begin by letting fall a single drop into the infusion of tournesol; if this test be reddened, the poison must be tried by copper filings, which will be converted into a nitrate of copper, of a blue colour, and orange-yellow vapours will be disengaged; lastly, it should be saturated with potash, and the result evaporated; and if it act with fire, and with the sulphuric acid, as nitrates do, it may be decided that the subject of the experiment is really nitric acid. If the quantity is considerable, the remainder should be mixed with charcoal, phosphorus, or sulphur, in order to obtain, by ebullition, the orange-coloured vapours of the nitric acid. Amongst the signs which serve to point out this kind of poisoning, we ought to pay particular attention to the yellow, citron, or orange-coloured spots which may be perceived upon the chin, lips, and hands: the state of the interior of the mouth will also frequently furnish marks by which the cause of the symptoms to which the patient has fallen a prey, may be ascertained.

If the nitric acid has been taken in wine, vinegar, tea, &c., we must proceed to the analysis of these fluids, according to the rules described at large.

If with wine, no alteration will take place, on the addition of copper filings, at the ordinary temperature; but with heat, the fluid becomes yellow, the copper is dissolved, and a green colour is produced.

If with vinegar, the liquor must be saturated with potash, then

evaporated, and treated with highly concentrated alcohol: the nitrate of potash thus formed may be easily detected.

If mixed with tea, the colour becomes deeper in proportion as the acid is added. The physician will keep in view, that it is impossible to decide upon the existence of the nitric acid in these kinds of mixtures, unless by obtaining a nitrate by the addition of an alkali, and orange-yellow vapours of nitrous acid gas, by boiling with copper filings.

SECOND CASE.

The Patient is living: all the Poison has been swallowed: the Matter vomited can be procured.

The relation of the case, the evidence of the assistants, the actual state of the patient, the chemical examinations of the fluids vomited, are the resources which the practitioner must avail himself of, in these circumstances, which are always embarrassing. The matter vomited, exhibits a variable colour; sometimes it partakes of the yellow tinge which the animal or vegetable substances affected by the poison impart to it; sometimes it is rendered green by a portion of the resinous part of the bile *(green matter)*, set at liberty in the stomach by the nitric acid: sometimes also its colour approaches to red: the falling of this matter upon the hearth, or ground, almost always produces ebullition or effervescence, owing to the disengagement of carbonic acid gas from some carbonates, which are decomposed by this powerful caustic. These are sufficient to shew the importance of observing correctly the principal physical qualities of the liquids vomited, before proceeding to their analysis.

We must begin by examining the fluid part, which commonly floats over the food or texture which have been decomposed; this must be poured off; and if it should not be in sufficient quantity to be easily separated, the whole must be pressed through a fine piece of white linen, and the liquid part should be tried with the tincture of tournesol, copper filings, and caustic potash. If these three tests act in the manner we have described, it may be con-

cluded that it contains nitric acid. It may happen, from being combined with too great a quantity of water, that the mixture will not exert any action upon water, at the ordinary temperature. In this case it must be heated to ebullition, in order that the metal may decompose the nitric acid, when brought to a suitable degree of concentration. It is easy to conceive, that this method will always succeed, whilst there remains a portion of acid, not combined with the alimentary matter, and this is the case which most frequently occurs.

If the nitric acid, from its combination with albumen, muscular flesh, or various other aliments, has been rendered insoluble, and consequently it cannot be found in the decanted or expressed portion, it must be sought for in the flaky and solid substances. For this purpose they must be put into a phial, and made to boil for three quarters of an hour, in a solution of pure potash. The liquor, which will be of a colour more or less red, must be filtered, and evaporated in a capsule of porcelain. The mass thus obtained will leave a residue consisting principally of nitrate of potash. There can be no doubt in this case that the nitric acid was combined with the alimentary substances. The juridical physician will not be able to decide on the presence or absence of this corrosive, until he shall have submitted the matter vomited to the different experiments we have just detailed.

THIRD CASE.

The Patient is living: the whole of the Poison has been swallowed: the Vomitings cannot be procured.

The practitioner in this case can gain no information from chemistry.

FOURTH CASE.

The Patient is dead.

The nitric acid is perhaps the only poison of the mineral kingdom, which destroys life by producing lesions of a particular na-

ture, so as to render it possible sometimes to recognise it by the simple examination of the dead bodies. The yellow tinge which it communicates to the lips, chin, and a great portion of the digestive canal; the conversion of the mucous membrane into a greasy substance, the perforations of the stomach, and effusion of a muddy yellow fluid into the abdomen, are so many characters, which are only found together, where they have been produced by this acid; and it may be affirmed that, if all the patients who have fallen victims to its action, constantly exhibit the whole of these appearances, they should be sufficient almost to decide with certainty, that the poisoning has been the consequence of the ingestion of aqua fortis. This explanation will suffice to make it appear how important a matter it is, that the practitioner called upon to examine a body suspected to have been poisoned by the nitric acid, should examine attentively the different lesions of the digestive canal, and other organs. If these lesions should be the same as we have just described, and the chemical experiments made upon the contents of the stomach, furnish results agreeable to the principles laid down, it may be decided that the poisoning has been the consequence of nitric acid. In case the organic lesions should present a character different from what we have described, far from excluding the idea of the possibility of poisoning by aqua fortis, the greatest care ought to be employed in the search, to discover if the nitric acid does not form a part of the solids or fluids contained in the stomach, or whether it be not intimately combined with the texture of this viscus; in this troublesome examination, what we have delivered concerning the analysis of the matter vomited, will serve as a guide.

TREATMENT OF POISONING BY THE NITRIC ACID.

Does there exist any antidote to the nitric acid?

M. Tartra says in his dissertation, that the quantity of nitric acid remaining at liberty in the stomach, may be neutralized in a manner more or less favourable to the preservation of animal life, according to the promptitude of the administration of an alkaline

solution, of strong soap and water, or pure magnesia suspended in water.

I have tried a great number of experiments upon living animals, with the design of determining to what degree magnesia might be considered as the antidote to the nitric acid. The animals submitted to these experiments were placed under the same circumstances as those which had taken the sulphuric acid, and furnished results precisely similar. Those to whom two drachms only of nitric acid were given, diluted in three or four ounces of water, suffered a great deal more, and lived much less time, than those which had been made to swallow the same dose of nitric acid, without any addition of fluid, and to which, three, four, or six drachms of magnesia, suspended in a little water, had been given. This earth then appears to be capable of diminishing the effects of the nitric acid, provided it be employed a short time after the ingestion of this corrosive.

M. Desgranges has reported, in the *Journal de Médecine*, a fact which corroborates some of the results obtained by us.

Case.

A mechanic, thirty-six years of age, swallowed, in a moment of despair, more than half a glass of aqua fortis. He instantly felt a great heat and considerable irritation in the throat, and down to the stomach. The excitement produced in the stomach, occasioned the greatest part of this fatal fluid to be returned by vomiting; or at least, all its superabundant parts which were not employed in corroding the parts with which they had come in contact. M. Desgranges, who was instantly informed of the circumstance, found him vomiting with efforts almost convulsive. The water which had been given him, was returned strongly impregnated with acid, and set his teeth on edge to a very painful degree. The internal pains were extremely acute, and gave the idea of tearing and erosion. A drachm of pure magnesia, suspended in half a glass of sugared water, was immediately administered, and at the same instant the patient felt himself relieved. The vomiting, however, very quickly returned, but with less fa-

tigue and exertion of the injured parts; half a drachm more of the same remedy put a stop to them altogether. He was afterwards made to take a scruple every half hour, and in less than three hours the patient no longer suffered any pain; he still retained some sensibility in the region of the stomach, but nothing acute, or tearing: he affirmed, that at each draught of the *drink whitened* by the magnesia, he felt as if a kind of mucus, or, to use his own expression, a *coat of velvet*, had lined all the corroded parts, to his great relief, and thus weakened the extreme sensibility, and chased away the pain.

The next day, a swelling and considerable tension were discovered within the throat; the outside was equally swelled, respiration was impeded, deglutition rendered painful, and almost impossible, and numerous burnt sloughs appeared at the lower part of the mouth. He was twice bled in less than twelve hours, once in the foot; his glysters were made more purgative, the first having remained without any effect; at the same time a tolerably strong dose of *ol. ricini*, was given in a white linctus. The evacuations which followed, produced an amendment in the symptoms, which gave confidence to the patient. Towards the sixth day, he complained of an increase of heat and of agitation, towards night a sort of miliary eruption appeared on the skin, attended with great itching. Diaphoretics, sweetened with honey, and drank copiously, served to make it disappear.

Many physicians have recommended the exhibitions of potash and soda, as antidotes to aqua fortis: the caustic and irritating properties of these alkaline substances ought to cause them to be rejected; at least unless they be diluted with a great quantity of water, or their corrosive property be neutralized by the combination of an oily body, as soap. This medicine, which is composed of oil and soda, has been often of great service in cases of poisoning by the nitric acid; it easily decomposes in the stomach; the acid unites to the soda, and forms nitrate of soda, while the oil remains free.

Crab's eyes, powder of coral, prepared pearls, burnt hartshorn, chalk, and all the other varieties of calcareous carbonates, have been extolled and employed for arresting the progress of the mur-

derous effects of aqua fortis. If no other substances are at hand, these medicines may be employed, as they possess the power of combining with this acid, and neutralizing it. They have however the inconvenience of disengaging too great a quantity of carbonic acid gas, which distends the stomach beyond measure.

Having examined the effects of the different substances capable of neutralizing the nitric acid in the stomach, we shall next trace out the steps which the practitioner ought to follow in the different cases of poisoning by this corrosive.

If the nitric acid has been taken in very great quantity, and there is reason to believe that a part of it remains free in the stomach, he should have instant recourse to the calcined magnesia, which may be given in the dose of a drachm, suspended in a glass of water: at the same time, the patient should be made to swallow a quantity of sweet and mucilaginous drinks, in order to fill the stomach, and oblige it to evacuate the poison diluted with these drinks. As soon as the vomiting takes place, the same dose of magnesia should be repeated, and the emollient drinks persisted in; such as linseed, or marshmallow tea, solution of gum-arabic, milk, broths, &c. In case of a want of magnesia, an abundant solution of soap and water should be employed. This remedy, on which Majault has cast a great degree of obloquy, may be administered by every body, without the assistance of the apothecary, and immediately after the accident; its use is beside perfectly free from danger: the rapidity by which it is decomposed by the nitric acid in the stomach is such, that it can neither inflame nor corrode the membranes of this viscus, as has been supposed by Majault. The medicinal soap ought to be preferred to that in common use, as being more soluble in water, more pure, and of a less disagreeable flavour. We should not hesitate to fill the patient well with water, until the medicines we have recommended can be procured.

Oil of sweet almonds, and of olives, administered in a very large dose, have sometimes been extremely useful in the first moments of this kind of poisoning, by procuring very copious vomitings.

In such cases where inflammation of the abdomen is made known by its usual characteristic symptoms, leeches must be applied to the parts affected, and general bleedings employed: these means however must be omitted where spasm or tension exist, or where one or more of the viscera are affected with gangrene.

Emollient glysters, warm baths of half the body, and fomentations, ought to be employed to arrest the progress of the inflammation produced by the caustic. Gentle narcotics are of great utility, to destroy the spasm occasioned by the corrosion of the stomach. The theriaca, so much boasted of as a general antidote, ought to be rejected from the treatment we are describing. All heating food and spirituous liquors ought to be carefully avoided. The patient should observe the most rigorous low diet.

If the nitric acid has been taken in a very small quantity, and there be reason to presume that it has wholly combined with the membranes of the mouth, throat, œsophagus, and stomach, the neutralizing method must be given up, in order to have recourse to emollients, which must be used in great abundance, conformably to the precepts we have just laid down.

PHYSICAL PROPERTIES OF THE MURIATIC ACID.

Pure muriatic acid, is in the form of a colourless fluid, of an intolerable smell, and an extremely caustic acid taste; its specific gravity is as 1.203, when in its greatest degree of concentration; it strongly reddens the tincture of tournesol.

When exposed to the action of caloric in close vessels, it disengages a great quantity of muriatic acid gas, which is colourless, very soluble in water, of a strong pungent smell, which excites coughing, reddens strongly the tincture of tournesol, and which exhales, on exposure to the air, a white smoke or vapour, very thick, owing to its instantaneous union with the water of the atmosphere, which forms anew with it muriatic acid diluted with water, and which precipitates.

The liquid muriatic acid transforms the nitrate of silver into an insoluble muriate.

It does not disturb lime-water, nor does its vapours corrode glass; characters which serve to distinguish it from the fluoric acid, to which it has in other respects some affinity.

When poured upon a soluble salt of lead, it decomposes it, and gives rise to a precipitate, which is white, heavy, and soluble, in thirty or forty times its weight of distilled water.

When heated with the peroxyde of manganese, it forms deuto-muriate of manganese, disengaging oxygenated muriatic acid gas of a greenish yellow colour.

It causes no change in a strong infusion of tea, or in water saturated with sugar.

ACTION OF THE MURIATIC ACID UPON THE ANIMAL ECONOMY.

This acid has the greatest analogy in its mode of acting, with those of which we have before spoken: when injected into the veins, it produces death suddenly, by coagulating the blood. 2nd. When introduced into the stomach, it produces in a very short time the most violent inflammation: the nervous system is affected by sympathy, and life is speedily extinct.

The symptoms produced by the muriatic acid, do not differ in any respect from those observed in the cases of poisoning by the sulphuric and nitric acids, for which reason we conceive it useless to enumerate them. It appears however that the patients who have swallowed a certain quantity of it, emit, in the first moments of the accident, a thick smoke, of a white colour and very pungent smell.

LESIONS OF TEXTURE PRODUCED BY THE MURIATIC ACID.

The lesions resulting from the action of this acid, bear the greatest resemblance to those produced by the sulphuric acid. Redness of the mouth, pharynx, and stomach; extravasation of venous blood in some parts of this last viscus, perforations in some part or other, are the principal injuries occasioned by it, and which are very seldom accompanied by any yellow colour, of the parts with which it comes in contact.

APPLICATION OF WHAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISONING BY MURIATIC ACID.

This acid is easily recognized when it is free from mixture, by the action which it exercises on the following re-agents: viz. Tincture of tournesol, potash, soda, or barytes; nitrate of silver, acetate or nitrate of lead, peroxyde of manganese. The vapours which it diffuses in the air, and the manner in which it acts with caloric, will furnish sufficient proofs of its presence.

If it were mixed with wine, vinegar, or any other substance incapable of rendering it insoluble, its existence would be easily demonstrated by distilling the fluids which contained it, and by treating the volatilized products found in the recipient, by all the re-agents of which we have spoken.

When the muriatic acid forms part of the matter vomited, or of that found in the digestive canal after death, we must have recourse to pure potash, perfectly free from any muriates. All these substances being heated with distilled water, and the alkali we have proposed, ought to furnish, after three quarters of an hour of ebullition, a fluid in which the nitrate of silver will demonstrate the presence of the muriatic acid, if this corrosive really formed any part of their composition.

TREATMENT OF POISONING BY THE MURIATIC ACID.

The experiments which we have instituted on different living animals, allow us to draw the conclusion, that calcined magnesia and medicinal soap, are the most proper substances for neutralizing those parts of the poison, which are not yet combined with our texture. We ought then to have recourse to these medicines, from the first moment of the ingestion of the poison, without neglecting at the same time copious draughts of warm water, milk, broth, and different mucilaginous and emollient drinks. The antiphlogistic and anti-spasmodic treatment, must be employed in those cases, where the violence of the symptoms would induce a

fear of, or may have already announced, the inflammation of one or more of the organs; or spasm, convulsions, &c.

PHYSICAL AND CHEMICAL PROPERTIES OF THE PHOSPHORIC ACID.

This acid is solid, entirely destitute of smell or colour, and yields a very sharp taste. It is most commonly seen in the form of a thick liquid, extremely viscid, of a specific gravity greater than that of water; it reddens strongly the tincture of tournesol.

When exposed to the action of caloric it dissolves, and forms a white and transparent glass. If the temperature is much elevated, it finishes by evaporating, provided the operation be performed in a crucible of platina, for vessels of earth, or of glass, are capable of combining with it, and preventing its volatilization.

ACTION OF THE PHOSPHORIC ACID UPON THE ANIMAL ECONOMY.

When a few grains of phosphoric acid are injected into the veins, dissolved in a very small quantity of water, the blood becomes coagulated, and the animal dies in the course of one or two minutes; if the acid be weakened, it does not experience any inconvenience. When introduced into the stomach, the phosphoric acid destroys life at the end of a variable space of time, according to the degree of concentration, and the dose employed.

We are of opinion, that the analogy existing between the mode of action of the phosphoric acid, and those whose history we have given, renders any further discussion of this subject unnecessary.

The history of the symptoms, lesions of texture, and treatment of this kind of poisoning, would be a repetition of all that has been said in treating of the sulphuric and nitric acids. As for the application of it to medical jurisprudence, it will be sufficient for the practitioner to refer to what we have said already.

OF SOME OTHER MINERAL AND VEGETABLE ACIDS.

There remains still a certain number of acids which are capable of producing symptoms more or less serious, when introduced into the stomach; we shall proceed to point out some of them. We shall not speak at all of their action upon the animal economy; nor of the symptoms produced by them, or lesions of texture; neither of the treatment necessary to be opposed to them. All these objects bearing a strong analogy to what we have said concerning the other acids.

OF THE FLUID NITROUS ACID.

This acid may appear under a blue, green, clear orange-yellow, or deep orange-yellow, according as it is more or less charged with nitrous acid gas: it strongly reddens the tincture of tournesol, and acts with great force upon our texture. Its smell and taste are very remarkable.

OF THE FLUORIC ACID.

Pure fluoric acid is always in a fluid state; it is colourless, its smell is very pungent and penetrating; its taste is extremely disagreeable; it reddens very strongly the tincture of tournesol.

M. Thenard, who first discovered this acid in a pure state, says: "it is of all bodies the most corrosive; it acts upon the animal "texture with great energy: scarcely is it applied to the skin, "when it is instantly disorganized; a severe pain is quickly felt; "the parts bordering on the point touched, become white and pain-"ful, and form a thick blister, which is filled with matter. Even "when the quantity of acid has been very small, scarcely visible, "the same phenomena take place: only a few hours would be re-"quired for their production."

OF THE SULPHUROUS ACID.

This acid is limpid and colourless; its smell is pungent, and similar to that of burning sulphur: its taste is very peculiar.

When exposed to the action of caloric in a close vessel, it furnishes a very great quantity of sulphurous acid gas, which is colourless, and has the same smell as the fluid acid.

OF THE PHOSPHOROUS ACID.

This acid is always fluid and colourless; it has a slight smell of phosphorus, and strongly reddens the tincture of tournesol.

OF THE OXALIC ACID.

The oxalic is a vegetable acid, which is seen under the form of small white crystals, pointed, and lamellated; it is possessed of an acid taste, extremely pungent: sometimes it is obtained in quadrilateral prisms, or in square cakes: it strongly reddens the infusion of tournesol.

OF THE TARTARIC ACID.

The tartaric acid crystallizes in fine needles, or in irregular hexaedral prisms, or square plates rather rhomboidal, with oblique edges: its taste is extremely acid and pungent; it reddens strongly the infusion of tournesol.

ARTICLE THE ELEVENTH.

SPECIES XI.—CAUSTIC OR CARBONATED ALKALIES.

Var. 1. Caustic or Carbonated Potash.
2. Caustic or Carbonated Soda.
3. Caustic or Carbonated Ammonia.

OF POTASH.

Alcoholized potash *(potasse à l'alcohol)* deprived of its carbonic acid (deut-oxyde of *potassium*) is solid, of a white colour; its taste is acrid, and excessively caustic; it turns the syrup of violets green, with great energy; and restores the blue colour to the infusion of tournesol, when reddened by acids.

OF THE *LAPIS INFERNALIS.*

The *lapis infernalis* differs only from pure potash, in that it contains sulphate and muriate of potash, silex, a little oxyde of iron, &c.: therefore when it is dissolved in water, and treated by a solution of the nitrate of silver, beside the precipitate of oxyde of silver, soluble in the pure nitric acid, there is obtained a muriate of silver, which is curdled, and insoluble in this re-agent. The soluble salts of barytes demonstrate also the presence of the sulphate of potash, by producing a white precipitate of sulphate of barytes, insoluble in water and in the pure nitric acid. In other respects the *lapis infernalis* possesses all the properties of the pure potash.

SUB-CARBONATE OF POTASH (*SALT OF TARTAR*).

The sub-carbonate of potash of commerce, always contains sulphate and muriate of potash, silex, and a small quantity of oxyde of iron, and of manganese; it does not crystallize, and is commonly found in the form of white masses slightly inclining to yellow, possessed of an acrid caustic taste. Its action upon the syrup of violets, upon water, and the deuto-muriate of platina, is the same as that of pure potash.

ACTION OF POTASH UPON THE ANIMAL ECONOMY.

The caustic effects of *the lapis infernalis*, when applied to the exterior of the body, are too well known to need any description in this place; we shall therefore confine ourselves to the results of the introduction of potash, and of the sub-carbonate of potash, into the veins, and into the stomach.

Experiments prove, that pure potash, injected into the veins, produces death by coagulating the blood; when introduced into the stomach, it inflames this viscus, corrodes, and perforates it, so that the animal dies of a true *gastritis*, which sometimes terminates in gangrene.

SYMPTOMS OF POISONING BY THE CAUSTIC POTASH.

Plenck relates that a patient of a strong constitution, swallowed an ounce of salt of tartar (sub-carbonate of potash); he was shortly afterwards seized with a violent vomiting, which continued for forty-eight hours, and with an inflammation of the stomach; which however he did not sink under.

A styptic, urinous, and caustic taste; a severe heat in the throat; retchings, vomitings, sometimes of bloody matter, alkaline, turning the syrup of violets green, and most commonly effervescing with the acids; copious alvine evacuations, a most severe pain in the epigastrium, excruciating gripes, injury of the intellectual faculties, &c. these are the alarming symptoms produced by the alkali of which we have just been giving the history. If the potash has been swallowed in a tolerably strong dose, death soon occurs.

LESIONS OF TEXTURE PRODUCED BY POTASH.

I am disposed to believe, from a great number of facts, that this alkali is, of all the corrosive poisons, that which most frequently perforates the stomach: it produces also inflammation of the different coats of this viscus, and of the intestines.

APPLICATION OF ALL THAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISOING BY POTASH.

It is impossible to confound pure potash with any other substance, if we pay attention to the chemical characters which follow. It is deliquescent—dissolves in distilled water,—turns the syrup of violets green,—is not disturbed by carbonic acid gas,—forms with sulphuric, nitric, &c., acids, salts which are soluble.

If this alkali be mixed with the fluid or solid contents of the stomach, whether found after death, or expelled by vomiting, its presence may, without difficulty, be demonstrated by following the proceedings we are about to describe. 1st. After having filtered the liquid portion, it should be tried by the syrup of vio-

lets, which will be turned green if the fluid contain potash. 2nd. We must be assured that it does not exhale a smell of ammonia. 3rd. It should be precipitated by the deuto-muriate of platina, which will produce in it a canary-yellow sediment. 4th. It should be mixed with fluid carbonic acid, which will produce no disturbance in it; whilst it would precipitate lime, barytes, and strontian, if either of these alkalies should be found in the fluid. 5th. Lastly, it should be evaporated, in order to obtain the solid potash. If we reflect ever so little on the property which potash possesses, of forming, with almost all animal substances, soluble compounds or mixtures, it will be seen, how very rarely it must happen, that this alkali is not discovered by the methods we have just described.

TREATMENT OF POISONING BY POTASH.

Is there any antidote to potash?—From the experiments which I have tried upon animals, it appears that vinegar diluted with water, is the medicine which can be administered with the greatest success. All the animals to whom caustic potash was administered, and who were immediately after gorged with vinegar and water, suffered less than those who took water alone. If, after having introduced into the stomach of a dog a certain quantity of solution of caustic potash, he be made to swallow at the same moment, a strong dose of concentrated vinegar, and the œsophagus be tied to prevent vomiting, the animal will make slight efforts to vomit, and exhibit but very few symptoms of poisoning. After death, which takes place at the end of four or five days, the texture is found uninjured, neither corroded nor perforated, unless the quantity of vinegar given, should prove too weak to saturate all the alkaline particles.

The following fact serves to support what we here advance. M. Baruel, chemical preparator to the medical school of Paris, had the misfortune, some years ago, to introduce into his mouth a solution of pure potash in alcohol, which he was pouring off by means of a small funnel; immediately after, he experienced a very violent heat and pain in the different points of the mucous membrane which lines the mouth; he had recourse to vinegar,

which quickly saturated all the free alkali: by this means the symptoms, far from acquiring a fresh degree of intensity, diminished sensibly, so that the corrosive only produced a slight inflammation of the mucous membrane.

The physician called in to the assistance of persons poisoned by caustic or carbonated potash, should then have recourse to vinegar in large quantities, as this medicine is possessed of the twofold properties of neutralizing the free alkali, and promoting vomiting. After the first moments of the accident, the patients should be instantly supplied with cold or warm water, or with any other mucilaginous and emollient drink. As soon as the first symptoms are relieved, such means should be employed, as are calculated to prevent or arrest inflammation of the organs contained in the abdomen, and in the superior parts of the digestive canal.

OF SODA.

The physical and chemical properties of this alkali, bear the greatest resemblance of those of potash; for which reason we shall limit its chemical history to a few characters, passing over those which are common to both these corrosives.

The mode of action of soda, upon the animal economy, the symptoms, and lesions of texture it produces, exactly resemble those we have described under the article *potash*. The same may be said of the mode of treatment necessary to oppose to the symptoms occasioned by this alkali.

OF LIQUID AMMONIA (*ALCALI VOLATIL FLUOR*).

The liquid ammonia deprived of its carbonic acid, is colourless; its taste is extremely caustic; its smell strong, and pungent; it turns the syrup of violets green, and restores the blue colour to the infusion of tournesol, that has been reddened by acids.

OF THE SUB-CARBONATE OF AMMONIA.

The sub-carbonate of ammonia is solid and white, its smell is ammoniacal, its taste caustic and pungent; it turns the syrup of

violets green. When exposed to the air, it volatilizes by degrees. It is very easily soluble in cold water, and when this solution is boiled it evaporates, so volatile is it.

ACTION OF AMMONIA UPON THE ANIMAL ECONOMY.

The fluid ammonia exerts a very strong action, when injected into the veins, or introduced into the stomach: it almost always occasions death; at one time by acting on the nervous system, and particularly the vertebral column; at another time by producing inflammation more or less considerable of the different parts of the digestive canal, the irritation of which produces lesion of the brain by sympathy.

Experiment. Sixty grains of fluid ammonia tolerably concentrated, were injected into the jugular vein of a strong dog, although of small size. The animal instantly experienced a stiffness in its four limbs, resembling tetanus: he had an involuntary excretion of urine, and his muscles, more particularly those of the lips and extremities, were agitated by convulsive movements. He continued to live in this state till the tenth minute after the injection. The body was immediately opened: the contractile power of the muscles was already extinct, the lungs were crepitating, of a livid hue, and contained a small quantity of blood: there were found in the left auricle of the heart, a few gelatinous clots, formed by some blood of a deep red colour: the left ventricle contained a tolerable quantity of the same fluid not coagulated, and blackish.

SYMPTOMS AND LESIONS OF TEXTURE PRODUCED BY FLUID AMMONIA.

Martinet, Huxham, Haller, &c. report cases wherein the fluid ammonia produced death in the space of a few minutes, after burning the lips, the tongue, palate, &c., and producing hæmorrhages of the intestines and the nose, and hectic fever.

If to these symptoms we join those we have mentioned in the preceding experiment, a general idea may be formed of the symptoms produced by this energetic poison.

The lesions of texture produced by ammonia, are exactly similar to those observed after taking other corrosive substances.

APPLICATION OF ALL THAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISONING BY AMMONIA.

If the ammonia be pure, it will be sufficient to distinguish it by paying attention to its odour, and to the action it exerts upon the syrup of violets, the carbonic acid, and caloric.

If it be combined with any fluid, its presence may be easily ascertained by distilling the mixture in a retort, to which is adapted a recipient, containing a small quantity of water: the free ammonia will quickly become volatile, and will saturate the fluid contained in the balloon: it is even of importance to paste on the interior of the receiver, a few pieces of paper of tournesol, reddened by an acid, in order that the smallest possible quantity of ammoniacal gas may be discovered by the restoration of the blue colour of the paper.

TREATMENT OF POISONING BY THE FLUID AMMONIA.

Vinegar and water ought to possess here the same advantages as those we have spoken of, in giving the history of potash; there is no doubt but that it is a medicine useful for neutralizing the ammonia, which may be found free in the digestive canal. Unfortunately, this alkali exerts its action on the nervous system with extreme celerity, and the necessity of acting without the least delay cannot be too strongly enforced, in order to oppose the developement of the nervous symptoms, and of those which characterize the inflammations of the abdominal organs.

ARTICLE THE TWELFTH.

SPECIES XII.—CAUSTIC ALKALINE EARTHS.

VAR. 1. Barytes.
2. Lime.

OF BARYTES.

IT is extremely useful to fix the attention of men of science on Barytes and its compounds. Being endowed with the most energetic poisonous properties, some of the preparations of this kind produce death in a very short space of time, amidst the most excruciating pains and violent convulsions; it is then of the utmost importance that those physicians who employ them in certain scrophulous and lymphatic affections, &c. should understand perfectly their effects, and the means of preventing the serious symptoms to which they give rise.

Barytes (deut-oxyde of *Barium*) is a solid alkali of a greenish gray colour; its taste is acrid and caustic; it turns the syrup of violets green, and reddens turmeric.

OF THE CARBONATE OF BARYTES.

THE carbonate of barytes differs from caustic barytes. 1st, by its insolubility in water; 2nd, by the effervescence it produces when dissolving in the nitric or muriatic acids.

OF THE MURIATE OF BARYTES.

THIS salt crystallizes in square plates, or four-sided prisms, very broad, and of little thickness; it has an acrid and very pungent taste; it reddens the tincture of tournesol, and does not change the colour of the syrup of violets.

ACTION OF THE DIFFERENT COMPOUNDS OF BARYTES UPON THE ANIMAL ECONOMY.

Muriate of Barytes. Amongst the mineral poisons, there are very few which exert so powerful an action as the muriate of barytes; whether injected into the veins, introduced into the

stomach, or externally applied, it produces death in a space of time exceedingly short.

We may conclude from facts, 1st, That the muriate of barytes, when injected into the veins, produces death by acting upon the nervous system, and coagulating the blood. 2nd, That when applied externally, or introduced into the stomach, it exerts its action likewise upon that system, after having been absorbed and carried into the current of circulation; it produces also in these circumstances, inflammation of the texture with which it comes in contact. Mr. Brodie is of opinion, from two experiments he instituted, that the muriate of barytes occasions death, by acting upon the brain and the heart.

OF BARYTES AND CARBONATE OF BARYTES.

Experiment 1st. At five minutes after one o'clock, a small dog was made to swallow thirty-three grains of caustic barytes, reduced to a fine powder. At the end of ten minutes the animal was lying down upon his belly, and appeared to suffer considerably; at three quarters after one, he vomited, with much effort, a small quantity of mucous matter, of a greenish colour, mixed with blood; he had the hiccup, and uttered cries excessively plaintive. At two o'clock, he was in such a state of insensibility, that he might have been taken for dead; he might be pinched without giving the least sign of pain; his limbs, when lifted up and abandoned to their own weight, fell like an inert mass of matter; the pupils were dilated. At twenty-five minutes after two, he vomited a small quantity of greenish yellow matter, after making violent efforts: his breathing was exceedingly deep; he still continued to moan. He died at four o'clock, after having experienced some slight convulsive movements in the posterior extremities.

Dissection. The mucous membrane of the stomach was of a deep red colour throughout its whole extent: it exhibited, in that portion next to the pylorus, two black spots, formed by venous blood extravasated upon the muscular membrane. The duodenum, and the other intestines, were in their natural state. The

lungs were of a deep red colour, towards the posterior lobes their substance was crepitating.

Barytes, whether pure or carbonated, when introduced into the stomach, produces death, by acting upon the nervous system; it corrodes at the same time, the viscus with which it comes in contact.

SYMPTOMS OF POISONING BY BARYTES.

We are not acquainted with any detailed case of poisoning by the compounds of barytes; for which reason we are obliged to refer, for the history of the symptoms and lesions of texture produced by this alkali, to what we have laid down in the preceding paragraphs.

APPLICATION OF WHAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISONING BY BARYTES, AND ITS COMPOUNDS.

Muriate of Barytes. A salt which does not redden the tincture of tournesol, which does not turn the syrup of violets green, which is not precipitated by the hydro-sulphurets nor by ammonia, but which, on the contrary, is precipitated by the sub-carbonate of ammonia, soda, or potash; which is not soluble in concentrated alcohol; which furnishes, with the sulphate of potash or the sulphuric acid, a white precipitate insoluble in water, and in the nitric acid, and which gives, with the nitrate of silver, a curdled precipitate of muriate of silver, likewise insoluble in the nitric acid, can be no other than the muriate of barytes. The practitioner will easily recognise this salt, when it is without mixture, by submitting it to the tests we have just mentioned.

If the muriate of barytes has been mixed with fluids capable of hindering the menstrua from acting upon it, as they would have done if it had been alone, it will be necessary to treat the suspected fluids with the sub-carbonate of ammonia dissolved in water; in a short time a precipitate of carbonate of barytes will be obtained, which must be dried on a filter, in order to be calcined with charcoal; by this means the caustic barytes will be obtained, the properties of which are extremely remarkable, and easy to de-

termine. We must proceed in the same manner, when we seek for the salt in the fluids vomited, or in those which may be contained in the stomach after the death of the patient.

Lastly, when all the attempts made on the fluid matter have been insufficient to discover this poisonous substance, it will be necessary to calcine in a crucible, all the solid parts, previously dried and mixed with charcoal, finely powdered. If at the end of two hours of a strong heat, *sulphate of barytes* be obtained, which is easy to recognise by the characters we have described, we may be assured that the poison has been produced by a soluble preparation of this kind, which has probably been rendered insoluble by its union with some sulphates. If, instead of a sulphuret of barytes, the calcined product should contain *caustic barytes*, there would be strong grounds for believing that the muriate has been converted into a carbonate by its mixture with some sub-carbonates combined with the food.

Barytes. What we have just advanced, will render it needless to enter into the details of the experiments, which the practitioner ought to institute in order to discover this alkali, the chemical properties of which we have explained in the beginning of this article.

TREATMENT OF POISONING BY BARYTES, AND ITS COMPOUNDS.

Is there any antidote to barytes, and the muriate of barytes?

Reflecting on the force with which barytes and the salts of barytes, lay hold of the sulphuric acid, in order to form insoluble sulphate of barytes, I have thought that the sulphates would be (of the salts the most easy to procure) those which would oppose with most energy the murderous action of poisons of this kind.

The physician called in to the assistance of the unfortunate persons who have swallowed the compounds of this kind, ought then to have immediate recourse to copious solutions of the sulphate of soda, or sulphate of magnesia (Glauber, or Epsom salts), or even to the water of pits, which is often found to contain a sufficient quantity of sulphate of lime. If the vomiting does not

take place in a short space of time, it should be encouraged by tickling the uvula with a feather, by irritating the throat, and even by the administration of an emetic. By these means the poison will be expelled very frequently, before it has been absorbed in a quantity sufficient to produce death. The after-treatment of this poisoning will vary according to the degree of violence, and the nature of the symptoms to which the patient shall be subjected.

OF QUICK LIME.

Lime (oxyde of calcium) is solid, of a grayish white colour, and caustic taste; it turns the syrup of violets green, with some energy, and reddens the colour of turmeric. Its specific gravity is as 2.3.

When it has been perfectly calcined, it produces with water the same phenomenon as the barytes, and furnishes a limpid solution.

ACTION OF QUICK LIME UPON THE ANIMAL ECONOMY.

Experiment. A small dog was made to swallow a drachm and half of quick lime reduced to powder. At the end of ten minutes, the animal vomited a tolerable quantity of alimentary matter; his mouth was filled with foam, and he appeared to suffer a little pain. The next day (2nd day) he appeared to be recovered, and ate with appetite. The two following days (3d and 4th) he continued in good health. On the 5th day, he was made to swallow three more drachms of quick lime powdered. He vomited two minutes after, and fell into a state of dejection: he made complaints from time to time, and died three days afterwards, without having experienced either vertigoes, convulsive movements, or paralysis.

Dissection. The mouth, fauces, and œsophagus, were a little inflamed: the mucous membrane of the stomach exhibited, throughout its whole extent, a deepish red colour: it was evidently inflamed: the coats beneath it did not appear in any way affected: the pylorus, duodenum, and the other parts of the digestive canal were in their natural state. The lungs, which were of a

rose colour, contained air, and exhibited no trace of turgidness, or thickening.

We may conclude from this experiment; 1st, That lime introduced into the stomach, is not a very energetic poison: 2nd, That it occasions death by producing inflammation of the texture with which it comes in contact.

SYMPTOMS AND LESIONS OF TEXTURE PRODUCED BY QUICK LIME.

Nausea, vomitings, epigastralgia, colics, frequent stools, and all the symptoms which characterize, or are complicated with, inflammation of the stomach and intestines, may be the consequence of the imprudent taking this caustic alkali.

When the texture is examined after death occasioned by lime, nothing is observed but an inflammation more or less intense of those parts which have been in contact with it. (Vide preceding experiment,)

APPLICATION OF ALL THAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISONING BY LIME.

Lime, when free from mixture, is soluble in water; its solution turns the syrup of violets green; it produces a white precipitate, with the carbonic and oxalic acids; lastly, it experiences no change from the sulphuric acid. These characters are sufficient to decide upon its presence.

When this alkali forms part of the matter vomited, or that found in the stomach after death, the mixture must be calcined, if the tests are not capable of detecting it: by this means, all the animal and vegetable parts capable of concealing it, will be destroyed, and this alkali will soon be obtained in a caustic state. The residuum must then be treated by distilled water, and examined by all the re-agents we have spoken of, in giving its chemical history.

TREATMENT OF POISONING BY LIME.

All the rules established, where we have marked out the steps the physician ought to follow in order to cure persons poisoned by caustic potash and soda, may be applied here.

ARTICLE THE THIRTEENTH.

SPECIES XIII.—PHOSPHORUS.

Many respectable physicians have administered this substance with the intention of combating certain chronic diseases, adynamic and ataxic fevers, epilepsy and paralysis; some among them are of opinion that this medicine is possessed of properties which promise to render it extremely useful: other practitioners, who have been witness to the ill effects it has produced in certain nervous affections, have not concealed the danger attendant upon its administration, even when the greatest precautions are used. Zealous of seeing the Materia Medica founded upon sure principles, these praise-worthy men have published cases in which they have seen phosphorus produce death in a very short time, and accompanied with the most excruciating pains.*

We are of opinion that it would be useful to direct the attention of scientific men to a substance, the properties of which are capable of becoming fatal to the animal economy.

PHYSICAL AND CHEMICAL PROPERTIES OF PHOSPHORUS.

Phosphorus is a solid body, semi-transparent, slightly brilliant, flexible, and soft: it is easily cut with a knife, and exhibits it a vitreous fracture, sometimes a little lamellated: it has a very sensible smell of garlic, and similar to that of the arsenious acid, when thrown on burning charcoal; it appears insipid when pure; it

* When used for medical purposes, it acts as a powerful stimulant. It is prepared by dissolving the phosphorus in ether. One ounce of sulphuric ether, rectified on the muriate of lime, will hold six grains in solution. Volatile oils also dissolve it. The solution of phosphorus in ether, is taken in doses of a few drops, in some convenient vehicle. J. G. N.

is commonly transparent and colourless; its specific gravity is as 1.770.

ACTION OF PHOSPHORUS UPON THE ANIMAL ECONOMY.

Phosphorus, dissolved in oil of olives, and injected into the veins, produces death in a very short space of time: when introduced into the stomach, it occasions symptoms, which are exceedingly variable according to the state of division in which they have been administered, but which in all cases produce death. What is the mode of action of this poisonous substance?

It results from Mr. Magendie's experiments, 1st, that phosphorus, introduced into the stomach, occasions death, by producing inflammation, more or less violent, in different parts of the digestive canal, which, if violent, sympathetically induces a lesion of the nervous system. 2nd. That it gives rise to these symptoms by combining with the oxygen of the air contained in the alimentary canal, and that it gives birth to phosphorous acid, and probably to phosphoric acid, in such manner that the corrosion depends upon the action of these acids. 3d. That whenever the phosphorus is introduced in cylinders, phosphorous acid is constantly formed; which corrodes the portions of the membranes with which it comes in contact, so, as the phosphorus proceeds progressively from the stomach to the rectum, it may be understood, that the inflammation ought to be strongest in those places, where the greatest possible quantity of phosphorous acid is formed; for instance, those which the combustible body has already passed through. 4th. That the combustion is slower in proportion as the stomach contains a greater quantity of food, the combustible body finding itself in that case enveloped, and consequently more sheltered from the contact of the air. 5th. That death soon succeeds when the phosphorus has been previously divided in oil: in this case the combustion is most rapid, and the animal dies amidst the most horrible convulsions. It is probable the product of this combustion is phosphoric acid.

M. Giulio, professor of medicine at Turin, in a physiological work on phosphorus, has drawn the following conclusions: 1st.

That phosphorus introduced into the stomach and intestines of animals, undergoes there a combustion, and produces symptoms peculiar to that combustion. 2nd. That the burning irritation caused by the disengagement of caloric during this combustion, as well as the caustic impression of the sulphurous vapours, produces an inflammation in the œsophagus and intestines, proportioned to the quantity of phosphorus swallowed, dissolved, and burnt. 3rd. That the inflammation of these parts, which is sufficient to account for the death of the animal, is not necessary to produce it. The burning impression produced upon the nerves of the stomach and intestines, is sufficient to explain the murderous effects of phosphorus: thence arise the tremblings of the body; prostration of strength, and the terrible convulsions, which, in these experiments, are constantly witnessed in animals submitted to the action of phosphorus internally administered in sufficient doses. 4th. That the death of frogs, produced by the simple phosphorous vapours, and by the contact only of the interior parts of the mouth with phosphorus, and the speedy destruction of the irritability of their muscles, exhibit an incontestible proof, that phosphorus, in a certain state, is possessed of a deleterious property, and destroys vitality by impairing the nervous power. 5th. That water, which does not dissolve phosphorus, produces slight, serious, or fatal symptoms, according to the quantity of particles of phosphorus it holds in suspension.

SYMPTOMS AND LESIONS OF TEXTURE PRODUCED BY PHOSPHORUS.

The symptoms and lesions of texture to which phosphorus gives rise, vary according to the state of division in which it happens to be taken. 1st. If it be solid, in small cylinders, and the stomach be filled with food, the symptoms will not take place till some hours after it has been swallowed, and they will be in every respect similar to those which distinguish inflammation of the stomach and intestines.

2nd. If the phosphorus has been previously dissolved in oil or ether, whatever may be the state of the stomach, in a short time

the most cruel sufferings, the most obstinate vomitings, and the most alarming symptoms, will make their appearance, and portend a speedy dissolution. It is evident that the lesions of texture will be more serious in this last case than in the former.

APPLICATION OF WHAT HAS BEEN SAID, TO THE DIFFERENT CASES OF POISONING BY PHOSPHORUS.

It is impossible to confound pure phosphorus with any other body in nature. In short, its smell of garlic, its other physical properties, that of smoking in the air, its great fusibility, and its combustibility, are so many characters which will not allow of any mistake on that score.

If the poison is to be sought for after death ; the intestinal canal ought to be examined, to see if it does not contain some solid pieces of phosphorus of a red colour, which may be known by the proceedings we have just pointed out. In case we should not be able to discover the least trace of this combustible body, we must collect together all the fluid and solid substances which line the stomach and intestines, in order to be assured whether they do not contain phosphorus or phosphoric acid, produced by combustion in the stomach.

TREATMENT OF POISONING BY PHOSPHORUS.

When phosphorus has been taken in a solid state, the most pressing indication is to administer two or three grains of antimoniated tartrate of potash : by this means the physician will easily succeed, in throwing up the poison before it has had time to act, or at least before it has produced any decided action. If it has been taken in a state of division, there is no doubt, but it will be extremely advantageous to cause the patient to take immediately copious draughts of water containing magnesia in suspension ; for, 1st, these draughts will fill the stomach with fluid, drive away the atmospheric air, and the phosphorus will be no longer able to burn with the same rapidity ; 2nd, they will favour vomiting by dis-

tending the stomach, without adding to the irritation which the poisonous substance has already produced; 3rd, they will saturate the phosphorus or phosphoric acid that may be formed, and consequently hinder them from corroding the texture with which they come in contact.

If, notwithstanding all the assistance we have advised, inflammation of the first passages should declare itself, or the patient be attacked with alarming nervous symptoms, it will be necessary to have recourse, without delay, to the most powerful antiphlogistics and antispasmodics.

ARTICLE THE FOURTEENTH.

GLASS AND ENAMEL, IN POWDER.

Ought glass, enamel in powder, and the different kinds of sharp angular stones, to be considered as substances capable of corroding the parts with which they come in contact; and ought they to be reckoned amongst the poisons of this class? We find, in the annals of medicine, several facts relative to this important question; some of which tend to prove, that the sharp fragments of these stony substances may be swallowed with impunity; others, on the contrary, establish in the most positive manner the danger that exists from introducing them into any part of the digestive canal. *Caldani*, *Mandruzzato*, *M. le Sauvage*, and others, report experiments made upon men and animals, in which the ingestion of glass was not followed by any accident. *M. Portal*, *Fodéré*, &c. &c. speak in their works, of persons who have experienced the most serious symptoms from these bodies remaining in the digestive canal.

M. Marc, in a work entitled *Manuel d'Autopsie Cadavérique Médico Légale*, says, "The observations which medical men "have had the opportunity of making upon the eaters of glass, and "a few recent experiments of *Caldani* and *Mandruzzato*, which "appear all to decide in favour of the innocence of these kinds of "substances, have been too lightly adopted. *Caldani* made ex- "periments upon animals, and even (what appears difficult to "conceive) upon a young man of fifteen years of age, whom he

"caused to swallow pounded glass, without his having expe-
"rienced the slightest inconvenience. *Mandruzzato* repeated
"these same experiments upon animals and upon himself, and ob-
"tained the same results. These observations however prove,
"at most, that pounded glass introduced into the stomach, is not
"always hurtful; and such isolated facts by no means prove,
"that in other cases, and under different circumstances, one or
"more sharp points applied to the internal surface of the alimen-
"tary canal, might not produce there a mechanical action of the
"most fatal kind. It is, moreover, clear, from the fate which
"terminated the existence of the most experienced of these glass-
"eaters; and they almost all died of intestinal diseases (*Ploquet
"sur les Morts Violentes*), from the different sudden deaths after
"swallowing of glass (*Gmelin in his History of Mineral Poisons*,
"and Metzger); that these kinds of substances may be extremely
"dangerous."

The physical properties of glass in fragments, are sufficiently well known, to render it unnecessary to detail them. If the presence of this substance finely powdered were to be determined, we should melt it in a crucible, or what is still better, upon a piece of charcoal, by the assistance of a blow-pipe: in a short time a lump of glass would be obtained, whilst, at the same time, the organic substances with which it may have been mixed, would be decomposed by the calcination.

ARTICLE THE FIFTEENTH.

SPECIES XV.—CANTHARIDES.

Synonym. Cantharides of the shops. *Cantharis Vesicatoria*—*Meloe vesicatorius*—Lytta Vesicatoria; a kind of insect of the family of Cantharides, Order Coleoptera, Class Pterodicera. (Latreille).

PHYSICAL AND CHEMICAL PROPERTIES OF CANTHARIDES.

Cantharides, according to M. Robiquet, contain:

1st, A green fluid oil, insoluble in water, soluble in alcohol, and by no means vesicatory.

2nd, A black matter, soluble in water, insoluble in alcohol, and possessed of no vesicatory property.

3rd, A yellow matter, soluble in water, and soluble in alcohol, at the ordinary temperature, not vesicatory.

4th, A white substance, in the form of small crystalline plates, insoluble in water (soluble however in this fluid, when it is mixed with the yellow matter), soluble in boiling alcohol, in which it subsides, on cooling, in crystalline flakes, after the manner of spermaceti; soluble in the oils, strongly epispastic.

5th, A fat matter, insoluble in alcohol, not epispastic.

6th, Phosphate of lime, which forms the basis of the skeleton.

7th, Phosphate of magnesia.

8th, A small portion of acetic acid.

9th, A still greater quantity of uric acid.

Cantharides may be reduced to a fine powder, of a greenish grey colour, mixed with some shining points, of a very beautiful and very deep green, in every respect resembling that of the insect when whole. The smell of this powder is acrid and nauseous.

ACTION OF CANTHARIDES UPON THE ANIMAL ECONOMY.

Cantharides, when brought in contact with our texture, very soon produces symptoms the most serious, almost always followed by death.—What is their mode of action?

It results from many experiments: 1st. That the part of the cantharides soluble in oil of sweet almonds, when injected into the veins, in no very strong dose, exerts its action upon the nervous system, and principally upon the vertebral column. 2nd. That when this insect is introduced into the stomach, it acts as a corrosive, and occasions death in a very short time, by inducing a

severe inflammation of this viscus, and acting upon the nervous system; it produces likewise inflammation of the internal coat of the bladder, when it remains in the stomach, a few hours before life is destroyed. 3d. That when it is applied externally, it destroys animals sometimes by the same kind of action which it exerts when introduced into the stomach.

SYMPTOMS OF POISONING BY CANTHARIDES.

Observation 1st.

"In 1572," says Cabsol, "we went to visit a poor man in Provence who was attacked by the most horrible and formidable *satyriasis* that one could see or imagine:—the fact is this: he was labouring under a quartan fever; to cure which, he took the advice of an old sorceress, who made him up a draught of the seeds of nettles, and two drachms of cantharides, and other things, which produced such a degree of satyriasis as proved fatal, in spite of all the medicines administered."

Observation 2nd.

An abbé, of middle age, being in this town, on account of a lawsuit, took up his abode for the night in a house of ill fame; and having finished his business, he came to lodge there in the evening. He was kindly received, and, having acquired much appetite in the course of the day, ate, by way of collation, of a certain sweetmeat, into the composition of which the powder of cantharides entered. A short time afterwards, that is to say, the next morning, the symptoms which I have above described, occurred to this abbé, and still more violent, since he passed pure blood both by stool and urine. Physicians being called in, and seeing the abbé labouring under such symptoms, with an erection of the penis, knew, at first sight, that he had taken cantharides. They ordered him emetics, and glysters made of pearl barley, rice, and decoction of manna, linseed, fenugreek, oil of lilies, goat's or stag's lard; and then afterwards a small quantity of theriaca, mixed up with conserve of roses, in order to expel the poison from the body; for the same reason,

they gave him milk to drink, and administered injections to the penis and intestines, with other refrigerating and mucilaginous articles, in order to correct, obtund, and destroy the virulence and malignity of the poison. His drink consisted of barley ptisan; his eating, of fowls, veal, kid, fat pigs, boiled, with lettuces, potherbs, &c. which food served him likewise as medicines, as well for relaxing the bowels, as for relieving the pains arising from the acrimony of the poison: and on the region of the kidneys, the loins, and the perinæum, were applied several refrigerating articles; beside which, the warm bath was employed, in order to drive out the poison from the pores of the skin: but, notwithstanding all these remedies, applied according to art, the abbé died of gangrene of the penis.

Observation 3d.

N***, a young lady, fifteen years of age, of a bilious temperament, and a strong constitution, being in a state of despair on account of finding herself without any means of existence, swallowed, on the 12th of June, 1812, about eight grains of the powder of cantharides; a few hours after, she felt a very severe pain in the hypogastric region, a burning heat with itching in the parts of generation, and a constant want to make water, which she could only accomplish drop by drop, and with most cruel suffering. A few moments afterwards, she became a prey to horrible convulsion; during which her limbs were contorted: she uttered piercing cries, and often lost her reason. *(Milk, linseed tea, camphorated emulsion, emollient glysters).* These medicines put an end to the principal symptoms.

The following day she only complained of pains on making water, and a darting pain in the urinary passage; her urine was extremely red, and covered with small black pellicles *(the same treatment).* On her entrance into the Hotel-Dieu, on the 26th of June, she exhibited no other remarkable symptom; her health continued to improve; the stomach and intestines performed their functions freely. *(Edulcorated gum arabic, emollient glysters, boluses of camphor and nitre eight grains.)* On the 30th, she experienced again a slight scalding on making water, which gradually went off in the course of a few days.

The following are the symptoms of poisoning by cantharides: a nauseating and infectious smell, retchings, copious vomitings, abundant, and frequently bloody, alvine evacuations; very violent epigastralgia, horrible gripes, and excruciating pains in the hypochondria: heat in the bladder, urine sometimes bloody; an obstinate, and sometimes painful priapism; pulse frequent, and hard; a very disagreeable sensation of heat, and ardent thirst; sometimes a horror of liquids, frightful convulsions, tetanus, delirium, &c. &c.

LESION OF TEXTURE PRODUCED BY CANTHARIDES.

The lesions of texture, resulting from the action of cantharides upon the digestive canal, are extremely similar to those of the other corrosive poisons. Fungous tubercles are sometimes seen on the internal coat of this canal, with varices and ulcerations. It does not appear at all doubtful, that they give rise likewise sometimes to inflammation of the bladder and parts of generation: this kind of injury takes place more particularly when the patient only dies one or two days after the poisoning.

APPLICATION OF ALL THAT HAS BEEN SAID, TO THE CASES OF POISONING BY CANTHARIDES.

It will be always easy to distinguish cantharides, when a portion of the powder not taken can be procured. In fact, whatever be the state of division of this powder, even when it shall have been passed through a silken sieve, it will be possible to discover, by an attentive examination, a number of shining points, of a very beautiful green colour. The same method must be had recourse to in those cases where they must be sought for in the matter vomited, or in the contents of the stomach after death. If the characters furnished by the re-agents should differ from those I have described, the practitioner must pay no regard to them, in deciding on the presence or absence of cantharides; for animal substances present in the different menstrua very complicated phenomena, which are little understood, and consequently liable

to lead to error. In this case, he must attend simply to the physical properties of the powder, to the lesions of texture, to the symptoms, and the history of the case.

TREATMENT OF POISONING BY CANTHARIDES.

We have not yet acquired a sufficiently extensive knowledge of the nature of the principles composing cantharides, and animal substances in general, to be able to flatter ourselves with the hope of tracing out successfully the antidotes of the different poisons which they furnish. For which reason we are obliged to refer the reader, for the treatment in question, to all that has been said generally in the articles, on the other corrosive substances, reminding him particularly of the advantage to be derived from the exhibition, in the first moments, of gentle emetics, such as oil in large quantities. Barthez has employed sometimes with success, an emulsion of milk of almonds, and syrup of diacodium. M. Giulio obtained great advantages from friction with a liniment composed of oil of olives, liquid laudanum, and ammonia; he employed also a tincture of musk and opium.

CHAPTER II.

Class 2d. ASTRINGENT POISONS.

THE astringent poisons are so called, because they frequently produce a remarkable constriction of the great intestines, and especially of the colon. We shall perceive however in the end, that they are capable of producing inflammation of the texture of the digestive canal, and that they frequently exert their action upon the nervous system. We rank in this class only the saturnine preparations.

ARTICLE I.

SPECIES I.—THE COMPOSITIONS OF LEAD.

Var. 1. Acetate of lead.

Var. 2. Red oxyde of lead, litharge.
3. Carbonate of lead. Ceruse.
4. Wines sweetened by lead.
5. Water impregnated with lead.
6. Food cooked in leaden utensils.
7. Syrups and spirits clarified with acetate of lead.
8. Saturnine emanations.

If we were to judge of the interest excited by any medical subject, by the number of writings to which it has given birth, we could not but regard the poisoning by lead, as the most important to be known of all those that have been treated of, up to the present time. In fact, Hippocrates, Henckel, Stoll, Tissot, Bordeu, Sauvages, and many other celebrated physicians, have endeavoured to throw some light on certain points of the history of the colic occasioned by the preparations of lead.

OF LEAD.

Lead is a solid metal; of a shining bluish white colour; it is soft enough to be scraped off with the nail, and to be bent in all directions: it is extremely malleable; its specific gravity is, as 11.352.

When exposed to the action of caloric, it easily enters into fusion, without becoming volatile, at least in any sensible manner.

Oxygen is capable of combining with lead, and of forming three oxydes, which differ from one another in their composition, and in their chemical and physical properties.

Lead, in its metallic state, is not poisonous, and may without inconvenience be associated with the tin, with which kitchen utensils are tinned. M. Proust, in a very excellent work on this subject, has concluded, from a very great number of experiments:

"1st. That the tinning which consists even of equal parts of lead, cannot be dangerous; since it is sufficient that the lead should be combined with tin, in order to prevent it from being dissolved, either in lemon juice, or vinegar, the two acids most

to be dreaded. The tin, being more oxydable than the lead, dissolves exclusively in these acids, and prevents the second from being attacked. The lead cannot appropriate to itself an atom of oxygen, but the tin would carry it off in an instant."

"2nd. That lead, when combined with tin in equal portions, and beyond that, can never take precedence of this last, so as to be oxydated, and dissolved before it. This same combination, internally taken, and in a stronger dose than what a whole family could swallow, even when the whole of the tinning shall not last more than eight days, is not in a condition to expose, even in the slightest degree, the health of any one: neither is there a single example well attested of it."

If instead of cooking acid aliments in vessels of tin, alloyed with lead, vessels of this last metal only be employed, there is no doubt but oxydation and solution of some of the metallic particles would take place, the ingestion of which would occasion symptoms, such as we shall describe in giving the history of the acetate and carbonate of lead.

OF THE ACETATE OF LEAD OF COMMERCE. *(SUGAR OF LEAD.)*

The acetate of lead crystallizes in *parallelopipedes* flattened, terminated by two surfaces disposed in *talus* or in unformed needles, of a white colour, and a sugary flavour, slightly styptic.

The sugar of lead, treated by distilled water, is almost wholly dissolved at the ordinary temperature, provided at least that it be not mixed with a great quantity of the protoxyde, or other insoluble substances. The filtered solution is limpid, transparent, and colourless, and possesses very remarkable properties.

OF THE RED OXYDE OF LEAD AND LITHARGE.

The deut-oxyde of lead *(minium)* is of a beautiful red colour, very heavy, and easy to distinguish from other preparations of this kind.

Litharge is only the yellow protoxyde of lead melted, and which has been left to crystallize by cooling. It always contains

a small quantity of carbonic acid, which it carries off from the air with which it is in contact. It is in the form of small reddish or yellowish scales, which are brilliant and vitrified.

Heated with charcoal in a red hot crucible, it becomes decomposed, and furnishes metallic lead and carbonic acid gas; this character likewise belongs to all the other oxydes of lead.

OF THE CARBONATE OF LEAD.

The carbonate of lead is of a white colour, and dissolves readily in carbonic acid water. If the fluid in which this salt is dissolved be evaporated, crystals of acid carbonate of lead will be obtained.

When heated in a crucible with charcoal, it becomes decomposed, and gives out metallic lead.

OF WINES SWEETENED BY LEAD.

Wines sweetened by lead lose a great deal of their austere acid and bitter taste; they acquire a flavour which is sweet, and rather styptic.

When introduced into a glass retort, to which a balloon is adapted, they furnish, by the action of a gentle heat, alcohol, which condenses in the recipient, and there remains in the retort, a thick fluid, consisting of the different fixed principles of the wine, and of the saturnine preparation which entered into its composition. This character, added to those we have spoken of in giving the history of litharge, will not allow the confounding of wines adulterated with lead, with any other poisonous substance.

OF WATER IMPREGNATED WITH LEAD.

If we pay attention to the facility with which lead passes to the state of carbonate, when brought in contact with aerated water, we shall not feel surprized that persons have sometimes been strongly incommoded, by having drank water which had remained some time in reservoirs of this metal, exposed to the air.

The hydro-sulphurets, sub-carbonate of soda, the chromic and sulphuric acids, &c. act with water impregnated with oxyde, or

acid carbonate of lead, in the manner we have stated, when giving the history of this metallic acetate; but the existence of carbonate of lead in these fluids, can only be ascertained by the acids decomposing it with effervescence, and by its furnishing metallic lead when calcined with charcoal.

OF FOOD COOKED IN LEADEN UTENSILS.

Those kinds of food which contain free vegetable acids, or saline preparations, are capable of attacking utensils made of lead, of oxydating them, or of favouring their oxydation; indeed of dissolving them. We have already observed, that these consequences do not follow when the lead is combined with tin, because this metal, being more eager for oxygen, prevents its solution. Whatever may be the state of the solution of lead mixed with the food, it communicates to it a taste more or less sugary, and metallic lead may be obtained from it, by calcining it in a crucible. It is clear, that if the fluid part of the food contains lead in solution, the tests which we have recommended to be employed, will discover it, even when it only contains a few particles.

ACTION OF THE DIFFERENT COMPOUNDS OF LEAD UPON THE ANIMAL ECONOMY.

A single glance at the medical observations hitherto collected, will be sufficient to convince any one of the danger to which those persons are exposed, who make use of lead and its compounds. Painters, plumbers, potters, glaziers, workers in glass, gilders, chemists, miners, &c. &c. are often attacked with the most severe colics, sometimes succeeded by death, from having only handled saturnine preparations, or even from being placed within the sphere of their emanations.

When injected into the veins, the salts of lead produce symptoms exceedingly grievous, and destroy life in a very short space of time, even when only a few grains are injected. Lastly, when introduced into the stomach in a larger dose, they universally give rise to symptoms, which are more or less severe, and which the animals sometimes sink under.

We conceive ourselves authorized to conclude, from a great

number of facts ascertained with the greatest caution, that the phenomena exhibited by animals submitted to the action of lead, under the different circumstances we have just spoken of, take place from causes which are not always the same. We shall now relate the circumstances which appear the most proper to support this assertion.

CAUSES OF THE SYMPTOMS PRODUCED BY SATURNINE EMANATIONS.

Animals living about the boilers, in which the preparations of lead are evaporating, in the course of a few days become dejected, lose their appetite, and pass their excrements with difficulty. This state of things in a short time grows worse; their urine soon becomes bloody; sometimes they vomit blood, and their excrements become tinged with it: their agony is expressed by a continual going round, in which action they expire, having the belly flattened laterally, and their flanks quite sunk in. One of these animals, after having remained some time in a warehouse of *minium*, died in horrible convulsions. Its limbs were strongly contracted, and the claws pushed out from the fingers; there was nothing remarkable in the interior, except a contraction somewhat distinct of the intestines: all the other organs were sound.

Jean B***, house-painter, forty years of age, of a sanguine temperament, and strong constitution, was brought to the Charity, in the month of April, 1803. He was senseless; felt excruciating pains in the abdomen, which was contracted; the pulse was scarcely perceptible; the limbs were agitated with violent convulsions: he died a few hours afterwards.

Inspection of the Body. The tongue was clean, the belly tolerably distended, and not at all retracted: the muscles of the left arm were violently contracted.

The brain was sound, as were likewise the heart and lungs. On opening the abdomen, there exhaled a sharp and irritating odour: the liver was in its natural state, the spleen in good order, the stomach sound and empty; the small intestines were sound, though rather red, and contained some gases; the colon and rectum were empty, and exceedingly contracted; but were easily distended; the cœcum contained yellow liquid fæcal matter; the

kidneys and bladder were in their natural state, the muscles were extremely red.

M. Merat, from whom we have borrowed these facts, rightly concludes that lead, in these kinds of affections, exerts its deleterious influence upon the muscular coat of the intestinal canal, and particularly on the nervous system distributed over these muscles: thence the anomalous nervous appearances sometimes observed. "What tends to support my opinion, that this disease is seated in "the muscular coat, is the retraction and constriction of the intes- "tine which exists in certain parts of it, properties inherent in the "muscles, not possessed by the other systems. If the lead ex- "erted its action on the mucous coat, there would be an abundant "secretion of the fluid peculiar to that membrane; there would "be either dysentery or diarrhœa, which is far from being the "case; since there is constipation. Still less does this metal act "upon the peritonæal portion of the intestines; we should then "have a kind of *peritonitis*, that is to say, fever, tension of "the belly, distension, heat, &c.—all which phenomena are far "from existing, and the direct contrary to which are found; "such as flattening of the abdomen, insensibility to pressure, "apyrexia, &c."

EFFECTS PRODUCED BY THE INJECTION OF SATURNINE PREPARATIONS INTO THE VEINS.

Experiment. From one to three grains of acetate of lead, were frequently injected into the jugular veins of several weak and middle-sized dogs, without their having appeared to be incommoded by it. Once or twice only the animals submitted to these experiments made some slight efforts to vomit, and threw up a small quantity of whitish stringy matter.

It follows from these facts, 1st. That the acetate of lead introduced into the torrent of the circulation, is not so energetic a poison as most of the other metallic salts; 2nd. That when it is injected in the dose of several grains, it is capable of producing serious accidents, followed by death more or less speedily, the cause of which appears to depend on a lesion of the nervous system.

ACTION OF THE ACETATE OF LEAD INTRODUCED INTO THE STOMACH.

Experiment. At eleven o'clock, a dog, of middle size, was made to swallow while fasting, an ounce and a half of acetate of lead, solid and perfectly levigated: five minutes afterwards the animal made efforts to vomit, and threw up at three different times a considerable quantity of whitish matter: the vomitings returned again in the course of an hour. At four o'clock he was quiet, and appeared to be suffering pain in the belly. The next day, at nine in the morning, he drank a great quantity of water, which he soon threw up, and refused to take food: he enjoyed the free exercise of his limbs and his senses: and was not agitated by any convulsive movements: he expired at six in the evening, in a state of great dejection.

The Dissection took place the next day at noon. On opening the stomach, the mucous membrane was found to be of a deep red colour throughout its whole extent: near the cardia were found several spots of a black colour, about the size of a pea; the portion bordering on the pylorus, likewise exhibited a few of these spots; it was moreover sprinkled with a multitude of points of small diameter, and of a blackish gray colour: the surface of this membrane, which is in immediate contact with the muscular coat, as well as the muscular and serous coats, were of a fiery red colour, so that the stomach appeared to be highly inflamed, even before it was opened. The intestinal canal presented no alteration; the lungs were perfectly sound.

It results from facts: 1st. That acetate of lead introduced into the stomach in a large dose, produces death in the course of a few hours, even when the animals are allowed the power to vomit. 2nd. That animals who swallow this salt in a solid form, and throw up a part of it by vomiting, die in consequence of the corrosion it produces in the digestive canal, which corrosion the inspection of the dead bodies places beyond all doubt. 3d. That when taken in a liquid form, and it lies long enough in the stomach for absorption to take place, its fatal effects depend more on its action upon the nervous system, than on the inflammation it pro-

duces. 4th. That it produces no serious symptoms unless when taken in a sufficiently strong dose, and after having remained a sufficient length of time in the stomach. When swallowed in small quantity its action is confined to the exciting vomiting, and increasing the alvine discharges : the same thing takes place with a great number of saturnine preparations.

SYMPTOMS OF POISONING BY SATURNINE PREPARATIONS.

Case.

D***, house-painter, aged thirty-six years, of a good constitution, experienced in the month of November, 1809, slight colics, which occupied the whole belly : his appetite was lost ; he continued however to work ; but the colics increased, notwithstanding he took milk to appease them. Some theriaca however which he took in brandy, procured him a little relief. He came to the Charity for cure, sixteen days after the invasion of the disease. There was no head-ache, the tongue was dry and white, he had a disagreeable and bitter taste in the mouth ; his breathing was free ; he felt severe pains in the belly, which were not increased by pressure, although the patient seemed afraid of it. He had no alvine evacuations for three days ; the urine was scanty : the pulse slow, giving only forty pulsations in a minute : the patient had not slept for three days.

The treatment was immediately entered upon. He went twice to stool, passed a great deal of urine ; the pains and the pulse were in the same state. The vomit administered to him on the second day of his admission, made him throw up eight different times a greenish matter : he slept at night : the pains became less, and the pulse natural. The purgatives evacuated him freely the following day ; and on the twelfth day from his admission he went out of the hospital perfectly cured. (This observation is extracted from the dissertation of M. Merat.)

To these different facts, we think proper to add the following :

1st. James, in the Medical Dictionary, tom. ii. p. 837, says,

under the article *Bellon*, that he has twice been obliged to treat persons labouring under this colic for having taken *Sugar of Lead* (acetate of lead) for the purpose of stopping the *fluor albus*.

2nd. Tissot reports, that the acetate of lead, administered in Phthisis Pulmonalis, has three times occasioned the metallic colic of which we are treating.

A whole family, according to the report of Van Swieten, were attacked by paralysis, for having for a long time made use of water contained in a large vessel of lead. Another family experienced the same disease, for having drank the water of a well, loaded with selenite, and which had attacked the lead of which the vessel was composed that served for drawing the water. The father of this family was for a long time attacked with palsy; the mother died in consequence of a long and painful colic, accompanied with icterus: out of twenty-one children, eight died in infancy, and the others were ill every time they came to their father's house. There are likewise instances of unfortunate accidents occasioned by water transmitted through leaden pipes, or by rain water falling off the roofs of buildings covered with lead, and received afterwards into vessels.

Lastly, Wedekind, Boerhaave, De Brambila, Haeberl, Percival, Wall, &c. &c. speak of colics of this kind, produced by the external application of plasters or cataplasms, into the composition of which lead had entered.

After having established the facts which are to serve for the medical history of poisoning by lead, we shall proceed to trace out the symptoms which characterise the colic proceeding from emanations of this metal, from the moment of its invasion to its termination.

Invasion. This is sometimes rapid enough, at other times slow: in the first case, the patient perceives gripings more or less severe, which at first are of short duration, but return immediately, and at last are continued. The excretion of the alvine discharge is painful and difficult: the excrements are hard, and like those of some animals; the patient experiences nausea and vomiting, particularly when the pains are most acute. The abdomen re-

tracts, and sinks in towards the navel; and those parts which form the anterior parietes, tend towards a contact with the vertebral column. anorexia and watchfulness come on. The degree of anxiety is sometimes very great, and the patients are obliged to take to their bed. It is worthy of observation, that fever does not take place, whatever be the intensity of the pains.

In some persons, it has been seen, that the symptoms we have been describing have appeared all at once with great energy: this sudden invasion is very uncommon.

In the slow attack, the gripings begin by being obtuse, and very soon cease; they then return again in a short time, and produce pains which in the end become insupportable. The other symptoms we have been describing, soon make their appearance.

Beside these symptoms, there are others which belong to the two varieties of attack. The countenance is pale, or rather yellowish, and sharp during the pain: by placing the hand on the belly, far from increasing the pain, you relieve it. There is scarcely ever any head-ach; the breathing is sometimes difficult: sometimes also the limbs are in great pain, which is more violent at night. Very frequently there are eructations—borborygmi are rarely observed. Delirium, icterus, retraction of the testicles, convulsions, &c., are so many accidental symptoms which sometimes accompany this complaint.

We are of opinion that it would be useful to dwell upon some of the principal phenomena of this kind of poisoning.

Eructations. I have twice observed, in persons attacked with the painter's colic, excessively frequent eructations, which produced in the mouths of the patients the same sensation as any thing sugared. This circumstance is extremely rare; I do not know that any author has taken notice of it.

The Vomitings. Their duration is variable: sometimes they continue for several days; but for the most part they cease after the second day of the treatment. The matter of which they consist, is liquid, greenish, or blackish, and bitter.

Retraction of the Abdomen. M. Merat, in order to give an an idea of this remarkable symptom, says: "The retraction of

the abdomen is a phenomenon purely mechanical. Suppose an elastic cord extended from the pubis to the xiphoid cartilage, if it be pressed from within outwards, it will become convex: on the contrary, suppose that nothing presses upon it, it will then resume its natural state, that is to say, it will form a line exactly straight. The intestines, in their natural state, push the layer of the anterior muscles of the abdomen forwards, and form the projection we observe: if they are drawn in, contracted, as in the metallic colic, the muscular parietes form the straight line, if the retreat of the intestines be not beyond this line; for if they be still more retracted, the abdominal parietes follow them, probably from the effect of atmospherical pressure; and then these parietes, especially the umbilical region, which is naturally rather convex, are excavated beyond the right line, or supposed to be in this state: that is what is called *the belly depressed inwards*, or simply *retracted*. As the contraction of the intestines is stronger in proportion as the pains are more violent, it will follow, that the more intense the colic is, the more the belly will be retracted; and consequently we may judge of the intensity of the colic by the retraction of the belly." (*Op. Citat.*)

Pressure. When the umbilical region of a person attacked with metallic colic is gradually pressed with the hand, the pain diminishes, and the patients experience so much relief, that they do not hesitate under certain circumstances, to make two or three persons get upon their belly*. However, it sometimes happens that the pain is increased by the slightest pressure; so that this sign cannot be considered as pathognomic of this affection.

The Gripes. According to M. Merat, the continued pains, which persons attacked with this disease, experience, are seated in the small intestines; whilst those which are more acute, and which come on by fits, have their seat in the colon, principally in its transverse portion. We shall not attempt to explain the cause of the pain which accompanies these colics; we are afraid of being bewildered in conjectures.

* Fernel de Lue Venerea, cap. ii. Merat, page 5.

Constipation is a symptom common enough in this affection; it appears to depend on the progressive constriction of the intestinal canal, which opposes the excretion of the accumulated matter. Sometimes the patients, far from being constipated, are tormented with a looseness more or less considerable.

The Absence of Fever. It is easy to prove, that the colic of lead is rarely attended with fever: out of fifty-seven patients observed by M. Merat, in the year 1811, three only had fever: I can affirm that I have seen, in my own practice, a very considerable number of cases of this kind, without having ever once met with a patient in a febrile state, at least unless there was complication.

The urine presents no particular character.

The alvine excretions are generally of a yellow colour, they are rounded and hard, like the excrements of a quadruped: in proportion as the disease advances, they soften and become almost watery.

LESIONS OF TEXTURE PRODUCED BY THE PREPARATIONS OF LEAD.

We have proved, that acetate of lead introduced into the stomach in the dose of several drachms, produces inflammation of one or more parts of that viscus: at one time the mucous membrane of the stomach is simply attacked with phlogosis on its inner surface; at another time the inflammation extends to that surface, which is united to the muscular coat; in this case it is often of a very deep red colour, and the other membranes of the stomach partake more or less of the inflammation. There are sometimes observed, in the interior of this organ, black points, or spots, varying in size and extent; which are almost always the consequence of a certain quantity of extravasated venous blood, or of the injection of the blood-vessels by the same. Lastly, we have seen in the stomach of animals who have taken a strong dose of acetate of lead, and have not vomited, a membranous lining tolerably thick, of an ash colour, easily detaching in small pieces; the origin of which appeared to be owing to the decomposition of a part of the acetate of lead by the mucous, bilious, and other

fluids, contained in this viscus. The mucous membrane lying under this lining, was of a dark gray colour throughout its whole thickness, and appeared to have exercised the same action on the acetate of lead. The same phenomenon had taken place along the whole course of the intestinal canal. It is easy to conceive that the other preparations of lead would produce similar lesions when taken in sufficient quantity to occasion death.

The case is not the same with saturnine emanations. All writers on the subject agree in declaring, that in the colics produced by them, the digestive canal exhibits no vestige of inflammation; a contraction of the diameter of the great intestines, particularly of the colon, is the only thing observed. The metallic particles emanating from these kinds of substances act directly on the nervous system, without a possibility of demonstrating their presence in the digestive canal, as we shall soon prove.

M. Fodéré adds, that the bodies of persons who have died of the colic of lead, exhibit the mesentery and its glands, the chyliferous and lymphatic vessels, inflamed and obstructed, and the thoracic duct nearly obliterated. According to that author, the liver, spleen, pancreas, and lungs, are often inflamed, tumefied, and purulent, and the heart shrivelled. The whole body, in consequence of the constriction of the chyliferous vessels, is in a state of complete marasmus. We are under the necessity of declaring that almost all these signs are wanting in the majority of cases of simple colic of lead, terminated by death (*vide* Merat, p. 213 *et seq.*) We have not observed one of these appearances in the two persons we have seen die of this affection.

Henckel has asserted, without ever having opened the body of any person who had died of the painter's colic, that this disease induced inflammation and gangrene of the intestines. Bordeu asserts that he has seen the intestines abraded, livid, swelled, perforated, &c.; but an attentive examination of the facts related by this author, will make it evident, that the lead colic, in all the persons of which he speaks, was complicated with peripneumonia, peritonitis, &c. (*Journal de Médécine*, tom. xxvi. p. 210.)

APPLICATION OF ALL THAT HAS BEEN SAID TO THE DIFFERENT CASES OF POISONING BY SATURNINE PREPARATIONS.

FIRST CASE.

The Patient is living: the rest of the Poison can be procured.

Whatever may be the preparation of lead, the introduction of which into the stomach has produced the symptoms, it can be easily ascertained, if it be without mixture, 1st, by the facility with which the metal can be obtained from it, by calcining it in a crucible with charcoal; 2nd, by the action exerted upon it by the sulphuric, chromic, and muriatic acids, the alkalies, the hydro-sulphurets, and the sub-carbonate of soda.

For a great length of time, the wine-merchants have added litharge to sour wines, with the intention of sweetening them. According to M. Moller, the inventor of this fraud is a priest of the Black Forest. This adulteration may be ascertained, 1st, by distilling a part of the fluid in a retort, in order to obtain the alcohol; 2nd, by calcining the residuum with charcoal, in order to separate the metallic lead; 3rd, by assaying another portion of the adulterated wine, by the tests we have described. In these trials, the juridical physician will pay no attention to those precipitates, whose colours exhibit anomalies dependent upon the wine: such are those obtained with ammonia, and sometimes with the hydro-sulphurets.

Percival *(On the Poison of Lead*, p. 61*)* relates, that accidents have happened in the sugar-refining houses at Manchester, from the drinking of beer, which had been fermented in vessels of lead. It is clear, that in this case the metal had been oxydated and dissolved: it may therefore be found again, by submitting this spirituous liquor to the proofs we have pointed out for wine.

The bakers have sometimes employed ceruse *(white lead)* for the purpose of rendering the bread heavier and whiter. The presence of that variety of the carbonate of lead may be ascer-

tained, 1st, by calcining the flour or the bread in a crucible, in order to convert the vegeto-animal parts into charcoal, which will not be long in reviving the metal; 2nd, by treating another portion by the acetic acid at the ordinary temperature, and pouring upon the acetate of lead formed, the re-agents proper for recognizing it. The same operation may be performed upon bread made of leaven, which has been some time in leaden utensils.

Evaporation and calcination may likewise be employed to separate the lead from oils that have been clarified with the oxyde of this metal, for the purpose of sweetening them, and absorbing altogether their disagreeable smell. The same process will serve for a multitude of other mixtures similar to those we have just spoken of.

If the poisoning has been occasioned by saturnine emanations, it can only be known by the existing symptoms, and the history of the case. It will be in vain, in cases of colic produced by metallic effluvia, to have recourse to experiments made on the excrements and urine: analysis proves that it is impossible, in these substances, to discover the lead. M. M. Barruel and Merat, examined the urine of a person affected with this disease: it was not at all disturbed by the addition of the hydro-sulphuret of ammonia, and the part which subsided did not exhibit the least vestige of lead. On comparing the results which it furnished with those given by the urine of a healthy person, they saw that there was not the slightest difference. M. Merat observed, that the excretion of the urine in this patient was extremely painful; which would induce a belief, that the morbific cause was more active than in the case where it flows naturally, and that it appeared to act more particularly upon the bladder.

The excrements have likewise been the objects of research by M. M. Barruel and Merat. They reduced to charcoal, six pounds of the excrements passed during the first eight days of the metallic colic, a period when the third purgative had already produced its effect, and when the patient experienced no more pain. The charcoal when burnt, furnished forty-four grains of ashes: four ounces of distilled water poured upon them, furnished a fluid,

clear, transparent, devoid of smell, and of a taste slightly brackish; it did not turn the syrup of violets green, nor did it contain a single particle of lead. The portion which was not dissolved in the water, being treated by the means most proper for discovering this metal, did not shew the slightest trace of it. (Merat, Op. Citat. p. 122).

SECOND CASE.

The whole of the Poison has been swallowed: the Matter vomited can be acted upon, as well as that found in the Digestive Canal after the Death of the Patient.

After having expressed the fluid portion through a piece of fine linen, it must be assayed by the tests which served to discover the existence of the salts of lead; and if the precipitates obtained are of a nature to induce a belief, that the fluid contains some preparation of this kind, it must be evaporated to dryness, and calcined with charcoal in a crucible; at the expiration of three quarters of an hour of a red heat, metallic lead will be obtained, the characters of which have been shewn.

It has very often happened in the experiments I have made on this subject, that the fluids vomited, contained scarcely any of the acetate of lead, whilst the solid matter with which they were mixed, contained a considerable quantity of this salt in a solid state. Without enquiring into the cause, which under these circumstances, opposes the solution of the acetate in cold water, the practitioner will proceed to boil all the solid portions in distilled water; and if the fluid obtained at the end of fifteen or twenty minutes, and filtered, precipitates like the salts of lead, he will endeavour to separate the metal, in order that he may decide that the poisoning has happened by a preparation of lead.

It must never be forgotten, that the simple examination by the tests, is not sufficient to decide on the presence or absence of metallic poisons. I can assure the reader, that I have in my researches, three different times, seen the matter vomited by animals poisoned by the acetate of lead, which was not at all disturbed by the addition of soluble sulphates; in which the hydro-sulphurets

produced a brown colour, without occasioning any distinct precipitate; and which nevertheless contained acetate of lead, since the sulphuric acid instantly converted it into an insoluble white sulphate, and the chromic acid threw down by little at a time chromate of lead of a canary-yellow colour.

If all the experiments made on the fluid portion of the matter vomited, should become fruitless for discovering the poison, the whole of the solid portions previously dried, should then be calcined with potash and charcoal; by this means metallic lead will be obtained. If we reflect ever so little on the facility with which broth, albumine, milk, the sulphates, muriates, food, &c., decompose the soluble salts of lead, which they convert into an insoluble substance, we shall perceive how very rarely it can happen, in the kind of poison we are treating of, that a greater or less quantity of this metal is not found in the solid matter vomited. Wherefore, by the aid of the proceeding which we recommend to be put in practice, the physician will always succeed in decomposing or carrying off from the metallic lead, all the principles with which it was combined.

Should the juridical physician be required by the magistrate to discover the metal after the death of the person, he will proceed to act as we have already directed, after having carefully collected all the solids and fluids contained in the stomach, as well as the flaky mucous covering which lines the interior of the digestive canal: he must not neglect either, to submit to calcination the mucous membrane of such portions of the canal as shall have undergone any alteration.

TREATMENT OF POISONING BY THE COMPOUNDS OF LEAD.

Is there any antidote to saturnine preparations introduced into the stomach?

It results from facts: 1st, That the sulphate of lead may be swallowed with impunity in a large dose. 2nd. That the sulphate of magnesia decomposes the acetate of lead in the stomach, and transforms it into an insoluble sulphate of lead. 3d. That the corrosive effects of this poison are prevented by a sufficient quan-

tity of sulphate of magnesia, and the contrary happens when this salt is not in sufficient quantity to effect the total decomposition of the poisonous substance. 4th, That the sulphate of magnesia is a true antidote to the acetate of lead.

There is no doubt but that the other saturnine preparations would be equally decomposed, and transformed into insoluble sulphates, by the addition of sulphate of magnesia, or *of any other soluble sulphate.*

We see then, that in a case of the ingestion of any drink containing a soluble salt of lead, the first duty of the physician, is to cause the patient to take copious draughts of water containing three or four drachms of sulphate of magnesia, soda, or potash, to each pint. The course he ought to take is altogether different, when the case of poisoning has happened from saturnine emanations; for instance, in any of the numerous cases of painter's colic.

In the hospital, called the *Charité*, at Paris, a treatment has been adopted, for several years past; the efficacy of which, is perfectly acknowledged at this day. It is very uncommon to meet with a case of simple lead cholic, which does not yield to this method of cure when wisely conducted. It is as follows:

On the day of the patient's reception, the painter's purgative glyster is administered, composed of four ounces of senna leaves, boiled in a pint of water, and which is afterwards mixed with half an ounce of sulphate of soda, and four ounces of emetic wine. *(Vin. Antimon. Tart.)*

In the course of the day the following drink is given:

Take of Simple Cassia,*	2 pints.
Epsom Salts,	1 ounce.

* The water of *simple cassia* is thus prepared:

Cassia pods bruised,	2 ounces.
Water,	2 pints.

Boil for a quarter of an hour, and strain.

Sometimes, if the cholic be severe, there is added,

Syrup of Buckthorn, 1 ounce.
or, Confection Hamech, 2 ounces.

In the evening an anodyne glyster is administered, made with six ounces of nut-oil, and twelve ounces of red wine. There is given internally a drachm and a half of theriaca, with which is incorporated, according to circumstances, a grain and a half of opium.

The second day in the morning, there are given at twice, with the interval of an hour, six grains of tartar emetic dissolved in eight ounces of water. When the patient has done vomiting, he is made to take during the rest of the day the following sudorific ptisan:

Take of Guaiacum,
China root, } of each one ounce.
Sarsaparilla,

Boil them for an hour in three pints of common water.
Reduce that to two, and then add:

Sassafras, 1 ounce.
Liquorice, 4 ounces.
Boil them gently and strain.

In the evening, the anodyne glyster and theriaca with the opium, as on the first day.

The third day, the patients take, at four different times, in the forenoon, the laxative sudorific ptisan, which is made thus:

Simple Sudorific Ptisan, 2 pints.
Senna, 1 ounce.
Simmer it a few seconds, and strain.

During the day the simple sudorific ptisan: in the evening the painter's purgative glyster; two hours after, the anodyne glyster, and theriaca with opium.

The fourth day, the following purgative is administered.

Take of Infusion of Senna,*	1 ounce.
Glauber Salts,	4 drachms.
Jalap, in powder,	1 drachm.
Syrup of Buckthorn,	1 ounce.

In the evening, the glyster of oil and wine, and the theriaca; during the day, they are made to take for drink, the compound decoction of guaiacum.

The fifth day, the laxative sudorific ptisan; in the evening, at four o'clock, the purgative glyster; at six the anodyne glyster; and theriaca with opium at eight.

The sixth day, the painter's purgative is given, with the simple sudorific ptisan, the anodyne glyster, and the theriaca with opium, as on the fourth day.

Should the patients, notwithstanding the use of all these means, have no evacuation, the painter's purgative pills are had recourse to.

Take of Diagrydium,† Resin of Jalap,	of each 10 grains.
Gamboge	12 grains.
Confection Hamech,	1 drachm and a half.

Syrup of Buckthorn, a sufficient quantity to make of the whole twelve boluses, to be administered at intervals of two hours each.

We shall conclude our remarks on the treatment of the Charité, by an observation taken from the work of M. Merat: "I attend-

* This is prepared with two drachms of senna and eight ounces of water, which is reduced to six by ebullition.

† Diagrydium is a preparation of Scammony with Sulphur and mucilage of Quince.

"ed," says he, "six or seven years ago, an apothecary who ma-
"nufactured a great quantity of the *Salt of Saturn*, and who was
"attacked by the metallic colic. I wished to enter upon the
"treatment of the Charité, but the patient vomited all the ptisans:
"the tartar emetic largely diluted only passed: and I was conse-
"quently reduced to this only means. His colic was cured in
"eight days, after having taken about eighty grains of emetic tar-
"tar, in drinks and glysters. A similar method might be em-
"ployed under such circumstances. Perhaps, we might even try
"if it would not succeed in all colics; in which case, this treat-
"ment might supersede the other, which is beyond every thing
"nauseous to the patient." (page 36.)

The antiphlogistic method, so particularly extolled by Dehaen, Bordeu, and Tronchin, is not suitable, and ought to be abandoned in the treatment of the painter's colic produced by saturnine emanation; the case would be different, however, if the patient had swallowed some compound of lead, and was suffering under unequivocal symptoms of inflammation of one or more of the abdominal organs.

My countryman, Doctor Luzuriaga, who has published an excellent dissertation on this disease, very properly recommends to give to the patients attacked with this disease, a grain of opium every three hours.*

Castor oil, baths, blisters, mercurial preparations, sulphate of zinc, sulphur, alum, bitter salts, alkalies, acids, camphor, musk, oxygen, chamomile, extract of colocynth, balsam of Peru, and an infinity of other medicines, have in their turn been proposed by various practitioners, to combat the symptoms produced by this disease. Experience has not yet ascertained the respective value of these remedies, several of which are evidently of no utility.

* Dissertation medica sobre el Colico de Madrid, inserta in las Memorias de la real Academie Medica de Madrid, por el Doctor Don Ignacio-Maria Ruiz de Luzuriaga, Socio de las reales Sociedades de Medicina é Historia Natural de Edinburgo, &c. Madrid, 1796.

CHAPTER III.

Class 3d. *Of Acrid Poisons.*

THE name of acrid poisons has been given to such as possess a taste more or less caustic; and which, when applied to the surface of the body, produce inflammations, accompanied frequently by *phlyctenæ*, with loss of the epidermis; and which commonly terminate in suppuration. When introduced into the stomach, these poisons give rise to local phenomena, similar to those we have described under the article *corrosives*, notwithstanding the opinion of some physiologists who have pretended to establish distinctions drawn from the lesions presented by the animal texture after death. This truth will be placed beyond all doubt when we come to treat of the general principles relative to poisonous substances of this class.

OF WHITE HELLEBORE.

The white hellebore (*Veratrum Album*), Cl. Polygamia, O. Monœcia, Lin. family of the *Junci* (of Jussieu), appears to be the real hellebore of the ancients.

ACTION OF WHITE HELLEBORE ON ANIMAL ECONOMY.

Experiment 1st. At one in the afternoon a small dog was made to swallow two drachms and a half of the dried root, perfectly pulverized. At the end of five minutes the animal began to vomit, and in a quarter of an hour from the ingestion of the poisonous substance, he had already vomited six times mucous bilious matter of a yellowish colour. At a quarter past two he was moaning, and making excessively deep inspirations; his mouth was filled with foam. At three, he walked about with great difficulty; staggered in every respect like a person intoxicated with wine. The next day at half past twelve, he had no longer any vertigo, and was able to walk about at his ease. The fol-

lowing day at nine o'clock, he ate very heartily, and since that time his health has been perfectly restored.

Experiment 2nd. At one o'clock the œsophagus of a tolerably strong dog was detached and perforated, and two drachms of the dried root of white hellebore in powder, contained in a cone of paper, were introduced into the stomach, and the œsophagus was tied. At two, violent efforts to vomit; an hour and a half after, dejection and moaning: the animal however walked about freely. At eight in the evening, very strong vertigoes: he died two hours after. The mucous membrane of the stomach was of a tolerably bright red throughout its whole extent, without any vestige of ulceration; that which lined the duodenum and jejunum was somewhat red; no sensible alteration in the other organs. Wepfer affirms that he administered to a puppy of three weeks old, a scruple of white hellebore mixed with milk: the animal instantly vomited it, had some alvine evacuations, and a few convulsive movements; an hour afterwards it appeared to be dead. In half an hour it was opened: the heart and diaphragm were contracting; the interior of the stomach was somewhat red. (Wepfer, *Cicutæ Aquaticæ Historia et Noxæ*, p. 219.)

Etmuller says, in the Preface to his work on Surgery, that this root, when applied to the abdomen, produces a violent vomiting.

Schreder has observed the same phenomenon to take place in a case where this root was used as a suppository.

Helmont reports that a royal prince died in the course of three hours after taking a scruple of this poison, which induced convulsions.

Given in the same dose, the root of hellebore has produced spasms, suffocation, loss of voice, and a coldness over the whole body. (Vicat, *Histoire des Plantes Vénéneuses de la Suisse*, p. 165. *Yverdon*, 1776.)

A tailor, his wife, children, and workmen, took some soup in which the root of white hellebore had been put instead of pepper. Shortly after, these persons were seized with a general coldness, and their bodies became covered with an icy sweat; their debility was extreme; they were almost in a state of insensibility; and their pulse could scarcely be perceived. At the expiration of two

hours, the eldest child, who was not four years of age, began to vomit copiously, but with considerable straining; the rest were shortly after in the same condition. Vicat, who was called in at this juncture, ordered them to take a considerable quantity of warm water with oil, and shortly after gave them mallows tea sweetened with honey, by which means they were relieved, and completely restored. (*Idem*, p. 166.)

Theophrastus asserts, that the vines, amongst which the white hellebore grows, yield a wine which provokes urine.

Several authors affirm, that the root of white hellebore dried, powdered, and snuffed up the nose with the intention of producing sneezing, has caused abortions, floodings which it has been impossible to restrain, hæmorrhages from the nose, suffocations, and sudden death.

OF BLACK HELLEBORE.

Black hellebore (*Helleborus niger*) belongs to the Polyandria Polygynia of *Lin.* and to the family of the Ranunculaceæ of Jussieu.

ACTION OF THE ROOT OF BLACK HELLEBORE ON THE ANIMAL ECONOMY.

Morgagni mentions a person who took half a drachm of black hellebore, and expired eight hours after. He experienced some pains, and was seized with vomiting. The whole of the digestive canal was inflamed; the inflammation was greater in the large, than in the small intestines; several portions of the latter presented alternately a state of constriction and relaxation; there was no gangrene: forty-two hours after death, the limbs were still flexible.

Desirous of investigating the effects of black hellebore, upon the animal economy; I have performed a number of experiments upon dogs; varying them in such a manner as sometimes to cause death, and at others to allow the animals to recover. From these facts, we are induced to believe;

1st. That the powdered roots of white and black hellebore ap-

plied to the cellular texture, are rapidly absorbed, carried into the circulation, and give rise to violent vomitings, and different lesions of the nervous system, which the animals speedily sink under, and which seem to bear an analogy to those produced by the narcotics.

2nd. That their local effects are confined to the production of a slight inflammation, not sufficient to occasion a speedy death.

3rd. That they act in the same manner when introduced into the stomach; but in this case their effect is slower, and less violent.

4th. That it may even happen in this case, that those animals are not destroyed which are allowed the power of vomiting; in the opposite case, their death is a constant result after certain doses.

5th. That the root of the white hellebore is more active than that of the black.

6th. That the part which is soluble in water, is that in which the poisonous property of these two species of hellebore resides.

7th. That the alkaline extract of black hellebore, which forms part of the Tonic Pills of Bacher, is likewise extremely active.*

The fetid hellebore is also capable of producing death. We read in the *London Chronicle*, 1768, No. 1760, that a child lost its life, from taking this root in the pulp of apple. It has likewise been seen, after its use, that persons have lost their hair, nails, and even the epidermis which covers the whole body. (*Oxford Magazine*, for the month of March, 1779, p. 99.)

OF BRYONY.

The genus *Bryonia* belongs to the family of the *Cucurbitaceæ*.

Characters. Flowers monœcious or diœcious ; calyx short, monophyllous, bell-shaped, with five *teeth:* corolla adhering to the calyx, bell-shaped, or nearly resembling a rose, the border of which has five divisions, oval and veined. *Male flowers:* three stamina, two of which adhere together by means of the filaments.

* The water distilled from black hellebore root acts also upon the nervous system.

Female flowers: one style, having three divisions; stigmata grooved; inferior germen, egg-shaped, which, when ripe, becomes a spherical or oval berry, smooth on the outside, containing a small number of seeds.

ACTION OF BRYONY ON THE ANIMAL ECONOMY.

A number of observers have attested that the administration of bryony has been followed by violent vomitings, accompanied with faintings, sharp pains, alvine evacuations profuse, and of a serous nature, great thirst, &c.

Actual experiments induce us to believe,

1st. That the bryony root acts upon men in the same manner as upon dogs.

2nd. That its effects may depend on the inflammation it produces, and the sympathetic irritation of the nervous system, rather than on its absorption.

3rd. That its deleterious property resides especially in the portion which is soluble in water.

OF ELATERIUM.

The *momordica elaterium* (Cucumber of the Ass, Wild Cucumber) is a plant of the family of the *cucurbitaceæ*, arranged by Linnæus in the *monœcia diandria*. The leaves are petiolated, heart-shaped, the lateral lobes ear-shaped, scattered; and their petiole especially is thickly armed with prickly hairs. This plant grows in barren and stony grounds.

ACTION OF ELATERIUM ON THE ANIMAL ECONOMY.

Experiments induce us to think,

1st. That the first effects of elaterium are dependent on the inflammation it produces, as much as on its absorption.

2nd. That death, which is the consequence of the administration or application of this substance, must be attributed to the lesion of the nervous system sympathetically affected.

3rd. That besides, it exerts a special action upon the rectum.

OF COLOCYNTH.

The Colocynth *(Bitter Apple)* is the fruit of the *Cucumis Colocynthis* (Monœcia *Syngenesia* of Lin.), which belongs to the family of the *Cucurbitaceæ*, and grows in the islands of the Archipelago. This fruit is the size of an orange, of a yellowish white colour, devoid of smell, round, dry, light, spongy, and composed of membranous layers. It contains a very great number of small cells, within which are lodged the seeds, which are flat, oblong, sweet, and emulsive: it possesses an acrimonious taste, exceeding bitter, and nauseous.

ACTION OF COLOCYNTH UPON THE ANIMAL ECONOMY.

1st. A woman was subject to colics for the space of thirty years, in consequence of having taken an infusion of the pulp of Colocynth prepared with beer. (Fordyce, *Fragmenta Chirurg. et Med.* p. 66.)

2nd. A person took the decoction of three apples of Colocynth: he had copious and bloody alvine discharges; and would have sunk under them, if oil had not been speedily administered to him in glysters and by the mouth. (Tulpius, *Obs.* lib. iv. c. xxvi. p. 218.)

3rd. Dioscorides has observed, (lib. iv. c. clxxviii) that Colocynth, introduced into the rectum, produced a bloody flux.

4th. Lebret, a rag-merchant, swallowed three ounces of Colocynth, with the hope of getting rid of a gonorrhœa, with which he had been attacked for several days. A short time afterwards he felt severe pains in the epigastrium, and vomited abundantly. At the expiration of two hours he had copious alvine evacuations; the lower extremities became bent, his sight was obscured, and he could only hear with great difficulty; a slight delirium came on, which was succeeded by vertigo. He was made to drink a great quantity of milk, which produced vomiting: ten leeches were applied to the abdomen, and the symptoms subsided by degrees. (*Report made by the patient.*)

These data, and direct experiments tend to prove :

1st. That the effects of Colocynth depend chiefly on its local action, and on the sympathetic irritation experienced by the nervous system.

2nd. That it is nevertheless absorbed and carried into the circulation, and that it acts also directly upon that system, and on the rectum.

3rd. That the active principle of this medicine resides both in the portion soluble in water, and in that which is insoluble.

4th. That it acts on men as on dogs.

OF GAMBOGE.

Gamboge is a gum-resin, obtained in the kingdoms of Siam and Ceylon, by making incisions in the leaves and young sprouts of the *Stalagmitis Gambogioides* (*Poligamia Monœcia*, WILD). The wood of the *Gambogia Gutta*, L. (Polyandria Monogynia) furnishes likewise, on incision, this substance in the form of a juice, which speedily concretes.

ACTION OF GAMBOGE ON THE ANIMAL ECONOMY.

From actual experiments it results :

1st. That Gamboge may be taken in a tolerably strong dose into the stomach of dogs that are suffered to vomit, without producing any serious accidents.

2nd. That in the contrary case it occasions a speedy death, which does not appear to depend on its absorption, but on the powerful local action it exerts, and on the sympathetic irritation of the nervous system.

3rd. That it destroys life rapidly when applied to the cellular texture, and that its effects are similar to those of an extensive burn, which produces no eschar.

OF THE FLAX-LEAVED DAPHNE (*DAPHNE GNIDIUM.*)

This shrub belongs to the Octandria Monogynia of L. and

the family of the *Thymalææ* of Jussieu. It is also vulgarly called (*Sainbois*) Spurge-flax.

Character of the Bark. Fragments very long, not very thick, extremely flexible; outer skin brown, smooth, and yellowish on its internal surface. This bark has no smell; its fracture is fibrous, its taste acrid and burning.

ACTION OF THE FLAX-LEAVED DAPHNE ON THE ANIMAL ECONOMY.

Vicat asserts that the Flax-leaved Daphne has given rise to a fatal diarhœa.

The *Daphne Mezereum*, *Cneorum*, &c. produce nearly the same effects. Linnæus reports, that a young lady, labouring under intermittent fever, died while spitting blood, from having taken twelve berries of the *Daphne Mezereum*, which had been given her with the design of purging her. (*Flora Suecica*, No. 338.)

Some person having given to an hydropic patient, the wood of Mezereon, the latter was all at once attacked with a diarrhœa, which was continual, and accompanied with insupportable pains; he had beside, for six weeks, vomitings, which returned every day with extreme violence, although, during the whole of that time, every proper remedy was had recourse to, in order to quiet them. (Vicat, *Histoire des Plantes Vénéneuses de la Suisse*, p. 140.)

The facts just described induce us to think:

1st. That the bark of the *Daphne Gnidium* is not absorbed.

2nd. That it gives rise to very powerful local inflammation; and sympathetic irritation of the nervous system, to which the fatal symptoms resulting from its administration ought to be attributed.

3rd. That it appears to exert the same action on the human species, as on dogs.

OF THE PALMA CHRISTI (RICINUS.)

The Palma Christi (*Ricinus Communis*) is a native of the Indies, and of Africa, of the Monœcia Monadelphia L. and of the family of the *Tithymaloides*.

Characters of the Seeds. Oblong, flattened, oval, blunt at the extremities; shell brittle, thin, smooth, and spotted with black, of a very acrid taste; the nut whitish, insipid, oily.

ACTION OF THE FRUIT OF PALMA CHRISTI ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, a small dog tolerably strong, was made to swallow thirty grains of the fruit of Palma Christi, in as great a state of division as possible. At the end of twenty minutes, he vomited without any effort some white matter, stringy and liquid, in which the ingested fruit was observed. At nine, he passed a stool, partly liquid, partly solid, and experienced no further inconvenience; in the course of the day he fed heartily. The following day at noon, a drachm and half of the same fruit suspended in two ounces of water, were introduced into the stomach, and the œsophagus was tied, to prevent vomiting. An hour after, he had made no efforts to vomit, nor had passed any stool; he was dejected. At four o'clock, he passed a solid stool; he complained greatly, and died at six o'clock.

Dissection. The stomach contained a little fluid matter, in which were swimming some portions of the fruit of Palma Christi; the mucous membrane of this viscus, which lined the great extremity, was little inflamed, but easily detached in pieces: the intestinal canal and lungs presented no remarkable alteration.

Bergius relates, that a robust man chewed a seed of Palma Christi, which he afterwards swallowed, and which produced a stinging sensation in the fauces. He passed the night quietly; but the next morning he had copious vomitings, and during the whole day he made alternately efforts to vomit, and to go to stool, without however passing much.

These facts tend to prove that the seeds of the Palma Christi produce a local irritation, and that they act upon the nervous system after being absorbed.

OF EUPHORBIUM (*EUPHORBIA OFFICINARUM.*)

A plant of the family of the *Tithymaloides* of Jussieu, and of the Dodecandria Trigynia of Lin. It is however Monœcious.

The *Euphorbia Officinarum* has the stem naked, with several angles, and the thorns double. There flows from its stalk a milky juice, which dries in small brittle pieces, which bear the name of *Euphorbium*, and with which we made the following experiment.

Euphorbium is in irregular drops, frequently perforated; its colour is reddish on the exterior, and whitish within: it has no smell, its fracture is vitreous: when reduced to powder, it irritates the nostrils, even at a great distance.

This poison has been sometimes administered imprudently as a purgative, and produced vomitings and bloody stools: applied to the hairs, and to warts, it causes them to fall off: which proves that this plant is excessively acrid.

Experiment. At seven in the morning, five ounces of the fresh juice of *Euphorbia Cyparissias* were given to a small robust dog, and the œsophagus was tied. The animal went several times during the day to stool. The next day he was dejected. The day following, he was still more so, but preserved the free use of his senses and of motion. He died in the night. The rectum exhibited some spots slightly red; the other organs appeared sound.

Vicat mentions the case of a man who had his face excoriated, by having it rubbed with the juice of this Euphorbium. Lamotte speaks of a glyster prepared with this plant, which had been taken instead of mercury, the effect of which proved fatal.

There are a great many species of Euphorbia, which are poisonous: such as, *Euphorbia Antiquorum*, *Euphorbia Canariensis*, *Euphorbia Tirucalli*, *Euphorbia Peplus*, *Euphorbia Helioscopia*, *Euphorbia Verrucosa*, *Euphorbia Platiphyllos*, *Euphorbia Palustris*, *Euphorbia Hiberna*, *Euphorbia Characias*, *Euphorbia Amygdaloides*, *Euphorbia Sylvatica*, *Euphorbia Exigua*, *Euphorbia Mauritanica*, *Euphorbia Nerifolia*, *Euphorbia Esula.*

Scopoli asserts that this last species produced death in a woman who, half an hour before, had swallowed thirty grains of the root of it. In other circumstances the same author has witnessed gangrene of the abdomen, and death, to succeed quickly to the imprudent application of the *esula* to the abdomen. He moreover makes mention of a person who, having the eye-lids closed, allowed them to be rubbed with the juice of this plant. Inflammation soon after declared itself, and was followed by the loss of the eye.

It results from these facts :

1st. That Euphorbium exerts a local action extremely violent, capable of producing acute inflammation ;

2nd. That its fatal effects depend rather on the sympathetic irritation of the nervous system, than on its absorption ;

3rd. That it appears to act on the human species as on dogs.

OF SAVINE.

Savin *(Juniperus Sabina)* ranged by Jussieu in the Coniferæ, belongs to the Diœcia Monadelphia of Linnæus.

From three different experiments performed with this substance on dogs, it results :

1st. That Savine exerts a local action tolerably energetic ;

2nd. That its effects depend principally on its absorption, and its action on the nervous system, the rectum, and stomach.

OF THE *RHUS RADICANS* AND *TOXICODENDRON.*

The *Rhus Radicans* is a plant of the family of the Terebinthaceæ of Jussieu, and ranked by Linnæus in the Pentandria Digynia.

M. Bosc, to whom we are indebted for some most excellent observations on this plant, has assured himself that it is only a variety of the *Rhus Toxicodendron*, from which it differs only by its leaflets, which are smooth, and very entire ; so that they ought to be confounded under the common denomination of *Rhus Toxicodendron.*

It is extremely common in Carolina.

ACTION OF *RHUS RADICANS* ON THE ANIMAL ECONOMY.

Experiment 1st. A small dog was made to swallow three drachms of the dried powder of *Rhus Radicans:* the animal experienced no inconvenience.

Experiment 2nd. Two drachms and a half of the aqueous extract of *Rhus Radicans*, were applied upon the cellular texture of the back of a small dog; three days afterwards, the animal had not exhibited any remarkable phenomenon.

The celebrated *Fontana* relates, that having touched at three different times, and at the interval of several days, some leaves of *Toxicodendron*, he experienced serious symptoms; four or six days after, the eye-lids, the extremities of the ears, and in general every part of the face, became tumefied, and appeared to be filled with an aqueous fluid. The spaces, which separate the fingers, became red, and were covered with small vesicles full of a transparent humor; the epidermis came off in little scales, and he felt a terrible smarting for the space of a fortnight, and an insupportable itching afterwards, for a fortnight longer; the pulse was greatly agitated. M. M. *Gouan* and *Amoureux*, have fully proved these vesicating effects on the skin.

The milk of these leaves produced no phenomeon when applied upon the cellular texture of rabbits, guinea pigs, and pigeons; the same thing happened when they were made to swallow it.

The different facts we have just reported tend to prove:

1st. That the most active part of the *Rhus Radicans* or *Toxicodendron*, is that which is disengaged in a state of gas; whilst it does not receive the direct rays of the sun.

2nd. That it acts like the acrid poisons.

3rd. That the watery extract internally administered, or applied to the cellular texture, produces a local irritation, followed by an inflammation more or less intense, and that it exerts a stupefying action on the nervous system, after being absorbed.

4th. That it appears to act in the same manner when injected into the jugular vein.

The *Rhus Vernix* produces effects similar to those we have just described.

OF THE *ANEMONE PULSATILLA (WIND FLOWER).*

This plant belongs to the family of the *Ranunculaceæ* of Jussieu, and to the Polyandria Polygnia of Lin.

ACTION OF *ANEMONE PULSATILLA* ON THE ANIMAL ECONOMY.

Experiment. At one o'clock, a wound was made on the inside of the thigh of a robust dog; two drachms and a half of a watery extract of Anemone Pulsatilla, were applied upon the cellular texture, and the lips were united by a few stitches. The next day, at eight in the morning, the animal had experienced nothing remarkable. In the evening he was weak, but little sensible, and kept himself lying on the side. He had however no vertigo, nor did he utter any complaint. He died the day after, at five in the morning. The mucous membrane of the stomach was generally red; it presented here and there spots of a very bright red; the rectum was somewhat inflamed; there was no sensible alteration in the lungs; the limb was very much inflamed.

Helwing asserts, that the syrup of Anemone Pulsatilla has given rise to fatal accidents.

Bulliard reports, that an old man affected for some time with rheumatic gout, applied to the calf of the leg the root of this plant bruised between two stones; and after drinking a bottle of wine, went to bed. He fell a prey to the most cruel sufferings, for ten or twelve hours, and the whole limb was gangrened. Scarifications were made on it, and compresses of camphorated spirit were applied; by these means the progress of the mischief was arrested, and the patient was entirely cured of this rheumatic affection. *(Histoire des Plantes Vénéneuses de la France, p. 79.)*

M. *P*——, apothecary, experienced a violent itching of the eyes, gripes, and vomiting, in consequence of pounding some dri-

ed Annemone Pulsatilla: these symptoms were all removed by diluent medicines.

We are of opinion, that it may be inferred from the preceding statements:

1st. That the Anemone Pulsatilla produces violent inflammation of the parts with which it comes in contact.

2nd. That it is absorbed, and carried into the circulation.

3rd. That it appears to act by stupefying the nervous system.

4th. That it likewise probably exerts an irritating action on the lungs and stomach.

5th. That its deleterious properties reside in every part of the fresh plant.

6th. Lastly, that its effects are much less active, and become null on its being dried.

Several other species of this plant are also poisonous, such as the *anemone pratensis*, *anemone sylvestris*, *anemone nemorasa*, and it is probable that the *anemone palmata*, *narcissiflora and ranunculoides*, are equally deleterious.

OF ACONITE.

Characters of the genus. The Aconite, as ranged by Linnæus in the Polyandria Polygynia, and by Jussieu, in the *Ranunculaceæ*, presents a calyx with five leaflets, the superior one of which is concave, in the form of a casque; the petals are numerous, very small, in form of scales: the two superior ones, called *Nectaries* by Linnæus, are elongated, concealed under the casque, furnished with a long claw, elbowed at the extremity, in such a manner that their border is reflected back, in the shape of a lip, and their extremity is thick, obtuse, in form of a crozier: the capsules are most commonly to the number of three, oblong, straight, pointed.

Aconitum Napellus. Stem straight, simple, firm, leafy, six decimetres in height, terminating in a spike, somewhat dense. It grows in sheltered and moist places in the mountains. All the parts of the Aconite in the fresh state, when chewed, produce a sense of heat and pain in the mouth and throat.

ACTION OF *ACONITUM NAPELLUS* ON THE ANIMAL ECONOMY.

Experiment 1*st.* At noon, a small robust dog was made to swallow two drachms of the watery extract of Aconite bought at an apothecary's; a quarter of an hour after, the animal was somewhat drowsy, shut his eyes, hung down his head, then on a sudden raising it again, performing a motion similar to that of persons who awake after having fallen asleep standing, or in a chair. During this shock he was threatened with a fall upon his breech; the pulsations of the heart were regular, and somewhat accelerated. The next day, he experienced some vertigoes. He died the day following. The brain presented no alteration; the lungs, which were dense, and of a brownish colour, were distended with blood, and less crepitating than natural; the digestive canal was sound.

Experiment 2*d.* M. Brodie injected into the rectum of a cat, an ounce of juice of Aconite leaves. Three minutes afterwards the animal rejected almost the whole of the fluid, and remained quiet for six minutes; he then vomited, and attempted to walk; but staggered as if drunk. Thirteen minutes after the injection, he was lying upon the side, motionless, except that he shewed from time to time some slight convulsive motions of the limbs. Respiration became slow and painful, and he appeared to be dead forty-seven minutes after the experiment. A few moments before he expired, the heart beat a hundred regular pulsations a minute.

Experiment 3*d.* The same physiologist applied upon the cellular texture of the side of a young rabbit, about twenty drops of the juice of Aconite leaves. At the end of twenty-three minutes the same symptoms took place, and the animal died forty-seven minutes after the application of the deleterious substance. (*Philosophical Transactions*, *anno* 1811, p. 1, page 185 and 193.)

If, says M. Brodie, the leaves of Aconite be chewed in small quantity, a sensation of numbness is felt in the lips and gums, which does not subside till after two or three hours.

Cases.

The root of *Aconitum Napellus* was administered to four highwaymen. Two of them, after having experienced the most violent pains, were saved by appropriate means; the other two died, one of which, a few hours after the administration of this root, became an idiot; the face was covered with a cold sweat; asphyxia, spasms, and syncope took place; he passed involuntary stools; vomited bilious and livid matter; his body swelled, and he died apoplectic.*

Willis relates that a man died mad, and in a very short time, in consequence of having eaten a sallad, in which there were some of the fresh leaves of *Aconitum Napellus*. (*De Animâ Brutorum*, p. 289.)

The juice of Aconite, introduced into a small wound made in the thumb, has been known to give rise to pains in the fingers and arm, cardialgia, anxiety, with fear of suffocation, lipothymia, agitation, and finally gangrene and copious suppuration.†

It results from the facts just related,

1st. That the juice of the leaves of Aconite, introduced into the stomach or rectum, or injected into the cellular texture of dogs, produces serious accidents, followed by a speedy death;

2d. That the same happens from the root of this plant, the effects of which appear still more decided than those of the leaves;

3d. That the watery extract of Aconite prepared by expressing the juice of the fresh plant, possesses nearly the same poisonous properties as the juice, whilst at the same time it is incomparably less active when it has been obtained by decoction.

4th. That the resinous extract is more energetic than the watery one.

5th. That these different preparations are absorbed, and carried into the circulation; that they act particularly on the nervous system, and more especially on the brain, where they produce a kind of mental derangement.

* *Mithiolis in Dioscorid. ed. C. Bauch.* p. 768, tom. ii. p. 1.

† *Alberti Jurisprudentia Medica*, tom. vi. p. 724. *Obs. de Rodder.*

6th. That they exert besides a local irritation, capable of producing inflammation more or less violent.

7th. That they appear to act on the human species as on dogs.

The *Aconitum Cammarum*, Monk's Hood, is possessed of a flavour more acrid than the preceding, and of extremely energetic properties.

Mathiolus relates, that a criminal condemned to death, ate some of the root of this plant. He perceived a tolerably strong flavour of pepper, and at the end of two hours was seized with vertigoes, and commotions of the brain so violent, that he thought his head full of boiling water; a general swelling of the whole body took place; the countenance livid; the eyes were out of their sockets: the unfortunate man finally died in most horrible convulsions.

We find in the *Sepulchretum* of Bonetus, and in the *Memoires de l'Académie de Suède*, facts similar to the preceding. Formerly arrows were poisoned with the juice of this plant.

The *Aconitum Anthora* appears also to be poisonous. *Hoffman* says, that it overturns the stomach, and occasions a burning heat accompanied with thirst and anguish about the heart. *Solier*, *Lobel*, and *Prévot*, have seen this root produce vomitings and stools. How then could it happen that the ancient authors have announced this root as the antidote to the other species of Aconite.

Aconitum Lycoctonum (Wolf's Bane). The root of this plant mixed with salad occasioned considerable uneasiness to several guests who partook of it. Others have felt vertigoes, heat, and swelling of the tongue, in consequence of having chewed the flowers of this species of Aconite. (*Bauhinus*, l. c. p. 653.)

OF CELANDINE.

The Celandine *(Chelidonium Majus)* belongs to the Polyandria Monogynia of L. and to the family of the *Papaveraceæ* of Jussieu.

ACTION OF CELANDINE UPON THE ANIMAL ECONOMY.

Experiment 1st. Three drachms of the watery extract of Celandine, were introduced into the stomach of a small feeble dog, and the œsophagus was tied. At the end of six minutes the animal made violent efforts to vomit: four hours after, he was lying on the side; he made deep inspirations; sensibility and mobility were diminished to such a degree, that the organs of hearing and vision were no longer capable of receiving impressions; and he was not able to stand. He died a very short time after. The stomach contained a small quantity of a fluid excessively viscid, and of a brownish colour; the mucous membrane was of a bright red throughout its whole extent, and of a blackish red in its folds; the intestinal canal was not altered; the lungs were of a reddish colour, crepitating, and appeared not to be affected.

Experiment 2nd. At three o'clock, an incision was made in the inside of the thigh of a small dog, and a drachm and half of watery extract of Celandine dissolved in a small quantity of water, was applied to the wound. At five, the animal experienced nothing remarkable. The next day, at nine in the morning, he was found dead. The digestive canal exhibited no sensible lesion; the wound was inflamed, and the lungs somewhat livid.

From the preceding facts it results,

1st. That Celandine and its extract produce serious symptoms, followed by death.

2nd. That their deleterious effects seem to depend on the local irritation they excite, as much as on their absorption and action on the nervous system.

3rd. That it appears to act also on the lungs.

OF STAVESACRE.

Stavesacre *(Delphinium Staphysagria)* belongs to the Polyandria Trigynia of L. and to the family of the *Ranunculaceæ* of Jussieu.

ACTION OF STAVESACRE ON THE ANIMAL ECONOMY.

Experiment. An ounce of Stavesacre reduced to a fine powder, was introduced into the stomach of a small robust dog, and the œsophagus was tied. Two days after, the animal was dejected, but had experienced neither vertigo nor convulsions. He died fifty-four hours after the operation. The mucous membrane of the stomach presented a crimson red colour in the third part of its extent next to the pylorus, the other parts were somewhat less red ; there was no sensible alteration in the other organs.

Another animal submitted to the same experiment furnished similar results, except that he died at the expiration of fourteen hours.

Hillefeld made dogs swallow the infusion of Stavesacre ; these animals died, after having had vomitings, involuntary stools, general trembling, and great debility.

These facts induce us to believe,

1st. That Stavesacre is not absorbed, and that its deleterious properties depend on the local irritation it produces, and the sympathetic lesion of the nervous system ;

2nd. That the part soluble in water is the most active : so likewise the local effects of its administration are more severe when it is moistened before being applied to the cellular texture.

OF THE MEADOW NARCISSUS.

The Meadow Narcissus *(Narcissus Pseudonarcissus)* belongs to the Hexandria Monogynia of L. and to the family of the *Narcissi* of Jussieu.

ACTION OF THE MEADOW NARCISSUS UPON THE ANIMAL ECONOMY.

Experiment 1*st.* At half past nine, there were introduced into the stomach of a young dog of middle size, four drachms of a watery extract of Meadow Narcissus, and the œsophagus was tied. At the end of an hour, the animal made efforts to vomit. At noon, he had one stool, which contained a tolerable quantity of

solid matter. Forty minutes after, he made fresh attempts to vomit. At eight in the evening, he was somewhat agitated, uttered plaintive cries, and experienced some slight giddiness; his breathing was not at all impeded. He died in the night. The left lobe of the lungs presented, near its inferior edge, a violet-coloured spot, containing venous blood, and as broad as a crown-piece; the remaining portion of this viscus was sound. The stomach contained a small quantity of a mucous brownish fluid, which could easily be detached; the mucous membrane presented several irregular spots tolerably extensive, of a cherry-red colour, without any apparent ulceration; the duodenum was somewhat inflamed; the mucous membrane lining the inferior part of the rectum was rather red; the ventricles of the brain contained no serosity; the veins creeping over the external surface of this organ were distended with black blood.

Experiment 2*d.* At two o'clock, a drachm of a watery extract of Meadow Narcissus, was applied to a wound inflicted in the inside of the thigh of a small dog. The animal died in the night, without any person being able to observe him. The mucous membrane of the stomach was filled with small spots of a cherry-red colour: the wound was not very much inflamed; the other organs presented no remarkable alteration.

It results from the foregoing experiments,

1st. That the extract of Meadow Narcissus produces a local irritation not very intense;

2d. That it is quickly absorbed, and produces severe symptoms, followed by a speedy death;

3d. That it is emetic.

4th. That it appears to act on the nervous system by destroying sensibility, and on the mucous membrane of the stomach; that its action is more energetic when applied to the cellular texture.

OF THE *ÆNANTHE CROCATA.*

This plant belongs to the *Umbelliferæ* of Jussieu, and the Pentandria Digynia of Lin.

Cases.

1st. On the 10th of April, 1677, a townsman of the Hague ate, with one of his friends, some roots of the Ænanthe. In a short time they both felt a great heat in the throat and stomach, which was followed by alienation of mind, vertigo, cardialgia, nausea, and diarrhœa. One of them had violent convulsions, the other bled at the nose; the one who had eaten the most, died at the end of two hours, the other at the end of three.

2nd. The 15th Messidor, year 10, there were brought to the principal Naval Hospital at Brest, the dead bodies of three soldiers of the 82nd Demi-brigade. These unfortunate Belgians, deceived by the resemblance which the root of *Ænanthe Crocata* bore to one made use of in their own country, ate a great quantity of it. Its sweetish flavour pleased their palates, and contributed to the keeping up of their error. They very soon experienced a general uneasiness, nauseas, vertigoes, and vomitings. To these succeeded most violent convulsions, and with such rapidity, that they sunk under them in less than an hour, and before any assistance was given.

Dissection. Nothing remarkable on the exterior surface of the body. One of these bodies was preserved for four days, and, at the end of that time, no sign of putrefaction was observed: the brain and its membranes were sound, the lungs distended, their vessels full of black and dissolved blood. In the bronchia, trachea, and mouth, was found a frothy and whitish fluid. The lungs in one of these bodies presented on their external surface some petechiæ; the cavities of the two circulatory systems empty; the heart sound. The stomach contracted, and inflamed in its extremity and its lesser curvature; its coats thickened: the intestines puffed up, and their vessels injected; the venous and arterial systems distended with a fluid of the same nature, dissolved and blackish: the derangements were precisely the same in all the three.

These observations prove, that the *Ænanthe Crocata* exerts an energetic local irritation, and that it acts powerfully on the nervous system.

Vacher relates, that seventeen soldiers ate of the root of *Ænanthe Fistulosa*. Three of them died; the rest were saved by vomiting. (*Act. Helvet.* vol. iv.)

OF THE *GRATIOLA* (HEDGE-HYSSOP.)

827. The Hedge-Hyssop (*Gratiola Officinalis*) belongs to the family of the *Scrophulariæ*, and to the Diandria Monogynia.

ACTION OF HEDGE-HYSSOP ON THE ANIMAL ECONOMY.

Experiment 1st. At a quarter past ten, three drachms and a half of watery extract of Hedge-Hyssop, were introduced into the stomach of a small strong dog, and the œsophagus was tied. At eight in the evening, the animal had not exhibited any remarkable phenomenon. The next day, at ten in the morning, he uttered plaintive cries: he was lying down on the side, and expired an hour after: his breathing had not been impeded. The mucous membrane of the stomach exhibited, throughout its whole extent, a cherry-red colour: it was black wherever it forms the folds observed in the interior of this viscus; it was easy to be assured that this last alteration was the consequence of a certain quantity of black extravasated blood within the space which separates it from the subjacent muscular coat. This last was nearly in its natural state; the interior of the rectum was evidently inflamed: all the remaining portion of the alimentary canal was a little red. The lungs did not appear affected; there was no serosity in the ventricles of the brain: the exterior cerebral veins were distended with black blood. The pia matter was injected, and of a vermillion red colour.

Experiment 2nd. Twenty-eight grains of the same poisonous substance, dissolved in four drachms of water, were injected into the jugular vein of another robust dog of middle size. An hour after, the animal had a stool; he experienced some giddiness, and became as it were insensible, lay down, and expired two hours after the injection. It was impossible to discover the least trace of alteration in the texture of the digestive canal.

Buchner, *Blair*, *Boerhaave*, &c. have frequently seen serious accidents produced by this plant.

We are of opinion, that it may be concluded from the foregoing experiments,

1st. That an extract of Hedge-Hyssop produces a local irritation extremely violent;

2nd. That it appears not to be absorbed, and that its effects depend on the sympathetic lesion of the nervous system;

3rd. That it is much more active when injected into the veins.

OF THE *JATROPHA CURCAS* (INDIAN NUT.)

This plant belongs to the family of the *Tithymaloides* of Jus. and the Monœcia Monadelphia of Lin.

Characters of the fruit. It is first green, afterwards yellow, lastly black, nearly of the shape and size of a young walnut, and contains under a bark, that is thick, leathery, shrivelled, and smooth, three shells whitish, bivalve, and of one seed each. This species grows in the hot parts of America.

ACTION OF THE *JATROPHA CURCAS* ON THE ANIMAL ECONOMY.

Experiment. At eight in the morning, three drachms of this seed, deprived of its ligneous covering, and reduced to a paste, were introduced into the stomach of a robust dog of middle size, and the œsophagus was tied. At a quarter before nine, the animal began to make efforts to vomit. At nine, he uttered some plaintive cries. At ten, he could no longer walk; he remained lying on the side, in a state of great insensibility. He died an hour after. He was opened at two o'clock. The whole of the digestive canal was red on its external surface; the mucous membrane of the stomach was of a deep cherry-red throughout its whole extent; the interior of the rectum was of a fiery red; the lungs were crepitating, and of a reddish colour; the ventricles of the heart contained black fluid blood.

The results from this and several other facts, are:

1st, That the seed of the *Jatropha Curcas* possesses poisonous properties that are extremely energetic;

2nd. That it appears not to be absorbed; and that its fatal effects depend on the violent inflammation it produces, and on its sympathetic action on the nervous system;

3rd. That it acts more strongly when introduced into the stomach, than when applied to the cellular texture;

The fresh root, or the juice of the *Jatropha Manihot* produces swelling of the body, nausea, vomitings, pains of the stomach, evacuations, tenesmus, vertigo, pains of the head, loss of sight, coldness of the extremities, faintings, abolition of the vital powers, and death. (Piso, *Hist. Natur.* l. iii. c. 17).

Similar phenomena are produced by the seeds of the *Jatropha Multifida*.

OF THE SQUILL (*SCILLA MARITIMA*).

The Squill belongs to the family of the *Liliaceæ* of Jus. and the Hexandria Monogynia of Lin.

ACTION OF SQUILL UPON THE ANIMAL ECONOMY.

Experiment. At nine in the morning, two ounces and a half of the onion of Squill whole, partly in the shape of pulp, and partly liquid, were introduced into the stomach of a small robust dog, and the œsophagus was tied. Twenty minutes after, the animal made violent efforts to vomit, which were frequently repeated during the half hour that followed, and he uttered some complaints. At half past ten, he was found dead. He was opened at eleven: the heart no longer contracted; it was filled with blackish and coagulated blood: the lungs were of a rose colour, and crepitating: the digestive canal was not the seat of any sensible alteration.

Plenck mentions a child which had convulsions in consequence of taking some Squill.

We are of opinion, from the preceding facts,

1st. That the fatal effects of Squill depend chiefly on its absorption, and the action it exerts on the nervous system;

2nd. That the lungs do not exhibit any organic lesion, and that the acceleration of the respiration appears to depend on the nervous influence;

3rd. That it nevertheless produces a local irritation so much the more energetic, as death is longer in taking place.

4th. That it excites more frequently nausea and vomitings.

OF THE *SEDUM ACRE* (HOUSE-LEEK).

This plant belongs to the Decandria Pentagynia of Lin. and to the family of the *Joubarbes* of Jus.

ACTION OF HOUSE-LEEK ON THE ANIMAL ECONOMY.

Experiment. At eight in the morning, four ounces and a half of the juice of this plant, were introduced into the stomach of a tolerably strong dog, and the œsophagus was tied. The animal made efforts to vomit at the expiration of half an hour. In the evening, he was dejected, and preserved the free use of his senses and motions. He died in the night.

Dissection. The mucous membrane of the stomach was of a fiery red in that half of it next the pylorus : the intestinal canal appeared sound ; the lungs were of a reddish colour, and somewhat more dense than in their natural state.

We are of opinion that it may be concluded, that the juice of House-Leek produces a local irritation of some degree of violence, and that death depends on the consecutive lesion of the nervous system.

OF THE MEADOW RANUNCULUS (*RANUNCULUS ACRIS*)

This plant belongs to the family of the *Ranunculaceæ* of Jus. and to the Polyandria Polygynia of Lin.

ACTION OF THE MEADOW RANUNCULUS ON THE ANIMAL ECONOMY.

This species of Ranunculus, when applied to the temples, has produced pains, an intolerable heat, and fainting ; when applied to the joints, it has stiffened them ; it has almost always occasioned ulcers, and other disagreeable symptoms.

Ranunculus Sceleratus. *Plenck* relates, that the juice of this

plant, administered to a dog, produced anxiety, vomitings, contortions, and great restlessness ; these symptoms were succeeded by a speedy death. The interior of the stomach was red, and corroded in some points ; the pylorus was tumefied, and of a livid red.

Krapf has made experiments on himself and on dogs, in order to assure to himself of the effects of this species of Ranunculus: 1st, he experienced extremely severe pains, and convulsive movements in the interior of the abdomen, in consequence of having swallowed a single flower which he had well pounded. 2nd. Two drops of the expressed juice of this plant occasioned, beside the above mentioned symptoms, a burning and convulsive pain throughout the whole length of the œsophagus. 3rd. In another experiment, he chewed the thickest and most succulent leaves of this species of Ranunculus: his mouth was filled with saliva ; the tongue became inflamed and excoriated ; the nipples of his breasts were elevated, of a bright red colour, and chapped at the extremity ; he could no longer distinguish tastes ; his teeth, which were set on edge, experienced from time to time shooting pains ; the gums were very red, and bled on the slightest touch.

Ranunculus Flammula. *Murray* asserts, that a woman had a gangrene of the arm in consequence of having applied this plant close to the wrist: it made such havoc, that the tendons and bones were laid bare. (*App. Medicaminum*, vol. iii. p. 87).

It is well known that whole flocks have perished from grazing, in the spring, in pastures where this plant was common.

The *Ranunculus Bulbosus*, *Ficaria*, *Thora*, *Arvensis*, *Alpestris*, *Polyanthemos*, *Illyricus*, *Gramineus*, *Asiaticus*, *Aquatilis*, *Plantanifolius*, *Breynius*, and *Sardous*, are equally poisonous.

We are of opinion, that, from the foregoing facts, it may be concluded :

1st. That these different species of Ranunculus and their extracts, produce a severe inflammation of the texture to which they are applied ;

2nd. That the death resulting from them is the consequence of their sympathetic action on the nervous system ;

3rd. That they do not appear to us to be absorbed;

There exists besides a considerable number of vegetable poisons belonging to this class, which we shall enumerate succinctly: they are rarely used in medicine, and their effects are similar to those whose history we have given. The names are as follows.

Rhododendrum chrysantum. R. ferrugineum—Fritillaria imperialis—Pedicularis Palustris—Cyclamen Europæum: Plumbago Europæa—Seeds of *cevadilla—Colchium autumnale—Convolvulus Scammonea—Cerbera ahovai—Cerbera Manghas—Cynanchum erectum—C. Vimiall:—Lobelia syphilitica—L. longiflora Apocynum;—Androsæmiflorium;—Gannabinum—Venetum;—Asclepias Gigantea—Hydrocotile vulgaris;—Clematites vitalba, Flammula, Recta et Integrifolia:—Pastinaca sativa annosa:—Sælanthus quadragomus, Forskalii, and glandulosus:—Phytolacca Decandra—Croton tiglium—Arum maculatum, Dracunculus, Dracontium Colocassia, Esculentum, Virginicum, Arborescens and Seguinum;—Calla palustris.*

OF NITRATE OF POTASH.

The Nitrate of Potash, ranked by *M. Fodéré* in the class of acrid poisons, is a salt, the poisonous properties of which have long fixed the attention of judicious physicians. Some observations reported in works on the Materia Medica, and Medical Jurisprudence, tended to prove, that the ingestion of this salt might prove fatal; the experiments, which we have tried on animals, leave no doubt on this head, and it is easy to prove that in the dose of two drachms, this salt produces serious symptoms, succeeded almost constantly by death, if not expelled by vomiting.

Cases.

A man labouring under a periodical fever, took by mistake an ounce and half of Nitrate of Potash. A short time afterwards, the most severe anguish, with a sense of internal cold, took place at the stomach. To this succeeded fainting and syncope; and in less than ten hours the patient expired. (*Comparetti.*)

A grocer's wife of Edinburgh, two months advanced in pregnancy, swallowed by mistake a handful of Nitre. Instantly came on, sharp pains of the stomach, nausea, and vomiting of several mouthfuls having the taste of Nitre. A quarter of an hour after, the whole body was swelled. There were administered, ten minutes after, some ipecacuanha, and a saturated solution of Glauber salts. The woman miscarried at the expiration of half an hour, and passed by stool a great quantity of blood mixed with detached portions of the mucous membrane of the intestines; the throat was excoriated, which circumstance could not allow the patient to swallow any thing pungent. Five days afterwards, the general pains, and different nervous symptoms began to yield to the use of milk, mucilaginous drinks, and opium. M. Alexander, who has related this case, does not say whether the patient was perfectly restored to health. (*Ancien Journal de Médécine*, tom. lxxi.)

These facts enable us to conclude:

1st. That the Nitrate of Potash, introduced into the stomach of dogs and of men, acts in the same manner as acrid or corrosive poisons.

2nd. That it is capable of producing death when it is not vomited, and has been swallowed in the dose of two or three drachms.

3rd. That it appears to act immediately on the mucous texture of the digestive canal, and subsequently on the nervous system, after the manner of stupefying poisons.

4th. That it is not absorbed when applied to the cellular texture, and consequently that it is confined, in this case, to produce local effects.

5th. That we cannot admit the opinion of *M. Tourtelle*, physician of Besançon, who believes that this substance acts like the other neutral salts.

CHEMICAL HISTORY OF NITRATE OF POTASH.

Nitrate of Potash is a salt of a white colour, and of a cool and pungent taste. It crystallizes in long prisms of six sides, and semitransparent, terminated by diedral tops. These crystals

frequently adhere to each other in such a manner as to form flutings.

It dissolves in four times its weight of water at 15 degrees; boiling water dissolves *four times* its weight.

OF OXYGENATED MURIATIC GAS (*CHLORINE*).

This gas, which is now considered to be a simple substance by the most celebrated chemists, is called *Chlorine*, on account of its greenish yellow colour. It possesses a disagreeable taste, and an odour so suffocating, that it is impossible to respire it, even when mixed with the atmosphere, without experiencing a sensation of strangulation, and a tightness of the chest. Its specific gravity, 2.470. Far from reddening the infusion of tournesol, like the acids, it destroys it by turning it yellow.

ACTION OF GASEOUS CHLORINE ON THE ANIMAL ECONOMY.

M. Nysten, who published in 1811 a very beautiful work on the injection of gases, into the veins, arteries, pleura, &c. made some experiments upon Chlorine, which we have repeated, and which we have found to be extremely correct.

It is known by a great number of experiments, that animals quickly perish when plunged into the gaseous Chlorine. *M. Nysten* says on this subject: "This gas is not absorbed when respired pure; it appears to act only by irritating the bronchia locally, and its action is so energetic, that the animal dies before becoming asphyxied by the black blood. What proves beside, that it acts only by irritating, is, that when it is respired diffused in the atmosphere in too small quantity to destroy life in the lungs, it confines its action to the producing a cough more or less severe, and sometimes, as it has been observed by Fourcroy, a phlegmasia of the mucous membrane of the bronchia." (*Recherches de Physiologie et de Chimie*, p. 144, anno 1811.)

OF NITROUS ACID GAS.

The Nitrous Acid Gas is of an orange yellow colour; it has a strong smell, extremely disagreeable; its taste is acrid and

caustic ; it reddens the infusion of tournesol, dissolves rapidly in water, and attacks mercury. Its action on the metals, and on organized substances, is in general stronger than that of the Nitric Acid. These characters are sufficient for distinguishing this gas from every other production, natural or artificial.

ACTION OF NITROUS GAS ON THE ANIMAL ECONOMY.

M. Nysten, who has made a great number of experiments on the Nitrous Gas, is convinced that it produces death in a very short time, and that it turns the blood brown. The Nitrous Acid Gas, of which we have given the history, and which is composed of Nitrous Gas, with the addition of oxygen, appears to us to act, 1st, by irritating strongly the bronchia, and small pulmonary vessels; 2nd, in causing the blood to undergo an alteration similar to that of the Nitrous Gas.

The fluid Nitrous Acid, exerts on our texture the same action as that we have described under the Article *Nitric Acid*.

OF SULPHUROUS ACID GAS.

The Sulphurous Acid Gas is constantly disengaged whenever sulphur is burnt in the open air, or in oxygen gas ; it is recognized by the following properties. 1st. It is colourless ; 2nd, it has a pungent smell, which is the same as that of burning sulphur ; 3rd, it reddens the tincture of tournesol, which it changes in the end to a straw yellow ; 4th, it is very soluble in water.

According to *M. Hallé*, it kills Guinea-pigs who inhale it, in less than a minute and a quarter. Its effects depend upon the irritation it produces in the lungs.

After having explained in detail, the phenomena produced by this class of poisons, we shall proceed to point out in a general way, the symptoms and lesions of texture to which they give rise : by these means we may be able to establish some general data, with respect to their mode of action, and the mode of treatment necessary to adopt, in order to counteract their effects.

SYMPTOMS PRODUCED BY THE ACRID POISONS.

A short time after the administration of these poisons, there is felt an acrid, pungent taste, more or less bitter, a burning heat, and considerable dryness in the tongue, and in every other part of the mouth, and a constriction, more or less painful, in the throat. Shortly after, acute pains begin to be felt in the stomach and bowels, which are quickly followed by nausea and copious evacuations upward and downward. These evacuations sometimes take place without effort; but more frequently they are excessively painful, and the animals strain to provoke them, when the digestive canal has been completely emptied. The pulse and beatings of the heart are strong, frequent, and sufficiently regular; respiration is somewhat accelerated, and no remarkable change can be perceived in the manner in which their sensations and motions are executed. A few hours after, phenomena are observed, which announce a lesion of the nervous system. The animals are almost in every instance affected by vertigoes, they begin to stagger, their pupils become dilated, they fall into a state of great insensibility, respiration and the circulation begin to fail, and they expire without uttering the least complaint. Sometimes they experience convulsions more or less violent, their limbs become stiff, they utter plaintive cries, and expire.

LESIONS OF TEXTURE PRODUCED BY THE ACRID POISONS.

When poisonous substances of this class have been introduced into the stomach, in a dose sufficiently strong to kill the animals, alterations, more or less considerable, are discovered, the intensity of which depends in general on the nature of the poison ingested, and the period at which the animals have fallen victims to it.

1st. The different parts of the mouth, œsophagus, stomach, and intestinal canal are inflamed; sometimes the mucous membrane only presents, throughout its whole extent, a fiery red colour; sometimes this colour is of a cherry, or of a blackish red; in that case it is not uncommon to see the muscular and serous coats par-

take of this inflammation, and a number more or less considerable of black spots resembling sloughs, or longitudinal zones of a deep red colour, are discovered, which depend on the extravasation of black blood between the coats, or in the chorion of the mucous membrane. Sometimes small ulcers are found near the pylorus; but most frequently the inflammation confines itself to the fauces, stomach, and great intestines, which phenomenon appears to arise from this cause, that the poison has been longer in contact with these parts than with the others. It is easy to perceive, that the lesions we have just described have the greatest analogy to those produced by the corrosive poisons. In fact, we do not hesitate to declare, that there exists a perfect identity between the alterations of the digestive canal produced by the poisons of these two classes when introduced into the stomach.

2nd. The lungs exhibit very commonly lesions more or less considerable; their colour is sometimes violet; but in general it is a deeper red than in the natural state. Their texture is more tight, dense, distended with blood, and less crepitating, at least some parts of them: it is not uncommon to find in them a bloody serosity. These phenomena may arise from the repeated and fruitless efforts to vomit; we are of opinion however, that they are frequently the result of a special action of the poisonous substance upon the lungs: the hellebore seems to us to be principally in point.

3rd. The ventricles and auricles of the heart, are more or less distended by blood differently coloured, according to the period at which the dissection takes place. In a number of circumstances, this fluid is found coagulated one or two hours after death, and it is almost constantly in this state at the end of fifteen or eighteen hours. This pathological fact, of which we warrant the correctness, is far from confirming the opinion advanced by some authors, that in poisoning by vegetable substances the blood remains fluid for a long time. In truth, they have principally wished to speak of narcotic substances; but we shall see, when giving the history of these poisons, that their assertion is totally void of foundation.

4th. The brain and its meninges exhibit no notable lesion in

cases of poisoning by acrid substances ; nevertheless, a fulness of the veins running over the external surface of this viscus, is sometimes observed.

5th. The other organs have not appeared to us to undergo any sensible alteration from poisonous substances of this class.

When applied to the surface of the skin, or the cellular texture, these poisons produce the local phenomena which we have described ; and when death takes place, the lesions we have enumerated, are found, excepting that the digestive canal is seldom affected.

It results from the foregoing considerations : 1st, that, in a case of poisoning, the juridical physician will be often greatly embarrassed to determine, from the simple *lesions of the internal organs*, whether the poison ingested belong to the class of acrid, or to that of corrosive poisons ; 2nd, that in the case where chemical analysis shall have proved that the poisoning has not been produced by one of the corrosive poisons, and that every thing favours the belief of its belonging to the class of *acrid poisons*, it will be impossible to decide, by the simple *examination of lesions on dissection*, what is the poison that has produced them, these lesions being pretty nearly the same in all ; 3rd, in fine, that, taking into consideration the symptoms, and especially the intense inflammations produced by acrid substances, we cannot confound the poisoning produced by them, with that which results from the narcotic, or even from the narcotico-acrid, poisons, which either do not inflame the texture of the organs, or produce only a very slight inflammation.

GENERAL ACTION OF ACRID SUBSTANCES ON THE ANIMAL ECONOMY.

It seems natural to pass to general considerations on the mode of action of the poisons contained in each class, after having given their particular histories in distinct sections, and described the lesions and general symptoms to which they give rise. It is evident that no inconvenience can follow this method, when the individuals which compose the class unite together a very great number of common characters, and their physiological action is almost

identical. Generalities are then even indispensable, on account of the facility they afford of retaining a multitude of important facts. But is this the case with the class we are treating of?—We are of opinion that it is not. How many substances do we see classed together, which evidently exercise a different mode of action. What connexion is there, for instance, between the Hellebore, the Spurge flax, and the *Jatropha Curcas?*—Do not these two latter substances act by producing a strong inflammation, whilst the first, being rapidly absorbed, exerts a fatal action on the nervous system, and produces only a slight inflammation? If we have united in one catalogue objects so dissimilar, it is because they are found in the classification proposed by *Vicat*, adopted by *Fodéré*, and which we have followed. We are conscious of the extreme difficulty attending a new arrangement founded on the mode of action of poisons; and, till we shall have multiplied the experiments in the different climates of Europe, we shall not hazard the proposal of an Essay at classification. These considerations will exonerate us from giving to this article all the extent it is capable of receiving; we shall confine ourselves to the propositions following:

1st. The major part of acrid poisons produce a strong local irritation followed by inflammation, more or less intense, of the parts to which it has been applied, and death takes place through the sympathetic irritation of the nervous system, without the poison being absorbed: the animals almost constantly die in a state of dejection, and of general insensibility. In these cases, the phenomena of poisoning make their appearance more rapidly when the poison has been introduced into the stomach, than when it has been applied to the cellular texture. The Spurge-flax, *Jatropha Curcas*, &c. appear to act in this manner.

2nd. Sometimes, after having inflamed the texture, the poisonous substance is slowly absorbed, and carried into the circulation; and its effects depend on the direct action it exerts on the nervous system, and on the sympathetic irritation of this same system. Under certain circumstances, the poisons thus absorbed act on the rectum; such are the colocynth and savine. Some affect the lungs also.

3rd. There exists a certain number of acrid poisons, which are rapidly absorbed, and carried into the circulation, and which produce in a short time repeated vomitings, vertigoes, and the most perfect stupefaction. The roots of black and white hellebore are of this number. Death takes place more speedily when these poisons are applied to the cellular texture, than when they are introduced into the stomach. Does this phenomenon depend on the digestion of the hellebore in this viscus, and on its decomposition, or is the venous absorption more active when a wound is made in the thigh, and some small veins have been consequently cut?—Be it as it may, these poisons produce a slight inflammation, and exert an action on the lungs.

4th. Lastly, some of the poisonous substances of this class are rapidly absorbed, and give rise to vertigoes, violent convulsions, &c. phenomena which appear to partake both of excitement and stupefaction, and which depend on an immediate action upon the nervous system. They produce, besides, inflammation of the texture with which they come in contact: this is the case with Aconite.

It will be observed, without doubt, in the preceding propositions, that we admit the absorption of some of the poisons of this class, whilst at the same time we attribute the effects produced by the rest, to a sympathetic irritation of the nervous system. We believe we are able to explain the reasons which induce us to admit, or to reject their absorption.

A. It is evident that, if the poisonous substance when applied to the cellular texture, exerts only a slight local action, and produces, in a short time after its application, vomitings, vertigoes, convulsions, and death, in the course of a few hours, we ought to admit *that it has been absorbed.*

B. For a still stronger reason may we affirm, without fear of error, that the poisonous substance *has been absorbed* in the case where the application to the cellular texture has been immediately, or almost immediately, followed by symptoms more or less serious, terminated by death, and on dissection there are discovered inflammations in the lungs, or digestive canal, as takes place with tartar emetic, arsenic, and corrosive subli-

mate*. Again it appears certain that *it has been absorbed*, but in a slow manner, when, being little soluble in water, its application to the cellular texture is not followed by any remarkable symptom, till after the expiration of four and twenty, or six and thirty hours; death does not supervene before two or three days; and it has only exerted a local inflammatory action, not very violent, and which cannot be regarded as the cause of death.

C. It is also extremely easy to conclude, that *it has not been absorbed*, when its application to the cellular texture is not followed by any general symptom, and is confined to the production of an extensive slough. Thus we may cauterize repeatedly the limb of a dog with concentrated sulphuric acid, caustic potash, nitrate of silver, &c. several days will elapse before the animal will discover the smallest sign of derangement in the functions performed by the principal organs, and it is not till nature shall have excited an inflammation, in order to throw off all those parts which have become extraneous, that the animal can sink under the excess of pain.

D. But can it be concluded that the poisonous substance *has been absorbed* in cases where it produces a very violent inflammation in the cellular texture, with which it has come in contact, where death takes place on the first or second day, when the animal has not vomited, when no lesion of the principal organs is discovered after death, and nevertheless the substance is dissolved in water, and placed in the interior of the thigh, near to the lymphatic vessels, and a multitude of venous ramifications? —Such is the question on which we wish to throw light, and it embraces a multitude of substances; for instance, Nitre, Euphorbium, Jatropha Curcas, &c. We are of opinion, 1st, that it is of no use to admit the absorption of any of these substances, in order to explain the phenomena they produce; 2nd, that it is probable it does not take place. The first of these propositions will appear evident, if we call to mind that the application of these sub-

* My friend and pupil, Dr. Smith, has just published an excellent inaugural dissertation entitled, *Essai sur le Danger de l'Application des Caustiques*; in which he proves that corrosive sublimate is absorbed, when applied to the cellular texture, and that it produces constantly inflammation of the stomach.

stances produces a violent inflammation, accompanied by severe pains, which may be compared to an extensive burn. Now we know, that in affections of this nature, sympathetic lesion of the nervous system has often produced, in animals, a speedy death, without any absorption having taken place. In what manner has the nervous system been affected?—The following are the data which tend to induce a belief that *none of these substances have been absorbed.* Strictly speaking, we cannot acquire the certainty that a poison has been absorbed, unless it shall be found in some part or other of the internal organs; nevertheless it is agreed to admit absorption whenever, after a speedy death, inflammatory phenomena, or sloughs, are discovered in any part where the poison has not been applied; as for example in the digestive canal; or when, a short time after its application to the cellular texture, the animals are seized with vomitings, vertigoes, convulsions, &c. Now the poisons in question produce none of these effects. Besides, a great number of substances which are evidently absorbed, act much more rapidly when applied to the cellular texture of the thigh, than when introduced into the stomach: such are the Hellebore root, both black and white, Upas-tieuté, Nux Vomica, Purple Foxglove, Opium, &c. In this case, on the contrary, death takes place constantly much later when the poison has been injected into the cellular texture, which seems to prove that it depends on the nervous irritation, which is much more violent in the stomach than in the limbs.

It will probably be objected that the poisonous substances we are speaking of are capable of being absorbed, and of producing, independently of a violent local irritation, effects more or less sensible on the texture of the internal organs; in this case death would depend on several different causes. This objection may be of some weight, but it is not founded on any fact of pathological anatomy, and consequently we cannot admit it.

It is *moreover possible* that we may be accused of wishing in almost every instance to explain death by the unappreciable lesions of the nervous system. In fact, it may be said to us, (especially after reading the different articles contained in this volume,) that the nervous system is affected in a multitude of ways, which bear

no apparent resemblance to each other: what is there in common between the symptoms produced by Camphor, *Cocculus Indicus*, Nux Vomica, Upas-tieuté, and those produced by Opium, Hellebore, Cherry Laurel, or still more by Squill, Purple Fox-glove, Euphorbium, Bryony, Gamboge, the different corrosive poisons, &c. &c.? The knowledge we have of the infinite lesions of which the nervous system is susceptible, is so confined, that it would be needless to try to give a satisfactory solution of this question; it is nevertheless perfectly demonstrated, that a multitude of different causes are capable of affecting this system, and producing affections which have very little resemblance to one another. Examine the list of mental derangements so ably delineated by the illustrious *Pinel*, how striking the difference in comparing the furious maniac with the idiot! and again what relation is to be discovered between these affections and epilepsy, paralysis, *ataxic* fevers, and a multitude of the *neuroses*, unless that there is a derangement in the sensitive faculty, and in the phenomena depending upon it? We shall make it appear, however in the sequel, that certain poisons, which act on the nervous system, affect peculiarly and constantly certain parts of it, such as the brain, the spinal marrow, &c. &c.

TREATMENT OF POISONING BY ACRID POISONS.

Is there any antidote to the acrid poisons?

If it be admitted that an antidote is a substance capable of decomposing the poison in the stomach, and of forming a fresh compound which does not act on the animal economy, we can affirm that we know of no body possessed of this property with regard to the acrid poisons. These poisons belong for the most part to the vegetable kingdom; now the analysis of vegetables is too little advanced for us to be able to determine exactly what is the intimate nature of the poisonous principle which they contain, and consequently what is the re-agent capable of decomposing it. It would be absurd, in the present state of science, to attempt to arrive at the solution of such a problem by theory; there would hardly be any thing more than conjecture and chance,

which would conduct us, with the aid of a multitude of experiments, to a discovery of this sort. Let us hope that modern chemistry, by bringing to perfection vegetable analysis, will furnish us with the proper means for elucidating this important subject.

But if no antidote exists to acrid poisonous substances, there are abundance of medicines which, properly administered, are capable of quieting, diminishing, and even of removing altogether the symptoms of poisoning. What then is the line of conduct to be pursued by a physician, called in to a disease of this kind?

If the poison swallowed be of that kind which acts by producing a violent inflammation, succeeded by a sympathetic affection of the nervous system (and almost all the poisons of this class act in that manner), the antiphlogistic treatment must be employed, after having encouraged vomiting by the assistance of copious warm mucilaginous drinks, and even by means of cold water. Emetics, vinegar, and all other substances that are capable of increasing the irritation of the parts already affected, are to be avoided with great care, as we have had occasion to observe in a great number of experiments made on that subject. In cases where the vomitings should be extremely violent, a few drops of Sydenham's liquid laudanum should be administered; in fine, the data we have before established in speaking of corrosive poisons should be entirely followed.

If the poison should be of the number of those which are rapidly absorbed, and which direct their principal action to the nervous system, the kind of lesion of that system must be paid attention to. Thus, for example, the poisoning produced by the roots of hellebore, which occasion a very remarkable stupefaction, will be combated by an infusion of coffee and camphor in small doses frequently repeated; and if these medicines are thrown up a short time after their ingestion, they must be used in injections and in frictions: it must not however be forgotten, that these poisons produce also an inflammation, which must be combated by emollient drinks. Lastly, in these kinds of poisonings, recourse must be had to emetics only in cases extremely

rare, where the poisonous substance shall not have excited copious vomitings.

If, instead of being stupefied, the nervous system be in a state of great excitement, which very seldom happens with poisons of this class, recourse must be had to opiates, and the different medicines which are capable of diminishing this excitement.

We may then reduce to the following precepts whatever relates to the treatment in question: 1st, to favour vomiting by copious mucilaginous drinks, at least unless the poisons should naturally provoke sufficient evacuations: 2nd, to appreciate the nature of the secondary phenomena produced, and to combat them by appropriate means, which will vary according to the kind of lesion that has taken place. . . . .

CHAPTER IV.

Class 4th. OF NARCOTIC POISONS.

THE denomination of *Narcotic Poisons* is given to those which, being rapidly absorbed, produce stupor, drowsiness, paralysis, or apoplexy, and convulsions.

OF OPIUM.

Opium is a gummy resinous juice, produced by incision of the head of the white or garden poppy (*Papaver Somniferum*), and concreted. It is heavy, compact, homogeneous, soft, of a reddish brown colour withoutside, slightly shining, opaque, plastic, somewhat capable of adhering to the fingers: its fracture presents a greenish or blackish tinge; its smell is strongly virulent and nauseous; its taste acrid, bitter, and hot. It inflames when brought near a lighted candle, and burns with a strong brightness: its odour at that time is not Narcotic. It dissolves partly in water, whatever be its temperature: warm water softens it, and reduces it to a soft paste, so that it may be cleared from extraneous bodies, by passing it through a cloth with expression. Vinegar, lemon-juice, wine, and alcohol, equally produce the solution of a part of the opium. *M. Desrosne*, who has been successfully em-

ployed in the analysis of this juice, has found, 1st, a crystallizable substance; 2nd, an extractive matter; 3rd, resin; 4th, oil; 5th, an acid; 6th, a small quantity of feculent matter; 7th, mucilage; 8th, gluten; 9th, remains of vegetable fibres, and sometimes a small quantity of sand and little stones.

ACTION OF OPIUM ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, a small robust dog was made to swallow three drachms of crude Opium. At ten, the animal experienced no sensible phenomenon. At half past twelve, his posterior extremities were extremely weak, and paralyzed; he kept himself lying always on the belly. The muscles of the trunk and face were attacked with violent convulsions, so that the animal made strange contortions of countenance, and was every moment moved from his place, notwithstanding that he supported himself firmly upon his four legs. His physiognomy exhibited stupidity; the organs of vision and of smelling exercised their functions freely; the animal did not moan at all, but appeared extremely dejected; the pulsations of the heart were slow and feeble. At six in the evening, the convulsive twitchings were stronger and more frequent; the whole of the posterior parts were completely paralyzed. He died in the night. The next day he was opened; and it was remarked that the head was slightly reversed toward the back, the legs stiff, and separated one from the other. The stomach contained almost the whole of the Opium, which might be recognized by its smell. The mucous membrane of this viscus was covered over with a slight whitish colour, easily detached, and presented no vestige of inflammation; the lungs exhibited several livid patches distended with blood, very little crepitating.

This experiment, repeated upon other dogs with the crude Opium, or with the watery extract, furnished similar results. Sometimes however, the animals vomited after having experienced effects more or less decided, and some of them have recovered without receiving any assistance.

Cases.

A young lady, twenty-two years of age, poisoned herself with opium: the following symptoms were observed: perfect immobility and insensibility; countenance pale and cadaverous; pupils insensible to the impression of light; lower jaw fallen, and very moveable; muscles of the limbs and trunk in a state of relaxation; deglutition ceased; respiration for the most part scarcely perceptible; less heat of skin than in the natural state. Inhaling of ammonia, stimulant frictions, blisters, antispasmodics internally, and stimulant glysters were employed without any success. The patient vomited some liquid matter, which was blackish; she only recovered her senses to fall again in a moment after into a state of stupidity; and died about seventeen hours after having swallowed the opium.

On the 6th of November last, about four in the afternoon, Mr. A. Cooper informed me, that he had just been to see a young man of about eighteen years of age, who, at ten in the morning, had swallowed about six ounces of laudanum, which remained in the stomach, and had produced symptoms which threatened a speedy death. Mr. Cooper, who only saw him five hours after the accident, informed me that he had given him, at half past three, a solution of a drachm and half of white vitriol (Sulphate of Zinc), which had produced some retchings, and caused him to vomit about an ounce and half of a fluid, which exhaled a strong smell of Opium. The state of lethargy had gradually increased; he had also fallen into a state of complete insensibility, and sinapisms had been applied without any remarkable effect.

Mr. Cooper having invited me to see this young man, in order to take such further means as circumstances might dictate, I went there at a few minutes after four. I found the patient on the floor, upon his knees, with the body bent forward, and supported by two of his friends, who, as I learned shortly after, had formed the determination to replace him in the bed, and leave him to his fate, having no further hope from any medicines that might be employed. His head was resting on the sternum, his eyes closed, countenance pale; breathing slow and sonorous, as in a

state of apoplexy; his hands were cold, and the pulse beat from ninety to ninety-six strokes in the minute, but in a weak and irregular manner. All his muscles were in a state of relaxation, and the flesh of his arms especially was extremely soft to the touch, and void of elasticity.

The blue vitriol, or sulphate of copper, was the first remedy that came into my mind for exciting vomiting; about half a drachm of this substance was immediately dissolved in water, and the patient being rudely lifted up, and strongly shaken, he opened his eyes, and seemed as if he wished to offer some resistance to the attempts which he perceived we were making. We continued however to pour down his throat about half the quantity of the vitriol, which was a dose equal to fifteen grains, which he swallowed with a degree of difficulty, such as might be supposed to exist just at the last gasp. Instantly his countenance, which had been for a moment animated, became more ghastly than ever. It was scarcely a minute after he had swallowed the whole dose, when he threw up on a sudden, a great quantity of a brownish fluid, which exhaled a strong smell of laudanum, which was immediately followed by two other similar vomitings, the whole of which might be estimated at two pints. He was then made to swallow some warm water, and removed briskly into another room, with the intention of opposing that state of numbness in which he was. His limbs, which at my first entrance were entirely deprived of motion, returned a little to their state of contraction, for he began to support himself on his legs with the assistance of the persons who were about him. He continued however to keep his eyes shut, unless when awoke by a brisk and sudden call; the pupils were dilated, the breathing apoplectic. I recommended strongly to his friends, who were extremely active and very intelligent, to keep him as much as possible on the legs, and walk him continually about the room.

When I came again to see him, about nine in the evening, I found him sufficiently recovered to take that exercise with the assistance of one of his friends. His countenance appeared more natural, but he still answered only by monosyllables when pressed by questions, and that like a man in a state of extreme intoxica-

tion. He had vomited once or twice in the course of the afternoon, and gave me to understand that he felt a sensation of cold at the pit of the stomach, a remarkable heat on the surface of the body, and a marked coldness of the extremities. Notwithstanding the state of amelioration which we could perceive, his sleep was still profound, he snored strongly even when he was walking about the room: and when suddenly woke, he opened his eyes, and often fell again into his state of somnolency. Mr. Cooper came also to see him in the evening, and we both agreed to recommend that he should still be kept in the same state of forced activity during the night, and should be made to take repeated doses of assafœtida with the volatile alkali, camphor, and even musk, if the other stimulants did not appear sufficiently active. It was moreover agreed that a blister should be applied to the head, and sinapisms to the feet, and that tea and coffee should be frequently presented to him, as also lemon juice, of which he had taken some small doses during the evening with very great advantage. We recommended also that he should not be left, during the night, more than half an hour, without rousing him from his lethargy, in order to make him take some medicine, or some nourishing drink.

On seeing him the next morning, November 7th, I learned that at twelve o'clock, he had been so much better, that his friends deemed it unnecessary to apply the blister: a small quantity of camphor julep with assafœtida was the only medicine that he had taken; but he frequently made use of tea, coffee, and lemon juice, which he took with great pleasure. He had likewise been prevented from sleeping, being kept incessantly in a state of constant agitation, till six in the morning, at which hour he returned to his bed.

I saw him in the morning; I found him still asleep; but on approaching him he awoke suddenly with a troubled appearance at first; but soon recovering himself, he said (which was correct) that he had slept, he believed, three or four hours. He complained of a painful sensation in the throat, as if it had been excoriated; he observed moreover that a glyster, which had been given him, had passed a little at a time with some excrementitious mat-

ter, without his being able to perceive it, or capable of preventing it.

The following day, November 8th, he was in a situation to walk out; his appetite was not yet returned, but yet he had not an aversion to food; he still complained of pains in the throat, and more so at the root of the tongue; pains which appeared evidently to be the result of the caustic medicines which had been given him. He had passed no stool since the accident, except what was produced by the glyster that had been given him; he was still pale and low; complaining of an uncomfortable sensation at the pit of the stomach, not however amounting to a pain; I ordered him a dose of rhubarb and calomel. He was shortly after perfectly restored. (*Transactions Medico-chirurgical*, trad. de l'Anglais, tom. i. p. 89. Observ. de *M. Marcet.*)

M. Nysten published in 1808 a very interesting work on Opium, from which we shall make an extract. This extract contains the conclusions from facts which precede it, and from a very great number of experiments made by this physiologist.

1st. The watery extract obtained with cold water, and which has undergone only one evaporation, is more active than the other preparations of Opium, without excepting even the gummy extracts of Cornet, Béaumé, and Rousseau, prepared by repeated evaporations, by long digestion, or by fermentation.

2nd. The resinous matter, which is very little soluble, produces the same effects as the watery extract, but in a much stronger dose, and it does not inflame the mucous membrane of the stomach. If this membrane has sometimes been found in a state of phlogosis, after cases of poisoning by Opium, this phlogosis has been owing to the spirituous liquors in which the Opium has been taken, or to some other irritating substance administered as an antidote.*

3d. The *Chrystallizable essential salt*, improperly called the *Narcotic Principle*, is still less active than the resin. *M. Nysten*

* *Vicat* says: the resinous extract of Opium possesses very little activity; for fifteen grains of it did no harm to a dog, and *Charas* swallowed six grains without experiencing any thing but a degree of gaiety. *Op. citat.* p. 220, anno 1776.)

has taken four grains of it, and experienced only a very slight disposition to sleep.

4th. The pellicle, which separates during the evaporation of the extract, is less energetic still than the essential salt.

5th. The distilled water of Opium, strongly saturated with the aromatic principle, is capable of producing drunkenness and sleep, when taken in a strong dose. *M. Nysten* has swallowed two ounces of it without any sensible effect.

6th. It is sufficient to inject three or four grains of the watery extract of Opium into the carotid of a dog, to kill him in the space of a few minutes.

7th. It requires a little stronger dose in order to produce the same effect, if injected into the crural or jugular vein. Nearly the same thing happens when the injection has been made into the pleura or peritonœum.

8th. The effects of Opium are always less speedy and energetic when it is injected into the cellular texture.*

9th. They take place all the same, when the watery extract has been injected into the bladder; but a great quantity will be necessary to determine death.

10th. The application of Opium to the brain is not mortal; although it is by acting especially on this organ, that Opium, introduced internally, gives rise to dangerous symptoms.

11th. Opium does not destroy the contractility of those muscles with which it may be brought in contact, and the symptoms of poisoning which take place under these circumstances depend on its absorption and action upon the brain. A heart, plunged into a solution of Opium, continues to contract there for a very long time.

12th. The analogy which has been supposed to exist between

* We are of opinion that it may be added: "*a.* That they are still much less so when it has been introduced into the stomach, which probably depends, 1st, on its being partly digested and converted into a less pernicious substance; 2nd, on the venous absorption being less active. *b.* The effects of Opium are in general more decided when it is injected in glysters, than when it has been introduced into the stomach, at least, when the glyster has not been suddenly returned. Be it as it may, the injection of this medicine into the anus, is constantly followed by speedy and repeated vomitings.

the effects of Opium and those of wine is incorrect: Opium, whether in a small or great dose, directs its action to the vital properties, and it is even in this manner that it becomes a powerful sedative; wine, on the contrary, reanimates these properties; and when it even produces a debilitating effect, it is because they have been elevated to too high a degree of energy that they fall into a state of collapsus.

13th. It is not by acting on the nervous extremities of the stomach that this poison produces death, as *With* has supposed; for animals, on which the section of the *par vagum* of both sides has been performed, die at the end of two or three hours, and after having experienced intoxication, somnolency, and convulsions, as we have described. (*Bulletin de la Société Philomatique*, Mai, 1808, tom. i. p. 143).

It ought to be observed in the forgoing propositions, that *M. Nysten* confines himself to saying, when speaking of the immediate cause of death brought on by Opium, that *this medicine is absorbed, that it acts on the brain, and that it constantly directs its action to the vital properties.* But what is this mode of lesion?—Does Opium act by stupifying this organ? or does it begin by exciting it, in order afterwards to produce stupefaction?—In other words, is this medicine to be ranked among the narcotics, or amongst those which excite the nervous system?—This question, which has been long agitated among physiologists of very considerable merit, is very far from having received any satisfactory solution; this is sufficient to show how many difficulties it presents; therefore we do not pretend, in seeking to throw a light upon it, to investigate it thoroughly.

Balthasar Louis Tralles, in a treatise entitled *Usus Opii salubris et noxius in Morborum Medela*, (in 4to. anno 1754) is the first who considered Opium as a stimulant. Brown has since taken up this opinion, which he has consecrated by these words: *opium mehercle non sedat.* In fact, many physicians are of opinion at this day that this medicine is an excitant; it increases, say they, the movements of the heart, and consequently the circulation becomes more rapid; the arteries beat with greater force, the pulse is hard and full. Besides, the Turks, who take Opium pure, and

in the form of extract, find in the use of it an oblivion of their calamities ; a thousand delicious images, a thousand agreeable visions present themselves to their imagination ; they give themselves up to frantic and extravagant actions ; roaring fits of laughter, mad proposals distinguish them ; they feel a greater propensity to venereal enjoyments ; all their passions, all their desires, are exalted ; a warlike ardour animates their minds ; they are prepared to brave death without fear—a valuable resource, which the officers of the Turkish armies know well how to turn to advantage ; frequently too they abandon themselves to violent fits of madness ; they murder, or stab all who make the least resistance to them. This state lasts several hours : then dejection and languor succeed. They become cold, melancholy, sad, stupid, and sleepy. Let us listen to the illustrious traveller *Chardin*, whilst recounting the effects of a certain drink prepared with the bulb and seeds of the poppy. " There is," says he, " a decoction of the head and seeds of the poppy, which they call *Coquenar ;* for the sale of which there are taverns in every quarter of the town, similar to coffee-houses. It is extremely amusing to visit these houses, and to observe carefully those who resort there for the purpose of drinking it, both before they have taken the dose, before it begins to operate, and while it is operating. On entering the tavern, they are dejected, sad, and languishing ; soon after they have taken two or three cups of this beverage, they are peevish, and as it were enraged ; every thing displeases them ; they find fault with every thing, and quarrel with one another ; but, in the course of its operation, they make it up again, and each one giving himself up to his predominant passion, the lover speaks sweet things to his idol ; another, half asleep, laughs in his sleeve ; a third talks big, and blusters ; a fourth tells ridiculous stories ; in one word, a person would believe himself to be really in a madhouse. A kind of lethargy and stupidity succeed to this unequal and disorderly gaiety ; but the Persians, far from treating it as it deserves, call it an extacy, and maintain that there is something supernatural and heavenly in this state. As soon as the effect of the decoction diminishes, each one retires to his own house."

On the other hand, some very respectable philosophers, at the

head of whom we shall place professor *Barbier* of Amiens, are of opinion, that all the phenomena produced by Opium, are the result of an influence essentially debilitating. This observer says: "In consequence of this debilitating action, the cutaneous capillary vessels fall into a state of atony, and lose their contractile and impulsive power; by which means it happens, that these vessels become distended by stagnant blood, which obstructs in its course that which is propelled by the heart, and which is consequently forced to accumulate in the arteries. It is also to this same cause, that is to say, to the detention of the blood in the capillary vessels, that we must ascribe the tumefaction of the face and eyes, the discoloration of the skin, and the increase of temperature observed after the ingestion of Opium. All those who die poisoned by Opium, are in a state of very decided erection; this phenomena is more particularly observable in Turks who have been killed in battle. This is moreover an erection purely passive, in which the vital properties have no concern, existing from a physical cause only. If Opium enlivens and increases the courage of the Orientals, it is because they live under a different climate; have other customs, other kind of habits, because they use this substance habitually; lastly, because they frequently do not take pure Opium, but a preparation in which the stimulant ingredients counter-balance at least the stupefiants." (Barbier, *Pharmacologie Générale*, p. 490, an. 1816.)

Mayer, professor at Frankfort on the Oder, in a work entitled *Considerations sur les Effets de l'Opium*, has considered the action of this substance under a point of view somewhat different. "In the dose of a quarter of a grain, or half a grain," says he, "Opium ceases to be stimulant, and may also be employed as a direct and immediate sedative in *Hypersthenic* diseases, for instance, to quiet the erections in *blennorrhagia*. The same medicine exerts a specific stimulus on the nerves and on the system of the circulation, the energy of which it exalts, whilst at the same time it produces atony of the muscles, and obstructs or suspends the functions of the digestive organs. Hence it follows that the calm produced by Opium has been erroneously attributed to an anterior excitement, which never takes place but when it has been exhibited in a large dose, and thus its effects may be

compared to those of fatigue, and of an excess of food, which only induce quiet by an indirect debility.

Such are the principal opinions entertained to the present day, on the immediate effects of Opium. We are of opinion that they may be successfully confuted by means of the experiments which we have made, and which lead us to the establishment of the following facts.

Opium, employed in strong doses, ought not to be ranked either amongst the narcotics or the stimulants; it exerts a peculiar mode of action, which cannot be designated exactly by any of the terms at this moment employed in the Materia Medica.

In fact, all the animals suqmitted to the influence of a tolerably strong dose of this poison, are plunged, presently after, into a state of decided lethargy; their heads become heavy, they feel giddiness, their posterior extremities become weak, and are shortly after completely paralyzed (phenomena which declare a direct stupifying action). Twenty-five, thirty, or forty minutes after, the pulse is full, strong, frequently accelerated; convulsive movements take place; these movements, weak at first, become in a short time so violent, that the animals are suddenly lifted up from the ground, their head is strongly bent backward upon the spine; their extremities grow stiff by intervals, and are agitated; they utter frequently plaintive cries (phenomena which declare a stimulant action). This excitement continues till the moment of death, which takes place at the expiration of two, three, or four hours, and for the whole time of its continuance the symptoms of stupefaction, first produced, remain. The animals, far from being deeply sunk in sleep, are capable of being roused from their lethargy by a slight noise; by the least contact, or when any object whatever is brought near to their eyes: frequently also when shaken they grow extremely stiff, almost the same as if they had taken *nux vomica*.* How vastly different are these phenomena from those produced

* The experiments we are speaking of, were made by injecting thirty-six or forty grains of a watery extract of Opium into the cellular texture. We are of opinion, that this manner of operating is the most proper to illustrate the mode of action of poisons that are absorbed, and which might undergo some decomposition on the part of the digestive organs.

by Hellebore and Camphor. The former of these substances, which we consider as essentially *stupifying*, plunges the animals, shortly after its application, into a state of perfect lethargy ; sensibility, and the motive faculty appear to be annihilated to such a degree, that life might be thought to be extinct three or four hours before death actually takes place, did not the phenomena of respiration shew the real state of things. *Camphor*, on the contrary, shews a decided excitement of the brain, from the moment of its application ; anxiety, agitation, convulsions, contortions, and the most horrible grimaces of the face, are the primitive symptoms produced by it ; to which, in a short time, succeed symptoms of relaxation and atony, which may be considered as the consequence of a prolonged excitement ; besides, in cases of poisoning by this substance, the animals enjoy lucid intervals, and do not commonly die till after the third or fourth paroxysm.

Opium, employed in a small dose, seems to confine its action to the production of those symptoms which we have pointed out as declaring themselves at first, such as announce stupefaction ; sometimes however, it produces a very considerable excitement, which effects, are the consequence of a peculiar idiosyncrasy.

We cannot admit that there is any identity of action between Opium and spirituous liquors when employed in large doses.

OF BLACK HENBANE *(HYOSCIAMUS NIGER)*.

This plant belongs to the family of the *Solana* of Jus. and the Pentandria Monogynia of Lin.

ACTION OF HENBANE ON THE ANIMAL ECONOMY.

Experiment 1st. A small dog was made to swallow two drachms of the dried leaves of Henbane, finely powdered : the animal did not appear incommoded. To another dog three ounces of the fresh root of black Henbane were given in small round slices, which had been gathered in the month of April : the œsophagus was tied. Forty hours after, the animal had experienced no other phenomenon than dejection : the same state continued three days after the operation.

Experiment 2nd. On the same day (April 22nd) another dog was made to take eight ounces of the juice proceeding from three pounds of the fresh root of black Henbane gathered in April, which had been pounded with two ounces of water, and one ounce of the contused root: the œsophagus was tied. Three hours afterwards, the animal was somewhat drowsy. At the end of two hours more, his posterior extremities were feeble, and bended with ease: the pupils were dilated, and the lethargy more decided; otherwise the animal experienced no giddiness or convulsions: he preserved the free use of his senses and motive faculty. The next morning, these symptoms appeared diminished; but he was slightly dejected: this state of things continued the whole day, and he died in the night.

CASE.

Baudouin and *Laudet* ate on the 12th, at nine in the morning, some young shoots of black Henbane dressed with olive oil. In a short time the ground appeared to fly from under their feet; their countenance became stupid; their tongue was paralyzed, and their limbs became benumbed. M. Choquet, physician of the hospital of Puerto Real near Cadiz, was called in the same day at two in the afternoon; and found them with their eyes haggard, the pupils very much dilated, their look fixed and dull, their breathing difficult, pulse small and intermitting: there were besides, *aphonia*, *trismus*, *risus sardonicus*, loss of sense, aberration in the functions of the intellect; which, together with disposition to sleep, placed these patients in a state of *typhomania*; the extremities were cold, the inferior ones paralyzed, the superior agitated by convulsive movements; to all these alarming symptoms was added also *carphologia*.

M. Choquet, after having conquered the contraction of the jaws, caused each of the patients to swallow the half of a solution of ten grains of Antimoniated Tartrate of Potash, in two pints of water. *Laudet* vomited a tolerably large quantity of fluid, in which it was easy to distinguish the parts of a plant altered by coction. The emetic water was continued, and purgative glysters were administered, which produced in *Laudet* vomitings, and

abundant alvine discharges. The state of mania with delirium, but without fury, in which *Baudouin* was, rendered him by no means docile; he took considerably less of the emetic solution, and consequently had only very slight evacuations. To these means succeeded the administration of wine vinegar in large doses, dry frictions over the whole surface of the body, and particularly the abdomen. At ten in the evening, *Laudet* already experienced a sensible amelioration; his delirium had ceased, the difficulty of breathing was less, he was awake, had recovered a little of his natural warmth, sensation, and speech; the other symptoms had undergone but little diminution. The paralysis of *Baudouin* had also somewhat diminished, as well as his propensity to sleep; but the other symptoms appeared to be exasperated, and his madness was extreme; it was very difficult to hold him. M. Choquet continued the use of the vinegar, purgative glysters, and frictions, during the night of the 12th. On the 13th, at seven in the morning, *Laudet* made use of his limbs with facility; his pulse was perfectly developed, and his bowels free, whilst he enjoyed all his intellectual faculties: he felt only a small degree of head-ache above the orbits, resulting from the bad disposition of his digestive organs: a strict low diet, and the use of lemonade, in a short time removed every complaint. *Baudouin*, who had attempted to run away during the night, was stopped by the guard of the hospital; and as he could only recollect himself confusedly, his delirium was continually running on assassination, desertion, bayonets, and court-martial: his pulse was very much accelerated, but more regular, and not so tight as on the 12th. His appearance was still fixed, his countenance haggard, and the abdomen was extremely hard and tense. Attributing the duration of these symptoms to the circumstance of the patient having had only very slight evacuations, sixty grains of a purgative powder were administered to him in the form of a bolus; this drastic, joined to purgative glysters, produced several stools. Towards noon, the pulse was considerably elevated, the breathing had become full, and a copious perspiration, which was soon succeeded by a looseness of the belly, terminated this useful secretion; in fine, at four in the evening, *Baudouin* was nearly as well as his comrade; he

had equally regained the use of his faculties, speech, sensation, and motion. Two days of regimen, and the use of lemonade, sufficed at length to put these two soldiers into a situation to return to their duty.

Grunwald has seen the decoction of the leaves of this plant, administered in a glyster, give rise to a furious delirium. Several practitioners have remarked symptoms of poisoning after the administration of a glyster prepared with the extract of this plant.

It results from the facts related:

1st. That the juice and decoction of the root of black Henbane in full vegetation, produce serious symptoms when introduced into the stomach; but that their effects are less severe if employed in the beginning of the spring.

2nd. That the juice of the leaves is less active.

3rd. That the watery extract obtained by evaporating in a water-bath the juice of the fresh plant in full vegetation, possesses nearly the same poisonous properties as the juice, whilst it is incomparably less active when obtained by decoction of the plant not sufficiently developed, or too much dried, which explains why *certain extracts of Henbane found in commerce are endued with no virtue.*

4th. That these preparations act nearly in the same manner, whether applied upon the cellular texture, introduced into the stomach, or, in fine, injected into the veins: in this last case it requires but a very small quantity to produce death.

5th. That they are absorbed, carried into the circulation, and exert a remarkable action on the nervous system, which may be compared to a mental alienation, to which succeeds a remarkable stupefaction.

6th. That they do not produce inflammation of the texture.

7th. Lastly, that they appear to act in the same manner on the human species as on dogs.

The white Henbane (*Hyosciamus albus*) is likewise extremely poisonous.

When taken in the dose of twenty-five grains, it has produced lethargy, convulsions, *subsultus tendinum*, and insensibility; in another instance, its use destroyed the faculty of deglutition, pro-

duced delirium, and suppressed the voice: symptoms which, indeed, were of not long duration.

The following fact was communicated to M. Fodéré, professor of the School of Medicine of Strasbourg, by Dr. Picard.

"In the month of April, 1792, a large quantity of Henbane was carried by mistake on board the French Corvette, *La Sardine*, which the sailors had gathered in one of the islands of Sapienzi in the Morea, where the vessel chanced to be. A part of it was put into the sailors' mess, and the remainder into those of some of the subaltern officers. At four o'clock they all dined. In a short time they experienced vertigoes, vomitings, convulsions, gripes, and copious stools; which, as they seized the whole ship's company, determined them to fire a gun, and make all the necessary signals for calling on board the absent boats. M. Picard arrived on board, and perceived the second gunner Ribergue, making a thousand grimaces and contortions, very much resembling the *Danse de Saint-Guy*. He ordered the plant to be brought to him, which had been employed, and recognized the *white Henbane*. He kept up the evacuations upwards and downwards, and used afterwards drinks with vinegar. Those who had no evacuations were for some time in a sickly condition, and struggled with a protracted convalescence; the others quickly recovered. It was necessary however to combine the most powerful anti-spasmodics with the evacuating plan, in order to restore *Ribergue* to perfect health." (*Médécine Légale*, already quoted, tom. iv. p. 23.)

Golden Henbane (*Hyosciamus aureus*). *M. de Voilemont* has given the decoction of this root to dogs. "There comes on them," says he, "a trembling, and feebleness in the legs; old dogs are five or six days without eating or drinking, and in the end die. Young ones, on the contrary, drink excessively, eat scarcely any thing, and at the end of eight or ten days are in good health.

The *Hyosciamus Physaloides* and *Scopolia*, are equally poisonous.

OF THE PRUSSIC ACID.

The Prussic Acid, in the most concentrated form that it has hitherto been obtained, is a fluid colourless, transparent, and of an

exceedingly strong smell, similar to that of the blossom of the peach, or bitter almond trees; its taste, which is at first cool, becomes acrid, irritating, and excites coughing; its specific gravity at 7°. is as 0.70583; it scarcely reddens the tincture of tournesol; exposed to the action of caloric, it boils at 26°5; it is capable of congealing at 15 below 0; the crystallization of this acid in its concentrated form may even take place when a few drops of it are poured upon paper; in this case, it becomes in part volatile, absorbs caloric from the portion not volatilized, which by that means becomes congealed. It inflames in the atmosphere on approaching a body in a state of combustion; it is little soluble in water; is easily dissolved by alcohol; it gives with the Nitrate of Silver a white precipitate. Combined with Potash and Oxyde of iron, it furnishes a double salt of a lemon colour, which dissolves in water, and the solution of which throws down in a blue precipitate, more or less deep, the salts of iron of the second and third degree of oxydation; in a crimson, inclining to brown, the salts of copper at maximum; in a blood colour the salts of Urania; and in an apple-green those of Nickel.

ACTION OF THE PRUSSIC ACID UPON THE ANIMAL ECONOMY.*

Experiment 1st. A small bitch was made to swallow two drops of Prussic Acid. Immediately after, her breathing became accelerated, she staggered, fell, passed abundance of urine, and vomited twice; in a short time after, she was restored to health. Five hours afterwards, she was made to take eight drops, and the animal in a short time experienced the following symptoms: cough, salivation, accelerated respiration, staggering; weakness of the posterior extremities, plaintive cries, alvine evacuations, falling down, opisthotonos, dilatation of the pupil, tetanic stiffness, and, in less than five minutes, paralysis, first of the posterior limbs, then of the anterior; general insensibility, except in the tail, which was agitated from time to time; pulse accelerated, from seventy-two to a hundred and fifty pulsations per mi-

* These experiments were made with Prussic Acid, prepared according to the process of *Scheele*, and consequently containing a great deal of water.

nute; great mobility of the eyes and eye-lids; at length, sleep. Fifteen minutes after, the animal rose up, passed some urine, experienced an opisthotonos, and in half an hour was recovered. The next morning the animal was again made to swallow sixteen drops of the same poison. Instantly, respiration accelerated, very strong cries, convulsions, opisthotonos, then emprosthotonos; its fore paws placed above the head, general tetanus, pupils dilated, ears cold, urine copious, general paralysis, tongue hanging out, eyes fixed, eye-lids moving. Five or six minutes after, respiration difficult, trismus, *subsultus tendinum*. At the end of half an hour, she rose up, and appeared to suffer pain in the belly; was frightened at the least noise, sought dark places, and was all in a tremor. An hour after, she ate with voracity.

Professor *Emmert*, who had published, as early as 1805, an excellent treatise on the effects of the Prussic Acid, asserts, that a crow died a few seconds after the injection of half a drachm of this acid into the trachea; it exhibited all the phenomena of opisthotonos.

The same physiologist injected into the jugular vein of a horse some warm Prussic Acid, and he remarked that, a few minutes after, the breathing was more frequent, convulsive movements took place in all the muscles of the body, and the pupil was dilated. The animal died twenty-one minutes after the injection. The blood drawn after the injection coagulated without producing any crust, whilst that drawn before the operation had one; there were bubbles of air in the heart.

My friend *M. Fueter* communicated to me the following fact, which has since been inserted in the *Annales de Chimie* of the month of October, 1814. M. B., Professor of Chemistry, left by negligence a flask containing alcohol saturated with Prussic Acid; the servant girl, seduced by the agreeable smell of the liquor, swallowed a small glass of it. At the expiration of two minutes, she fell down dead, as if she had been struck with apoplexy. The body was not opened.

Scharinger, Professor at Vienna, prepared, six or seven months since, some Prussic Acid pure and concentrated; he diffused a

certain quantity of it upon his naked arm, and died a short time after.

OF THE LAUREL (*PRUNUS LAURO-CERASUS* OF OF LIN. OR BETTER *CERASUS LAURO-CERASUS*).

This shrub belong to the genus *cherry-tree* of the family of the *Rosaceæ* of Jussieu.

It is cultivated in gardens; its flowers and leaves have the flavour of the bitter almond.

ACTION OF THE DISTILLED WATER OF THE LAUREL ON THE ANIMAL ECONOMY.

The distilled water of the Laurel contains Prussic Acid. *Schrader* has witnessed that in pouring it upon a ferruginous salt, a blue precipitate of Prussiate of iron was obtained by the addition of a few drops of an alkali, and of any acid except the Nitric or the Nitromuriatic. *Bohn*, *Bucholz*, *Roloff*, and *Gehlen*, have also recognized in it the presence of this acid.

Madden, *Mortimer*, *Browne-Langrish*, *Nicholls*, *Stenzelius*, *Heberden*, *Watson*, *Vater*, *Rattrai*, the *Abbé Rozier*, *Duhamel*, and *Fontana*, have successively made experiments on the deleterious properties of this fluid. We have also tried ourselves a great number: the following are the principal results.

Experiment 1*st*. A wound was made in the back of a little dog; an ounce and half of distilled Laurel-water, were injected into the cellular texture. At the end of half an hour the animal vomited a tolerably large quantity of alimentary matter. Three minutes after, he threw up by the mouth some greenish, glutinous, and frothy matter. Thirty-five minutes after the operation, he made several circular turns in the laboratory; his head seemed to be heavy; his extremities grew feeble, first the posterior, then the anterior ones; he could scarcely support himself. Five minutes more had scarcely elapsed when he fell down upon the side, inclined his head upon his back, and his paws were agitated with slight convulsive motions: he might be moved like an inert mass of matter, and was incapable of standing; his breathing was diffi-

cult and accelerated; he preserved the use of his senses. Ten minutes afterwards he uttered very acute plaintive cries. These symptoms continued till death, which took place an hour and half after the application of the poisonous substance. Sensibility had diminished by degrees, in the organs of sight and hearing.

Dissection. The vessels of the superior surface of the brain were black, very much distended, and gorged with blood; there was no fluid in the ventricles of this organ; the lungs were more red than in their natural state; the digestive canal presented no sensible sign of alteration.

The same experiment repeated upon a stronger dog furnished the same results.

Experiment 2d. Browne-Langrish injected four ounces of the same fluid into the abdomen of a dog; the animal experienced the symptoms described above: and died twenty-two minutes after.

Experiment 3d. Fontana laid bare the sciatic nerve of a large rabbit; he wounded it with a lancet, and covered the whole extent that had been wounded with lint, moistened with fifteen drops of distilled laurel-water; he afterwards so disposed the parts that the poisonous substance could not communicate itself to any thing in the neighbourhood of it; the wound was then brought together by suture, and the animal did not appear in any way incommoded.

Douellan gave to a relation, whose heir he was, a medicine containing Laurel-water: the unfortunate patient experienced convulsions, foamed at the mouth, had the jaws locked, and the eyes fixed: he expired an hour after.

M. Fodéré says: "whilst I was attending my studies at Turin, in 1784, the chamber-maid, and man-servant of a noble family of that town, stole, for the purpose of regaling themselves, from their master, a bottle of distilled Laurel-water, which they took for an excellent cordial, which was kept locked up for the sake of preserving it. Fearful of being surprized, they hastily swallowed, one after the other, several mouthfuls of it; but they paid in a short time the price of their dishonesty, for they expired almost instantly in convulsions. The dead bodies having been carried to

the University they were examined; the stomach was found slightly inflamed, and the rest in a sound state."

In 1728, two women having taken this fluid, one to the dose of ten drachms in an hour's time, the other of two table-spoonfuls, the first lost the use of speech, experienced a painful sensation in the stomach, and expired without vomitings, stools, or convulsions; the second sat down on a chair, and died immediately after, without convulsions, or any other apparent commotion.

A young man died in a few minutes after having drank a part of the distilled Laurel water contained in a phial: he experienced a severe affection of the stomach.

OF THE OIL OF LAUREL.

Experiment. A drachm of this oil was mixed with six pounds of common water; the whole was shaken up together, and two ounces of the mixture were administered to a dog; the animal was paralyzed to that degree, that he was no longer sensible of the irritation of any agent whatever. He died in half a minute.

Fontana prepared an oil by distilling the leaves of the Laurel in vessels of glass without the addition of water. He administered two, three, and four drops of it to rabbits, tortoises, pigeons, and frogs, which died in a very short time after, and which exhibited symptoms similar to those we have been describing.

OF THE WATERY EXTRACT OF LAUREL.

Injected into a wound, in the inside of the thigh of a dog: it produced no other effect than loss of appetite.

Double the quantity was injected in the wound of another dog, and he died forty-eight hours after the operation.

ACTION OF BITTER ALMONDS ON THE ANIMAL ECONOMY.

Experiment. A cat, two months old, swallowed a drachm of bitter almonds pounded. In a short time after, it dragged along its hind legs, became paralytic, and experienced four attacks of

epilepsy. In the evening the respiration became panting, and it died. The stomach was red at its orifices, and contained mucus: the heart and auricles were filled with fluid blood; there was an effusion of blood throughout all the right side.

Every thing tends to induce a belief that the leaves of the peach-tree, fruits with kernels, the pips of apples, and the different bodies containing Prussic Acid, exert on the animal economy, a deleterious action more or less considerable.

It results from these facts:

1st. That Prussic Acid is hurtful to the different classes of animals, more to those which have warm blood, than to the others: insects however die resembling animals with warm blood by the promptitude with which they are frequently seized; but receding from them by the inverse order in which the parts die.

2d. That it produces death so much the more rapidly as the circulation is more active, and as the organs of respiration are of greater extent.

3rd. That it is more pernicious to young animals than to others.

4th. That it exerts its action upon whatever texture it may be brought in contact with, the nerves and dura mater excepted.

5th. That the intensity of this action varies according to the part upon which it is applied; thus for instance, it is extremely deleterious when injected into the jugular vein or into the trachea; it is less so when injected into the thorax; still less when introduced into the stomach or rectum; its action is still more weak when applied to wounds, and death takes place sooner when the wound has been made on the anterior limbs. (*Emmert.*)

6th. That if the dose be not sufficiently strong to cause death, the animal returns very speedily to life, more especially if the poison has been brought in contact with the eye, or with the stomach.

7th. That its effects depend on its being absorbed and carried into the circulation.

8th. That its action is retarded, but not suspended, when it is brought in contact with a part which no longer communicates with the brain or spinal marrow.

9th. That it appears to act on the human species, as on the warm blooded animals.

10th. That it destroys the irritability, and ought to be classed amongst the narcotics.

11th. That it does not produce any inflammatory lesion capable of being demonstrated after death; nevertheless, that the venous system appears distended, whilst the arteries are empty, the pupils frequently dilated, the lungs spotted; alterations which are common to a very great number of the stupifying poisons.

It is evident that the distilled water and oil of Laurel, as well as bitter almonds, exert a mode of action analagous to that of Prussic Acid.

The watery extract of Laurel is not poisonous, or very little so, which doubtless depends on the Prussic Acid being volatilized during the evaporation of the fluid, to the consistence of an extract.

OF THE STRONG SCENTED LETTUCE (*LACTUCA VIROSA*).

This plant belongs to the Syngenesia Polygamia Æqualis of Lin. to the family of the *demi-flosculeuses* of Tournefort, and to the order of the *Chicoraceæ* of Jussieu.

ACTION OF THE STRONG SCENTED LETTUCE ON ANIMAL ECONOMY.

Experiment 1*st.* A strong dog was made to swallow about a pound and half, of the leaves of strong scented Lettuce: the animal did not appear to be incommoded.

Experiment 2*d.* Two drachms of the watery extract of strong scented Lettuce, bought of an apothecary, were applied to the cellular texture of the back of a dog. Five days after, the animal experienced such vertigoes that he could not stand; he had all along refused food, but had not experienced any remarkable symptom. He died the same day. No sensible alteration was perceived in the internal organs.

The facts just related lead us to believe,

1st. That the extract of the strong scented Lettuce, prepared

by evaporating the juice of the plant by a gentle heat, is more active than that which has been prepared by decoction.

2d. That it is absorbed and carried into the circulation, and that its action is more intense and more rapid when it is injected into the jugular vein, than when applied to the cellular texture of the thigh: this last mode of application is followed by effects more decided, than when the extract is introduced into the stomach.

3d. That it acts on the nervous system after the manner of the narcotics.

OF THE SOLANUM.

The experiments of *M. Dunal* prove evidently, that the *Solanum Dulcamara* may be administered in a strong dose without any inconvenience. He administered to dogs as much as four ounces of its watery extract, without their having experienced any accident. The same thing happened to one of these animals that was made to take one hundred and eighty ripe berries of the *Solanum Dulcamara*. A cock, that swallowed fifty of them, did not seem at all incommoded. With the intention of understanding the influence of the state of maturity of these fruits, a dog was made to take an hundred berries of Dulcamara before they were ripe: they gave rise to no symptom. *M. Fages*, doctor of Montpellier, has employed the watery extract of Dulcamara, in a very strong dose, on a man affected with herpetic eruption. On the forty-seventh day of the treatment, the patient took daily, in one single dose, ten grains of the watery extract of Dulcamara. In another instance, this medicine was carried with impunity to thirty-two drachms, which was divided into two doses.

The nightshade *(Solanum Nigrum)* has likewise fixed the attention of *M. Dunal*: he has given to porpoises, dogs, and cocks, from thirty to a hundred berries of *Solanum Nigrum* and of *Solanum Villosum*, without their having experienced the least inconvenience. He has eaten himself at different times a tolerably large quantity of these berries, without any accident. *M. Dunal* is of opinion, from these facts, that the history of poisoning by the

Nightshades, found in the works of *Gmelin*, of *M. Alibert*, and in the *Ephemerides des Curieux de la Nature*, belong rather to the fruit of the *Atropa Belladonna*, which was classed with the *Solanæ* by the botanists anterior to *Tournefort*. It is evident that the observation reported by *Wepfer* (*de Solano Furioso*, p. 222, *libr.* citat.) belongs also to the *Belladonna*.

We have made some experiments with a view to determine what was the action of the watery extract of Nightshade prepared by evaporating in a water-bath the juice of the fresh plant.

And their results induce us to believe:

1st. That the extract of Nightshade is not very poisonous.

2d. That it is slowly absorbed, and destroys sensibility and mobility.

M. Dunal has however observed, that the juice of *Solanum Nigrum*, *Villosum*, *Nodiflorum*, *Miniatum*, applied to the eyes, occasioned a slight dilatation of the pupil, and rendered the organ insensible to the impression of a bright light. (p. 88.) These effects continued for two, three, four, or five hours, and have constantly been less than those obtained by rubbing the same parts with the juice of *Belladonna*.

Solanum Fuscatum (*Melangena Fructu Rotundo, cum Spinis Violaceis* of *Tournefort.*) A dog was made to swallow the pulp and seeds of fifteen berries of this species; the breathing very shortly became difficult; the muscles of the abdomen contracted and relaxed with some violence; the lips were quivering, the mouth foaming; the animal made fruitless efforts to vomit; the heat of the body was very much increased; and he threw himself from side to side. An hour and a half after, he was more calm, and had vomited a great quantity of the poison: he was soon after perfectly recovered. (Dunal, p. 104.)*

* The beautiful memoir of *M. Dunal* is terminated by the following paragraph: "The facts which we have reported, are in opposition to the general opinion, which is, that all the *Solana* are poisons. The causes of this opinion are; 1st. That plants, extremely different from each other, have been confounded, by attributing to some of them the properties of others: 2nd. That it has not been remembered, that the properties of plants ought to be examin-

Taxus Baccata (Yew). Different opinions have been advanced concerning the properties of this plant. *Ray*, *Berkley*, *Matthiolus*, *Bauchin*, *Julius Cæsar*, &c., affirm it to be poisonous. *Lobelius*, *Camerarius*, *Haller*, &c., are of a different opinion. *Bulliard* says; "I have several times swallowed the yew berries, after the example of the children, who give to this fruit the name of *Morviaux:* I have remained for a long time, and during the greatest heats, in places planted with yews recently trimmed: I have never experienced the slightest inconvenience from it." (Op. citat. p. 157.) We are of opinion that it ought to be ranked amongst the narcotics, and that the different opinions of authors on this subject arise from the circumstance of their having examined yews of different ages, and exposed in different places.

We have injected into the jugular vein of a large strong dog, forty grains of the watery extract prepared with the leaves of this plant, and dissolved in half an ounce of water. Two minutes after, the animal experienced vertigoes; his head appeared heavy; his posterior extremities began to bend. Five minutes after, he was asleep, and on the point of falling, when he was suddenly awoke. These symptoms diminished, and the next day the animal seemed to be recovered. The same experiment was again instituted on a dog of middle size, not so strong as the former. He experienced the same symptoms, and died in the course of the night: no alteration could be perceived on dissection.

Actæa Spicata. Linnæus says, that the berries of this plant have excited a furious delirium, succeeded by death. *Colden* reports, that the ingestion of these fruits, and of a tincture prepared with the root of this plant, was succeeded by a considerable degree of anxiety and cold sweats, without however any other serious accident.* *Le Monnier* affirms, that its extract killed fowls. We have often given to dogs from four to six ounces of a decoction of *Actæa Spicata* gathered in the month of May, and have observed no sensible phenomenon.

ed from organ to organ. 3rd. That the two general precepts of Linnæus have been believed without examination; *Plantæ quæ genere conveniunt etiam virtute conveniunt, quæ ordine naturali continentur etiam virtute propius accedunt.*"

* Colden, *Act. Upsal*, anno 1743, p. 132.

Physalis Somnifera. *Plenck* ranks the root of this plant amongst the narcotics, and asserts, that it has less deleterious properties than Opium.

Azalea Pontica. *Gmelin* relates, that the honey gathered from the flowers of this plant, produced in ten thousand Greek soldiers vomitings, dysentery, and intoxication; and they became mad.

Ervum Ervilia (Lentil). *Binninger* has remarked that the bread, into the composition of which the seed of this plant entered, had so much weakened the inferior extremities of the persons who had eaten of it, that they were obliged to walk supported by two crutches. *Valisneri* has seen incurable palsies produced by this food. Horses and fowls experience similar phenomena from this seed.

Lathyrus Cicera. The seeds of this leguminous plant possess nearly the same poisonous properties, as those of the preceding, according to *Divernoi.*

Plenck also classes the *Peganum Harmela* amongst the narcotics.

Paris Quadrifolia. It is believed that this plant occasions vomiting and spasms. *Gesner* swallowed a drachm of it in wine and vinegar: he had copious perspirations, and experienced a dryness in the throat. (GESNERUS, 1st. *Epist.* Med. fol. 53.)

Saffron is looked upon by some physicians as a narcotic poison. We have instituted some experiments, which prove that it is not deleterious to dogs, or at least, that it is only so in a very small degree: 1st. Three drachms of Saffron, that had been infused in water for twelve hours, were introduced into the stomach of a small dog: the infusion was also ingested, and the œsophagus was tied. Five days after, the animal had not experienced any remarkable symptom; he was a little dejected. He died the following day, and it was impossible to discover the slightest alteration on dissecting the body. A drachm of Saffron, mixed with two drachms of water, was applied to the cellular texture of the thigh of a small feeble dog. The animal died at the end of the fourth day, and had shewn no other symptom than de-

jection. The opening of the body threw no light on the cause of his death.

OF AZOTIC GAS.

Azotic Gas is without colour or smell, and transparent. It extinguishes bodies in the state of combustion: its specific gravity is, as 0.96913: it does not redden the infusion of tournesol: it is insoluble in water, and produces no turbidness with lime-water.

ACTION OF AZOTIC GAS ON THE ANIMAL ECONOMY.

Experiment 1st. Guinea-pigs, when plunged into this gas, are asphyxied at the end of five minutes. They die in three minutes and a half if the experiment is begun by emptying the lungs of the air that may be contained in them, as *M. Nysten* has proved. At the moment of immersion into an atmosphere of pure Azote, or almost pure, the animal experiences a difficulty in respiration, which becomes great, elevated, and more rapid than ordinary: it grows gradually weak, but without any lesion of the nervous functions. *(Dr. Dupuytren.)* After death, the arterial system is found filled with black blood. This asphyxia only takes place through a defect of oxygen, as young animals can be easily restored to life by exposing them to the air.

Experiment 2nd. *M. Nysten* has injected into the jugular vein of several dogs, from twenty to one hundred and fifty centimetre cubes of Azotic Gas, and observed the following symptoms. Cries expressive of pain, convulsive stiffness of the limbs and trunk, agitation, pulse rare, and hardly perceptible, slow respiration, and death. *M. Nysten* concludes from these experiments that Azotic Gas, injected into the veins, exerts a sedative action upon the vital force of the heart, an action which is independent of another entirely mechanical, which it exerts on this same organ.

Experiment 3rd. The same physiologist has injected into the pleura of a dog, one hundred and fifty centimetre cubes of this gas, which has been absorbed, and produced no hurtful effect.

Dr. Dupuytren has proved that this gas is one of the causes of the *Plomb*, or asphyxia arising from privies.

OF THE PROTOXYDE OF AZOTE *(OXIDULE D'AZOTE)*.

This gas is invisible and without smell; it has a sweetish taste; its specific gravity is, as 1.3693. It is soluble in water. When brought in contact with a taper presenting a few ignited points, it lights it instantly, and causes it to burn with brilliancy: in this case the gas is decomposed, and the Azote set at liberty.

The effects of this gas on the animal economy have not been the same in the different persons who have respired it. *Sir H. Davy* experienced at first a giddiness, a pricking sensation at the stomach; towards the end of the experiment, the muscular force increased, and a sort of lively delirium took place, which finished by bursts of laughter. *M. Proust* felt only a stupefaction, and an inexpressible uneasiness. *M. Nysten* has concluded from a multitude of experiments made by injecting this gas into the veins; 1st. That it dissolves with the greatest promptitude in the venous blood of the animals into which it is injected. 2nd. That when injected in the quantity of from thirty to forty decimetre cubes, it does not at first give rise to any observable primitive effect; but if the injections are multiplied, especially if the dose be augmented, it finishes by producing on the nervous system phenomena similar to those it produces when respired in great quantity, and those phenomena may be followed by death, which begins then by the brain. 3rd. That notwithstanding the solubility of the acidulous gas of Azote, if a very large quantity of it be injected at once, for instance, 200 or 300 centimetre cubes, it instantly produces the distention of the pulmonary portion of the heart, and death, which in that case begins by the heart. 4th. That, injected in considerable quantity, but not sufficient to produce fatal nervous phenomena, and with the necessary precautions to prevent distention of the heart taking place, it is capable of occasioning staggering, but that this effect quickly ceases, and is not followed by any serious consecutive accident. 5th. That it

does not occasion any apparent change in the arterial blood. (Op. citat. p. 77.)

SYMPTOMS PRODUCED BY THE NARCOTIC POISONS.

The symptoms produced by this class are nearly the same, whether the poisonous substance be introduced into the cellular texture or into the stomach, or injected into the veins; characters which distinguish them from the major part of those which we have been speaking of in the three preceding classes.

These symptoms may be reduced to the following; stupor, numbness, heaviness of the head, inclination to sleep, at first slight, afterwards insurmountable; vertigoes, a sort of intoxication, furious or lively delirium, sometimes *pain;* convulsive movements slight or strong in all parts of the body; paralysis of the posterior extremities, dilatation of the pupils, diminished sensibility of the organs of sense, a state resembling apoplexy, pulse frequent or rare, full and strong, particularly in the first period of the disease; respiration in its natural state, sometimes however a little accelerated; nausea, vomiting, especially when the poison has been applied to the cellular texture, or injected in a glyster; the nervous symptoms grow more severe, and the animals die. Death takes place very suddenly when the poison has been injected into the veins; it is less so, when it has been applied to the cellular texture: lastly, it happens still more slowly when it has been introduced into the stomach.

LESIONS OF TEXTURE, PRODUCED BY THE NARCOTIC POISONS.

1st. No alteration can be discovered on dissection in the digestive canal of persons, who have swallowed one of the poisonous substances of this class; and if facts contrary to this assertion be met with in authors, it is because there have been administered irritating substances capable of producing inflammation.

2nd. When applied to the cellular texture, or to the cutis, they

produce a slight irritation similar to what any other extraneous body would do.

3rd. The lungs frequently exhibit lesions similar to those we have described in giving the history of acrid substances, and it is remarkable enough, that a number of those animals which are affected with this lesion do not experience, when alive, any morbid phenomenon which could give rise to a suspicion of it: respiration is neither accelerated nor difficult. This fact, it appears to us, ought to be placed beside another, which is sometimes observed in the human species, viz; *that there are cases of chronic, or even of acute pneumonia, without either cough or expectoration, or fever; the patients do not even complain of breathing with any great degree of difficulty**.

4th. The blood contained in the ventricles of the heart, and in the veins, is frequently coagulated a short time after death: an assertion diametrically opposite to that advanced by several professors of Medical Jurisprudence.

5th. The brain and its meninges frequently exhibit distensions of the veins, which creep over their surface, or are distributed throughout their texture. The lesions of the other organs do not appear to us, capable of being appreciated.

TREATMENT OF POISONING BY THE NARCOTICS.

The remedies hitherto proposed as antidotes to the Narcotic poisons, are, 1st, vinegar and the vegetable acids; 2nd, the infusion or decoction of coffee; 3rd, a solution of Chlorine in water (fluid oxygenated muriatic acid); 4th, Camphor; 5th, water and emollient drinks; 6th, bleeding. We shall here relate the experiments we have made to ascertaining the efficacy of these means,

* The diagnosis in these diseases can only be established with certainty, by the concurrence of the two following signs; 1st. The impossibility of making deep respirations. 2nd. The pain in the breast; alone these signs would be of small avail; combined, they are sufficient for deciding on the existence of this affection. How often have we seen our friend and master *Dr. Récamier*, whose medical knowledge is so extensive, recognise by these means affections of the lungs, which had escaped the sagacity of other practitioners!

principally in cases of poisoning by Opium. We shall afterwards point out the steps necessary to be taken by the medical attendant in cases of this nature.

1st. *Of Vinegar and the Vegetable Acids.*

Ought we, in the present state of medical knowledge, to persist obstinately in admitting a fact, not supported by precise experiments, merely because some illustrious men have advanced it, and it has been generally adopted? Whatever be the respect due to the illustrious characters who are constantly and successfully occupied in bringing to perfection human knowledge, we are of opinion that it is of importance not to embrace their opinions, when they are the declaration of incorrect facts, and tend rather to retard than accelerate the progress of medical science. Wherefore we shall not hesitate to oppose a doctrine, professed still in our days by the greatest masters of the art, to wit; *that vinegar and vegetable acids are antidotes to Opium.* In fact, vinegar and the other vegetable acids can only be the antidotes to Opium, inasmuch as they decompose it rapidly in the stomach, and convert it into a substance, the effects of which will not be hurtful to the animal economy; now we are able to affirm from a very great number of facts collected with care, *that these acids aggravate the symptoms of poisoning by Opium, whenever they are not vomited.*

If the effects produced by Opium and its extract administered alone, be compared with those produced by them associated with vinegar, we shall be obliged to conclude, 1st. That, in the first case, the phenomena of poisoning are longer in making their appearance. 2nd. That they are in general much less violent. 3rd. That death constantly takes place at a later period. 4th. That they are scarcely ever followed by inflammation of the stomach, whilst vinegar instantly produces it, when it is a little concentrated.

It is then evident that the use of this acid would be followed by the most serious symptoms, if the animals to which it is administered should not vomit the poision which has been introduced into the stomach. It happens differently when the poison-

ous substance has been expelled by vomiting: in that case, the vinegar and water, and other vegetable acids, possess the property of *diminishing the symptoms of poisoning*, and *even of putting an end to them altogether.*

Experiment. At eight in the morning forty grains of the watery extract of Opium, dissolved in two drachms of water, were injected into the cellular texture of the thigh of a small strong dog. At nine the dog was under the influence of the poison; six ounces of common lemonade were introduced into the stomach: the œsophagus was tied. At half past eleven, the animal was labouring under tolerably strong convulsive movements; the posterior limbs were paralyzed (*three ounces of lemonade*): at two, he was in a deep sleep. He was made to take four more ounces of lemonade, and another dose was given him at six: at half past eight, the sleep was less profound, the animal was able to support himself upon his posterior extremities (*four ounces of lemonade*). This medicine was discontinued during the night, and he died at four in the morning.

2nd. *Of the Infusion and Decoction of Coffee.*

Experiment. At nine in the morning, two drachms of the watery extract of Opium, dissolved in three ounces of a strong infusion of coffee, at the temperature of 40°, were introduced into the stomach of a small robust dog; the œsophagus was tied.* At eleven the animal was scarcely under the influence of the poison; his posterior extremities began to grow weak. The ligature of the œsophagus was untied, and three ounces more of the same infusion were injected into the stomach. At one the pupils were dilated, the animal still walked about freely, and had no tendency to drowsiness. He then took eight ounces of the same medicine: immediately after he made some efforts to vomit, which depended probably on the great quantity of fluid contained in the stomach. At three, he was extremely agitated; his eyes started from the orbits, the body was stiff, and the posterior

* The infusion, which we have employed in all our experiments, has been prepared by pouring from eighteen to twenty ounces of boiling water upon seven or eight ounces of excellent coffee, reduced to a fine powder.

limbs completely paralyzed; from time to time the animal attempted to rise; he moved himself in every direction, dragging the hind feet after him; then stopped all at once, grasped the ground with his fore feet, reflected his head upon the back, and appeared to suffer considerably. From the beginning of the experiment, he had preserved the faculty of seeing and hearing; six ounces of the same infusion were administered to him: the symptoms continued, and he expired at twenty minutes after four.

Decoction of Coffee.

Experiment. At ten in the morning, two drachms of crude Opium bruised and mixed with ten ounces of a strong decoction of coffee, were introduced into the stomach of a large dog: the œsophagus was tied. At four, the posterior extremities were feeble, and the animal had only a very slight tendency to sleep: he died the next day at four in the morning. The vessels of the exterior surface of the brain were slightly injected; there was no serosity in the ventricles; the lungs presented several patches of a dense texture, and of a livid colour; the digestive canal was sound.

It results from our experiments:

1st. That the infusion and decoction of coffee ought not to be considered as antidotes of Opium, because they do not possess the property of decomposing it in the stomach, or rather because they do not convert it into a substance destitute of any quality prejudicial to the animal economy.

2nd. That neither one nor the other of these two preparations of coffee, when introduced with Opium into the stomach, increase the deleterious action of this poison, as takes place with vinegar; and consequently that there is no danger of employing them in any case where the person would not be able to vomit, whilst there would be a great deal in employing vinegar under the same circumstances.

3rd. That the infusion of coffee well prepared, administered at several different times, diminishes rapidly the symptoms of poisoning by Opium, and may even put a stop to them altogether.

3rd. *Of Chlorine dissolved in Water (fluid Oxygenated Muriatic Acid).*

It has been announced in some work on the Materia Medica, that Chlorine diminishes the action of Opium on the animal economy. Supposing this fact true, we have thought that it might be explained by the facility with which this body seizes on the hydrogen of certain vegetable and animal substances, and decomposes them. It was possible that the result of such a decomposition was a matter incapable of exerting an injurious action on the animal economy: in this case, Chlorine would have been an *antidote to Opium*, and, for the same reason, it would have been so probably to a very great number of other poisonous substances belonging to the vegetable kingdom. These considerations have appeared to us sufficiently important to fix the whole of our attention, and we have tried the following experiments.

Experiment 1st. Two drachms of the watery extract of Opium, suspended in ten ounces of water containing Chlorine, were introduced into the stomach of a strong dog (this fluid Chlorine was not sufficiently concentrated to discolour ink); the œsophagus was tied. At the end of three quarters of an hour, the animal was under the influence of the poison, and expired five minutes afterwards. The digestive canal exhibited no vestige of inflammation; which proves that the solution of Chlorine was extremely weak, since we have seen, that it inflames the texture of the stomach when moderately concentrated.

Experiment 2nd. At a quarter before nine, thirty-six grains of the watery extract of Opium, dissolved in one drachm of water, were injected into the cellular texture of the thigh of a small robust dog. Six minutes after nine, the animal exhibited all the symptoms of poisoning by Opium. Four ounces of water containing a small quantity of Chlorine, were administered to him. At half past ten, his situation did not appear to be changed. He was made to take another dose of the same medicine: at a quarter past one he had passed several stools, and was somewhat better *(four ounces of water containing Chlorine)*. At three o'clock the animal was quiet, the posterior extremities were less feeble *(fresh dose of the medicine)*. At five he

was capable of standing; at seven he walked about freely (*four ounces of water, slightly impregnated with Chlorine*). No assistance was given to him during the night. The next morning at seven o'clock, he staggered a little, and appeared dejected: he was made to take four ounces more of the same medicine; but died five hours afterwards. This experiment, twice repeated, furnished the same results; whence it follows, that a weak solution of Chlorine is capable of diminishing the effects produced by Opium, and might probably put an end to them altogether if its administration were not interrupted; however, as this medicine does not present any decided advantages over vinegar, and since its preparation is somewhat complicated, we ought to give the preference to this vegetable acid, which daily necessities render extremely common.

4th. *Of Camphor.*

Camphor has been extolled by some as the antidote of Opium. We wished to ascertain how far this assertion was well founded.

Experiment 1st. Two drachms of Opium, and as much Camphor bruised, were introduced into the stomach of a small robust dog. Twelve hours after, the animal was under the influence of the Opium, his extremities were slightly paralyzed. He died thirty-six hours after the ingestion of the mixture. The digestive canal exhaled a strong smell of Camphor; the mucous membrane of the stomach was of the natural colour; but it presented near the pylorus *two ulcers*, each one as large as a shilling, with elevated edges, and of a blackish colour.

In other experiments, the doses of these two substances were varied, and it was observed that death constantly took place when they were administered in a sufficiently strong dose, and that the phenomena which preceded it depended at one time on the Camphor, at another time on the Opium, according as one or the other of these poisons happened to be in excess.

These facts are sufficient for us to affirm that Camphor does not decompose Opium, and hinder it from acting as a poison, and consequently that it is not its *antidote*. We shall see, however, at the end of this article, that the physician may employ

with success small doses of this medicine, in order to combat the symptoms produced by a large quantity of Opium.

5th. *Of Water and Mucilaginous Drinks.*

We have established that water acidulated with the vegetable acids might be extremely useful in cases of poisoning by the narcotics, and especially by Opium. Might it not be imagined that the good effects of this drink depend on the great quantity of water which enters into its composition ?—the desire of throwing a light on this subject has engaged us to make some experiments, the results of which ought so much the more to excite our curiosity, as *M. Porta*, an Italian physician, has lately announced positively in one of the last numbers of the Journal of *M. Leroux*, *that by means of cold water administered in drink and in glysters*, *and applied in fomentation to the abdomen*, he obtained the cure of a lady who had been poisoned by mistake with the decoction of three ounces of Opium.

Experiment 1st. At eight o'clock, a drachm and a half of the watery extract of Opium, dissolved in eight ounces of water at the ordinary temperature, were introduced into the stomach of a dog of middle size : the œsophagus was tied. At half past eight, the animal began to be under the influence of the poison *(six ounces of water)*. At nine, the symptoms of poisoning were much more violent : the same quantity of water was administered to him. He died at ten. It is certain that the same quantity of extract dissolved in one or two ounces of water, would not have produced death until the expiration of ten, twelve, or eighteen hours.

Experiment 5th. The same results were obtained by applying the mucilaginous decoction, instead of common water.

These experiments prove evidently :

1st. That the good effects of acidulated drinks do not depend on the water which they contain.

2nd. That this fluid ingested into the stomach with Opium, facilitates its absorption, by dissolving it, and consequently that the

making patients poisoned by this substance swallow a quantity of it should by all means be avoided.*

6th. *Of Bleeding.*

Bleeding has been extolled by some celebrated physicians, for curing the disease produced by Opium. *Tissot* says: "if it should happen that by imprudence, by mistake, by ignorance, or by evil design, that too great a quantity of Opium, or of any other preparation into which it enters, shall have been taken; such as theriaca, mithridate, diascordium, liquid laudanum, &c. the patient must be immediately *bled*, and treated in every respect as if he had a sanguineous apoplexy, made to respire a great quantity of vinegar, and to drink plenty of vinegar and water." (Avis au *peuple.)* Several practitioners have remarked that Opium acts with less energy when administered to persons who have lost a great quantity of blood. These considerations engaged us to make a number of experiments, whence it results:

1st. That bleeding has never aggravated the symptoms of poisoning by Opium, nor accelerated the moment of death.

2nd. That it has appeared useful in some instances, and even has sufficed to restore the animals, which would have died if it had not been put in practice.

3rd. That it appears to us, that it ought to be performed on plethoric and robust persons, who may be under the influence of Opium.

4th. Lastly, that it is more advisable to open the jugular vein, than any other.

The detailed examination, which we have just given of the

* The property which water has of dissolving rapidly the watery extract of Opium contained in the stomach, furnishes us with an answer to an observation which might be made to us; viz; *if the experiments tried by introducing the vinegar of commerce into the stomach of dogs that have taken the extract of Opium, hastens death, does the same thing take place when vinegar simply diluted with water is administered, and the poison has not been expelled by vomiting?*—We are of opinion, in consequence of a very great number of facts, that it is still dangerous to employ vinegar and water; because this acidulated drink dissolves better the Opium, than water would do alone, and consequently that the absorption is more energetic.

value of each of the means proposed, for combating the poisoning in question ; permits us to trace out the steps which the physician called in to a case of this kind ought to pursue.

1st. *He will favour the expulsion of the Opium, by vomiting*, by making the patient swallow strong emetics, such as are capable of exciting the contractility of the stomach : these are, the antimoniated tartrate of potash in the dose of five or six grains ; the sulphate of zinc in the *dose of from fifteen to eighteen grains ;* or the sulphate of copper, in the dose of three or four grains ; this last salt administered in a stronger dose, might be capable of occasioning death by producing the inflammation of some portions of the digestive canal, as we have already observed in several experiments made on this subject. Should these means prove insufficient to provoke vomiting, and there was a certainty of the person having taken a strong dose of Opium, might not one or two grains of tartarized antimony, dissolved in one or two ounces of water, be injected into the veins ?—These means would probably induce vomiting, and the expulsion of the Opium, which, without that, would have been absorbed, and have proved fatal.

2nd. *The dissolving these emetics in a large quantity of water must be avoided, or filling the stomach with fluid, whether mucilaginous, acid, or even watery, with the design of expelling the Opium.* In fact, these fluids do not always produce vomiting, and they possess the great inconvenience of dissolving the poison, and facilitating its absorption.

3rd. *Bleeding should be performed from the jugular vein immediately after the expulsion of the poisonous substance, which should be repeated according to the temperament of the patient.*

4th. *Then there should be administered alternately water, acidulated with vinegar, lemon juice, tartaric acid, and a strong infusion of hot coffee ;* these drinks should be given in a small dose, which should be frequently repeated, for instance, every ten minutes. We are convinced that it would be dangerous to administer the acidulated drinks before the expulsion of the poison.

5th. Glysters of camphor may be employed every twelve hours.

Care should be taken to warm frequently the patient's bed, and to rub his arms and legs roughly.

6th. If the patient should have taken the Opium some time before, and there be a suspicion that it might be found in the large intestines, recourse should be had to purgative glysters.

The precepts which we have just established, differ from those found in Bulliard, and in some other works treating on the mode of curing poisoning by Opium; however, we are certain that the means which we propose are salutary: we have often employed them in animals poisoned by a dose of Opium so strong, that they would have died at the end of two or three hours; and have succeeded in curing them. It is true, our experiments have been made upon dogs, and it may be objected to us, that the results might be different in the human species. This objection appears to us to be ill founded, for Opium is absorbed, and produces the same effect on men as on dogs. The means then proper for combating them, cannot be different. Beside, we are convinced, that the difference which may exist between these two species of animals with regard to the mode of action which poisonous substances exert, has been singularly exaggerated. We affirm, after having made more than two thousand experiments upon dogs, and compared them with what is observed in the human species, *that this difference is null with regard to the nature of the symptoms which poisons produce, and to the manner in which they ought to be combated; that it exists only in the doses necessary for producing the disease in the same degree, in the influence of the moral powers, and in the relative strength of the animals,—circumstances which can produce an influence only on the violence of the symptoms, and on the duration of the disease.*

Poisoning by henbane, nightshade, and the other narcotic poisons of this class, except the prussic acid, ought to be combated, as we have just described, when speaking of Opium.

Prussic Acid. *M. Coullon*, who has made some researches respecting the remedies proposed for curing the poisoning by this acid, has ascertained: 1st. That the oil of olives does not oppose the effects produced by prussic acid; 2nd. That the same may be said with respect to milk; 3rd. That ammonia affords a feeble

relief in this kind of poisoning; 4th. The same thing happens with respect to theriaca; 5th. Lastly, that Chlorine (oxygenated muriatic acid) is a feeble remedy.

Professor *Emmert*, whose medical knowledge is so extensive, has made numerous researches respecting the antidotes of the prussic acid, and has been desirous of communicating to us the result of his labours, which he has not yet published. "I have not yet been able to discover," says he, "any antidote for the prussic acid. The caustic potash does not oppose in any manner its effects, nor those of the water of the laurel, or of bitter almonds; phenomena so much the more extraordinary, as these two last fluids lose their poisonous properties when they are treated by the muriate of iron and potash; now, there is iron in the caustic potash. *Fontana* had already observed, that the *Lapis infernalis*, potash with lime, combined with the oil of laurel, did not prevent this latter from acting, whether it was administered internally, or applied externally. Amongst all the medicines I have employed, the *oil of turpentine* appears to be that which acts the most powerfully in combating the effects of these poisons. The same considerations may be applied to the *oil and to the bark* of the *prunus padus*, the action of which on the animal economy is the same as that of the prussic acid."

It results from these facts that the physician, who is called in to a case of poisoning of this kind, should hasten to administer a strong emetic; after which he should employ the oil of turpentine, and all the stimulants capable of exciting sensibility and contractility.

CHAPTER V.

Class 5th. OF THE NARCOTICO-ACRID POISONS.

THE name of *Narcotico-Acrid* poisons has been given to such as are endued with an acrid and nauseous taste, and which act at the same time as narcotics and rubefacients. We will shew hereafter how little the denomination of *Narcotico-Acrid* is applicable to the major part of the poisoning substances of this class; for,

1st, their narcotic effects are almost always the result of the strong excitement they produce at first; 2ndly, some of them do not produce any rubefaction on the texture to which they are applied.

OF THE BELLADONNA.

The *Belladonna* is a plant of the family of the *Solana*, arranged by Linnæus in the Pentandria Monogynia.

ACTION OF BELLADONNA ON THE ANIMAL ECONOMY.

Experiment 1st. Thirty ripe berries of Belladonna were administered to a small dog: the animal experienced nothing.

Experiment 2nd. At eight in the morning, half an ounce of the watery extract of *Belladonna*, prepared by evaporating in a water-bath the fresh juice of the plant, and dissolved in an ounce and a half of water, was introduced into the stomach of a robust dog of middle size: the œsophagus was tied. At half past eight, efforts to vomit, remarkable agitation. At five minutes after nine, fresh efforts to vomit, plaintive cries, posterior extremities beginning to grow weak. At half past ten, continual acute cries, posterior extremities still weaker. These symptoms increased in violence, and the animal died at a quarter before twelve. He was opened the next day. The inferior lobe of the right lung was dense, of a livid colour, and but little crepitating; the other lobes presented the rosy hue which is natural to them; the heart contained coagulated blood; the mucous membrane of the stomach was of a red colour throughout its whole extent, but it was not very much inflamed.

Experiment 3rd. Twenty grains of the watery extract of *Belladonna*, dissolved in two ounces of water, were introduced into the stomach of a young cat. A short time after, the animal threw up by vomiting, about the third part of the fluid ingested. At the expiration of thirty-five minutes, it staggered in walking. A quarter of an hour after, it was not able to make a single step without falling; the pupils were dilated; the animal lay down upon its side, and when made to walk, appeared completely intoxicated;

but it preserved its sensibility. Five hours after the ingestion of the poison, it was perfectly recovered. *(Experiment communicated by M. Brodie.)*

Some children ate in a garden the fruit of the *Belladonna*. shortly after they had a burning fever, with convulsions, and very strong palpitations of the heart; they lost their senses, and became completely delirious; one of them, four years of age, died the next day: the stomach contained some berries of the Belladonna bruised, and some seeds; it exhibited three ulcers; the heart was livid, and the pericardium without serosity.

The following are the symptoms experienced by above a hundred and fifty soldiers, who were poisoned by the berries of the Belladonna, which they gathered at Pirna, near Dresden.

"Dilatation and immobility of the pupil; insensibility, almost complete, of the eye to the presence of external objects; or at least confused vision: injection of the conjunctiva by a bluish blood; protrusion of the eye, which in some appeared as if it were dull, and in others ardent and furious; dryness of the lips, tongue, palate, and throat; deglutition difficult, or even impossible: nauseas not followed by vomiting; sensation of weakness, lypothymia, syncope; difficulty, or impossibility of standing; frequent bending forward of the trunk; continual motion of the hands and fingers; gay delirium, with a vacant smile; aphonia, or confused sounds uttered with pain; probably ineffectual desires of going to stool; insensible restoration to health and reason, without any recollection of the preceding state. (*Journal de Sedillot*, Decembre, 1813, p. 364, observ. de *M. E. Gaultier de Claubry*).

Mappi says, that the wine of *Belladonna* gave rise to a universal gangrene, which was followed by death. (*Plant. Alsat.* p. 36.)

The facts above detailed permit us to conclude:—

1st. That the *Belladonna* and its extract possess poisonous properties, extremely energetic.

2nd. That they do not exert a very violent local action: but that they are absorbed, carried into the circulation, and act upon the nervous system, and particularly on the brain.

3rd. That they produce symptoms common to some other

poisons, which are insufficient to characterize that species of poisoning, notwithstanding what has been advanced on that subject by many authors.

4th. That the extracts found in commerce vary singularly with respect to their energy, according to the manner in which they have been prepared; and that the most active are *those which have been obtained by evaporating with a very gentle heat, the juice of the fresh plant.*

5th. That their action is much more violent, when injected into the veins, than when they have been applied upon the cellular texture; and by a still stronger reason, than in the case where they have been introduced into the stomach.

6th. That these preparations appear to act on the human species in the same manner as upon dogs.

OF THE *DATURA STRAMONIUM.*

The *Datura Stramonium* is a plant of the family of the *Solanæ*, arranged by Linnæus, in the pentandria monogynia.

Calyx large, tubular, bellied, with five angles and five divisions; permanent at its base; corolla very large, monopetalous, in shape of a funnel, of a white or violet colour, the tube insensibly dilating, longer than the calyx, having a border with five folds, and five acuminated teeth; five stamina; one style with a thick stigma, having two layers; superior germen rounded, and grooved with four furrows: the fruit is a capsule, having four valves, rounded, covered with curved points, straight and thick; quadrilocular inferiorly, bilocular superiorly, and containing a very great number of kidney-shaped seeds, the embryo of which is nearly circular, and placed in the midst of the perisperm. Stalk from nine to twelve decimetres in height, round, hollow, and extremely branchy: leaves petiolated, smooth, broad, angular, and pointed. This plant is fond of fat and moist lands; it is found by the side of roads, and in cultivated places.

ACTION OF THE *DATURA STRAMONIUM* ON THE ANIMAL ECONOMY.

Experiment 1st. At half past nine in the morning, half an

ounce of the watery extract of *Datura Stramonium*, prepared by an apothecary, and dissolved in six drachms of distilled water, was introduced into the stomach of a robust dog of middle size: the œsophagus was tied. At the end of six minutes, the animal made some efforts to vomit, and was extremely agitated; he ran about the laboratory, and endeavoured to make his escape, uttering plaintive cries. An hour after, he had already tried twelve or fifteen times to vomit; his posterior extremities were a little weak, but he still preserved the power of walking about freely; his breathing was accelerated at intervals; the pulsations of the heart were strong and frequent, and he continued to moan. At three quarters past ten, he was a little drowsy; the weakness of his legs increased, and he preserved the use of his senses. At eleven, the posterior extremities bent, and he fell down on his side, but he shortly after rose again; he already staggered a little in walking. At half past four, continuation of the complaint, vertigoes very apparent. He died in the night.

Dissection. The stomach contained about six ounces of a bloody fluid; the mucous membrane, which was of a bright red throughout its whole extent, presented on the folds which it forms near the pylorus, a very great number of black bands, which were longitudinal, about a line in breadth, and which were only blood extravasated between this membrane and the subjacent coat; this latter was of a cherry red in the places corresponding with these bands: the rectum, which was without alteration, was lined with a black stringy matter; the lungs were of a deep red in several places, and distended with black and fluid blood; the ventricles of the brain contained no fluid; the external veins of this organ were injected and distended.

Experiment 2nd. Fifteen grains of the same extract, dissolved in four drachms of water, were injected into the jugular vein of a very strong dog. At the end of two hours, the animal uttered some cries, and vomited twice some bilious matter. He made his escape in the night, and was seen alive two days afterwards, on the roofs of the houses adjoining to the laboratory.

In collecting together all that has been written on the effects of this plant, upon the human species, by *Haller*, *Krause*, *Storck*,

Sprœgel, *Plehwe*, and *Triller;* it may be said that it has produced intoxication, delirium, loss of sense, drowsiness, a sort of madness and fury; loss of memory, sometimes transitory, sometimes permanent; convulsions, paralysis of the limbs, cold sweats, and excessive thirsts and tremblings. *Haller* opened the body of a woman, who had taken the seed of this plant, believing it to be that of Gith. The cortical substance of the brain was full of blood; and there were some hard clots in the cavities of the cranium.

The *Datura Metela*, *Tatula*, and *Ferox*, are also poisonous. *Gmelin* says, that beer poisoned by the seeds of the *Datura Ferox*, has given rise to a delirium, which lasted four and twenty hours.

The conclusions to be drawn from these experiments are entirely analogous to those which we have given at the end of the article on the *Belladonna*, a plant which equally belongs to the family of the *Solana;* the *Datura* appears however to excite more strongly the brain, and to produce a more violent general action.

OF TOBACCO.

Tobacco (Nicotiana Tabacum) is a plant of the family of the *Solana*, arranged by *Linnœus* in the Pentandria Monogynia.

ACTION OF TOBACCO ON THE ANIMAL ECONOMY.

Experiment 1st. At eight in the morning, five drachms and a half of rappee snuff, were introduced into the stomach of a robust dog of middle size, and the œsophagus was tied. A few minutes after, the animal made some efforts to vomit. At a quarter past two, he walked very slow, experienced slight vertigoes, and exhibited a continual trembling in the posterior extremities; the organs of sense appeared to enjoy all their faculties; the breathing was a little accelerated. At ten minutes after four, he was lying on the side, and could no longer support himself on his feet; however, he made from time to time ineffectual efforts to raise himself; his head was heavy, and exhibited a continual trembling; his countenance bore the marks of stupor; the muscles of the cervical vertebræ were agitated with slight convulsive movements;

the limbs were flaccid; the organs of sense appeared less susceptible of impression than in the natural state. The breathing was excessively deep, impeded, and accelerated; the pulsations of the heart were frequent and somewhat strong. He died at five o'clock; the next day he was opened. The lungs were livid throughout their whole extent; their texture was more dense than in the natural state, and they sunk a little in water; the heart contained a few clots of black blood; the stomach contained a great part of the snuff ingested; it presented only a few reddish points; the rest of the digestive canal was sound; the body was flaccid.

Experiment 2nd. At two o'clock, an ounce of rappee snuff was introduced into the stomach of a dog of middle size, and the œsophagus was tied. A few minutes after, the animal made efforts to vomit; at four, he experienced no remarkable symptom: he died in the night. The mucous membrane of the stomach was of a bright red throughout its whole extent; the other portions of the digestive canal appeared sound. The lungs were livid, distended with blood, much more dense than in their natural state, and presented a great number of black spots. The greater part of the snuff was found in the stomach.

Experiment 3rd. *M. Brodie* applied upon the tongue of a young cat, one drop of the empyreumatic oil of Tobacco: immediately all the muscles experienced violent convulsions, and the breathing was accelerated. Five minutes after, the animal became insensible, lay down on the side, and presented from time to time slight convulsive movements. A quarter of an hour after, it appeared recovered. The experiment was begun again, and the animal died at the end of two minutes: the thorax was instantly opened; the heart was contracting regularly and with force; the blood was of a dark colour. A tube was introduced into the trachea, for the purpose of conveying air into the lungs; the contractions of the heart were stronger and more frequent, and did not diminish at all during six minutes that the insufflation was continued; the tongue and brain presented no alteration.

Experiment 4th. One drop of the same oil, held in suspension by means of mucilage, in an ounce and half of water, was injected

into the rectum of a dog. Two minutes after, the animal became weak, and made fruitless efforts to vomit. Twenty-five minutes after, he appeared recovered. The injection was repeated: he experienced instantly the symptoms related in experiment 3rd, and died at the end of two minutes and a half.

1st. A woman applied to the heads of three children, who had the tinea, a liniment prepared with the powder of tobacco and butter: soon after they experienced vertigoes, violent vomitings, and faintings: and had profuse sweats. During twenty-four hours they walked as if they were drunk. (*Ephemer. des Cur. de la Nat.* Dec. 11, an. 4, p. 46.)

2nd. The decoctions of the leaves applied to parts affected with the itch, produced violent vomitings and convulsions. (VANDUMOND, *Recueil Periodique*, tom. vii. p. 67.) We read in the *Ephemerides des Curieux de la Nature*, that a person fell into a state of somnolency, and died apoplectic, in consequence of having taken by the nose too great a quantity of snuff.

3rd. The celebrated Santeuil experienced vomitings and horrible pains, amidst which he expired, in consequence of having drunk a glass of wine, into which some Spanish snuff had been introduced.

The facts we have just related induce us to believe:

1st. That the leaves of Tobacco, whether whole, or reduced to powder, as they are daily employed in commerce, are endued with energetic poisonous properties:

2nd. That their active part appears to reside in the portion which is soluble in water, and that it is absorbed, and carried into the circulation.

3rd. That their deleterious effects appear to depend on an especial action upon the nervous system; and that they produce almost constantly, a general trembling, which is rarely observed when other poisons are employed.

4th. That their action is much more energetic when the soluble portion is injected into the anus, than when it is applied to the cellular texture, and for a still stronger reason, than when introduced into the stomach.

5th. That independent of the phenomena which we have just

been speaking of, they exert a local action capable of producing an inflammation more or less violent.

6th. That they appear to act on the human species as on dogs.

7th. That the *empyreumatic oil* does not act directly on the brain, nor on the body of the nerves, but that it directs its action to the nervous system in a manner which it is not at present easy to determine.

8th. That the extract of the *Nicotiana Rustica* acts in the same manner as Tobacco, but that it is less active.

M. Brodie had been tempted to admit that the infusion of Tobacco, when injected into the rectum, acted primarily on the heart: however, the following experiment caused him to renounce that opinion.

After having taken off the head of a dog, he kept up the respiration by insufflation, and introduced into the stomach and the intestines, nine ounces of infusion of Tobacco. At the moment of the injection, the body of the animal remained motionless upon the table, and the heart was beating regularly one hundred times in a minute. Ten minutes after, the pulse gave one hundred and forty pulsations, the peristaltic motion of the intestines was increased, and the voluntary muscles of every part of the body presented very strong spasmodic movements; the articulations of the extremities were alternately bent and extended; the muscles of the spine, of the abdomen, and of the tail, were at one time relaxed, at another time contracted, in such a manner, that the body turned first one side, then on the other. The abdominal aorta was compressed during more than a minute, so that the circulation was stopped in the inferior limbs, which did not occasion any diminution in the muscular contractions. Half an hour after the injection of the infusion, insufflation was discontinued; the heart continued to transmit blood of a dark colour, and the muscular contractions diminished in violence and frequency. A ligature was made on the vessels which are at the base of the heart, in order to suspend the circulation; nevertheless, the muscular contractions continued, although less strong, and less frequent than before; at length, after a few minutes, they ceased altogether.

If the contractions of the voluntary muscles, says *M. Brodie*,

depended on the action of the blood mixed with the infusion of Tobacco, it is reasonable to suppose that they ought to have been diminished by the compression of the aorta, and that its ligature ought to have put a stop to them.

M. Brodie is of opinion, in consequence of this, that the infusion of Tobacco acts upon the heart by means of the nervous system.

OF PURPLE FOXGLOVE.

The purple Foxglove (*Digitalis Purpurea L.*) is a plant of the family of the *Personées* of *Tournefort*, and which Jussieu has classed amongst the *Scrophulariæ*.

The purple Foxglove is a biennial plant, which is found in the mountains, along hedges, in elevated woods, and in dry and sandy grounds; on which account the environs of Paris are abundantly furnished with it. *Bodard* says, that it appears to have a particular regard for the *Departement de la Mayenne*.

ANALYSIS OF PURPLE FOXGLOVE.

Six drachms of the powder of the leaves of purple Foxglove well dried, furnished to *M. Bidault de Villiers*; 1st. Two drachms, sixty grains, of watery extract; 2nd. Twelve grains of spirituous extract; 3rd. A peculiar precipitate, eight grains, and two drachms sixty grains, of an inert powder, which gave by the action of the re-agents, six grains of carbonate of lime, two grains of the oxyde of iron, three grains of sandy quartz, two grains of phosphate of lime, one grain of sulphate of potash, traces of sulphate and muriate of lime and of carbonated alkali, one grain of charcoal.

ACTION OF PURPLE FOXGLOVE ON THE ANIMAL ECONOMY.

The deleterious properties of Foxglove, and of most of its preparations, are placed beyond all doubt, by experiments made upon animals, and by numerous medical observations. We see in the dissertation of Schieman (*de Digitali Purpurea*, Gottingæ, 1786), that dogs have died in consequence of having taken the extract or

infusion of the leaves of Foxglove. Anxiety, melancholy, smallness and slowness of pulse, involuntary stools, and convulsions; such are the principal symptoms which these animals exhibited before death.

On what organ does the Foxglove exert its destructive action?

Experiment 1st. A strong dog was made to swallow a drachm and half of the powder of Foxglove. The next day, the animal had not experienced any remarkable phenomenon.

Experiment 2nd. At eleven o'clock, six drachms of the same powder were introduced into the stomach of a strong dog of middle size: the œsophagus was tied. At the end of two hours, the animal made efforts to vomit, his mouth was full of foam. At three, he experienced vertigoes, uttered plaintive cries, lay down upon the side, stretched out his paws, and inclined his head a little backward. At six, he was still able to walk, but staggered like a person drunk with wine; the pulsations of the heart were as before the operation. These symptoms increased in violence; the animal uttered complaints, and expired in the night. The stomach contained almost the whole of the powder ingested; the mucous membrane was scattered over throughout almost the whole of its extent, with spots of a bright red colour, evidently inflammatory; the rectum presented an alteration similar, but in a less degree.

Experiment 3rd. At one o'clock, an incision was made on the inside of the thigh of a small dog; the wound was sprinkled over with three drachms of the powder of Foxglove, and the lips were united by suture. At two, the animal had not experienced any thing. At four, he had vomited, and his mouth was full of foam. At half past nine in the evening, he experienced considerable vertigoes, and died an hour afterwards. The *dissection*, which took place the next day, did not exhibit any remarkable lesion.

Experiment. At half past eight an ounce of tincture of purple Foxglove, prepared with brandy at 24°, and the powder of this plant were introduced into the stomach of a small dog: the œsophagus was then tied. At the end of five minutes, the animal was in a state of remarkable stupor; he had vertigoes, and could

not make two steps without falling; the pulsations of the heart were by no means relaxed. At nine he remained lying upon the side; he complained from time to time; the stupor had increased; the pulsations of the heart were frequent, unequal, irregular; his inspirations were rare, but excessively deep; the eyes but little sensible to light, the pupils somewhat dilated; and he had no propensity to vomit. At half past one, convulsive tremblings of the muscles of the extremities; same state of stupor; impossibility of standing; complaints from time to time; pulsations of the heart frequent. At ten in the evening, he was in the same state. He died the next morning at four o'clock. The mucous membrane of the stomach presented several patches of a deep red colour; near the pylorus were perceived some longitudinal bands of a blackish red, the colour of which depended on a certain quantity of blood extravasated between this membrane and the subjacent coat; this latter presented no alteration; the duodenum exhibited a lesion similar to that of the stomach; there was found near the end of the colon, in the space of four fingers' breadth, on its internal surface, a very intense redness, which extended itself to the subjacent muscular coat; the rest of the intestinal canal appeared very little altered.

Experiment. Six ounces of brandy, at 24°, were poured upon ten drachms of the powder of purple Foxglove. After four days' digestion, the fluid was filtered and evaporated, adding water in proportion as the alcohol was reduced to vapour. At ten o'clock, four ounces of the fluid resulting from this process were introduced into the stomach of a small dog, being completely freed from all the spirit: the œsophagus was then tied. Twelve minutes after, the animal made efforts to vomit; his walk began to be vacillating; the pulsations of the heart were the same as before the operation; the eyelids heavy, like those of a person that is sleepy. At three, the stupefaction was carried a little farther. He died in the night. The mucous membrane of the stomach presented, in the two thirds of it next the pylorus, some small spots of a tolerably bright red colour, separated by intervals that were unaltered; the lungs and intestinal canal presented no sensible lesion.

M. Brodie, during my stay in London, was so good as to communicate to me the following fact, which has the greatest connection with those that we have just been stating. He injected into the stomach of a small dog, half an ounce of the tincture of Foxglove, the alcohol of which had been previously evaporated, as has been pointed out in the preceding experiment. Half an hour after, seeing that this dose was without effect, he introduced two drachms more of the same liquor. At the end of ten minutes, the pulse had fallen from one hundred and fifty, to one hundred and twenty pulsations in the minute, and the animal experienced a trembling similar to that observed in a paroxysm of intermitting fever. This shivering lasted twenty minutes, after which the pulse again gave one hundred and fifty pulsations a minute. Shortly after he vomited greatly and passed several stools, which were repeated several times during the first two hours, which followed the ingestion of the poison. The next day, the animal was perfectly recovered.

M. Ridault di Villers says, " I chewed a large pinch of the powder of the leaves of Foxglove, which I had dried myself with care, and kept for some time. It had at first a nauseous and herbaceous taste ; afterwards I found it extremely bittter, and it caused me to render a tolerably large quantity of saliva, which secretion continued some time after I had spit out the powder, which I had triturated without any mixture in my mouth. It was not until the bitterness was totally dissipated, that I thought I perceived a slight sensation of acrimony in the throat. It caused me also a kind of inclination to vomit, or rather a weak heaving of the stomach, and dryness in the mouth. (Op. citat. p. 45.)

M. Sanders, author of an excellent treatise on Foxglove, says, " In health every small dose of Foxglove increases the strength and frequency of the pulse, produces even inflammatory fever if it be increased, or if the use of it be continued. In a state of disease, the primitive effects are just the same, but there is observed beside, its influence on the affection, on the state contrary to nature ; it vivifies, if I may so express it, ulcerated surfaces which are bleeding, or pale ; facilitates the absorption of effused

fluids, or prevents their effusion ; fortifies the voluntary motions ; gives activity to digestion ; increases the evacuations by the skin and urinary organs ; renders the pulse insensibly febrile ; raises it from seventy to ninety pulsations in a short time, even from one hundred and twenty, to one hundred and thirty, or from one hundred and thirty, to one hundred and fifty, if the physician does not know when to stop ; in fine, Foxglove gives to the moral principle the peculiar character which belongs to restoration of force. These are its good effects ; but abuse and imprudence in the use of it, bring on derangement of the functions of the stomach, vertigoes, vomitings, want of sleep, violent pulsations of the vessels of the head, pains in different parts of the body, &c. Although the Foxglove be given up, the febrile symptoms continue nevertheless for four or five days with the same degree of intensity. In general, however, at the end of four and twenty hours, and often sooner, the pulse falls from one hundred and twenty, to one hundred and ten, and one hundred irregular pulsations. As to their force and frequency, they are still more reduced; there exist low spirits, nausea, oppression of the præcordia, vomitings, which afford no relief to the patient, salivation, diarrhæa, abundant secretion of limpid urine, clammy moisture of the skin, even profuse sweats ; countenance pale, expressive of despair. Two, three, or four hours more, and the violent symptoms diminish ; the pulse, far from rising immediately after the calm, sinks on the contrary to fifty, forty, thirty pulsations, and even lower. This increase of strength of the sanguineous system, and the consecutive diminution, vary according to the quantity of the medicine, the susceptibility of the person, the temperament more or less disposed to inflammatory fever ; according as the patient is at the moment affected with a local inflammation, as sound or ulcerated parts are tending to a laudable suppuration : in that case the action of the Foxglove, and that of the disease, are complicated ; and possess greater violence.

We may be permitted to conclude from the preceding facts :

1st. That the powder of Foxglove, its watery and resinous extracts, and its tincture, ought to be regarded as energetic poisons, in a certain dose.

2d. That the resinous extract is endued with poisonous properties more active than the watery extract, and that the powder is less powerful than this latter.

3d. That the action of the extracts is violent and rapid when injected into the jugular vein; that it is less so when applied to the cellular texture; and much less still when they are introduced into the stomach, and vomiting is prevented.

4th. That all these preparations begin by acting as emetics.

5th. That their effects on the organs of circulation vary according to the nature and dispositions of the individuals; sometimes no change can be observed in the manner in which this function is carried on; at other times the pulsations of the heart are relaxed; very frequently they are accelerated, strong, unequal, and intermitting.

6th. That the resinous extract appears to act especially on the heart or on the blood, since this fluid is constantly found coagulated immediately after death, whenever this extract has been applied to the cellular texture, or introduced into the stomach.

7th. That independently of these phenomena, Foxglove and its preparations act upon the brain after having been absorbed, and produce a sort of instantaneous stupefaction, which is quickly followed by death.

8th. That the powder of this vegetable occasions a local irritation capable of exciting an inflammation sufficiently intense.

9th. That all the observations conspire to prove that Foxglove acts upon the human species as upon dogs.*

* We foresee an objection which may be made to us by some practitioners; viz. *that Foxglove retards the motions of the heart in the human species.* We cannot admit this assertion in its full extent. In fact, 1st, we have taken every day, during a month, from four to twenty grains of this vegetable reduced to powder; we have never observed the smallest diminution in the pulsations of the heart; which circumstance agrees perfectly with an infinite number of observations reported by *M. Sanders.* 2d. How many times has not the administration of this powder, or of its tincture, in hospitals, been seen to increase fever, to produce a great heat in the chest, and spitting of blood. Wherefore we are of opinion, that this vegetable is very far from being entitled to be ranked amongst those which constantly diminish the motions of the heart, and this object appears to us of sufficient importance to fix anew the attention of practitioners.

OF MEADOW PIMPERNEL (*ANAGALLIS ARVENSIS*).

Experiment 1*st*. At eight in the morning, three drachms of the extract of Pimpernel, prepared by evaporating in a water-bath the juice of the fresh plant, and dissolving it in an ounce and a half of water, were introduced into the stomach of a robust dog of middle size. At half past twelve, the animal had a stool. At six in the evening, he was dejected. At eleven, sensibility appeared diminished. The next morning at six, he was lying upon the side, and appeared to be dead; he might be displaced like an inert mass of matter. He expired half an hour after. The mucous membrane of the stomach was slightly inflamed; the interior of the rectum was of a bright red colour; the ventricles of the heart were distended by black coagulated blood; the lungs presented several livid spots, their texture was more dense than in their natural state.

Experiment 2*d*. At eight in the morning, two drachms of the same extract, mixed with an equal quantity of water, were applied to the cellular texture of the thigh of a small robust dog. The animal exhibited the same symptoms as that which forms the subject of the preceding experiment, and died at half past seven in the evening. The digestive canal was sound; the limb operated on presented a slight inflammation; the lungs and the heart were the same as in the preceding experiment.

M. Gronier gave to horses some tolerably strong doses of the decoction of this plant, and he observed almost constantly a trembling of the muscles of the posterior extremities, as well as those of the throat, and a copious flow of urine. After death the mucous membrane of the stomach was found inflamed.

OF COMMON BIRTHWORT (*ARISTOLOCHIA CLEMATITIS*).

This plant, ranked by Linnæus in the Gynandria Hexandria, belongs to the family of the *Aristolochiæ* of Jussieu.

This plant has an acrid and bitter taste; it grows on the banks of rivers, in clayey places, and among ruins.

ACTION OF COMMON BIRTHWORT UPON THE ANIMAL ECONOMY.

Experiment. At seven in the morning, five drachms of fresh root of Birthwort powdered, were introduced into the stomach of a small robust dog; and the œsophagus was tied. The next evening, the animal had only experienced a slight dejection. The following day, at six in the morning, he had vertigoes, and could not walk without falling after making a few steps; he strained to vomit, and passed one solid stool; a quarter of an hour after, he was lying down on the side, but very little sensible to external impressions; his feet were stretched out, separated from one another, stiff, and were at intervals in a state of agitation. The head was reflected a little upon the back. At half past ten, the symptoms continued; the breathing was deep. He died at one o'clock. No alteration was discovered on dissection, except in the rectum, which presented some red spots.

The juice of the root of *Aristolochia Anguicida*, administered to serpents in the dose of a few drops, produces vertigoes, and causes them to die in convulsions. (Murray, *Apparatus Medicaminum*, tom. i. p. 516. Gottingæ, ann. 1793.)

It results from these facts:

1st. That the common Birthwort exerts a stupifying action on the nervous system.

2d. That it produces a slight inflammation in the texture to which it is applied.

OF HEMLOCK (*CONIUM MACULATUM*, L. OR *CICUTA MAJOR* OF *LAMK*).

This plant belongs to the family of the *Umbelliferæ* of Jussieu, and to the Pentandria Digynia of Linnæus.

Characters. Flowers white, forming umbels very open and numerous: general involucrum, from three to five leaflets reflected, and membranous towards their base; *involucellum* of three leaflets disposed on the external side of the umbel, and not extending beyond its rays. Each flower presents five petals heart-shaped, unequal, disposed in form of a rose, and inclining inwards: a small ca-

lyx, entire ; five stamina ; one inferior germen bearing two slender styles longer than the petals, and permanent ; fruit oval, and globular : each side has projections, consisting of tubercular elevations, of which three are dorsal, and two lateral. Stalk cylindrical, from three to five feet in height, thick, hollow, branchy, covered with leaves, and, in its inferior parts, with spots of a brownish purple, or blackish ; leaves large, somewhat soft, thrice-winged ; the leaflets of which are lanceolated, dentated, pointed, somewhat shining, of a blackish green colour ; root fusiform, a foot long, thick as the finger, yellowish without, whitish within, strong smell, and of a sweetish taste. This plant, when rubbed between the fingers, exhales a fetid smell ; it is found on the sides of ditches, and in rather moist grounds.

ACTION OF HEMLOCK ON THE ANIMAL ECONOMY.

Experiment 1*st*. A small dog was made to swallow a drachm and half of the powder of Hemlock. Four hours after, the animal passed one stool. The next day he was in excellent health.

Experiment 2*d*. Half an ounce of the same powder was introduced in the stomach of a small dog, and the œsophagus was tied. The animal died at the beginning of the sixth day, without having experienced any remarkable symptoms. On opening the body, the organs were found without any discernible alteration : no doubt this animal died in consequence of the operation. This experiment was repeated at noon, on a dog of middle size, with one ounce of the same powder. Seven hours after, the animal did not appear indisposed. The next day at noon he was walking about freely, and uttered no complaint. He did not appear more ill the following day at one o'clock. The next day he was able to walk about freely, but began to complain, and kept himself generally lying down on the side ; the pupils were not more dilated, than in their natural state ; the inspirations were deep and rare : he saw and heard very well. He died in the night. He was opened the next day, at seven in the morning : the blood contained in the heart was still fluid ; the lungs were sound ; the stomach contained almost the whole of the powder

ingested; no vestige of inflammation was perceived in the digestive canal, except in the interior of the rectum, which presented a few reddish spots.

Experiment. Two drachms of the *resinous* extract of Hemlock, prepared with the dry powder, were applied to the cellular texture of the back of a small dog. Six days after, the animal had not experienced any thing, and appeared to be in good health.

Two drachms of the same extract were applied to the cellular texture of the back of a small dog. Six days after, the animal, who had constantly refused food, died in a state of dejection, without having experienced any vertigoes. On opening the body no lesion could be discovered.

Twelve grains of the resinous extract of Hemlock, suspended in two drachms and a half of water, were injected into the jugular vein of a small robust dog. Immediately, the animal uttered plaintive cries, he experienced considerable vertigoes, and fell down on the side; the head was strongly reflected upon the back; the legs stretched out, and separated from one another; they were agitated by convulsive movements: these symptoms lasted nearly three minutes: then insensibility of the organs of sense, dilatation of the pupils, general tranquility, very remarkable coma; trembling of every part of the body. He died six minutes after the injection. The body was immediately opened. The heart was quivering; the blood contained in the left ventricle, was of a vermillion red colour, and partly coagulated; the right ventricle was almost empty, and the lungs were in their natural state.

1st. "Being in garrison at Torrequemada in Spain, I was called at seven in the evening, on the 2nd of March, 1812, to visit a grenadier, who was reported to be dying. I found the patient in a profound sleep, without sense, respiring with extreme difficulty, and lying on the ground on a little straw, in a small narrow low room, close shut, and filled with people and with smoke. His pulse small, hard, and slow, even to thirty pulsations in the minute; the extremities were cold; the face bluish, and distended with blood, like that of a person strangled. The patient was placed in the fresh air. I was informed that he had eaten, together with several of his comrades, some broth into which Hem-

lock had been put; and that since supper, the whole were as if drunk, and felt pains in the head and throat; that this grenadier, who had commonly a good appetite, had eaten a greater quantity of it than the rest, and, immediately after having supped, had undressed himself, lain down, and gone to sleep, whilst the others still remained at table to converse together; that an hour and half after, when they had begun to find themselves indisposed, they had remarked that this man was groaning and breathing with difficulty, which had determined them to have me called. I hesitated for a moment, whether I should begin by making him swallow, in large quantity, some hot vinegar, in order to neutralize, by this antidote, the effects of the narcotic; or by opening the jugular vein, in order to remedy speedily the manifest congestion of blood towards the head; or, in fine, by evacuating the poison by the shortest way: however, I determined on the administration of an emetic. I made him swallow twelve grains of emetic tartar, dissolved in warm water; and caused him to inhale the steam of vinegar. Cold fomentations were applied to the head, and dry and hot frictions to the extremities, in order to recal the circulation, and diminish the cerebral congestion: half an hour after having taken the emetic, the patient began to make some fruitless efforts to vomit, and in a short time his situation, which had given some hope before, grew visibly worse; nevertheless he still spoke, and complained of being very cold; but in a short time he lost again the use of speech and knowledge, and shewed only by continual palpitations of the breast, and of the epigastric region, the extreme anguish with which he was tormented. Then, without waiting longer for the effect of the vomit, I ordered him to swallow some hot vinegar, and the frictions to be kept up without intermission, whilst I went to seek a lancet to open the jugular vein; but I arrived too late, for the patient had ceased to live a few moments before my return, three hours after the fatal supper.

"*Dissection.* The stomach was half filled with crude broth; there were round the pylorus some red spots; the liver was very voluminous; there was no alteration in the intestines; the *vena cava* and the heart were emptied of blood; the pectoral cavity was

narrow; the left lobe of the lungs was sound, but the right lobe was entirely destroyed by a preceding suppuration. (This man, who was thirty-five years of age, was robust; he had experienced from time to time a dry cough, and his breathing was painful.) On opening the cranium, there flowed out a sufficient quantity of blood to fill twice an ordinary chamber-pot; the vessels of the brain were extremely gorged with blood." (Observation of *M. Haaf*, Chirurgien Aide-Major. *Journal de Médécine de M. Leroux*, tom. xxiii. p. 107, Fevrier.)

It results from the preceding facts:

1st. That the fresh leaves of Hemlock furnish, at a certain period, a juice which possesses energetic poisonous properties; while that which is obtained from the roots at the same time, possesses little activity.

2nd. That the watery extract prepared *by evaporating in a water-bath, the fresh Hemlock*, preserves the greatest part of the properties of the plant; whilst at the same time it possesses but little activity, and sometimes is even altogether inert, when obtained by boiling the dry powder in water, and evaporating the decoction at an elevated temperature.

3rd. That these different preparations produce effects more rapid and more positive, when injected into the jugular vein, than when applied to the cellular texture, and, for a still strongerreason, than when introduced into the stomach.

4th. That they are absorbed, carried into the circulation, and exert an action on the nervous system, and more particularly on the brain.

5th. That independently of this action, they exert a local irritation, capable of producing an inflammation more or less violent.

OF WATER HEMLOCK (*CICUTARIA AQUATICA* OF *LAMK*, OR *CICUTA VIROSA* OF LIN.)

This plant belongs to the family of the *Umbelliferæ* of Jussieu, and to the Pentandria Digynia of Linnæus.

ACTION OF WATER HEMLOCK ON THE ANIMAL ECONOMY.

Experiment 1st. *Wepfer* relates that half an hour after having given to a young dog more than an ounce of the root of Water Hemlock, cut into very small pieces, the animal passed a great quantity of saliva, vomited, had a mouthful of foam, and fell into very violent convulsions; at one time he presented an emprosthotonos, at another opisthotonos; he could not remain in his place; he staggered and fell down on his side. This situation continued two hours. The animal recovered his strength; a fresh portion of the root was given him; he passed a quantity of saliva immediately after, had a stool, and did not vomit; he lost his appetite, had convulsive movements from time to time, and when raised up, he immediately fell down on the side. He lived until the third day. His death was preceded by great torments, and a considerable agitation. The stomach, which was contracted and puckered, contained only the entire roots, such as they had been ingested; the internal membrane, which was more red than in its natural state, presented near the bottom, where the small portions of the root were found, some spots of a livid red colour; the serous membrane corresponding to these spots, presented similar ones, but larger; the intestines, which were quite empty, were contracted, and as it were dried; the rectum was lined with a greenish mucosity; the bladder was small, empty, and in folds; the ventricles of the heart contained a great quantity of black concrete blood.

Mæder, six years of age, accompanied by a child of eight years, and by six little girls, ate some roots of Water Hemlock, which he took for parsnips. Soon after he experienced anxiety of the præcordia, uttered a few words, lay down, and made water with considerable force; shortly after which he fell a prey to horrible convulsions, lost the use of his senses, and strongly closed his mouth: he gnashed his teeth, rolled his eyes about in an extraordinary manner, and rendered blood by the ears. He had a frequent hiccup; made efforts to vomit, without being able to open his mouth; he experienced severe pains in the joints; his head

was frequently bent backward, and the whole back was arched so that a little child might with safety have crept through the space formed between his back and the bed. The convulsions having ceased, he implored the assistance of his mother: whatever means were employed, it was impossible to raise him; his strength diminished, and he expired about half an hour after the invasion of the symptoms. The abdomen and the face swelled up after death; a small degree of lividness was observed near the eyes; there flowed from the mouth a very considerable quantity of green froth, which continued to appear as fast as it was wiped away. Amongst the other children who had likewise eaten the roots of this plant, the six little girls experienced bad symptoms, and recovered; but the child of eight years of age, who took a tolerably large quantity, died.

It results from the preceding facts,

That the *Cicuta Virosa* or *Aquatica*, exerts upon men and upon dogs an action similar to that of the *Conium Maculatum*, but more energetic.

COMMON FOOL'S PARSLEY (*ÆTHUSA CYNAPIUM.*)

This plant belongs to the family of the *Umbelliferæ* of Jussieu, and to the Pentandria Digynia of Linnæus.

This plant has often been confounded with parsley. The following are the characters which may serve to distinguish them: 1st. The leaves of the Fool's Parsley are of a blackish green on the upper side, and shining.

2nd. They have no odour when smelt without being bruised; but they give out a nauseous smell when rubbed between the fingers; parsley, on the contrary, presents an agreeable odour.

3rd. Its root is smaller than that of parsley, and dies every year in autumn. This plant is common in cultivated grounds.

ACTION OF COMMON FOOL'S PARSLEY ON THE ANIMAL ECONOMY.

1st. A boy six years of age, having eaten of this plant at four in the afternoon, which he took for parsley, began immediately to utter cries of anguish, and complained of cramps in the stomach.

Whilst he was going from the country to his father's house, the whole of his body became excessively swelled, and had a livid appearance; his breathing became every moment more difficult and short. He died towards midnight. Another child, four years of age, who was poisoned in the same manner, was fortunate enough to vomit up the plant; that however did not prevent him from being delirious, and talking extravagantly; in his delirium he thought always of seeing a quantity of dogs and cats; and although the physician did not arrive till next day, he was fortunate enough to save him. (VICAT, op. citat. p. 255.)

2nd. RIVIERE relates, that a person died after having taken a quantity of this plant. On opening the body, the tongue was found black; a brownish serosity was found in the stomach; the liver was hard, and of a yellow colour; the spleen livid; the body was not at all emphysematous.

3rd. In examining attentively the symptoms observed by several practitioners in poisonings of this kind, they may be reduced to the following: heat in the throat, thirst, vomitings; sometimes diarrhœa; breathing short, and sighing; pulse small, and frequent; head-ach, vertigoes, numbness of the limbs, and delirium.

OF RUE *(RUTA GRAVEOLENS).*

Experiment. On the 4th of June, at eight in the morning, six ounces of the juice obtained by triturating two pounds of the leaves of fresh Rue, with one ounce of water, were introduced into the stomach of a strong dog of middle size; the œsophagus was then tied. The animal had one stool during the day. The next day, he did not experience any remarkable symptoms. He died in the night. The mucous membrane of the stomach was slightly inflamed; the other portions of the digestive canal were sound; the lungs presented no alteration.

Experiment About eight ounces of the distilled water of Rue prepared from the dry plant, were introduced into the stomach of a small dog; the œsophagus was tied. He had experienced no other symptom than dejection, and died five days after the operation. The body was not opened.

Bulliard says, "In a dose a little too strong, Rue causes a

great agitation, fever accompanied by yawnings, a considerable dryness of the mouth, and a great pain in the throat. The skin, if it be handled any length of time, inflames, and the hands swell. (Op. citat. p. 150.)

It results from these facts :

1st. That Rue exerts a local irritation, capable of producing an inflammation, which in general has not appeared to us to be very severe.

2nd. That its essential oil, when introduced into the veins, acts like the narcotics, and that it is probable it exerts the same mode of action when introduced into the stomach ; but that it possesses little energy.

OF COMMON OLEANDER *(NERIUM OLEANDER.)*

This shrub belongs to the Pentandria Monogynia of Linnæus, and to the family of the *Apocyneæ* of Jussieu.

This shrub is from eight to ten feet high ; the stalk is straight, the bark purple, green, or greyish ; the branches long, slender, and erect ; leaves with short petioles, opposite, frequently ternate, lanceolated, somewhat narrow (they are nearly four inches long to nine lines of breadth in the middle), entire, pointed, smooth, stiff, of a dark green colour, having a strong rib on the lower side. The root is woody and yellowish, it gives out several stems that are straight and pliable. The whole plant has a bitter taste, extremely acrid.

ACTION OF COMMON OLEANDER ON THE ANIMAL ECONOMY.

Experiment 1st. At half past one, an incision was made on the back of a large dog ; fifty grains of the watery extract of Oleander, moistened with a few drops of water, were applied to the cellular texture. At the end of ten minutes, the animal had vomited three times some yellowish fluid matter. Three minutes after, he had two stools and vomited again. These vomitings were repeated several times during the succeeding six minutes ; then slight complaints, vertigoes, acceleration of the pulsations of the heart, weakness of the posterior extremities ;

head bowed forward as if it were difficult to support it; slight convulsive contractions of the right anterior paw. One minute after, the animal fell down without an effort on the side; his head was reflected backwards, and he became insensible to light and sound; the pupils were extremely dilated, the anterior right extremity presented from time to time some slight convulsive movements. He died in this state eight minutes after. The body was immediately opened: the heart was no longer beating; there was in the left ventricle a small quantity of blood of a deep red colour, partly coagulated; that contained in the other ventricle was partly fluid, and partly coagulated; the lungs, which were of a rose colour, were somewhat less crepitating than in their natural state; the ventricles of the brain contained no serosity; the external vessels of this organ presented a livid colour, and were distended by a tolerably large quantity of venous blood. There was no alteration in the digestive canal, nor in the limb operated on.

Experiment 2nd. At a quarter past one, the experiment was begun again with forty-eight grains of the same extract. At the end of eight minutes, the animal vomited alimentary matter mixed with bile. Two minutes after, he vomited again, he passed two liquid stools, and experienced slight vertigoes. Twenty-six minutes after the operation, he made violent and fruitless efforts to vomit; his walk was staggering, his posterior extremities weak, and he fell down on the side, reflecting strongly his head backwards upon the trunk; the muscles of the lower jaw, which were agitated by convulsive movements, approached and separated alternately this bone from the superior jaw. The anterior extremities exhibited a continual trembling, and the posterior paws slight convulsive shocks; the organs of sense were insensible to external impressions. This state continued eight minutes, and the animal died. He was immediately opened: the blood contained in the cavities of the heart was fluid, and of a red somewhat deep in the left ventricle. The lungs and stomach presented no alteration.

Libautius asserts that a person died in consequence of being shut up in a room to sleep, where there were some flowers of this plant. Another person, who ate some meat roasted on a

spit made of this shrub, experienced considerable agitation, became mad, had a syncope, and died. (LIBAUTIUS, *Comment. de Venenis ;* SCHENKINS, *de Venenis.*)

M. Gronier has administered three drachms of the powder of Oleander to a she-ass, which was extremely feeble ; the animal seemed to be very considerably excited. A vigorous horse, who had taken the same poison, fell into a state of dejection : he fell asleep, and expired eighty minutes after. (*Memoire lu à la Société de Médécine de Lyon*, en 1816.) Sheep die in a very short time after having drunk the water in which the leaves of Oleander have been macerated.

It results from the preceding facts :

1st. That the watery extract of this plant, when applied to the cellular texture, or introduced into the stomach, is a very active poison, and that it acts with considerably more rapidity and energy, when injected into the veins ;

2nd. That the powder possesses also poisonous properties, but in an inferior degree ;

3rd. That the distilled water is still less active than the powder ; that these different preparations are absorbed and act upon the nervous system, and especially on the brain, after the manner of the stupifying poisons ;

4th. That they almost constantly produce vomiting ;

5th. That independently of these phenomena, they excite a slight local irritation.

OF THE *UPAS-TIEUTÉ.*

The *Upas-tieuté* brought from Java by *Leschenault*, is nothing else than the extractive juice of a plant of the vine kind, of the family or genus of the *Strychnos* (a small group ranged by M. de Jussieu, next to the *Apocyneæ*). The word *Upas* signifies a vegetable poison, and the natives of Java employ two species of it, for the purpose of rendering the wounds of their arrows mortal : the first is the *Upas-tieuté*, which is produced by by a climbing plant, the second is called *Upas-antiar*, and is the produce of a large tree. These two species have been greatly confounded by writers, under the names of *Boa*, or of *Bohon-upas.*

ACTION OF *UPAS-TIEUTÉ* ON THE ANIMAL ECONOMY.

Experiment 1st. When small pieces of wood, of the size and form of an ordinary quill, are covered with the *Upas-tieuté*, and the extract is left to dry upon their surface; and these are forced into the muscle of the thigh of a dog, it is observed that, at the end of two or three minutes, the animal experiences a general uneasiness, and seeks the corners of the room; almost immediately after, all the muscles of the body contract, the vertebral column straightens itself, and the anterior feet for a moment quit the ground. This contraction is only momentary, the animal becomes quiet for a few seconds; then a second general contraction takes place; this is more decided that the first, and of longer duration; the straightening of the vertebral column is more sensible; the breathing accelerated. These symptoms cease on a sudden, the breathing becomes slower, the animal appears as if astonished. To this calm, which scarcely lasts a minute, succeeds again a strong general contraction; the anterior limbs, which are stiff, and closed together, are directed backwards, the breathing is considerably accelerated, the vertebral column straightened, and the head strongly elevated, and bent backwards on the neck. The breast being no longer supported, the animal, threatened by a fall, runs rapidly upon his hind legs, whilst a more intense contraction manifests itself; the muscles of the spine elevate the breast and head, the posterior limbs become stiff and motionless, the animal falls, first on the lower jaw, and soon after on the side. He then exhibits a complete tetanus, with immobility of the thorax, and cessation of respiration; the tongue and gums, which are of a violet colour, anounce a state of asphyxia. This state continues about a minute, then the tetanus disappears on a sudden, and the asphyxia a little at a time, in proportion as the breathing is restored. During this paroxysm, the animal preserves the use of his senses, and of the functions of the brain; it is not till the asphyxia is carried to the highest degree, that the action of these organs begins to weaken. At the end of another minute, fresh general con-

tractions, so intense, that the floor experiences an evident trembling. This shock may be compared to that which takes place, when a current of galvanic fluid is directed along the spinal marrow of an animal recently killed ; it is accompanied by asphyxia, and a little before it disappears, convulsive movements are observed in the face. The touching of any part of the body whatever, produces easily this general tetanic stiffness ; the animal dies five, six, seven, or eight minutes after the first attack. The state of the internal organs proves that he has died of an asphyxia ; the examination of the wound shews that the poisonous substance has introduced itself into the muscles ; and every part with which it has come in contact is tinged of a brownish yellow colour. Horses and rabbits furnish the same results, only that the attacks of tetanus are more numerous in those that are vigorous and adult.

Experiment 2nd. The right thigh of a dog was amputated, leaving the traces of the crural vein, and artery near the pelvis ; those vessels were detached from all the surrounding parts, which had been cut ; the vessels divided in the operation were tied ; the femur was sawed through, so that the circulation was only carried on in the thigh, through one vein and one artery ; linen and saw-dust were placed between the divided surfaces, in order to prevent their communication. A point of wood, furnished with three grains of *Upas* was forced into the isolated limb near the ham ; the animal experienced an attack of tetanus, at the end of ten minutes ; this attack was repeated, and he died fifteen minutes after the invasion of the symptoms.

Experiment 3rd. A small quantity of *Upas* was dissolved in water, and injected into the peritonæum of a dog. Twenty seconds after the the injection, the animal presented all the symptoms which we have described, and expired at the end of the third attack.

OF NUX VOMICA.*

Nux Vomica is the seed of the *Strychnos Nux Vomica*, which Linnæus has ranked in the Pentandria Monogynia, and which is found at the end of the family of the *Apocyneæ* of Jussieu. The tree, which produces these seeds, grows in Ceylon, on the coast of Coromandel, and in Malabar; it acquires a very considerable height, and its circumference is sometimes about twelve feet. It is fond of sandy grounds.

The Nux Vomica is round, about an inch in breadth, flattened, and from two to three lines in thickness. There is towards the centre of its two surfaces a sort of umbilicus: some silky threads of an ash colour, or yellowish, or transparent, or blackish, very short, very close, and fixed obliquely between a thin and bitter pellicle, which envelopes the perisperm, and cover the whole surface of this seed. The disposition of these silky hairs is such that they are all directed from the centre to the circumference, or those of one of the surfaces appear to cross those of the other. On the circumference of the seed is observed one point somewhat more projecting than the rest: it is that from which the young plant would proceed. The perisperm is of a brown yellow colour, or of a white verging towards green, and hard; it presents in its interior, when opened, a large cavity intended to lodge the embryo during its first developement: the sides of

* The important medicinal properties which have just been discovered in this substance, by Doctor Fouquet, one of the Physicians to the Hospital of the Charité of Paris, entitle it to a conspicious place in the Materia Medica. It appears, from the memoir which he has published, and which I propose to lay before the Philadelphia Medical Society; that *Nux Vomica* has been administered in doses of from 4 to 50 gr. in substance, and from 2 to 64 of the the alcoholic extract, daily, and with complete success, in cases of *paralysis*. When this disease depends upon a loss of activity of the nervous system, its effects are most astonishing. In cases of hemiphlegia, its success has not been so constant, although it has always produced very beneficial results; but when effusion has taken place, its administration has proved highly advantageous. It seems to act by producing spasms and contractions of the muscles, and, as the author informs us, acts only on the parts affected. Four grains in substance, and two grains of the extract, are the daily doses, advised in the commencement of the treatment. J. G. N.

this cavity are in contact, and are of the thickness of about a line throughout.

The *Strychnos Colubrina* furnishes also the Nux Vomica.

ANALYSIS OF NUX VOMICA BY *M. CHEVREUL.*

Acidulous malate of lime, gum, vegeto-animal matter, bitter matter, fixed and colouring matter, which was yellow, and probably starch, which could not be directly extracted on account of its desiccation; earthy and alkaline salts, woody hairs, and wax, which appears to preserve the perisperm from humidity.

ACTION OF NUX VOMICA ON THE ANIMAL ECONOMY.

Experiment 1st. A dog of middle size was made to swallow somewhat less than half a drachm of Nux Vomica mixed with honey. Three quarters of an hour after, the animal had convulsive movements in the posterior limbs, which were separated from one another, and pushed forward so that the dog rested upon his heels. All at once he rose up, stretched out strongly his limbs, and separated them: he made several bounds, as if all of one piece; the neck and back were in a state of tetanic stiffness, and were curved backwards; the tail was brought under the belly: he fell down again afterwards on the feet, touching the ground only with the extremity of his toes. A short time after, he fell down on the side; tremblings, tail extended straight; at last relaxation of all the muscles. The animal had a second attack, which began by convulsive movements of the face, mobility of the eyelids, whilst the eyes, which were immoveable from the tetanic contraction of their muscles, were starting out of their orbits. Shortly after, general tetanic stiffness. He might be raised up all in one piece; general trembling; the tongue was projected out of the mouth; it was of a violet colour, as well as the lips; the respiration was suspended by the tetanic contraction of the muscles of the thorax: general relaxation. In the attacks which preceded death, respiration was carried on during the paroxysm, and then the tongue and lips returned to their

natural colour. He expired at the fifteenth attack, twenty-eight minutes after the invasion of the symptoms, and preserved all along the use of his senses. The intensity of the symptoms might be increased, and even the attacks brought on by touching him, threatening him, or making a noise; but these means did not excite the convulsive movements of the face. A few moments before death, the breathing became somewhat noisy, as if the animal had the rattles.

Dissection. There was no vestige of inflammation in the digestive canal, nor in the respiratory organs, nor in the brain; the cerebral sinuses appeared somewhat more distended than in their natural state; almost the whole of the Nux Vomica was contained in the stomach; the heart contained blood which was blackish and somewhat coagulated, especially in the right auricle.

This experiment, repeated upon another dog, furnished similar results, except that the animal, who was weaker, was not affected till an hour after the injection of the Nux Vomica, and that he lived an hour, dating from the moment of the attack; in general also the symptoms were more decided.

Another small dog, who swallowed twelve grains of Nux Vomica in lumps, experienced symptoms similar to the preceding, half an hour after the ingestion, and died at the end of twenty-five minutes.

Bonetus has detailed experiments made upon young dogs, the results of which bear a great relation to those we have just described. (*Theophili Boneti Sepulchretum*, tom. iii. p. 497. *Lugduni*, 1700.)

Experiment 2nd. A frog of middle size was made to take three grains of Nux Vomica rasped, and mixed with honey. A quarter of an hour after, the breathing was accelerated, and the belly swelled; the trunk was straightened, whilst the eyes were sunk in; the feet were in their natural state, and the animal made a slight noise. He remained quiet during a few minutes, then had three other attacks, separated by a like interval of repose, and distinguished by the same phenomena, but more decided. *Fifth attack.* Convulsive movements, and considerable stiffness of the limbs

and trunk ; the animal might be turned about all in one piece : the duration of the movement of flexion was extremely short compared to that of the extension : touching, agitation, shaking of the floor, produced these effects. It was impossible to ascertain the state of vision, on account of the continual movements of the eye-lids. The stiffness diminished in intensity ; the action of the thoracic limbs was extinct, whilst the paws were still exercising their movements.

Dissection. The mouth and œsophagus were filled with thick mucosities ; the major part of the boluses ingested were stopped at the superior orifice of the stomach ; there was also a small quantity in this viscus ; the portions of the œsophagus and of the stomach upon which the poison had been applied, presented a red colour ; the membrane which envelopes the cerebellum, and the first part of the spinal marrow, exhibited veins somewhat more distended than in their natural state.

1st. *Hoffmann* reports that a young girl ten years of age, labouring under an obstinate quartan fever, took at two doses, fifteen grains of Nux Vomica. She died in a short time ; after having experienced extreme anxieties, and having made some efforts to vomit. (*Med. System.* tom. iv. cap. viii.) My pupil *M. Bell*, a young English physician, assured me that a similar accident had lately taken place in England.

2nd. A person swallowed in the morning, a scruple of Nux Vomica in powder, and drank afterwards a few glasses of cold water, in order to diminish the bitterness occasioned by this substance. Half an hour after, he appeared to be drunk, his limbs, and especially the knees, were stiff and tense ; his walk was staggering, and he was afraid of falling. He took some food, and the symptoms disappeared without his having had either stools or vomiting. (*Veckoskrift for Lakare.*)

The same author reports that a woman had convulsive movements, and a cardialgia of long duration, after having taken Nux Vomica.

3rd. The administration of Nux Vomica, and of the root of Gentian to a woman affected with intermitting fever, was followed

by dangerous convulsions, cold, and stupor of almost every part of the body. (Scutter, *Diss.* § 11.)

OF THE BEAN OF *SAINT IGNATIUS.*

This seed also appears to belong to the genus *Strychnos*, at least the tree which produces the fruits in which it is contained presents, in the flowers and leaves, the same parts, and the same disposition as the *Strychnos Nux Vomica.* Some botanists make a separate genus of it, which they call *Ignatia*, and a species of which, the *Amara*, would furnish the bean, which we are speaking of. Be it as it may, this seed is irregular, more or less angular, hard, having a kernel, and extremely bitter.

ACTION OF THE BEAN OF *SAINT IGNATIUS* ON THE ANIMAL ECONOMY.

Experiment 1st. A dog of middle size was made to swallow half a drachm of the bean of *Saint Ignatius*, rasped and mixed with butter. At the end of five minutes, he began to pant. Fifteen minutes after, he straightened himself out from time to time in a convulsive manner. The poison had scarcely been ingested half an hour, when the animal was carried rapidly forward, and fell down in a paroxysm of tetanus, first upon the chest, afterwards upon the side; the limbs and the neck were in a state of tension, the mouth of a violet colour; he preserved the use of his intellectual faculties; had an emission of urine; in fine, he had ten attacks, several of which had been provoked by noise or touching him, and he died in a state of asphyxia, at the end of twenty minutes.

Another dog, who had taken only ten grains of this poison, died at the fourth attack, three hours after its ingestion.

Six grains of this seed have proved sufficient to kill a dog in half an hour: this animal had drank water after having swallowed the poison.

Experiment 2d. The extract of the bean of *Saint Ignatius*, injected into the veins, the pleura, the peritonæum, or applied externally, acts like the Upas, or extract of Nux Vomica.

Camelli reports, in the Philosophical Transactions of London,

tom. xxi. p. 88. ann. 1699, that a dyspeptic man, who was attacked by vomiting, and diarrhœa, took a scruple of the bean of *Saint Ignatius*, which occasioned him itchings and terrible convulsive pinchings; he was not able to stand; his jaws were locked; the muscles of the face performed movements, which might be compared in a certain degree to those made in laughing.

We do not take notice here of the *Strychnos Potatorum*, nor of another species of *Strychnos* known under the name of *Pomme de Vontai*, because the juice and seeds of this plant do not possess any poisonous properties, according to the experiments of *M. M. Magendie* and *Delile (Dissertation Inaugurale de M. Delile, soutenue à la Faculté de Médécine de Paris, 6 Juillet, 1803.)*

CONCLUSIONS ON THE EFFECTS OF THE *STRYCHNOS*.

Upas-tieuté, Nux Vomica, and the bean of *Saint Ignatius* are poisons extremely energetic for a very great number of animals, and for the human species.

2nd. They ought to be regarded as substances producing excitement on the spinal marrow, on which they act, by producing tetanus, immobility of the thorax, and consequently asphyxia, of which the animals die.

3rd. With whatever part of the surface of the body, they may be brought in contact in a suitable manner, they are absorbed, carried into the circulation, and the absorption appears to be effected through the medium of the veins, as *M. Magendie* has first observed. *(Vide* his excellent *Memoire* on *Absorption.)*

4th. Their action is extremely prompt, when injected into the pleura, peritonæum, or jugular vein: it is less so when applied externally, or when injected into the arteries, at a distance from the heart. Its effects are still longer in making their appearance, when applied to the mucous surfaces.

5th. Their action is null, when the spinal marrow is removed by means of a piece of whalebone.

6th. The watery extracts of Nux Vomica, and of the bean of *Saint Ignatius*, are more energetic than the powders of these seeds; but they are less so than their resinous extracts.

7th. None of these poisons produce inflammation of the textures to which they are applied.

OF THE *ANGUSTURA PSEUDO-FERRUGINÆA.*

There is found abundantly in commerce, a particular bark, which the druggists designate by the name of fine *Angustura*, and which differs essentially from it. We are of opinion that it is so much the more important to make known its characters, as it ought to be ranked amongst the most energetic poisons in the vegetable kingdom; whilst the real Angustura might be taken in a strong dose without inconvenience. *M. Planche*, a distinguished apothecary and chymist of this capital, who has written a very excellent work on the natural history of these barks, has presented to M. M. *Pessieu* and *Bonpland*, the species which we are here treating of, and they have declared that they know not to what vegetable it could belong*.

The learned traveller *M. de Humboldt*, who has been so good as to communicate to me several particulars relating to the poisons of America, has told me that he did not believe that the bark of the *Angustura Pseudo-Ferruginæa* belonged to a tree of the same species as the real Angustura, which he has called *Bomplandia Trifoliata.*

Characters of the bark. The barks of this species are in general rolled up, of a yellowish grey colour on the inside. Some of them have the epidermis scattered over with whitish excrescences; others are covered with a matter which has the appearance of rust of iron, and which possess certain properties of it; other barks are more or less polished, sometimes very rugged, and scattered over with spots of various colours; these latter are, in general, more thick, and more bulky than the others; and although they differ in appearance, they possess the same chemical properties; they are only somewhat more ferruginous. The powder of this false Angustura is of a gray colour, similar to that of ipecacuanha, and of a smell resembling that root. It

* *Notice Chimique sur les Angustures du Commerce*, read before the Society of Medicine of Paris, the 2nd of June, 1807, by L. A. Planche.

is so bitter, that a great many persons cannot taste it without experiencing nausea.

If this powder be macerated with water in the same proportions, and during the same time as the real Angustura, a liquor will be obtained, which, when filtered, has a pale straw colour, that is not perceptibly altered by the contact of the atmosphere, of an insipid smell, and a bitterness, which may be compared to the powdered bark, furnishing a black gray precipitate with the sulphate of iron, and, with the nitrate of silver, a white precipitate, which, in the course of five or six minutes, passes wholly into a black. The sulphate of copper forms with it a precipitate less coloured and more copious than with the true Angustura; it is not rendered turbid by the solution of glue.

Water sharpened with muriatic acid, and agitated with the powder of this false Angustura, puts on a beautiful colour of a clear green, if an alkaline prussiate be poured upon it, and a short time afterwards it throws down prussian blue. It is necessary to remark that a very beautiful prussian blue may be obtained at the moment, if the yellow powder which covers the bark, be treated by the muriatic acid; which proves evidently that this matter is of a ferruginous nature. This singular phenomenon is not observed with the real Angustura bark.

The decoction of the ferruginous Angustura is higher coloured than its water of maceration; so long as it is hot, it is transparent, and becomes turbid by cooling, in which respect it resembles the Cinchonas. The metallic salts before mentioned, act in the same manner, within a few shades of colour which are not worth taking into consideration, upon the water of maceration, and upon the decoction, of the false ferruginous Angustura. (Planche, p. 7.)

ACTION OF THE *ANGUSTURA PSEUDO-FERRUNÆA* ON THE ANIMAL ECONOMY.

Experiment 1st. A dog of middle size was made to swallow eight grains of the bark of Angustura Ferruginæa, reduced to a fine powder. At the end of seven minutes, the muscles of the extremities were affected by a convulsive movement; the eyes,

which were haggard, shed abundance of tears ; the animal walked towards the corners of the laboratory, drawing the feet close to one another ; he panted continually ; twelve minutes after the ingestion of the poison, the agitation had increased ; the head was straightened from time to time in a line with the vertebral column : he bent the posterior legs ; the head and trunk were reflected backwards ; he made twelve or fourteen steps forwards, and so much at random, that he struck his face against a tub, and fell down immediately upon the side ; his eyes were then starting out of his head, and motionless, the conjunctiva was red, all the muscles of the trunk and extremities strongly contracted, the ears bent backwards, the organs of sense insensible to external impressions ; the muscles of the face were not agitated by any convulsive movement, and respiration was no longer carried on. This attack lasted five minutes, but the organs of sense preserved their insensibility only during the first minute, for in the middle and towards the end of the paroxysm, the approach of a stick was sufficient to increase the stiffness and all the other symptoms. At the end of this attack, the animal attempted to get up ; the mouth was wide open, and the breathing very panting. Ten minutes after, a fresh attack, which lasted four minutes. At last he expired, an hour and a quarter after the introduction of the poisonous substance into the stomach, at the end of the third attack. He was opened twenty minutes after. The heart was no longer beating ; the blood contained in its cavities was blackish, partly fluid, partly coagulated ; the lungs, which were distended with blood of the same colour, were somewhat less crepitating than in their natural state ; the stomach contained a great quantity of food, for no vomiting had taken place ; the digestive canal was sound.

Experiment 2nd. At three quarters past eight, a dog of middle size was made to swallow three grains and a half of the same powder. A quarter of an hour after, he was made to drink a great quantity of water. At six minutes after nine, the animal experienced a trembling in the legs ; he was touched, and instantly had an attack of tetanus, which lasted only a minute ; he rose up and did not appear ill. At eleven minutes after nine, he was again pushed about ; he immediately fell down in a state of remarkable

rigidity, which did not cease till the expiration of two minutes; he again made efforts to rise, and ran rapidly about the laboratory; he stopped all at once, pressing strongly his feet against the ground: he had at that moment the trunk excessively arched, and his head touched the ground. At one he had suffered no more attacks, and appeared to be no longer under the influence of the poison. He was made to take six grains of the same powder. Five minutes after, he had an attack which lasted two minutes, and died. In the different paroxysms under which this animal laboured, the tail was sometimes curved upwards, sometimes downwards. He was immediately opened. The blood contained in the ventricles of the heart was black and fluid; the lungs were very little altered; the stomach contained the powder of the Angustura dispersed among some food; there was no lesion in the digestive canal.

Experiment 3rd. A wound made in the inside of the thigh of a great dog, was sprinkled over with nine grains of the same powder. On the third day, the animal not having experienced any thing, thirty-six grains of the same poison were applied to the cellular texture of the other thigh. At the end of seven hours, the animal began to feel the effects of it; he had an attack of tetanus similar to that which we described in experiment 1st. This attack lasted ten minutes, and he died.

The Dissection took place the next morning. The internal organs presented no alteration; the first wound was red, infiltrated, without any appearance of eschar.

Experiment 4th. A small robust dog was made to swallow two grains and a half of the watery extract of *Angustura Ferruginæa*, which had produced no effect at the end of a quarter of an hour; he was then made to take six grains. A few moments after, the animal experienced a general trembling; he sat down on his hind legs; his body became arched, and he fell upon his side; his muscles were excessively rigid; there was no agitation of the legs; the pupils were dilated, the organs of sense insensible to external impressions, and the eyelids in a state of great mobility; towards the end of the paroxysm, which lasted two minutes and a half, he recovered the use of his senses; he rose up and walked about the laboratory. Four minutes after, some one sought to frighten him; instantly he fell down again, the head was reflected upon the

back, the breathing was suspended. At the end of a minute he opened his mouth and panted considerably. Two minutes after, he had a third attack, during which the organs of sense appeared to be insensible. The end of this paroxysm was marked by profound inspirations and by convulsive movements of the muscles of the face. He died three minutes after. He was opened immediately, the cavities of the heart were no longer contracting, the blood which they contained was black and fluid; the lungs were but little crepitating, and presented an increased degree of density in their texture; the digestive canal was sound.

Experiment 5th. Four grains of the same extract were brought in contact with the cellular texture of a small dog. At the end of ten minutes, the animal experienced general tremblings; his walk became uncertain, his eyes haggard, and three minutes after he fell into a violent paroxysm. He experienced four during the three hours that he lived. The body was not opened.

Experiment 6th. At seven in the morning, a robust dog was made to swallow a grain and a half of the *bitter yellow matter* separated from this species of Angustura. Five minutes after, the animal experienced all the symptoms which characterize the paroxysms of which we have just been speaking, and died at the expiration of fifteen minutes, at the end of the twelfth attack. This bitter matter had been prepared by *M. Planche*, who employed the following process:

"The bark of Ferruginous Angustura was exhausted by several successive macerations in alcohol, at 38°. The liquor, when filtered, was distilled in a glass retort; there were drawn off, by distillation, the seven-eighths of pure alcohol; the residue, being dried in a water-bath, was treated by boiling distilled water; it is the portion dissolved by this fluid, and concentrated to the consistence of an extract, which constitutes the bitter yellow matter. In order to observe well its colour, it is necessary to extend it in thin layers. This matter is extremely soluble in cold water; it is of an insupportable bitterness; it is possible that it is only a combination of the bitter principle with the yellow matter, for a small quantity of the yellow matter, without any sensible bitterness, but only styptic, may be separated (although, indeed, in a very minute quantity) by the means of sulphuric æther. The

bitter principle of this extract is found in the most concentrated form possible."

The preceding facts permit us to conclude, 1st. That the powder of *Angustura Pseudo ferruginæa*, and its different preparations, acts like Nux Vomica and the other Strychnos ;* 2nd. That the yellow matter appears to be the most active part.

Professor *Emmert*, whose medical knowledge is so extensive, has been so good as to communicate to me the results of an important operation performed by him at Bonne, on the bark of a species of Angustura, to which *Rambach* has first given, in 1804, the name of *Angustura Virosa*. This bark appears to be the same as that of which we have just given the history.

The following are the principal results obtained by *M. Emmert*. 1st. The *Angustura Virosa* is a violent poison for the human species, the mammifera in general, birds, fishes, and reptiles, when it is applied upon the mucous membranes, wounds, the pleura, the peritonæum, and upon all the parts which contain a great quantity of blood-vessels ; it is, on the contrary, inert, or little active, when brought in contact with the nerves, the tendons, or the epidermis not wounded.

2ndly. The effects of this poison may be prevented completely when the circulation in the part to which it has been employed is stopped : the phenomena of poison take place, on the contrary, even when the nerves of the limb on which it had been applied are cut. 3rd. Vinegar, oil of turpentine, and coffee, do not oppose the effects of Angustura ; coffee rather accelerates them, oil of turpentine appears to diminish them a little. 4th. After death, the involuntary muscles preserve their irritability, whilst the voluntary

* There are many practitioners, who are of opinion that Nux Vomica, Upas, bean of Saint Ignatius, and the false Angustura, act upon the brain as well as upon the spinal marrow. They bring forward, in support of their opinion, cases where the administration of Nux Vomica was followed with delirium and the loss of the intellectual faculties. It may be remembered that we have already said that such was the opinion of Wepfer. We have frequently remarked that animals submitted to the action of either of these four substances, lost the use of their senses ; but it was only a temporary effect, and always when the paroxysm was extremely violent. Consequently we are of opinion that their principal action takes place upon the vertebral column.

ry muscles no longer shew any sign of it. 5th. A child died after having taken by mistake, the decoction of this bark: he preserved the use of his intellectual faculties, and earnestly begged that he might not be touched, for he experienced terrible cramps after each time of handling him; he had a copious perspiration, but did not vomit." (Lettre de *M. Emmert* du mois de Janvier).

OF THE UPAS-ANTIAR.

The *antiar* is a tree of a new species, and the *upas* which it produces is a milky, bitter, and rather yellowish juice, flowing from the tree. It is not injurious if it merely touches the tongue, or if it drops on the skin; but if brought in contact with a wound, it produces a dreadful kind of death, both upon man and beast. The East Indians, availing themselves of these poisonous properties, use it in their wars. Our information concerning this substance, is derived from the interesting memoir of *Drs. Magendie and Delille*, read before the Institute, describing a number of very ingenious experiments upon dogs, and exposing the effects of this very subtle poison.

It appears well ascertained by the experiments alluded to:

1st. That the antiar is very poisonous, when injected into the carotid artery, the substance of the brain, or the jugular vein: that it is less so when injected into the pleura; less so when in contact with the cellular substance; and that its action when introduced into the stomach is still more feeble.

2d. That when absorbed and carried into the circulation, it acts upon the brain and spinal marrow; and this is proved by the loss of the senses, by the piercing cries, by the contortions of the head, and by the contraction of the muscles of the face.

3d. That it acts also as an emetic.

Mr. Brodie is of opinion, that this substance acts upon the heart, which it renders insensible to the action of the blood. He grounds this assertion upon the fact, that a short time after the application of the upas has been made, the contractions of the heart are irregular, intermittent, then become weak, and cease immedi-

ately after death: then this viscus is found distended by a large quantity of blood.

Mr. Emmert has made the same observations, on the state of the heart of animals poisoned by the antiar.

OF TICUNAS OR AMERICAN POISON.

We are informed by *De la Condamine*, in the abridged relation of a voyage in the interior of South America, "That the "Ticunas is an extract made by the aid of fire, of the juices of "several plants, and particularly of certain Lianes. The Indians "who prepare it, assert, that it is composed of more than thirty "different sorts of herbs or roots; and that the manner of com- "posing it was handed down from their ancestors."

This poison is easily dissolved in water, in the mineral and vegetable acids: when in contact with either acids or alkalis, no effervescence takes place, and it will not turn the juice of radishes either green or red.

Fontana's experiments upon this substance have proved,

1st. That its odour, when dry, or the vapours it produces when put on hot coals, are perfectly harmless.

2d. That when applied to the eyes, it produces no effect whatever.

3d. That when taken internally it is poisonous; but that it requires a certain quantity to kill even a small animal. When applied to the skin merely scratched, it sometimes, though not always, causes death; the larger animals more easily resist the action of the poison, and when it does not kill the smaller ones, its effects are soon over.

4th. That it requires about the hundredth part of a grain, to destroy a small animal; and that it is necessary that the poison should be dissolved, in order to produce death, or any visible alteration whatever.

5th. That the poisoned wounds of the muscles, are more fatal than those of the skin, the ears, and the gills of hens.

6th. That the arrows covered with dried ticunas, are more dangerous than the poison dissolved in water, and applied to a wound-

ed part; and the activity of these poisoned arrows, is increased by dipping them in boiling water.

7th. That the poison requires a certain time, to communicate itself to the animal; which time is longer than that necessary, to feel the effects of the poison of the viper; that the danger from both may be removed by amputating the parts when practicable, and performed in due time.

8th. That it kills in an instant when introduced into the jugular veins; but it does not coagulate the blood, as it does by the poison of the viper.

9th. That it produces no sensible alteration in a living animal, when applied to the nerves, either whole, divided, or wounded; provided they be separated from the muscles, and other surrounding parts.

10th. That the principle of the irritability of the muscles is affected by it, though the irritability of the heart is not.

11th. That it is not poisonous for snakes nor vipers.

The symptoms which this poison most commonly produces, are convulsions, syncope, total loss of strength and of motion, diminution or destruction of the sense of feeling: it is often observed that the animal which a few moments before was very lively, is a moment after deprived of motion and feeling, and is brought to the point of death. The muscles of animals who have died under the operation of this poison, are more pale than before, the veins situated near the heart fuller, and the blood rather darker.

OF THE WOORARA.

This substance is the poison, with which the Indians of Guyana prepare the points of their arrows. This does not differ much from the ticunas. According to Bancroft it belongs to a species of *Liane*.

Mr. Brodie has investigated the action of this poison upon the animal economy; and, from the numerous experiments he has performed, concludes:

1st. That the Woorara is absorbed by the veins.

2d. That it destroys the functions of the brain, and consequently that respiration ceases a short time after.

OF THE CURARE.

The *curare* is as much celebrated in the Oronooco as the *ticunas* is in the valley of the Amazon. Both are used to poison arrows. There are several species of *curare*; the strongest is that of Mandavaca village, which unites the Oronooco and the Rio-Negro, that of Vasiva, and that of Esmeralda. According to Mr. de Humboldt the genuine *curare* comes from a plant called *vejucó de mavacure*, the genus of which is yet unknown. This dreadful poison is contained in the bark of the *mavacure*. The juice of this bark is yellowish; it is concentrated by heat; when it has acquired the consistence of a syrup, the juice of the tree called *Kiracaguero*, which is not poisonous, but which gives it more consistence, is mixed with the curare. It is of a brown blackish colour, resembling opium. When well prepared, it may be kept three or four years; but it is generally very active only when fresh.

The abbe Gilij, in his Histoire de l'Amerique, says, that he has witnessed the surprising activity of this poison. The strongest animals perish in a very short time, when they are wounded with arrows impregnated with the *curare*. It acts wholly upon the blood, which it appears to coagulate. It may be left in the mouth without danger; the gums are not affected by it, unless they bleed already from some other cause. A bird, a stag, a monkey, or any other animal killed by the *curare*, may be eaten without any injury. Dissolved in water, this poison produces no accidents, or at least its powers are very much diminished: the humidity of the air produces the same effect, and Gilij has remarked, that the Indians put the points of their arrows in their mouth before throwing them. He states also, that in the Oronooco the Spaniards make a successful use of common salt and urine, to combat the effects of this poison.

There is another species of *curare*, called by the missionaries *curare destemplado*, because it is weak. It is used to poison the arrows which serve to catch young monkeys. The animal whose

life they wish to preserve, is scarcely wounded; the action of the poison, however, makes him faint; and he is then cured by introducing salt into the wound, and by rubbing it with the same salt.

Mr. de Humboldt has communicated some further particulars relating to the poisons of America.

"Near the river Amazon we have seen the poisons of Moyobamba, la Peca, and de Lamas. In drawing, during my residence at Guayaquil, the fruit of the vejuco de la Peca, which had just been sent to me from the Amazon, I experienced a numbness in my hands, merely from having handled the plant during the strong heats of these climates. The most celebrated antidote against the poisons of the river of the Amazons is sugar."

OF CAMPHOR.

Physical and Chemical Properties of Camphor.

Camphor is a vegetable substance, which chemists have already discovered in several laurels, and in some Labiatæ. Among the laurels, that which is known under the name of *laurus camphora*, L. contains the most. This vegetable is very abundant in China and Japan: the camphor is extracted by boiling in water the roots and the wood cut up in little pieces; it is then brought to Europe, where it is purified.

There is another vegetable, which, according to the learned Mr. *Correa de Serra*,* has the greatest affinity with the *shorea robusta*; from which may be extracted a camphor, which is thought far preferable to that extracted from the *laurus camphora*, by the inhabitants of the East. This tree grows at Sumatra.

* If it be this gentleman's lot not to travel through or reside in any country, without leaving a favourable impression of his talents as a man of science, and of his manners as a man of the world; it must be admitted also, that wherever the opportunity has presented, few gentlemen have received a more cordial and more respectful expression of respect and civility, than Mr. Correa de Serra has received, through every part of the United States, which he has visited. J. G. N.

Camphor is not soluble in water, but oil of olives will dissolve a large quantity, provided the temperature be increased.

DELETERIOUS ACTION OF CAMPHOR.

Camphor, introduced into the stomachs of dogs, in the dose of two or three drachms, produces severe symptoms, almost always followed by death: its deleterious properties are still more active, when injected into the veins.

To determine the mode of action of this substance, has been the object of some very well conducted experiments, whence it results,

1st. That when it is introduced into the stomach of dogs, in the dose of three or four drachms mixed with oil, the brain and nervous system are very briskly excited, and death ensues, in the midst of dreadful convulsions, in a very short time;

2d. That when injected into the veins, its deleterious action is still more rapid;

3d. That it will produce the same accidents, but in a slower manner, if put in contact with the cellular subtance of the internal part of the thigh.

4th. That asphyxia appeared to terminate the existence of the animals, subjected to the experiments;

5th. That camphor in lumps is not digested; and that it produces a local action capable of ulcerating the mucous membrane of the stomach, and consequently of causing death;

6th. That artificial camphor, in the dose of half an ounce, produces no lesion on the nervous system; and its action is limited to the production of a few small ulcers, in the mucous membrane of the stomach.

The following case is inserted with a view to prove, that Camphor acts in the same manner upon man, as it does upon dogs.

A man labouring under a violent hypochondriasis, which very frequently brought on spasmodic accidents, swallowed by mistake, at one dose, two scruples of camphor dissolved in olive oil. The effects of this imprudence were vertigoes cold at the extremities, cold sweats confined to the head, slight delirium accompanied by

constant dosing: the pulse small and languishing. To these symptoms soon succeeded great heat, an accelerated pulse, red urine; but the patient was immediately repaid for this accident by being entirely delivered from his spasms. (*Related by Mr. Hallé from Hoffman.*)

OF THE MENISPERMUM COCCULUS.

This is the fruit of a small tree growing spontaneously in the sand, in the midst of rocks, on the coasts of Malabar, of the Island of Ceylon, and in other parts of the East Indies. It is fond of the shade of large trees, around the trunks of which it entwines itself, reaching their most elevated branches.

The fruit is of a dark colour, about the size of a large pea; its external covering is rough, and contains an almond of a bitter taste, tough, whitish, shaped somewhat like a bean, and divided into two portions, by a separation partaking of the nature of wood.

Mr. Boullay an apothecary of Paris, and a distinguished Chemist, lately made an analysis of the almond of the *menispermum cocculus*. It results from his labours, that it contains, 1st, about one half of its weight of a concrete fixed oil, partaking in a degree of the properties of wax; 2d, a vegeto-animal albuminous substance; 3d, colouring matter of a particular kind; 4th, a particle of a new bitter principle, which Mr. Boullay calls *picrotoxine*; 5th, a very small proportion of fibre; 6th, malic acid, probably in the state of acid malate of lime and potash; 7th, sulphate of potash; 8th, muriate of potash; 9th, phosphate of lime; 10th, a very small quantity of iron and silex.

The deleterious effects produced by this seed, upon fishes, birds, wild goats, cows, crocodiles, &c. induced several physicians to make experiments upon living animals, with the intention of discovering its mode of action. Among others Mr. Goupil, a physician of Nemours, communicated to the Society of Medicine some interesting facts, from which, and from the labours of others, the following conclusions are drawn:

1st. That the *Menispermum Cocculus* pulverized, is an energetic poison for dogs.

2nd. That its action, like camphor, is upon the nervous system, and principally the brain.

3rd. That it ought not to be considered as an acrid, irritating poison.

4th. That the active part of this poison is the *picrotoxine*.

5th. That when introduced into the system, without being well pulverized, it produces no other effects, than nausea and vomiting.

6th. Finally, that vomiting appears to be the best method of preventing the accidents it causes, while it remains in the stomach.

OF POISONOUS MUSHROOMS.

OF THE AGARICUS MUSCARIUS. L; AGARICUS PSEUDO-AURANTIACUS *OF BULLIARD.*

The bug or red agaric. Paddockstool. The pileus of this plant grows to the size of 14 and even 18 centimetres diameter. It is sometimes convex, then almost horizontal; of a beautiful scarlet colour, darker in the centre, a little striped near the edge, and spotted with white skins, which are the fragments of the volva; It is not entirely covered by this volva at its origin, and it forms scales along the pediculus. This pediculus is thick at its basis, then cylindrical, full, white, and of the length of eight or 12 centimetres; the lamina are white, uneven, covered while young with a membrane inclining towards the pediculus, and forming its collar.

ACTION OF THE AGARICUS MUSCARIUS UPON THE ANIMAL ECONOMY.

Several French soldiers ate, two leagues from Polosk, in Russia, some Mushrooms, which appear to belong to this species: four of them strongly constituted thought themselves free from danger, because their companions for the most part were already afflicted with very serious accidents; and therefore constantly refused to take emetics. In the evening, the following symptoms made their appearance; anxiety, suffocation, ardent thirst, violent colic, pulse small and irregular, cold sweats, change of countenance, general tremor, tumefaction of the abdomen, and very fœtid fœces. The intensity of these accidents increasing, the pa-

tients were conveyed to the hospital. The cold and the livid colour of the extremities, a mortal delirium, and the most violent pains, did not leave them until their last moments : one perished a few hours after his admittance into the hospital, and the other three had the same fate in the night.

The inspection of the bodies, demonstrated the violent effects of this poison, which had inflamed the stomachs, and even produced gangrene in some, more than others : the mortification was more apparent in two of the stomachs than in the others. Both the stomach and intestines were distended by gas of a dreadful smell, and the mucous membrane of the small intestines, was totally destroyed.

Losel relates, that six men died after eating of this *agaric*.

The inhabitants of Kamschatca prepare with the *agaricus muscarius*, and the *epilobium angustifolium*, a very intoxicating liquor which sometimes produces mortal delirium, accompanied by despair. The servants who drink the urine of the individuals thus intoxicated, experience also the effects of this fatal mushroom.

OF THE AGARICUS BULBOSUS (*OF BULLIARD.*)

This plant grows to the height of 15 to 16 centimetres : while young it is entirely covered by a volva, which is divided, and continues as far as the basis of the pediculus ; and frequently leaves some parts adhering to the pileus ; the pediculus is of a cylindrical form, rather larger at its basis ; but when it grows old, the pileus is more or less convex, but never becomes concave, the laminæ are numerous, unequal, white, it only extends to two millimetres of the pediculus. They are covered, while young, by a membrane, which originates on the edge of the pileus ; and remains adherent to the extremity of the pediculus, under the form of a collar, whole, and inclining downwards.

OF THE AGARICUS BULBOSUS VERNUS (*OF BULLIARD.*)

This Mushroom and the preceding one may be included in some varieties of the orange cigue described by Paulet.

While young, it is wholly covered by its volva, which is separated at its summit, and leaves room for the mushroom ; the pediculus is cylindrical, thick, and provided with a volva at its basis ; full, and from five to seven centimetres long. The pileus is first convex, then becomes concave, because the edges are drawn up, as it grows. The laminæ are uneven, and covered, while young, by a membrane, stretching from the pediculus to the edge of the pileus : this membrane falls, and remains at the top of the pediculus, forming an entire collar. This plant is white, sometimes a little yellowish, at the summit.

ACTION OF THE AGARICUS BULBOSUS VERNUS UPON THE ANIMAL ECONOMY.

Case.

Guibert, his wife, daughter, two boys, and a servant girl, ate, at dinner, of a dish of fish containing also some mushrooms. Mrs. Guibert, who had dined solely on this dish, was awakened, at seven in the morning by frightful dreams, and nausea ; and vomited without pain a part of her dinner ; she was thrown into a state of coma, which ceased only while vomiting. Having taken an emetic, she was evacuated and felt relieved. She had perfectly recovered about three weeks after. One of the boys and the daughter, who had not taken any emetic, died, after having experienced the same accidents. The other boy and the servant, who had been relieved in time, recovered in about three weeks.

Guibert experienced naturally a real *cholera morbus*, accompanied by very painful spasms, especially in his feet, with retractions of the extremities. He was saved. None of these individuals experienced any fever; and all except Guibert, were plunged into a state of continual stupor.

It would be easy to relate here, many other cases of the deleterious effects of this poison, but the preceding one, it is supposed, will sufficiently exemplify its action.

OF THE AGARICUS CONICUS (*OF PICCO.*)

Micheli describes this mushroom in the following words : *Fun-*

gus é volva erumpens pileolo leviter fastigiato desuper murini coloris, inferne ex albo rufescente pediculo albo cylindrico.

ACTION OF THE AGARICUS CONICUS, UPON THE ANIMAL ECONOMY.

Case.

A woman of Stupinis, her husband, three sons, and a daughter, ate, on the sixth October, two pounds of this mushroom cooked with butter. One of the children, about seven years old, complained of violent pains in the abdomen, about two o'clock in the morning: treacle is administered to him. In the course of the succeeding day, every member of the family is affected more or less violently, with cardialgia dyspnæa, and all make violent efforts to vomit.

The seventh of October, the child of seven years suffered exceedingly in his belly, could take nothing else but cold water; the abdomen is tumefied, and the patient in a state of lethargy, uttering every now and then plaintive cries. Towards noon, after experiencing convulsive motions, the pulse becomes very small, and the child dies in spasms. His body was covered with violet spots. The stomach and intestines, distended with very fetid gas, were corroded on their internal surface: livid spots were observed near the pylorus: the colon contained living worms, and a remnant of mushrooms mixed with a yellowish fluid; the liver was very voluminous, pale, and without consistence.

The mother, who complained of suffocating anxiety, vomited some green matter, mixed with a little blood, and became yellow all over her body. She took nothing but treacle, and died eighteen hours after the invasion of the disease. The inspection of the body, presented a result analogous to the preceding.

Another child ten years old, and the daughter, experienced the same fate, the first the same day, and the latter three days after. The inspection of the bodies procured similar results.

The oldest of the children was afflicted with nervous colics, retractions of the extremities, cardialgia, frequent vomitings, palpitations of the heart, and a sense of strangling. An emetic admin-

istered in time procured an abundant evacuation. Hoffman's mineral liquor was administered with but little effect, and delirium with fever now made their appearance. He was bled, and thereby relieved; venesection was repeated in the evening, and an injection administered. The fever abated, and a smart purgative procured some salutary evacuations. The child recovered gradually.

The father, a man of sixty, was attacked with a violent dysentery, which lasted three days. He remained nearly five days without speaking, with a small languishing pulse, and only recovered by degrees. Both the father and the eldest son, had been treated with bark and the balsamic syrup. A year after, they still experienced the effects of the accident which had befallen them.

OF THE AGARICUS NECATOR, (*OF BULLIARD*).

This plant is of a red colour, inclining to yellow. Its substance is firm; there exudes from it, when incised, a milky liquor, which is acrid and caustic; the pediculus is cylindrical, full, naked, thick, and of the length of eight or ten centimetres at the utmost. Its pileus is first convex, then even, and then concave in its centre; it frequently extends more on one side than on the other; and is sometimes marked with circular stripes; it is never more than seven or eight centimetres in diameter, and its surface is covered with parings, which are darker, and give it somewhat of a woolly appearance, and which disappear with age; the leaves are unequal, the small number of those which are entire, form a prominence at their insertion on the pediculus. It grows in the woods, about the end of summer.

Bulliard says, that a very small quantity of this mushroom produces the most fatal accidents. It is said that the juice causes terrible colics.

OF THE AGARICUS ACRIS (*OF BULLIARD*).

This mushroom is white, its laminæ excepted; which, according to their age, are sometimes yellowish or reddish; the pediculus is naked, full, cylindrical, fleshy, two or three centimetres

long, and almost as thick: the pediculus, first convex and irregular, becomes even, then concave, with sinous edges: this pediculus is fleshy, and of the width of about eight or ten centimetres; the laminæ are numerous, unequal, often bifurcated, and growing rather over the pedunculus.

OF THE AGARICUS PYROGALUS (*OF BULLIARD*).

Its pediculus is cylindrical, naked, full, of a yellow, livid, and ground colour, three or four centimetres long, and eight or ten thick: its pileus is first convex, then even, rather depressed in the centre, of the same colour as the pedunculus, often distinguished by concentric darkish stripes; it reaches sixteen centimetres diameter; its laminæ are numerous, rather reddish, unequal, adhering slightly to the pediculus. Whenever the plant is wounded, there exudes from it a milky fluid, sweet while young, but which becomes acrid and caustic.

OF THE AGARICUS STYPTICUS (*OF BULLIARD*).

The general colour of this species, is that of cinnamon; its substance is rather soft, and is easily torn: its exterior is dry: the pediculus is naked, full, continued with the pileus, a little compressed, and expands as it reaches its summit; it is from ten to fifteen millimetres long; the hemispherical pileus, with its two extremities extended and rounded, and the edges rolled underneath: its largest diameter is three centimetres at furthest; the laminæ are narrow, entire, susceptible of being detached from the substance, and remarkable by the manner in which they all terminate at a circular line, which none of them passes.

Paulet says, that this agaricus, when given to animals, disorders and purges, but that it never kills them.

The *agaricus piperatus et agaricus lactifluus* are equally poisonous.

OF THE ORONGE CROSS OF MALTA.

A small bulbous mushroom, with a volva, and a straight stem; growing to the height of three or four inches; of the colour of a

pale skin, nearly like that of a calf; and the pileus of which is separated into five or six equal proportions, resembling in some degree a cross of Malta. Its substance, which is not covered by any skin, bears more resemblance to the true animal flesh, than to the pulpy matter of the mushroom. This substance is fresh, rather humid, of the same colour outside as inside, and has the perfume peculiar to the mushroom. The centre of the pileus is marked by a round knob, rather high and regularly circumscribed; its lobes are about $\frac{2}{12}$ths of an inch thick; its laminæ are almost all of the same length, and of the same colour, as that of the upper part of the pileus, and are inserted in a circular manner, or on a protuberance, without touching the stem. This stem, at first filled with a pithy substance, finishes by being emptied in great part, and becomes fistulous. The collar and the volva, are of a beautiful white colour.

Mr. Paulet ate about the half of one of these mushrooms; he soon experienced great weakness, and fainted. Half an hour afterwards, a great quantity of vinegar was administered to him: and he recovered the use of his senses; he immediately swallowed an emetic, and vomited the mushroom: he was affected notwithstanding with diarrhœa, weakness of stomach, and severe colics for several days.

OF THE FUNGUS MINIMUS TOTUS NIGER UMBILICATUS (*OF VAILLANT*).

White flesh, a little tinged with the outside colour, its laminæ are black and shining as jet, pressed and tender, about the sixth part of an inch high, containing in their intervals, small portions of laminæ placed on the side of the edges of the pileus, and uniting around the stem without adhering to it. This stem is straight, cylindrical, fistulous by the want of marrow, and about the fourth of an inch in diameter. Found in the Nivernois.

OF THE AMANITA FASCICULOSA PILEIS RUFO FUSCIS (*OF DILLEN*).

It grows in bunches at the foot of oaks; sometimes thirty are found united together by their basis; first of a dirty yellow colour,

then of a light red; it reaches the height of four and six inches, and bears pilei which are not more than an inch and a half wide; these heads, or pilei, first marked like brown crusts, especially in the centre, have their laminæ covered at their origin, by a white veil, thick, and firm, which gives them a globular form, and which is torn afterwards, to be converted into a collar; these heads end in taking the form of a pileus. The laminæ, at first as white as the veil, are intermixed with small portions of laminæ, and adhere strongly to the stem, where they terminate by small filaments, losing themselves in its substance, and finish by partaking of a slight red tinge, as well as the veil. The stems, rather bulbous below, are cylindrical, and one third part of an inch in diameter, tinged with the colour of the upper part of the pileus, and filled with a thread-like substance.

A dog ate a certain quantity of this mushroom; complained a great deal, and died twelve hours after swallowing the poison. The œsophagus was lined with white and viscous mucosities, and the stomach in a state of phlogosis, as well as the intestinal canal, the membranes of which were tumefied about $\frac{1}{24}$th of an inch, and filled with a brown fluid of the same colour as that of the mushrooms.

OF THE IVORY WHITE.

A small mushroom, of a shining white, resembling ivory, with a dry surface, very pleasant to the eye, found in autumn, especially in the park of Saint Maur (near Paris). Its laminæ, of unequal length, and circular, terminate for the most part as if by nervous filaments, implanted on the stem. This stem, which is full, about two inches high and a quarter of an inch diameter, is neither straight nor cylindrical, but a little flattened, and marked with a groove at its summit. The pileus is hollow in the middle, and its edges are divided.

One of these mushroms, administered to a dog, brought on, at the end of three hours, abundant evacuations from the stomach and anus; the animal refused food, and appeared to suffer considerably.

OF THE FUNGUS PARVUS PIPERATUS LACTEUM SUCCUM FUNDENS *(OF MICHELI)*.

A pileus with an acute, pointed, elevated centre. This point finally gives way to make room for a cavity, which is generally the case with all the acrid and milky mushrooms. This is white, but its substance turns red by age and by the contact of air; as well as the juice which exudes when it is cut, and which, from a beautiful white colour, soon becomes as red as carmine; this juice is acrid and burning. Its white laminæ, cut obliquely, are of unequal length. The stem, which is a continuation of the substance of the pileus, is cylindrical, and full of a pithy substance.

M. Picco gave this mushroom, hashed up with meat, to a dog, which died of gangrene twelve hours after.

OF THE FUNGUS PERNICIOSUS INTENSE AUREUS *(OF MICHELI)*.

It grows in bunches at the foot of the olive tree. The exterior colour of its pileus, is a deep yellow, and becomes of an olive colour; its laminæ are of a deep or dirty yellow tinge. The whole plant has nearly the shape of a whip; its lobes are in the shape of an ear. The substance partakes of the yellow predominating colour. Its flesh is not firm and fragile, but rather soft, with a velvet like appearance: its laminæ are high, of unequal length, and a little separated from one another. It has no disagreeable smell nor taste.

A painter and his mother, ate at Florence, some of this mushroom fried, and experienced, two hours afterwards, violent colics, and were very ill: they were successfully treated with oil and treacle.

The *ear of the green oak* ought also to be considered as suspicious.

OF THE FUNGUS INFUNDIBULUM REFERENS ALBUS *(OF BUXBAUM)*.

Animals which eat this mushroom, are affected in a sensible manner; soon throw it up by vomiting, and are very much dejected.

A dog was made to swallow one of these mushrooms; two hours after, the animal rejected it by vomiting.

Another species of this kind, known under the name of turpentine, produced the same effect upon another dog. Numerous instances of accidents produced by swallowing a mixture of two or three species of poisonous mushrooms might be related here; a single case will suffice to present its effects.

A farmer, his wife, three months advanced in pregnancy, and their three children, gathered in a wood, near their house, some mushrooms, without any care, and eat them at dinner. In the course of the night they were all affected with the various symptoms of this mode of poisoning, such as cardialgia, nausea, vomiting, and sense of suffocation. Two days after, the accidents became more serious, vomiting of bilious matter continued, respiration impeded, and pains in the whole of the abdomen, more violent at the epigastrium, tenesmus, and difficulty in the passage of the urine. Two of the children died that evening, and the third the next day. The situation of the parents became more critical; the pains in the stomach were excruciating; some convulsive motions were visible. The fifth day, the articulations of the feet and hands of the woman, were found tumefied, and the husband experienced cold chills, announcing the gangrene of the intestines. He died the next day. Some convulsions were experienced by the wife on that day also, but emollient and antispasmodic drinks, and an oily mixture, brought away a portion of the mushrooms which had not been digested. Four days after, the accidents had nearly ceased; the convalescence was long; but in three months she had perfectly recovered, and could feel very distinctly the motions of her child.

Lemonnier opened the body of a young woman, who had been poisoned by mushrooms. The portion of the stomach contiguous to the pylorus, was inflamed, the duodenum gorged with blood, and the internal membrane slightly spotted, presented here and there small excoriations; its lower portion was diminished in size.

Having proceeded thus far in the relation of the facts concerning poisoning by the different species of mushrooms, we will now

present a general view of their symptoms. An excellent report on this subject has been made to the Society of Medicine of Bourdeaux. "The pain in the stomach", says the author of the report, "colics, nausea, evacuations by the mouth and anus are the first symptoms exhibited. Heat in the bowels, languor, and pains soon become continual, and excruciating; cramps, convulsions, sometimes general, and sometimes partial, an inextinguishable thirst then follow; the pulse is small, hard, contracted, and very frequent. When the accidents, after having lasted a certain time, do not diminish by the administration of the usual remedies; vertigo, delirium, torpor, take possession of some individuals, and are only interrupted by pains and convulsions. Other patients have no torpor; the pains and convulsions succeed to strength, weakness and cold sweats take place, and after having been foreseen and announced by the patient himself, who has not for a moment lost the use of his senses, death terminates his series of pains.

The action of poisonous Mushrooms, only becomes manifest a certain time after being eaten: most commonly five or six hours after. It is sometimes at the expiration of twelve and sixteen hours; and more rarely twenty-four, that the symptoms of this poison make their appearance. The morbid alterations of almost all the visceræ demonstrate that this venom having, by means of digestion, acquired all its energy; is disseminated throughout the animal economy, causes the most violent irritation, and an inflammation, which rapidly passes to the state of mortification; this happens with much more intensity in the digestive canal, which received immediately the poison, and which contained for a longer time some of its dissolved portions.

The inspection of the bodies of individuals, who have perished by this cause, presents many phenomena which may be reduced to the following. Very extensive and numerous violet spots on the teguments; abdomen much enlarged, the pupil contracted, the stomach and intestines affected with phlogosis and gangrenous spots. Sphacelus in some portions of this viscus; very strong contractions of the stomach and intestines, œsophagus also affected with phlogosis and mortified in one of the cases.

In another case the intestines were gorged with fæces. Remnants of mushrooms have not been found in any case ; they were completely digested, or evacuated ; the lungs were inflamed and gorged with black blood ; almost all the veins of the viscera of the abdomen were in the same state of plenitude. Inflammatory and gangrenous spots were discovered on the membranes of the brain in its ventricles, on the pleura, lungs, diaphragm, mesentery, bladder, uterus, and even on the fœtus of a pregnant woman ; the blood was very fluid in this case, but in others almost coagulated.

The preceding statement of facts, permits us to conclude ; that Mushrooms act in a different manner according to the species to which they belong.

INDICATIONS WHICH OUGHT TO INDUCE US TO SUSPECT THE NATURE OF MUSHROOMS.

Those that grow in humid and marshy situations; in the shade, that is to say, in thick forests, where the sun's rays do not penetrate, ought to be rejected as of a bad quality : the substance of these mushrooms is softer, less compact, more porous, and contains much humidity. They have generally a hideous aspect, and present a humid and dirty surface. Paulet observes, that the existence of a mucous layer covering the surface of certain species, is not an indication of their suspicious quality ; but that to be considered good, they must unite the qualities of those which are known to be wholesome : for all the Mushrooms with a humid surface that are heavy, or that change colour when cut, or have a strong smell, bright colour, or several very distinct ones, especially if they originate in an involucrum, and grow in the shade, ought to be rejected as poisonous. Those that have been bit by the insects, and given up, are in the same case. We are also to consider as pernicious, those mushrooms, with bulbous and soft stems, or those that have remnants of skin attached to their surface. All those that grow rapidly, and which are easily corrupted, must also be classed with poisons. It was believed, during a long time, that Mushrooms, after being dried, were deprived of their deleterious properties : this fact,

which may be correct in regard to some of the species we have enumerated, is not so for all of them ; for the *agaricus piperatus* preserves its acrid properties. Besides, we have known an instance of the wife of a physician, who was poisoned by eating a piece of dried mushroom.

ACTION OF ALCOHOL UPON THE ANIMAL ECONOMY.

Experiment 1st. Two drachms of Alcohol were injected into the stomach of a cat. Immediately after, the animal was violently agitated, and then lay down on his side in a state of great insensibility and immobility ; respiration became laborious, and the throbbings of the heart accelerated. This situation lasted for about eight minutes, then respiration became more easy ; and the animal got up and walked about.

Experiment 2nd. An ounce and a half of the same liquor, was injected into the stomach of a very large rabbit. The same symptoms were brought on, and only disappeared forty minutes after.

Experiment 3d. We introduced into the stomach of a small but robust dog, six drachms of alcohol at 40°, after having tied the œsophagus. Immediately after the animal appeared agitated, made some attempts to walk, but could not succeed, was convulsed, and, after uttering many cries, he died, three hours and a half after he had taken the poison. Two hours after, the body was opened ; the blood contained in the heart was found to be black and coagulated ; and the stomach presented on its mucous membrane, a great many longitudinal streaks of a darkish red colour, formed by blood extravasated between the two membranes.

Other experiments have also been tried, to ascertain the effect of alcohol upon the cellular substance, and also when it was injected into the venous system ; the result of which will be given in the following pages.

Let us now consider what are the phenomena produced on mankind by alcoholic liquor, when taken in sufficient quantity to produce intoxication. My pupil, Dr. Garnier, who has written an excellent inaugural dissertation on this subject, divides intoxication into three different degrees.

The first is announced by the redness of the face; the eyes become animated, the forehead loses its wrinkles, the countenance bears the aspect of animation; the mind is more free; individuals in this state talk a great deal, and begin to stutter.

The second degree of intoxication is characterized by boisterous mirth, immoderate laughing, singing, and brutal conduct; irregular walk; crying; objects have a double appearance; the tongue is difficult to be managed, and the individual can scarcely articulate; sometimes he foams at his mouth, &c., &c., all which finish by bringing on a profound sleep, which lasts several hours, and which terminates the fit.

As to the third, it may be called a real state of apoplexy. We observe the exercise of the senses suspended, the face is pale and livid, respiration laborious; he foams at his mouth, and coma is manifest. This situation may continue for three or four days, and terminate by death. Morgagni relates the casé of a middle-aged man, who remained intoxicated, with loss of speech, during three days, and died the fourth, without experiencing convulsions*.

* There is a very general custom in France, of which the hard labouring class, and especially the military, are very fond, though it is not confined to any class, sex, or even age; of drinking a wine glass of pure brandy in the morning fasting, but seldom or ever after in any other part of the day. Many old men cannot recollect one day in their lives in which they have abstained from it. This is one of the numberless facts which prove that the human stomach may be habituated to eat and drink almost any food or drink, and that it is not to quality but to quantity it yields. My father has often related to me, that when the French army, commanded by General Rochambeau, in which he was an officer landed at Newport, in Rhode-Island, in June, 1780, some symptoms of dysentery having manifested themselves in the army, the physician-general was alarmed by the fear of its becoming general, and strict orders were issued, that the officers should, as far as practicable, prevent the soldiers from drinking pure water; a small quantity of rum in the proportion of half a pint for every seven men, was distributed, and was to be mixed in the presence of the officer on duty with the water prepared for their drink. The soldiers, whose allowance had not until then been discontinued, even in the passage, found it now a great hardship to be at once deprived of it; they filched some of the rum intended for the mixture, and reserved it for the morning. But although the quantity they had thus set apart, was ascertained not to be greater than that to which they had been accustomed in France,

The foregoing experiments and considerations induce us to conclude;

1st. That alcohol produces on cats, rabbits, and dogs, the same action as upon man.

2nd. That it acts with less energy when it is injected into the cellular substance, than when introduced into the stomach; but that it is much more active when injected into the jugular vein.

3d. That it begins by determining a strong excitement of the brain, to which coma and insensibility succeed.

4th. That its first effects are the result of the action it exercises upon the nervous extremities, and which is propagated to the brain: it is however absorbed afterwards.

5th. That there is no similarity, as has been pretended, between its action, and that of opium. Opium acts after being absorbed; it is therefore much more active when injected into the cellular substance of the thigh, than if it were introduced into the stomach, because in the first case absorption is more energetic; alcohol, on the contrary, acting on the nervous extremities, must produce much more rapid, and more intense phenomena in the stomach than when it is applied to the thigh. Alcohol occasions constantly, both on man and on dogs, an excitation of variable duration, which is followed by a comatose state, and great insensibility; opium, on the contrary, first produces a state of somnolency, always attended with palsy of the lower extremities, and which is soon followed by the most horrid convulsive phenomena; so that the animals finish by being in a real state of excitation. Opium does not inflame the texture of the stomach; alcohol, on the contrary, produces a violent phlogosis.

M. Brodie is also of opinion, that alcohol is not absorbed, and

which was often doubled and trebled; the shrieks, the roarings that were heard, soon after they had swallowed it, then the stupor, loss of sense, and sometimes contortions, which were manifested, soon indicated they had drunk the rum unmixed. My father thinks, but is not certain, that several soldiers of the German regiment of Deuxponts, commanded by the present king of Bavaria, who probably had drank more than the water allowance, died of the first effects of it. They however soon accustomed themselves to, and became too fond of the use of rum.

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that it acts sympathetically on the brain, through the medium of the nerves of the stomach. He grounds this assertion on the following facts. 1st. The inspection of the bodies of animals that died in consequence of taking alcohol, demonstrate a visible inflammation of the stomach; the brain, notwithstanding, has never been found inflamed. 2nd. The effects produced by this liquor are so instantaneous, that it appears impossible that absorption should have taken place in so short a time. 3d. A person intoxicated, often recovers by vomiting. 4th. When we introduce into the stomach alcohol combined with the tincture of rhubarb, and examine the urine after death, the tincture cannot be discovered; whereas, when this latter has been absorbed, and carried into the torrent of circulation; it may be found in the urine by adding a little potash, as Messrs. Home and Brande have ascertained.

M. Brodie compares the action of alcohol on the brain, with that which determines the commotion or pressure of that organ. And, in fact, these mechanical means occasion loss of motion, insensibility, dilatation of the pupils; respiration becomes painful, laborious, ceases, and the patient dies.

OF SULPHURIC ETHER.

Experiment 1*st*. The œsophagus of a small hearty dog, was tied, after introducing into his stomach half an ounce of sulphuric ether. Two minutes after the animal made efforts to vomit, which he renewed in a few instants. In about five minutes, vertigoes came on, and soon became very intense. Five minutes after, the animal could not stand; all the muscles appeared to have lost their power of contraction; there was no convulsive motion, and the organs of the senses possessed all their faculties. For the succeeding three hours, he felt much pain, made many efforts to rise and to vomit; he finally succeeded in standing on his hind feet; after remaining in this situation about half an hour, he fell again, and died about two hours after, and three from the beginning of the experiment. Upon examining the body, an hour and a half after death, the stomach was found to contain a small quantity of a viscous brownish fluid; its mucous membrane presented throughout a blackish red colour, and was much in-

flamed; the other membranes of this viscus partook of a lively red colour; the internal membrane of the duodenum was slightly inflamed; the remainder of the alimentary canal had a natural appearance; the heart contained black blood, partly fluid, and partly coagulated; the lungs were gorged with blood in a fluid state.

OF CARBONIC ACID GAS.

Carbonic acid gas is invisible, has a slight acrid taste, and a sharp smell. Its specific gravity is 1.5196; it destroys combustion, reddens the infusion of tournesol, dissolves in water, and forms with water of lime, of barytes, and strontian, a white precipitate. It is found in the atmosphere in certain grottoes, in volcanic countries, and escapes from lime ovens, and fermenting liquors.

ACTION OF CARBONIC ACID GAS ON THE ANIMAL ECONOMY.

M. Hallé's experiments prove, that animals are destroyed by this gas in two minutes.

In the month of April, 1806, a family, composed of seven persons, was rendered apoplectic, at Marseilles, by the vapour of an oven for burning limestone, which was in operation in the yard of the house, and which had penetrated by the door and windows. Five of the seven individuals perished, and two were saved. All of them tried to escape death, by leaving the house, and as it was during the night time that this accident occured, they were found on the stairs, on the step of the door, with lamps in their hands, and in the attitude of flight; but the deleterious gas had taken away their strength and means. Foderé, who relates the preceding fact, mentions also, that he has known waters charged with carbonic acid gas to produce vertigoes and a dimness of sight.

The destruction of organization produced by this gas is similar to that resulting from the gaseous oxyde of carbone, with the exception of the blood, which is not so black.

M. Nysten has proved, that it may be injected in pretty large quantities into the venous system without stopping circulation;

that it does not act first on the brain, and that when more is injected than the blood can dissolve, it determines the distention of this organ and death. 2d. That when it is injected with care, it only occasions a muscular debility, which lasts a few days. 3d. That it may be injected in a strong dose without producing any pulmonary lesion. 4th. That it darkens arterial blood, but less than the gaseous oxyde of carbone. 5th. That it may be injected in small quantities into the carotid artery, without producing any remarkable symptom; if injected in a large quantity it causes apoplexy, which appears entirely due to the unusual distention of the capillary system of the substance of the brain. 6th. That it cannot be considered as deleterious by itself.

OF THE GASES THAT ESCAPE DURING THE COMBUSTION OF CHARCOAL.

These gases may be considered as formed by a large proportion of gaseous oxyde of carbone, and a little carbonated hydrogen gas. It is evident that they can only contain atoms of carbonic acid gas; for this latter is decomposed by red charcoal, and transformed into gaseous oxyde of carbone.

The limits of this work, and the degree of interest which the gaseous oxyde of carbone, and the carbonated hydrogen gas present, in a practical point of view, will not permit us to enter into a detail of their properties. We shall however state the results obtained from experiments by M. Nysten. It appears, that the gaseous oxyde of carbone, although occasioning more alteration in the circulation than the carbonic acid gas, and enjoying many similar properties, may yet be injected in strong doses, without causing any pulmonary lesion. The carbonated hydrogen gas, on the contrary, when injected into the veins in sufficient quantity to cause a distention of the heart, produces death in a manner purely mechanical. It has also some of the properties of the preceding substance.

The general symptoms of this mode of poisoning are, considerable heaviness of the head, buzzing in the ears, dimness of sight, somnolency, diminution of strength, sometimes an inexpressible pleasure, which induces the individual to remain exposed to the

fatal vapour ; at other times violent pains of the head, difficulty of breathing, violent palpitations of the heart, which are soon followed by a suspension of respiration, of circulation, of the voluntary motions, and of the functions of the organs of the senses, deep coma : the heat remains the same as before the accident, and continues so sometimes for a long time. There is also at other times an involuntary excretion of urine.

The bodies of individuals who have fallen victims to this poison, preserve their heat for a long time ; the veins, especially those of the lungs and brain, are gorged with fluid and black blood ; the arterial system is almost empty ; there are sometimes purple spots over the body ; the stomach and intestines are somewhat red.

OF THE SPURRED RYE *(SECALE CORNUTUM).*

The spicæ of certain graminæ present sometimes a vegetable production, in the form of a spur or a horn, which is called *ergot*, *spur*, and which is most commonly met with on rye.

The *spur* or *ergot*, says Mr. Tessier, is a grain, generally bent and extended, and growing out of and over the gluma, which supplies the use of a calyx. Its two extremities, thinner than the middle part, are sometimes blunt, and sometimes pointed. It is rarely round the whole length : and most commonly three obtuse angles, and longitudinal lines extending from one end to the other, are observed. Small cavities, which appear as if formed by insects, are observed in several grains of the ergot. The colour of the ergot is not black, but violet, with various shades. On the greatest part of the grains we are speaking of, whitish spaces are observed at one of the extremities; that is the spot where the ergot adhered to the gluma. The violet covering of these grains contains a firm and whitish substance ; which cannot be separated from it even by long boiling. The spurred grains easily divide, and break with a noise like that produced by a dried almond. While the ergot remains in the state of grain, it has no disagreeable odour, except when fresh and collected together in quantities: but if pulverised, this odour is more perceivable : it

leaves then on the tongue a slightly biting taste, resembling that of spoiled wheat.

ACTION OF THE SECALE CORNUTUM ON ANIMAL ECONOMY.

Several individuals who had eat a small quantity of spurred rye, experienced nervous symptoms, while those who made use of it during a long time, or who had eat a great deal at a time, were afflicted with a gangrenous affection. These two diseases have received the names of convulsive ergotism, and gangrenous ergotism.

The use of the Secale Cornutum has produced epidemics that have devastated some parts of Silesia, of Prussia, of Bohemia, Hesse, Lusatia, Saxony, and Sweden. The disease made its invasion by an unpleasant sensation at the feet, cardialgia succeeded, and the head and hands were soon affected. The patients cry out loudly, complaining of a violent heat at their feet and hands; mania, melancholia, and coma intervene; the mouth emits a yellow greenish, and almost bloody froth. Almost all those who were affected with epileptic symptoms perished; those whose limbs, after experiencing the unpleasant sensation alluded to, became cold and stiff, had much less distention in the hands and feet. The pulse was the same as when in health. This is what authors call convulsive ergotism.

Experiments have been made with barley containing one third of ergot. The animal submitted to the experiment, died in about five weeks after he had began the use of that food. The inspection of the body presented gangrenous spots, on the liver, intestines, ears, tail, feet, &c. &c. The human species has also been affected with this disease. Several authors have written the histories of gangrenous epidemics occasioned by the secale cornutum, and noticed the same symptoms upon man as upon other animals.*

* This article has of late been added to the Materia Medica; and is now classed by Dr. Dorsey among the Emmenagogues. A dissertation on its Medicinal virtues, has been published by Oliver Prescott, A. M., in which he highly recommends its use, in cases of protracted labour. Cases of its suc-

Lolium temulentum. *Seeger* has proved by experiments that this substance is of a poisonous nature; the most prominent among its symptoms is the general tremor it produces. Violent vomitings, convulsions, and an increase of sweat and urine also result from its use.

Wheat. It sometimes happens that the farinaceous part of wheat is converted into a black dust, which communicates bad qualities to the bread. M. Foderé witnessed, in 1808, colics and diarrhæa proceding from this cause. Rusty grains may also produce the same effect.

Hippomane mancinella. This substance appears to have exerted its poisonous qualities in the case of a Piedmontese made a slave of in Turkey. An hour after swallowing it by mistake, the abdomen become tumefied, with great heat and ulceration of the lips by the juice of the fruit. He took a decoction of the leaves of the *avellana purgatrix*, vomited, and the evacuation lasted for four hours. He recovered soon after.

Peyssonnell informs us, that the Indians poison their arrows with the juice of the *mancinella*, which renders their wounds mortal; and that the rain which washes the leaves and the branches of the tree, raises blisters like boiling oil, &c. The Missionaries who have written on the natural history of America, relate, that the malignant vapour arising from the tree while they are cutting it, destroys the workmen. M. Castera was present when a negro had his hand and face swelled and burnt, by splitting a small branch.

Mercurialis perennis. This plant is noxious to sheep and to man. It has occasioned in several persons who had eat of it violent vomitings, excessive diarrhæa, burning heat at the head, profound sleep, and convulsions, which in one case was soon followed by death.

Chærophyllum sylvestre. Wild Chervil. The root of this plant, gathered in winter, is said to occasion delirium, profound

cess in amenorrhæa and in preventing floodings which occur in the early months of pregnancy, are recorded. The author recommends the decoction of half a drachm, in four ounces of water; one third to be taken as a dose, to be repeated in 20 minutes, if the first dose has not operated.

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stupor, numbness, not followed however by death. It appears also that the seeds and root of the *chærophyllum bulbosum* have excited vertigo and pains in the head. The *chærophyllum temulentum* is said also to have produced intoxication. The *Sium latifolium*, and the *Coriaria myrtifolia*, myrtle-leaved sumach, are mentioned by Beyersten and Sauvages as having produced death in the midst of horrible convulsions. The action of the latter is more violent than that of the former, which appears to be noxious, only when gathered in the month of August.

Among the plants which have hitherto occupied our attention there are many flowers, which emit an odour, which appears to be dependent upon the volatilization of an essential oil; and which has often occasioned fatal accidents. We cannot consider this odour as positive poison, that is to say, as capable of poisoning every individual, placed in all possible circumstances; but merely as a relative poison; the effects of which depend on the degree of nervous susceptibility and idiosyncrasis of the individual. How often do we not see, persons sleeping in narrow and closed rooms, with several pots of odorous flowers, without experiencing any ill effect whatever; while others could not remain there even a few minutes without encountering fatal accidents? The instances of such cases are so numerous that it is deemed useless to relate them in this work; we only remark that the following are the usual symptoms: numbness, palpitations, syncope, convulsions, cephalalgia, aphony, &c. and finally asphyxia.

SYMPTOMS OCCASIONED BY THE NARCOTICO-ACRID POISONS.

The poisonous substances of this class, for the most part, produce a series of remarkable symptoms, which are the same, whether they have been introduced into the digestive organs, whether they have been applied to the cellular substance, or whether they have been injected into the veins. This characteristic, which is rarely met with in the poisons of the three first classes, exists, as we have already remarked, in those of the fourth.

These symptoms may be reduced to the following: agitation, pain, violent shrieks, sometimes stupor, insensibility, convulsive

motions of the muscles of the face, of the jaws, and of the extremities; head often bent towards the back, vertigo, sometimes an extreme stiffness of the extremities, attended by a general contraction of the muscles of the thorax, producing an immobility of its sides; eyes red, prominent, insensible to exterior impressions; the pupils often dilated; the organ of hearing insensible to sounds; frothy at the mouth; tongue and gums of a livid appearance; nausea, vomiting, alvine dejections; pulse strong, frequent, regular; or small, slow and irregular; finally death, which is very prompt when poison has been injected into the veins; it occurs later when it has been applied to the cellular substance, and, in general, it happens much later when the poison has been introduced into the stomach. We are far from asserting that all these symptoms are caused by the same poisonous substance; we merely say, that they may be remarked in administering different poisons of this class.

LESIONS OF TEXTURE, PRODUCED BY THE NARCOTICO-ACRID POISONS.

Several of these poisons create a local irritation, susceptible of producing a violent inflammation, which may sometimes terminate in gangrene. The action of some of them is much less violent; finally, some others remain a long time in contact with the organic textures, without creating the least redness.

The lungs, the blood, the brain, its membranes, and the other organs in general, present the alterations already noticed in the article Narcotics.

TREATMENT OF POISONING BY THE NARCOTICO-ACRID POISONS.

The numerous experiments that we have made, in order to find an antidote to the various poisons of this class, have hitherto been unsuccessful; and we believe we may affirm: *that in the actual state of science we are acquainted with no substance possessed of the faculty of decomposing these poisons, and of transforming them into bodies incapable of exercising a deleterious action when not vomited.* We are therefore reduced to the necessity, of pointing

out the means calculated to diminish or to repel the accidents to which they give rise.

The effects produced by *belladona*, *datura strammonium*, *tobacco*, *digitalis purpurea*, *anagallis arvensis*, *aristolochia clematitis*, and the different species of *hemlock*, *nerium oleander & ruta*, ought to be treated on the following principles:

1st. If the poison has been swallowed but a short time, and has not occasioned abundant vomitings, two or three grains of antimoniated tartrate of potash, combined with 20 or 24 grains of ipecacuanha, dissolved in a small quantity of water, should be administered: by this method, the prompt expulsion of the poisonous substance will be effected; and there will be no fear of hastening its absorption from the small quantity of liquid used to dissolve the emetic. The action of the vomit, may be aided by the introduction of a barbed quill down the throat.

2nd. If some time has already elapsed, since the poison was swallowed; and there is reason to suppose that it has reached the intestinal canal; an emeto-cathartic, composed of two or three grains of Tart. antimon. Pot. and one ounce, or an ounce and a half of sulphat. Sodæ, will be advisable. Purgative injections will also be of service.

3rd. If by the help of these means, the patient vomits the deleterious substance; and there are symptoms of a determination to the head, venesection must be performed without hesitation: the jugular vein is preferable in this case, and the vein may be opened again, according to the temperament of the individual, and the benefit procured. This mode never appeared to us injurious, and we have frequently experienced its good effects. In cases where evacuants have produced no effect, and a congestion of the brain is apparent, venesection ought also to be resorted to.

4th. The use of acidulated drinks, and principally of vinegar dissolved in water, given in repeated small doses, is the next object of our attention. This preparation appears to us, to be peculiarly useful when it is weakened, and administered immediately after the expulsion of the poisonous substance. We are of opinion that the use of acidulated drinks, is in general injurious, when prior to the expulsion of the poison; 1st, because they do not pro-

more vomiting, and 2nd, because they dissolve the active parts of the poison, and thereby facilitate their absorption.

5th. If, by the use of these medicines, the nervous symptoms have disappeared; the inflammation, which is almost always the result of the administration of these poisons, must be combated. With that view, the acidulated drinks will be changed for emollient decoctions or infusions, such as the *infusion* of flowers of *marsh mallows*, *violets*, or the solution of gum arabic: a few leeches, applied to the abdomen, might also be useful.

It is but seldom that the poisonous substances in question have been used externally. If it should so happen, it would be necessary to follow the same precepts, with the exception of the evacuants: it would be further necessary to apply a ligature above the poisoned part, and cauterise the wound, in order to prevent the absorption of the poison, and its passage into the circulation.

The *upas tieuté*, *nux vomica*, *bean of St. Ignatius*, *Angustura pseudo-ferruginea*, *ticunas*, *woorara*, *upas antiar*, *camphor*, and the *menispermum cocculus*, produce effects very different from those of the preceding poisons; and require therefore a very different mode of treatment. *Drs. Majendie and Delille* have proved that the muriate of soda employed by the Indians, when they are wounded by the upas, is no antidote to this poison, whether it has been introduced into the stomach, or applied externally. The means which have proved most successful, in opposing its effects, as well as those of the nux vomica and bean of St. Ignatius, consist in making the patient reject the poison the soonest possible by means of emetics, and tickling of the throat; and to prevent asphyxia, which is the principal cause of death, by performing tracheotomy, and inflating air into the lungs. In several animals submitted to this mode of treatment, death has been retarded, and it only recurred on the cessation of air inflation. In cases where these poisons had been applied to wounds of the limbs, these gentlemen prevented them from becoming mortal by drawing out immediately the instrument which had penetrated; by cauterising the wound thoroughly, and by the application of a ligature above the wounded part. The efficacy of these precepts, is confirmed by the fact generally known, that a hæmorrhage in the limb

operated upon, prevents poisoning, because the blood cannot mix with the deleterious substance. It must be observed, that water charged with ether and oil of turpentine, has appeared to us salutary, in restoring entirely the health of the animals poisoned, by one or the other of these deleterious substances. We cannot leave this subject, without attempting to impress on the mind of our readers, the importance which ought to be attached to the inflation of air in the lungs: this method requires much patience from the physician; for it is only by being employed during several hours, that it is made efficacious. We affirm that fourteen animals out of twenty have been saved by this means; and there is no doubt, but that they would have perished by asphyxia, if it had not been resorted to.

Mushrooms. We have made many experiments to ascertain the effects of vinegar, common salt, ether, emetic, and volatile alkali, as antidotes to poisoning by these substances. Vinegar, and the solution of common salt, dissolve the active part of some of the mushrooms; the liquor thus formed is extremely injurious. Vinegar and salt, therefore, introduced into the stomach hasten death. Ether and volatile alkali are both sometimes attended with danger; and cannot be relied upon. The following is the method which has appeared to us worthy of being recommended to practitioners. The evacuation of the poison by means of *emetics*, *emeto-cathartics*, *and purgative potions and injections* is to be first procured. Purgatives are frequently preferable to emetics, because the action of these mushrooms is slow, and sometimes manifest only ten or twelve hours after they have been swallowed, and have reached the intestinal canal. It will be therefore advisable to prescribe three or four grains of Tart. Ant. Pot. united with 24 grains of ipecacuanha, and six or eight drachms of sulphate of soda dissolved in water; a potion composed of castor oil and syrup of peach-tree blossoms; and injections prepared with cassia, senna, and sulphate of magnesia, should also be administered. When the mushrooms are evacuated, a few spoonfuls of some preparation containing ether, will be of service; and if the patient complains of pains and irritation in the abdomen, mucilaginous drinks must be resorted to. The tartrate of potash alone

does not always evacuate. *Paulet* relates the case of a princess of Conti who swallowed twenty-seven grains without receiving any benefit. If the inflammation of the abdomen has already made some progress, the administration of irritating purgatives would be highly imprudent: it would on the contrary be necessary to have recourse to venesection, and the other antiphlogistic means, if there was much fever, with painful tension of the abdomen, cardialgia, dryness of the tongue, and burning heat of the skin. Forestus relates a case, wherein venesection was performed with good effects on the sixth day. Finally, when all these symptoms have disappeared, tonics such as white wine, bark, &c. are to be administered.

Alcohol and other spirituous liquors. When intoxication lasts a long time, and the individual is affected with coma, it will be advisable to have recourse to emetics, and then to acidulated drinks. Venesection may be advised if the patient is young, robust, and of a sanguine temperament. Irritating injections, and applications of vinegar over the surface of the body are also of use.

Asphyxia by the vapour of charcoal, and carbonic acid gas. The patient must first be undressed, and exposed to the free circulation of air, then laid on his back with his head and breast more elevated than the rest of his body, to facilitate respiration. Aspersions of cold water, and vinegar, may then be made on his face and thorax: three or four minutes after, these parts must be wiped with warm napkins, and the patient put into a warm bed, where he will remain two or three minutes; then the aspersions are to be renewed. This practice is necessary, for the body would finally become insensible to the action of cold water. Air must be inflated into the lungs, by means of a tube through the mouth, or what is better through one of the nostrils, while the other is stopped to prevent the egression of the air; with a view to facilitate the mechanism of respiration, it will be well to apply every now and then on the abdomen, napkins dipped in very cold fluids, which after remaining two or three minutes are to be succeeded by very warm linens. If these means should prove useless, an opening in the trachea may be performed, and a tube introduced

through which air may be inflated, either by the mouth, or a pair of small bellows. The patient may swallow cold water, slightly acidulated with vinegar. Frictions with camphorated spirit, or any other stimulating liquid, and warm napkins, ought to be made all over the body: the soles of his feet and the course of the spinal narrow ought also to be irritated by a strong hair brush; burning brimstone, and volatile alkali may be applied to his nose. Injections of water with vinegar, and others made of common salt, senna, and sulphate of magnesia, may be recommended. Emetics and fumigations of tobacco are to be avoided. Finally, when he is recovered, wine and some stimulating potion, will be of service.

Secale cornutum. Read has laid down the best principles, for the treatment of the *ergotism:* he says that, if the accidents are not violent, the fever is accompanied with convulsions and spasmodic motions, and pain in the head; these symptoms are to be treated in the usual way. But if the fixed pain, numbness, and cold, indicate the approach of dry gangrene, the following mode of treatment, is the most proper to prevent its progress, and attenuate its dangers.

The state of the pulse can alone determine on the necessity of bleeding, an operation which ought to be performed with great reserve. Emetics, administered in the beginning of the disease, produce salutary effects, but it is only when the nauseæ do not depend entirely upon the irritation of the stomach, and that the bitter taste in the mouth announces a congestion of *(saburral)* humours in the primæ viæ, that they are indicated. The day after taking the emetic, the patient is to be purged with some mild cathartic, if the fever is but slight. His usual drink ought to be the infusion of elder-flowers, marshmallows, and mullein, to which will be added four spoonfuls of vinegar, as much honey, and one grain of tart. ant. Potasse for each pint of liquid. As soon as the patient complains of numbness and cold at his extremities; it will be proper to apply linens dipped in a decoction of aromatic plants; having previously rubbed the parts with the hand or a piece of woollen: blisters may also be applied in places near the parts affected. The patient ought then to be put to the use of the following prepara-

tion. Take four ounces of bark in powder: half an ounce of sal ammoniac; boil the whole in about a pint of spring water; before it is done boiling add a few flowers of chamomile. The patient will take, every three hours, four ounces of this preparation. If the other applications are not successful, this preparation may be used as a fomentation.

Read recommends when the extremities are affected with mortification, to apply fomentations prepared in the following manner. Take four ounces of calcined allum, three ounces of roman vitriol, one ounce of common salt, and boil the whole in 2lbs. of water, to one half. If, notwithstanding all these means, amputation becomes necessary, we must wait, until nature herself has marked the time and place of the operation.

Odorous flowers. The asphyxia produced by these, will be combated by the means we have indicated, and the cephalalgia, syncope, and nevralgia will require the use of tonics and antispasmodics.

CHAPTER VI.

Class 6. *Of the septic or putrifying poisons.*

The name of septic poisons, has been given to those which produce a general weakness, dissolution of the humours, syncope, and which do not generally impair the intellectual faculties.

OF HYDRO-SULPHURIC ACID GAS (*SULPHURETTED HYDROGEN*).

Characters. This gas is transparent, colourless, has an excessively fetid smell, analogous to that of rotten eggs: *it reddens the infusion of tournesol.* It burns with a blue flame when in contact with air, and deposits, on the sides of the glass bell which contained it, a quantity of a yellow coloured sulphur. It is soluble in water, and forms bright yellow precipitates with the arsenious acid; and black sulphurets with the salts of copper, of lead, and of bismuth.

ACTION OF HYDRO-SULPHURIC ACID GAS ON ANIMAL ECONOMY.

It is well a known fact, that animals perish a few seconds after they are plunged into hydro-sulphuric acid gas, which on that account is considered as one of the most deleterious substances. *M. Chaussier* instituted, a series of interesting experiments on this subject in 1802; and *Mr. Nysten* has since undertaken some very interesting researches on the same object, which may now be considered as completely investigated; we have carefully repeated the experiments of these physiologists, and from their works have drawn our conclusions.

Any animal whatever perishes, in a few seconds, if he is plunged in an atmosphere of hydro-sulphuric acid gas; when that gas is combined with a large quantity of atmospheric air, death is retarded. According to Messrs. *Thenard and Dupuytren*, if the atmosphere contains only $\frac{1}{150}$, it is sufficient to kill a bird in a very short time: if it contains $\frac{1}{300}$, it will kill a middle-sized dog; and a horse will be destroyed in an atmosphere containing $\frac{1}{250}$.

Messrs. *Thenard and Dupuytren* have proved that the asphyxia produced in privies, noticed by M. Hallé in 1784, is sometimes produced by the hydro-sulphuric acid gas, or the hydro-sulphate of ammonia. The following are the results of *M. Dupuytren's* observations on man. "Sometimes the individuals are strongly "affected, and death takes place in a very short time; but in "other cases the symptoms of asphyxia are less intense; the pa- "tients may then be transported into the air, and it is observed "that after they have remained for some time in a state of appa- "rent death, they draw deep inspirations; by degrees respiration "is restored, but continues laborious; the throbbings of the heart "are felt, the pulse however is small and weak; the digestive and "locomotive systems have lost their power; the functions of the "brain are suspended, and if the patient recovers health, his "strength returns very slowly."

The symptoms produced on man and other animals that have hitherto been observed, may be reduced to the following summary:

violent cries, convulsions, violent contractions of the abdominal muscles, anxiety ; unequal, intermittent, convulsive pulse, respiration sometimes accelerated, at others suspended, and sense of cold in the ears.

The preceding considerations induce us to conclude, that the hydro-sulphuric acid gas, and the hydro-sulphuric water, are energetic poisons, for all animals ; that they are very active when inspired, less so when introduced into the pleura or the jugular vein, and that when injected into the cellular substance, the stomach, or the intestines, their action has much less energy. Finally that their action is much less rapid, when applied to the surface of the skin ; man may therefore use without inconvenience the sulphurous baths, in which this gas is generated, provided he does not remain there too long, and the gas does not enter into his lungs ;

That it is entirely absorbed without undergoing any decomposition ; that when carried into circulation it produces a general weakness ; a deterioration extended to the texture of the organs, and principally of the nervous system, and probably in the composition of the blood ;

That it may be injected in small doses in the venous system of animals, without producing any serious symptom.

That it does not kill by distending the heart, for it is very soluble in the blood ;

That it appears to act upon man, in the same manner as upon other animals.

TREATMENT OF ASPHYXIA, PRODUCED BY HYDRO-SULPHURIC ACID GAS.

It will be proper to begin, by using the means we have advised while speaking of asphyxia produced by charcoal ; a few spoonfuls of olive oil ought then to be administered, in order to excite vomiting, at least this practice has often been successful in cases of asphyxia, produced by privies. If it was necessary to disinfect a place, containing too much of this gas, it would be necessary to have recourse to *Chlore*. M. Dupuytren has succeeded by these

means, in curing asphyxia, in cases of animals which had breathed the hydro-sulphuric acid gas.

ACTION OF SOME PUTREFIED SUBSTANCES, UPON ANIMAL ECONOMY.

Experiment 1st. Half an ounce of the blood of a dog, in a state of putrefaction, was applied to the cellular substance of the internal part of the thigh of a middle-sized and robust dog. The animal experienced no remarkable symptom in the course of the day; but the next, after vomiting, some difficult inspirations, torpor, difficulty in walking; he expired. The inspection of the body was made the same day, and it was discovered that the limb upon which the operation had been performed, and all that side of the body, as high as the third sternal rib, were inflamed, and of a red livid colour; the digestive organs appeared natural, the lungs contained a quantity of black fluid blood; and the ventricles of the heart presented some blackish coagulated blood.

Experiment 2nd. The same operation was made upon another dog, of a smaller size, which died 18 hours after the application of the blood; the inspection of the body presented the same result.

These experiments repeated on two dogs, substituting six drachms of the bile of a rotten ox, resulted in death, in about 21 hours after: the inspection of the bodies only indicated suppuration in the limbs operated upon.

These and some other experiments made with other animal substances, in a state of putrefaction, such as the brain and stomach, are not sufficiently numerous and positive to enable us to affirm, whether the divers accidents and death, resulting from putrefied substances, depended upon the local irritation they produced, or their arrival in the course of circulation. We propose to write a work upon this subject.

Professor Fodéré classes putrefied food or aliments with poisons. He relates that during the siege of Mantua, several persons were attacked with dry gangrene of the extremities, and

scurvy, from having been obliged to subsist upon horse flesh nearly in a state of putrefaction.

OF VENEMOUS ANIMALS.

This name has been given, 1st, to those animals provided with a bag containing poison; and the bite of which, even when when slight, occasions serious symptoms, sometimes followed by death; 2nd, to those on which this bag has not yet been discovered, and which occasion the most terrible accidents when eaten; 3rd, to those, the fluids of which have undergone by disease such alterations as to render even their contact fatal. The bite of some animals in a state of health, unprovided with any poisonous bag, produces symptoms similar to those resulting from any sharp body whatever; these animals have also been termed venomous.

OF VENOMOUS ANIMALS, THE BITE OR STING OF WHICH IS ATTENDED WITH SERIOUS ACCIDENTS.

Of the Viper. (Vipera berus, coluber berus, anguis cinerea, macula dorsi fusca, longitudinali, dentata. L.)

The genus *Vipera*, such it has been adopted, by *Latreille and Daudin*, includes all the serpents with a triangular flat head, wider behind, terminated in the shape of a muzzle, with prominent edges containing venom, and poisonous fangs.

Specific characters. This reptile is commonly two feet, and sometimes, but very rarely, from twenty eight to thirty inches long, and about one inch thick: its colour varies from that of ashes or greenish, to the darkest gray; always deeper on the back than on the sides, where it is constantly scattered with brownish spots in regular distances. It presents on its back, a black serrated stripe, which extends from the back of the head to the extremity of the tail; this stripe is sometimes interrupted, but most generally it is continued or entire. The belly and underpart of the tail, are marked with transverse spots, of the colour of polished steel: there are usually one hundred and forty-six of these spots under the belly, where they are simple, and thirty-

nine under the tail, where they are smaller and double, and form two rows. The head of this viper is wider behind, more flat and shorter than that of snakes; the end of the muzzle is as it were truncated, and forms a prominent edge, drawn up like the snout of hogs, covered by scales larger than those of the back, spotted white and black. On the top of the head, two black lines are distinguished which diverge backwards, forming the letter V. These lines are separated by a dark spot, in the shape of the iron of a lance. The tail, shorter than that of snakes, is rather blunt, and larger in males than in females. The eyes are lively and sparkling; its look is audacious, especially when irritated. The tongue is gray, and bifurcated; and, when animated, the animal moves it with impetuosity, so that it appears like a burning dart. These characters are more than sufficient to distinguish the viper from snakes and the orvit.

The principal varieties of the common viper are, 1st, that with the serrated stripe, formed on the back of round spots, and on the tail of transversal spots; 2nd, the common reddish viper, with a very spare neck, and a variegated head; 3rd, the common viper, with a white spot surrounded with an arched brown line on the occiput; 4th, that which presents a spot with several divisions on the summit of the head; 5th, the viper aspick, with an angular and black stripe on the back, often interrupted by the brown or red colour of the whole, with the spots on the sides more plain.

The common viper is only found in Europe; it is met with in Italy, Spain, Germany, Great Britain, Siberia, in the environs of Paris, Fontainbleau, &c.

The venom of the viper is contained in a small bladder or bag, situated on both sides of the head, below the muscle of the maxilla superior, which exhibits two moving teeth or fangs, grooved in their length, and very sharp near the point. When the animal wants to bite, he presses the bladder by means of the muscle, the poison escapes, arrives at the basis of the tooth, passes through the sheath that covers it, and enters into its cavity through a foramen found at this place: then it runs along the groove of the tooth, and

comes out by the hole, which is near the point, to penetrate into the wound.

CHEMICAL AND PHYSICAL PROPERTIES OF THE POISON OF THE VIPER.

It is neither acid nor alkaline, for it does not redden the tincture of the croton tinctorium, nor does it turn the syrup of violets green. It is neither acrid nor burning, and only leaves on the tongue an impression analogous to that of the fresh fat of animals: it has a slight smell, similar to that of the fat of the viper, but it is much less nauseous; with the acids it produces no effervescence; if mixed with water, it thickens and turns it of a slight white colour; but if merely put into a bason of water, it sinks to the bottom. It does not burn when exposed to the flame of a candle, or on red hot coals. When fresh, it is rather viscous; and when dry, it sticks like pitch. It appears to be of the nature of gum.

ACTION OF THE POISON OF THE VIPER ON ANIMAL ECONOMY.

The celebrated Fontana, who has performed near six thousand experiments, on the bite, and the poison of the viper, thought himself qualified to establish the following facts.

1st. The venom of the viper is not a poison for all animals: leeches, snakes, eels, &c. do not perish by it; but all warm blooded animals do.

2nd. This poison is only mortal, when applied to small animals, and its danger on large ones depends upon the quantity of poison, the number of bites, and also the heat of the weather. The one-hundredth part of a grain will kill a sparrow, but it requires three grains to destroy a man, and twelve to kill an ox. It appears that the viper only contains two grains in its bags; which are only evacuated after several bites, whence it results that man may receive the bite of five or six vipers, without perishing.

3rd. The poison of two vipers, injected into the jugular vein of two large rabbits, occasioned death in less than two minntes, amidst cries and strong convulsions. The blood of the ventricles

of the heart is coagulated, and the stomach, intestines, mesentery, and muscles of the abdomen are inflamed.

4th. The poison of the viper, applied with the bite, produces the following symptoms: sense of acute pain in the wounded part, spreading throughout the limb, and even to the internal organs, accompanied with tumefaction and dryness which becomes livid, extends by degrees to the surrounding parts, considerable syncope, frequent, small, concentrated, and irregular pulse; difficulty of respiration; copious cold sweats, disorder in the vision, and intellectual faculties; nausea; bilious and convulsive vomitings, almost always attended with universal jaundice, sometimes pains in the umbilical region. The blood, which flows first from the wounds, is often blackish, some time after it issues sanies, and gangrene makes its invasion when death is to terminate the disease. The nature and the rapidity of the progress of the symptoms, occasioned by the bite of these animals, are singularly influenced by the climate, seasons, temperament, &c. These accidents are much more to be feared in South America and during summer than in Europe, as observed by Mr. Bosc. The symptoms appear with much more rapidity, and are much more serious upon feeble and timid persons, than upon robust and courageous individuals.

5th. This poison produces no mortal effect when applied to the skin, slightly scratched, of turkeys and rabbits. It occasions a very slight disease of the skin on guinea pigs; and one rather more serious on rabbits: the disease is limited to the part impregnated by the poison. But when the viper bites the skin of these animals in all its extent, they perish in a very short time. The poison does not appear to be mortal if it penetrates only into the cellular substance. It is perfectly harmless if applied to muscular fibres. Animals bit or wounded by the poisonous tooth of a viper, on the breast, belly, intestines, or liver, perish in a longer or shorter time. On the contrary, if the poison be applied to the ears, pericranium, periosteum, dura mater, cerebrum, medulla ossium, cornea transparens, the tongue, lips, palate, and stomach, the very reverse is manifest, and it often occurs that several of the animals, submitted to these experiments, exhibit no sensible

phenomena. It produces no effect whatever on the nerves, nor on the palpitating parts just separated from an animal.

6th. The action of this venom is not instantaneous; it requires a certain space of time, before its effects become apparent, either in the wounded part, or in the other organs. This time varies according to the constitution and size of the different animals. Fontana reckons it to be, for a certain number of animals, from fifteen to twenty seconds.

7th. The accidents it produces depend upon its absorption, its reaching the course of circulation, and the action it exercises upon the blood, which it partly coagulates, and also upon the nervous irritability, which it destroys, by carrying a putrifying principle into the fluids.

8th. It preserves its energy in the head of the viper, which has been separated for a long time; or when it has been simply left in the cavity of the tooth, which has been extracted from its socket. Animals have died from the wound of the tooth alone. When dried for several months in an open place, it loses its properties, and leaves no impression upon the tongue.

M. Paulet has written a work on the viper, called viper of Fontainbleau, which is also a viper berus, notwithstanding the opinion of this physician, who considers it as a particulars species. He establishes, contrary to the assertion of Fontana, that the bite of the common viper may become fatal to man.

"The poison which it possesses is generally mortal to man, and "other animals; principally to those who are weak, and easily in- "timidated, when it is inoculated by a wound, or by the sting of "the animal. A child, seven years and a half old, was bit above "the malleolus internus of the right foot, and died seventeen hours "after. Another child, two years old, expired three days after "having been bit on his cheek. A horse, debilitated by prece- "ding diseases, was also bit on the cheek, and perished eighteen "hours after."

"The most usual symptoms of the action of this poison are, a tu- "mour, at first hard and pale, then red, assuming a gangrenous as- "pect, and progressing, more or less rapidly, towards the heart. "This tumour is soon followed by syncope, vomiting, convulsive

" motions, and death: the intensity of these symptoms is in the in-
" verse ratio of the size of the animal wounded; or of the distance
" of the wound from the heart, and of the slowness of the pulsa-
" tions of the arteries."

OF THE VIPER NAJA *(COLUBER NAJA OF L., CHINTA NAGOO OF THE EAST INDIES, COBRA DE CAPELLO)**.

Experiment 1st. In the month of June, 1787, a dog was bitten in the internal part of the thigh, by the *comboo nagoo*, (a variety of this species of serpents). The animal immediately uttered very plaintive cries; he lay down two or three minutes after, and continued to whine and bark. Twenty minutes after he rose up, but could scarcely stand, and could not walk; his organization appeared essentially affected; he soon lay down again, was agitated a few minutes after with convulsive motions, and died, twenty seven minutes and a half after having been bitten.

Experiment 2d. In the month of July, of the same year, a large and hearty dog was bitten, in the internal part of the thigh, by another variety of the *viper naja*. Two minutes after, the limb was retracted upwards; a symptom generally indicating that the animal is under the influence of the poison. He continued however to walk during an hour, leaning on his other three limbs, without exhibiting any other symptom: he then stretched himself on the ground, appeared very uneasy, had a passage, but did not cry. A short time after, he was agitated with violent convulsive motions at his head and neck; his hind limbs were attacked with palsy; and he made useless efforts to rise. This situation continued till death, which happened two hours after the bite.

Experiment 3d. The same reptile bit, immediately after, another dog; no effect having been produced at the end of an hour and a half, this dog was bitten on the other thigh by another *cobra* which had bitten nothing for several days; two hours passed with-

* All our information, on this subject, is extracted from the admirable work of Russel, entitled, "*An Account of Indian Serpents, collected on the coast of Coromandel; by Patrick Russel.* London, 1796, 2 vols. *folio*.

out any symptom becoming visible, but during the ensuing hour the animal became a prey to all the accidents related before, and died five hours after the second bite.

Chickens, hogs, pigeons, and several dogs were submitted to many other experiments, performed by the *scinta nagoo*, *male nagoo*, and *arege nagoo*, varieties of the *viper naja*, resulting almost always in death. But when the poison was inoculated into animals of the same kind by wounds made in the internal part of the thigh, it produced little or no effect. A pigeon died seven hours after being wounded by a poisoned lancet.

Case I.

In the month of January, 1788, a Malabar woman was bitten in the lower part of the leg by a *cobra de capello*, and was visited by M. Duffin ten hours after. She had lost the faculty of seeing and hearing; deglutition had become so difficult, that it would have been impossible to introduce the smallest substance into the stomach; there were no spasms in the other parts of the body, but since the accident, every function had fallen into a state of torpor, which was increasing. She succeeded, however, with much difficulty in swallowing a Tanjore pill *(see its composition at the article Treatment)*; the wound was made larger, and a mercurial plaister was applied upon it. A second pill was administered three hours after, but, like the first, it produced no effect; a few hours later, a third one was administered, which procured some evacuations, and a determination to the skin. Eighteen hours after the bite, the patient recovered her senses, and the faculty of hearing and swallowing. During the three following days, she took a pill every morning, which produced nausea, and increased perspiration. The patient remained weak for eight or ten days, and then recovered.

Case II.

An Indian was bitten on the foot, by a large *Cobra de Capello*. A quarter of an hour after, his jaws were firmly closed, one against the other, and he appeared dead; the part that had been stung, presented four very wide wounds, upon which Eau de

luce* was applied. The individual soon shewed signs of feeling, and drew the limb upwards. Two bottles of madeira wine were heated, and he was forced to swallow them, by separating his jaws, and introducing the end of a funnel into his mouth. Most of it reached the stomach. In half an hour the eau de luce was continued to be applied internally, for three hours. The patient was so far insensible, that if he had not breathed now and then, he might have been taken for dead. He remained in this state forty hours; after which he appeared to recover his feeling. Twelve hours later he began to speak; but remained for some days weak and languishing.

OF THE COLUBER RUSSELIANUS, KATUKA REKULA PODA *OF THE INDIANS.* (*VIPERE E'LEGANTE OF DAUDIN*).

Experiment 1st. In October, 1787, a chicken was bitten on the wing, by this reptile; he was immediately seized with convulsions, and expired in thirty-eight seconds. The inspection of the body presented no alterations.

Experiment 2nd. The skin was taken off the internal part of the fore thigh of a rabbit, and he was bitten at that place by the same reptile. The thigh was immediately drawn upwards; the animal tried, however, to walk. Thirty-five minutes after, he was seized with convulsions; lost the power of standing on his feet, and was affected at intervals with universal tremor. He died an hour after being bitten.

A chicken, wounded by the same reptile, on the same day, died in six minutes.

Other experiments were tried, to ascertain what would be the action of this poison, merely applied to the cellular texture. Some slight appearances of convulsions, temporary loss of strength,

* The *eau de luce* is a particular ammoniacal soap, or the union of liquid caustic ammonia, with the empyreumatic oil of rectified succin. The mode of preparing it is as follows: dissolve 10 grains of white soap in 4 ounces of rectified alcohol, then add to it two drachms of oil of rectified succin; when the solution is made, a sufficient quantity of liquid caustic ammonia, very concentrated, is to be added. J. G. N.

remained visible for a day, but disappeared entirely the next in some cases ; and death occurred in others.

Therefore it appears well established :

1st. That the venom of the *Katuka Rekula Podá*, which is excessively dangerous to dogs, when applied with a bite, is almost harmless when introduced by an incision.

2nd. That chickens and pigeons, which never survive the bite of one of these serpents, do sometimes outlive the insertion of their poison in an incision, and experience indeed but very slight effects ; but they may also die after this artificial application ; without our being hitherto enabled to assign a cause for this difference.

OF THE COLUBER GRAMINÆUS *OF SHAW* (RODROO PAM *OF THE INDIANS*).

Experiment 1st. In October, 1788, the thigh of a chicken was bitten by this reptile : the limb was immediately drawn upwards, and the animal had a passage. Two minutes afterwards, he lay down : he was put upon his paws, but could not stand. Five minutes after being bitten, he was agitated with motions, which became very strong, principally in the head and neck, which were succeeded in about two minutes by the symptoms of stupor. He died eight minutes after the beginning of the operation. The skin that covered the wounded part was dissected ; and exhibited a black line about an inch long, extending towards the groin, and which having been cut, produced blackish blood.

Experiment 2nd. A hog was bitten on the same day by this reptile. Seven minutes after, the animal was dejected, and in a quarter of an hour fell into a state of stupor. The symptoms appeared to increase during the second and third hours, but in the course of two hours more, they decreased, and seven hours after he had been bitten, he was perfectly recovered.

These facts tend to prove, that the poison of this reptile, is not as deleterious as that of the *Cobra de Capello*, and of the *Katuka rekula poda*.

There are a great many species of the same genus, *vipera*, which are also poisonous :—we will enumerate them.

The *vipera chersea* of Linnæus (æsping of Sweden). It is found in the Northern countries of Europe. Linnæus relates, that a woman was bitten by this reptile, and died in a very short time. The viper of Redi; the black viper (*coluber præster*, *L*). The viper Cleopatra (*haje*). Viper *amodytes*, or sand snake, scythian cerastes, viper occellée of Latreille and Daudin, viper lébetine, in the shape of the point of a lance; triangular headed; hebraic, *atropos dipsas*, *severa*, *stolata coralline*, atrocious (called by the Portuguese *Cobra de Capello*); the white viper (*nivea*), brazilian, loberis, spotted, lactée and hæmachate.

OF THE GEDI PARAGOODOO *OF THE EAST INDIANS* (BOA *OF RUSSEL*).

Experiment 1*st*. A chicken was bitten on the wing, by this serpent; a short time after he fell into stupor, but he could still walk and stand up. At the end of ten minutes, he could not support himself. Five minutes later, he lay down, and appeared asleep. For a few minutes he made many useless attempts to rise, inclining his head sometimes on one side, and then on the other. Slight convulsions took place a short time after, and he expired in half an hour after being bitten. The wounded part had not lost its colour, but the gills and the sides of the mouth were of a deep red, the bill and some of the fingers presented a livid colour.

Experiment 2nd. A small bitch was bitten in the groin, by this reptile. A slight weakness in the limbs was the only symptom that had made its appearance in the course of a quarter of an hour. Fifty minutes afterwards, the animal lay on its side, and appeared worse; palsy of the hind limbs; an hour after being bitten he vomited, convulsions came on, and he died ten minutes after.

OF THE BUNGARUM PAMAK *OF THE EAST-INDIANS*, AND SACKEENE *OF BENGAL* (*BOA* OF RUSSEL).

This reptile was made to bite a chicken. The animal soon lay down, had two passages, and could not stand up; he made useless attempts to rise during the first ten minutes, and experienced a shivering of his head. Five minutes later, he appeared at the point

of death; convulsions soon came on, and he died twenty-six minutes after having been bitten. It is probable that this animal would have died sooner, if the serpent had been vigorous.

Russel relates several other cases of death, produced by the poison of serpents; the names of which are not mentioned; and draws the following conclusions:

1st. That the various reptiles that have been mentioned, are all poisonous, but in different degrees.

2nd. The symptoms they induce in the different animals, are nearly similar; appear about in the same order, but with more or less rapidity: their invasion generally taking place between the third and tenth minute; it is seldom delayed more than half an hour.

3rd. That when the reptile is lately caught, its poison is more active, than when it has been kept a long time; however it does not lose its poisonous qualities entirely, even when it has been shut up without food. In this case, although it does not possess the faculty of destroying robust quadrupeds, it preserves still sufficient power to destroy chickens, pigeons, &c.

4th. The first bite of the reptile, is more dangerous than others that he may make in the same day.

5th. The poison of these animals does not always kill the other animals; there are some which even recover, after having been a prey to fatal symptoms. The danger which they have to encounter depends on the degree of intensity and the rapid invasion of these symptoms.

6th. The period of death varies considerably. Dogs never die as soon as birds: this difference does not appear to depend on the size of the animals.

7th. The poison, when applied by the animal itself, is much more positive, than when applied artificially on a wounded part: but when it is once in the system, its symptoms are the same, and are as fatal to small animals.

OF RATTLESNAKES.

These snakes constitute a genus known under the name of *crotalus*, comprising eight species, which are, the *crotalus boiquira*,

crotale à queue noire, *crotalus durissus*, *crotale à lozange*, *crotalus dryinas*, *crotale sans tache*, *crotale camard*, *crotalus miliarius*.

Characters of the genus. The upper jaw contains one and sometimes two enormous hooks, or strong teeth, more than half an inch long; hollow in the greatest part of their length, and shut up in a kind of bag, or membranous sheath; whence they issue when the animal straightens them. The vesiculæ containing the poison, are situated under the skin that covers the jaws. It insinuates itself into these hooks, and comes out by a longitudinal hole, which is found inside, a little beneath the point. It has spots or transversal stripes under the body, and under the tail, which is terminated by one or several hollow, moving pieces, sonorous, and of the consistence of scales.

It does not enter into the object of this work, to relate every thing miraculous concerning these reptiles; we wish only to prove that the bite of these serpents is extremely dangerous; and to exhibit the principal accidents it determines. There are on record many cases of the dangerous effects produced by the poison of these animals; the following is given by Mr. Home in the *Philosophical Transactions for* 1810.

CASE.

Thomas Soper, 26 years old, of a feeble constitution; was bitten on the 17th of October, twice on the first phalanx of the the thumb, and twice on the joint of the index, by a rattlesnake four or five feet long. He took, a short time after, a dose of jalap, and some applications were made upon the wounds; but the hand swelled, and the patient was admitted into St. George's Hospital, half an hour after the accident. In the course of an hour, the tumefaction had reached the elbow; one half of the arm soon partook of the inflammation, and the pain extended to the axilla. Mr. Brodie, who first saw the patient, found the skin cold, and one hundred pulsations in a minute; nausea was also evident. *Forty drops of pure liquid ammonia and* 30 *drops of sulphuric ether*, in an *ounce of camphorated mixture*, were administered, but immediately vomited. *Pure ammonia* was applied on the wounds, and linens dipped in *camphorated spirit*

were also applied on the arm and fore arm. An hour after he took two drachms of *compound spirit of ammonia*, 30 *drops of sulphuric ether*, and *an ounce and a half of camphorated mixture;* which remained on his stomach. The accident had occurred at half after two o'clock, and at six the pulse was stronger; at half past seven it was very weak. (30 *drops of ether and the same quantity of ammonia in water.*) This dose was renewed at half after eight. At nine he felt much dejected, the skin was cold, the pulse feeble, and only eighty pulsations in a minute. He again took as much as 50 drops of the same medicines, which dose was renewed. At a quarter past ten, the pain in the arm was very acute and the pulse stronger; but the patient fainted every quarter of an hour. In this situation the pulse became imperceptible; but in the intervals his mind was not extremely dejected; he had two passages in the evening. M. Everard Home saw him for the first time at half after eleven. The hand, wrist, fore arm, arm, shoulder, and axilla were excessively tumefied; the arm was nearly cold, and it was impossible to perceive the pulsations in any part of it, not excepting those of the axillary artery: the wounds of the thumb were scarcely apparent; but those of the index were very visible: the skin was very cold. The next day, at one o'clock in the morning, he spoke in a confused manner; his pulse one hundred, faintings were frequent. The same medicine was given every hour. At eight in the morning his pulse was very weak, and one hundred and thirty-two a minute; the swelling had not reached the neck; blood was extravasated under the skin as far as the lumbar region. He soon began to vomit the medicine, and at eleven o'clock at night, 2 grains of opium were given, and repeated every fourth hour; vesiculæ and spots of a livid aspect had made their appearance, faintings were frequent, and the pulse scarcely perceptible.

The preceding are the most remarkable symptoms, which occurred until the third day of the disease. During the thirteen succeeding days, many variations were manifested in the pulse, which was sometimes very rapid, and at others reduced; during the three days preceding his death, it remained at 120 pulsations a minute. The inflammation was likewise subject to alterations,

and the small vesiculæ increased in size, and gave issue, when opened, to a serous matter. Finally, mortification appeared around the axilla; the stomach could retain nothing but porter; and he died on the 17th day of the disease.

Upon opening the body, sixteen hours after death, no apparent lesion was visible on the exterior, except in the wounded arm, where gangrene had made much progress. The pericardium contained half an ounce of a serous fluid mixed with air; the blood contained in the ventricles of the heart was coagulated: the portion of the stomach nearest to the cardia was distended by a fluid; the pylorus was contracted; the vessels of the mucous membrane of this organ were much dilated with blood. The vessels of the pia mater, and of the brain, were gorged with the same fluid; the ventricles of this organ contained more serosity than in the natural state; there was also an effusion in the cells that unite the pia mater to the arachnoides.

M. Everard Home, who has collected several facts concerning the poisons of the various serpents, is of opinion, 1st, that when the poison is very active, the local irritation is so sudden and violent, and its effects upon the animal economy so intense, that animals die in a very short time; in those cases, there is no alteration except in the wounded parts; the cellular texture is entirely destroyed, and the muscles are much inflamed; 2nd, that when the poison is less intense, its action is not always fatal; there is however a slight delirium, and much pain in the wounded part. About half an hour after, an inflammation appears, depending upon the effusion of serosities in the cellular texture, which increases with more or less rapidity for about twelve hours, and which extends to the parts affected; the blood ceases to flow from the smallest vessels of the tumefied parts; the skin which covers them becomes cold, the action of the heart is so weak, that the pulse is scarcely sensible; and the stomach so irritable, that it is with difficulty it retains any thing. About sixty hours after, these symptoms have acquired more intensity; inflammation and suppuration appear in the wounded parts; and if the abscess be very large the patient dies. When the wound has been made in the finger, this part is sometimes immediately affected with gangrene. If death takes place in one of these cases,

the absorbents and their glands do not undergo changes analogous to those produced by another *virus* ; and the only alteration exists in such parts as are connected with the abscess. In general, the symptoms which appear in these cases, progress more rapidly than those dependent upon a *virus*. This consideration, united to the danger of the accidents, which appear at first upon individuals, who recover after having been bitten, has induced the belief that their recovery was due to the medicines employed. Thus, for instance, the *eau de luce* is considered, in the East Indies, as a specific, against the bite of the *cobra de capello*. 3d. That this opinion does not appear well founded ; for death always happens whenever the poison is very active, and every time that it produces a local lesion of great extent ; whereas recovery takes place in all slight wounds. The effects of the venom on the constitution are so instantaneous, and the irritability of the stomach so great, that medicines can only be administered, until they are fully apparent, and then there is very little hope of success.

OF INSECTS.

OF SCORPIONS.

The sting of the scorpion produces accidents upon man, which vary according to the size of the animal, and the climate to which he belongs ; it is, in general, more dangerous in southern countries than in others.

Bontius says, that the great scorpion of the East Indies produces mania on those who are stung.

Mallet de la Brossiere saw, at Tunis, two individuals, who had been stung by a large scorpion, and who experienced serious symptoms, which only gave way to the use of volatile alkali.

M. Amoreux who has published a very interesting work on the poisonous insects, believes that their most usual symptoms may be reduced to the following : a red mark, which increases a little, and becomes black towards the middle, and which is usually followed by pains, more or less inflammation, swelling, and sometimes with pustulæ ; some persons are seized with fever, chills,

and numbness ; vomiting, hiccup, pains all over the body, and tremor, have also been remarked.

OF SPIDERS.

Spiders have been considered, by some authors, as excessively dangerous, while others affirm that they are perfectly harmless, and may be swallowed without danger. French spiders produce some slight symptoms.

OF THE TARENTULA.

This insect has given rise to a multitude of fabulous accounts, the offspring of ignorance and superstition. Even Baglivi is among those who have written upon the effects it produces. The opinion of well informed physicians is, that the sting of the Tarentula produces no extraordinary phenomenon, and that its effects are rather local than general. Some well managed experiments on this insect would be desirable.

OF THE BEE AND THE DRONE.

Every one is acquainted with the danger of the sting of certain bees. The following facts will shew the symptoms to which it gives rise.

A countryman, about 30 years old, is stung by a bee a little above the eye-lid ; he falls down immediately, and dies a few instants after. His face was inflamed, and he had, after death, a very abundant hemorrhage from his nose.

Zacutus has seen the sting of a bee followed by the mortification of the part.

M. Amoreux says, the sting of a bee is of itself nothing ; but if these insects, when in a swarm, attack a man or any other animal, they may cover him with wounds, and kill him, as much by the quantity of poison which they introduce into his body, as by wounding him.

The sting of the bee is generally followed by an acute pain, and an erysipelatous tumefaction, very hard in its middle, becoming white, and continuing as long as the dart remains in the wound.

Drone. *M. Amoreux* informs us, that this insect is sometimes more dangerous than the bee. In 1769, several individuals in Poland were stung by large drones; they produced an inflammatory tumour, which made rapid progress, and could only be stopped by deep scarifications.

OF THE WASP AND HORNET.

The sting of wasps may also become fatal.

A gardener of Nancy, having carried to his mouth an apple, containing a wasp, was stung on the palate near the *velum palati*. A sudden inflammation and painful tumefaction soon resulted, which, by intercepting the passage of air, killed this unfortunate man in a few hours.

The *Dictionnaire des Sciences Medicales*, Art. *Abeille*,* contains a case similar in its cause, which was relieved by using plentifully the muriate of soda, dissolved in as little water as possible.

M. Amoreux is of opinion, that the sting of wasps and hornets is not essentially different from that of bees and drones. The activity of their poison depends upon the part affected, upon the quantity of virus, and also upon the the season and climate, which give to these insects increased animation, &c. &c.

There are other insects, whose sting likewise occasions accidents similar to those we have described: we will simply enumerate them: the musqueto, ox-fly, tenthredo, ichneumon, tick, æustrus scolopendra, &c.

OF THE ANIMALS PRODUCING SERIOUS ACCIDENTS BY THEIR INGESTION.

This section comprises certain species of fish and muscles. The Edinburgh Medical and Surgical Journal for October, 1808,

* A complete Medical Encyclopedia, begun in France about six years ago, and composed by the first physicians, surgeons, and medical men in Europe, and doubtless in the world. Twenty volumes of this great work, have already been published—one volume of from 6 to 700 pages, with plates, contains as much matter as five common sized quartos, each volume sells in France for 9 francs, about 1.80 cents, in boards. J. G. N.

contains a paper by Dr. Chisholm on the poison of fishes; from which we extract our principal results.

OF THE CLUPŒA TRHYSSA OF L. YELLOW BILD.

The action of this poison is sometimes very violent, producing death in half an hour. In other cases, it produces a disagreeable itching all over the body; severe colics, contraction and heat of the œsophagus, nausea, heat on the skin, acceleration of the pulse, vertigo, loss of sight, cold sweats, insensibility, and death. The action of this poison is sometimes so very rapid, that individuals have been known to die while they were yet eating. This poisonous quality depends probably on the climate, for the same fish is eaten at Porto Rico, without any injurious effects.

CORACINUS FUSCUS MAJOR (*GRAY SNAPPER.*)

This fish affects principally the intestines, and produces *cholera morbus*, accompanied with excruciating pains: it occasions also an itching on the surface of the body; and a disease of the epidermis, similar to some species of leprosy. Its effects last a long time, and leave behind a chronic disease, characterized by weakness, palsy of the abdominal extremities, dimness of sight, and hardness of hearing.

The *sparus pargos* of Foster, *Porgee*, produces effects analogous to those of the coracinus; but they are much less intense in the East Indies.

CORYPHÆNA CÆRULEO VARIE SPLENDENS, CAUDA BIFURCA; CORYPHÆNA HYPPURUS *OF LACE'PE'DE. DOLPHIN.*

Dr. Chisholm relates, that this fish occasioned, in the case of an inhabitant of the island of Grenada, a violent head ache, nausea, eruption of large spots of a vermillion colour, insupportable itching, and a tightness about the breast: these symptoms gave way to a slight treatment.

MURÆNA MAJOR SUBOLIVACEA (*CONGER-EEL*).

The symptoms produced by the eating of this fish appear to be the following: a short time after eating it, the patient is affected with colics, *cholera morbus*, peculiar feeling in the lower extremities, which might be called *convulsive twitchings:* these symptoms sometimes last fifteen days with the negroes, and terminate by palsy of the inferior extremities. They all recover, however, after several months' sufferings.

SCOMBER MAXIMUS, *KING FISH.*

This fish, and principally that designated under the name of bastard king fish, sometimes produces cholera morbus, and an eruption of a red aspect.

MUSCLES.

It is well ascertained, that several persons have experienced serious accidents from the eating of muscles; these accidents have sometimes been followed by death.

Case.

Miss ***, aged sixteen, well constituted, and at a period distant from that of menstruation, eat five or six muscles that were just boiled, but not otherwise cooked. She experienced immediately, a very violent oppression, which kept increasing; her face swelled, the whole body was covered with white spots, large and prominent; the patient experienced much anxiety, perspired slightly, and her eyes shed tears almost involuntarily. A few cups of sugared water were administered, and, some time after, she took two drachms of ether in two ounces of mint water by spoonfuls. The first doses of this mixture were scarcely swallowed, when the pustulæ diminished, and the other accidents disappeared. The administration of a few cups of infusion of orange tree leaves soon dispelled both the fatigue and the agitation produced by this indisposition. The father of this young lady did not meet with any bad consequences, although he ate plentifully of the same dish.

Professor Fodéré, in his work on medical jurisprudence, relates having inspected the body of a man, who died two days after having eaten muscles; and who had experienced nausea, vomitings, and tenesmus; his pulse had been small, tight, and hurried; the stomach and intestines were slightly affected with phlogosis; there were also several lesions in other organs, but they were the result of preceding diseases.

Several opinions have been advanced upon the cause of the accidents produced by muscles and other poisonous fish.

1st. It has been supposed, that they were produced by a morbid alteration of these molluscæ; and, under that impression, the poison has been presumed to reside sometimes in all the parts of the animal, sometimes only in one of its organs. Mr. Burrows has collected, in his excellent Memoir on Poisonous Fish, a number of curious facts, which prove, with the authorities of Quieros, Forster, Thomas, Clarke, Chisholm, Quarrier, &c. that certain fresh fish, free from morbid appearance, have been eaten without inconvenience; but that the next day, these same fish became very poisonous, although they had been salted. He is of opinion, therefore, that the deleterious effects are to be attributed to a peculiar alteration of the secreted fluids, and of the functions of these animals; alteration which singularly inclines them to rapid putrefaction. He says also, that this poison is more active after the destruction of the vital strength. Otherwise he combats successfully the opinion of those who believe that the poison resides in one part of the animal only, such as the skin, stomach, intestinal canal, gall-bladder, and liver.

2nd. Others are of opinion, that the poisonous qualities of these molluscæ, and of the poisonous fish, are essentially due to the substances on which they feed. Thus the apple of the *hippomane mancinella*, the marine narcotic plants, such as the *corallina opuntia*, crabs, small starfishes, the spawn which they contain at a certain period of the year, the sulphate of iron, the preparations of copper, those of barytes, &c., &c. James Clarke, Chisholm, Beunie, have principally maintained these opinions. M. Burrows observes with truth, that the first of these opinions are are destitute of foundation, and that there is no fact which can

support them ; he consequently examines only the merit of those, which admit the existence of the deleterious principle in a mineral substance. 1st. The sulphate of iron is too innocent to be considered as the cause of accidents produced by these animals. 2nd. As to the preparations of copper ; how can their introduction into the bodies of these molluscæ be conceived ? undoubtedly after their solution in water. Now the analysis of sea water made in different places has never demonstrated the existence of one atom of this metal. Besides, would not the ingestion of a preparation of copper destroy these animals? we admit readily that the animals which stick to the copper of vessels, containing verdegris, are very injurious, by the quantity of poison applied to their surface. But how often do we not see fish caught in the ocean, create the same accidents as those taken, in low water, near the shore, where an atom of copper could not be discovered. 3rd. It has also been thought, that the effects produced by muscles, were dependant upon a particular disposition of the stomach (*idiosyncrasis*); this is the opinion of several learned physicians. Among others, our friend, Dr. Edwards, possesses, on this subject, a number of remarkable cases, which he has been kind enough to communicate to us, and from which he is induced to form the following opinion.

" If," says Dr. E. "it has hitherto been impossible to prove " that muscles contain a poison injurious to the generality of in- " dividuals ; and that on the other hand, these aliments produce " effects resulting also from fruits, and other fishes ; it is more " rational to admit that their production is due to a particular dis- " position of the stomach, a disposition which may appear all at " once, continue, or cease in a short time."

OF POISONOUS ANIMALS, WHOSE FLUIDS HAVE BECOME ALTERED BY PRECEDING DISEASES.

It has been known for a long time, that horses, oxen, sheep, dogs, and even men, under particular circumstances, contract diseases, by which the saliva, blood, and other humours, are altered, and become capable of occasioning fatal affections, followed some-

times by death: among these, the malignant pustula and ulcers, gangrene, hydrophobia, &c., are reckoned.

MALIGNANT PUSTULA.

Drs. Enaux and Chaussier have collected a great number of facts which tend to prove, that this disease is the result of a septic *virus* produced in diseased animals, and transmitted to man. These facts form part of a very interesting work printed at Dijon, in 1785, entitled "*Methode de Traiter les morsures des animaux enragés.*"

A shepherd had occasion to bleed one of his sheep, which had just expired suddenly; he carried it off on his shoulders; but the blood soaked through his shirt, and rubbed against his loins. Two days after, a pustule maligne made its appearance in that part.

A boy undertook to skin an ox that had been killed in a tavern of Gatinois, because it was sick; and inadvertently carried the knife to his mouth. The tongue soon swelled; he experienced a tightness about the chest; the body was covered with pustulæ, and he died on the fourth day, affected with general gangrene. The tavern-keeper, who had been wounded in the middle of the hand by a bone of the same animal, suffered exceedingly; his arm became sphacelated, and he expired on the seventh day. The servant girl received, on the right cheek, a few drops of blood of the same animal, which produced an inflammation, followed by gangrene.

A woman introduced some medicines into the throat of an ox, and immediately applied her hand, covered with saliva, on the breast of a young girl; who complained, a few hours after, of a burning itching at her breast. A chill soon followed, a general shivering, intense fever, and small blisters, which soon destroyed this young person.

Every kind of insect that sucks the blood of an animal affected with anthrax, may thus transmit the virus to man.

Wounds made with the point of a scalpel on young men who attend dissections, and who are of a weak constitution, sometimes

produce serious accidents, such as engorgement of the glands of the axilla, œdematous swelling, putrid fever, and death.

SYMPTOMS OF THE CONTAGIOUS MALIGNANT PUSTULA.

The following is the description given by Enaux and Chaussier of the most usual variety.

First period. Troublesome itching, but slight, without redness, heat, or tension of the skin; acute, but temporary, prickings, the epidermis falls off by degrees, and forms a serous vesicula, not exceeding at first the size of a millet seed, but which increases by degrees, and becomes brown; the itching returns now and then, the patient scratches, the vesicula covering the seat of the disease is ruptured, and two or three drops of a reddish serosity issue; the itching ceases for a few hours.

Second period. Formation of a small flexible tumour, hard, circumscribed, flattened, generally of the form and shape of a small lentil; the colour of the skin remains unaltered; only in the centre, and under the first vesicula, it is generally of a lemon yellow tinge, and livid; the itchings increase, and are accompanied by a sense of heat, of erosion, and of burning; then the texture of the skin becomes engorged; its surface appears stretched and shining; the corpus mucosum swells, and forms, around the central point, a sort of areola or circle of various sizes and prominent, sometimes pale, sometimes reddish or livid, sometimes orange coloured, or shaded with different colours; with small vesiculæ, isolated at first, but which afterwards unite, and are filled with a reddish serosity. The central tubercle forming the primitive tumour changes colour, it becomes brownish, very hard, and insensible; it is a gangrenous spot, which suddenly spreads.

Third period. The disease is not limited to the thickness of the skin; but by degrees it reaches the cellular texture: the centre of the tumour becomes harder, deeper, and quite black; the eschar extends by degrees; the areola of the vesicula, which always encircles it, indicates and precedes the progress of mortification. This areola advances, and enlarges by degrees; sometimes it rises, and forms around the primitive nucleus a kind of promi-

nence, which gives it the appearance of being deep, and which forms a second compact tumour, but less hard, and still sensible. There appears at the same time, a considerable swelling, which often extends to some distance, neither inflammatory nor œdematous, but more resembling the erysipelas; it is a sort of elastic throbbing tumour, which produces a sense of strangling, and of stupor in the part; gangrene at the same time is making progress in the cellular substance. If the patient is young and robust, and the treatment methodical, this third period will not last more than four or five days. The progress of the disease is first stopped by degrees, the swelling loses that state of tension and of tumefaction, which characterized the erethism and irritation; the areola of the vesicula assumes a more animated colour; the characters of genuine inflammation may now be traced; the patient feels there a gentle heat, and reiterated throbbings; gangrene is limited by giving rise, after the fall of the eschar, to an abundant suppuration; but, with weak and cachectic subjects, the disease progresses rapidly, and the infection becomes general.

Fourth period. After having successively invaded the corpus mucosum, the skin, and the cellular texture, this alteration becomes general, the pulse concentrated; it is more or less frequent, and unequal; the skin is dry, the tongue acrid and brownish; the heat appears moderate, and, notwithstanding, the patient feels an internal fire which consumes him; he often asks for drink, and nothing can quench his thirst; he is always in a state of dejection; he experiences weakness, cardialgia, continual anxiety; sometimes he complains of acute pains; at others respiration is short, and interrupted; the urine is scarce, thick, and of a brick colour: diarrhæa, colliquative sweats, and hemorrhagies are seldom seen. If the disease does not reach its last term, the patient falls into a state of obscure delirium; the intensity of all the local accidents is increased, the swelling becomes enormous, and he perishes in a state of gangrene, exhaling the most fetid smell.

What has been described in the two preceding pages, relates to the most usual variety, called prominent; but there is another one termed depressed (*déprimée*) which has been particularly well noticed by Dr. Davy la Chevrie, in his inaugural dissertation, Paris,

1807. It begins by an itching somewhat brisk, which lasts several days. The second day, a black spot, similar to the bite of the flea, is observed. The next day regular, and limited phlyctenæ, pain, heat, and a numb feeling in that part of the limb below the eruption; faintings, nausea, and a concentrated pulse. The phlyctenæ burst, and a reddish serosity escapes. A portion of skin that is seen underneath is black, charcoal like, and does not adhere much to the adjoining parts: there is but little swelling. The fifth day pains and faintings often repeated. The sixth, dejection, delirium, local tumefaction, very positive state of gangrene; finally death comes on. This form of the disease is more dangerous than the first.

OF HYDROPHOBIA.

The opinion now most generally admitted is, that hydrophobia is a terrible nervous disease, which may originate spontaneously both with man and beasts, but *which may also be communicated by the bite of an animal whose saliva is morbid.* It is principally under this point of view that it deserves a place in this work. Dr. Girard, of Lyons, has lately attempted to prove, that hydrophobia is never communicated, and that the saliva is not the cause of the phenomena which characterise it, but that they depend upon a local irritation. We cannot admit this hypothesis, because it is not grounded upon any decisive fact. We shall continue therefore to consider this disease, as susceptible of being transmitted by inoculation.

Spontaneous hydrophobia. Horses, mules, asses, oxen, hogs, and more frequently foxes, wolves, cats, and dogs, are seized with this disease without being bitten; man is also liable to being seized in the same mode; finally, it is asserted that cocks and ducks are affected spontaneously with this cruel disease, which they transmit to other animals. The ruminants do not appear to contract the disease otherwise than by inoculation. *Felix Plater* relates the case of a young woman who died of hydrophobia in consequence of a great fright she experienced, in seeing herself abandoned at night by her companions, while she was occupied in washing linen under a bridge. *Doppert* also relates, in the *Annals*

of Breslaw, that several children were seized with hydrophobia, without having been bitten by any animal affected. *Sauvages*, *Trecourt*, *Salius Diversus*, *Lecat*, *Kœhler*, *Lavirotte*, *Laurent*, &c. relate many similar cases.

Causes of Spontaneous hydrophobia. This disease is generally more frequent in burning summers, and severe winters, when animals are in want of water to quench their thirst. It appears, however, to be more common in cold countries than in warm ones. Bad nourishment, hunger, extreme fatigue while exposed to the sun, worms in the stomach, strong passions, fear, affliction, anger, despair, and several preceding diseases, are considered as determining causes of this disease. We are far from believing that all the animals under the influence of these causes are affected with hydrophobia; experience proves the contrary.

There is no essential difference between the symptoms of spontaneous hydrophobia, and those of which we shall treat in the history of hydrophobia by communication. They make their appearance, however, as soon as the cause exists; whereas, in the other variety, their invasion is retarded one or two months, and sometimes more.

Hydrophobia by communication. It is generally communicated by the bite of an animal affected with it. It may, however, be produced by the simple action of licking, or by the contact of the saliva on the lips, or wounds, ulcers, on parts lined with a mucous membrane. The annals of medical science abound with cases of this description; we will insert the following interesting one.

Case.

Surlu, twenty-four years old, was bitten on the 10th May, 1813, by a mad dog, in three different places, on his right heel, which were cauterised an hour after the accident with butter of antimony. Feeling perfectly secure by this operation, he for a month gives himself up to every species of debauchery; and at the expiration of that time time the wounds had entirely healed. All at once this young man loses his gaiety, his motions becomes sudden and rapid; he sits down and rises precipitately, and without

motive ; he sometimes cries, and expresses to his parents the fear he has of becoming mad. The next day he has a repugnance to drinks, and if he carries them to his mouth he rejects them suddenly. The third day from the first invasion, all the symptoms of hydrophobia are manifest, and he is taken to an hospital. The patient, on leaving his father's house, learns that his death is inevitable ; this idea is dreadful to him, and renders him furious. He arrives at the Hotel Dieu, in the same evening. The agitation of this wretched man, which disappeared however while answering questions which interested him ; the expression of his countenance, united to the uneasiness that appeared in all his person, the froth which came from his mouth and which he was constantly spitting, the sense of constriction, of pain in the back part of the throat, and the horror he felt for liquids, were characteristic signs of hydrophobia.

Professor Dupuytren, convinced of the impossibility of stopping the progress of this disease, by the bite of the viper, by the preparations of metallic oxydes, by venesection, baths, &c.: equally convinced of the inefficacy of opium in injections, even exhibited in enormous doses, it being impossible to administer it by the mouth, on account of the horror of liquids ; resolved to introduce it immediately into the venous system. He therefore produced a solution of the gummy extract of opium in distilled water, filled a small syringe (of Anel), and injected carefully into the vena saphæna about two grains of the mucous extract of opium. A moment after, the patient appearing calmer, it suggested to Dr. Dupuytren the idea of doubling the dose of opium : this he performed at about eight in the evening, by introducing into the cephalic vein about four grains of opium. The patient enjoyed during three hours the most perfect calm ; but then he became agitated, and was constantly changing situations : standing upright, kneeling on his bed, looking around him with astonishing rapidity ; sometimes uttering hideous cries, at others, exclaiming on the cruel disease to which he is a prey ; he regrets incessantly not having been able to take a last leave of his family, and especially of his father. It then became impossible to occupy his imagination ; the rest of the night was passed in a state of extreme agitation. The

next day, fourth since the invasion of the disease, Dr. Dupuytren saw him at about five in the morning, and found him in such an uncommon state of dejection, that he did not think he could live two hours longer. The attending matron indeed, under the persuasion that he had expired, had covered him with his sheet. At about eight o'clock, however, the patient recovers his senses; and is still occupied about his father. The agitation soon returns, he spits incessantly, desires to have the windows shut, not to let the current of air come upon him, and also that the curtains of his bed should not be touched. His imagination is occupied by questions, in which he feels interested: he answers them very well, and sometimes with gaiety. He allows a repetition of the injections, under the express condition that his father shall be sent for. An ounce of distilled water, holding in solution from 6 to 8 grains of extract of opium, is introduced into the circulation. Half an hour afterwards, Dr. Dupuytren returns to see him, and finds him in the same situation as he was the day before, and the same day; the mouth half open and filled with frothy saliva, the eyes fixed, the head inclining slightly backwards, without any motion of tetanus; respiration short, pulse scarcely sensible, finally he expired a few minutes after.

On the 19th of June, between the last injection and the death of the patient, Drs. Majendie and Breschet took some of the saliva, on a piece of linen, and inoculated near the bed two hearty dogs. One of them became mad on the 27th July, and bit two others, one of which had also caught the infection on the 26th August.

Drs. Enaux and Chaussier have seen a man attacked with this disorder, after having received on his lip some of the saliva of a mad dog.

Symptoms of Hydrophobia by communication. The symptoms of this cruel disease have been well described by Drs. Enaux and Chaussier.

As the wound is the focus of the poison, it is always there that the accident begins. If it be healed, the cicatrix becomes red, bluish, sometimes opens, and a reddish serosity oozes out; if it be still open, the edges spread over, the flesh swells, assumes a deeper colour than it ought to have, and gives passage to a serous and reddish pus: sleep is uneasy, agitated, troubled with subsultus,

and frightful dreams; the patient is overcome, heavy, plunged into a deep melancholy for which he can find no cause, and from which nothing can deliver him. Now and then he feels heat, a tremor which extends from the wound to the whole body, and appears to stop at the chest and throat; the pulse is often hard, small, and tight. This state is the first degree of the disease, and lasts four or five days. In the second, all the accidents increase, the pulse is frequent, and indicates an irregular nervous fever, destroying the principle of life: the patient experiences a painful constriction of the chest, of the throat; respiration becomes difficult, interrupted by involuntary sighing, now and then convulsions, produced by the slightest cause, make their appearance; he loses his senses, becomes furious, does not know those who surround them, and tries to bite them*. He is irritated by every thing; gay colours, strong light, sharp sounds, sometimes the single agitation of the air renews his paroxysms; although devoured by internal heat and ardent thirst, he dares not drink; the sight, the very idea of water are sufficient to make him shiver; the eye is vacant, fixed, sparkling, and appears inflamed, the voice is hoarse, the mouth filled with a frothy saliva, all indicate fury and characterise hydrophobia. At one time preserving his judgment, mild, and peaceable, he feels his misfortune, expects the paroxysms, warns his friends of them; but almost always the sight of water causes a secret horror, which his reason cannot overcome. Pains and vomitings aggravate his sufferings; the pulse becomes unequal, intermittent; a cold sweat covers the body, and death ends this scene of horror. This state never lasts more than three or four days.

This disease generally makes its invasion, before the ninth day on oxen, and dogs; sometimes after. In men the disease only appears at the end of thirty or forty days; there are instances however, of a more rapid invasion, and others again, wherein it only made its appearance after several months.

* This sign is far from being a constant attendant upon men affected with hydrophobia; we have seen eight persons affected, who gave no signs of this inclination. Dr. Dupuytren believes it is in the nature and disposition of the dog to bite, but not so in man.

LESIONS OF TEXTURE OBSERVED AFTER THE DEATH OF ANIMALS BY HYDROPHOBIA.

We have seen four cases in which no visible alteration could be discovered, and professor Dupuytren relates, in his lectures, ten different openings with similar results. Sometimes the mucous membrane of one or of several parts of the digestive canal, was found inflamed and even mortified.

Drs. Dupuytren, Majendie, and Breschet, who have made experiments upon mad dogs, have often observed, after death, inflammation in the internal membrane of the stomach. A sufficient quantity of worms has sometimes been met with, in the intestinal canal, to induce authors to believe that they were the cause of hydrophobia, which consequently was not a particular disease. In other cases the membranes of the brain, and of the medulla spinalis, were affected with phlogosis ; the brain dried up with or without effusion. The lungs have also been found to adhere to their coverings, gorged with black blood, thick, and dried up, the heart pale and void of blood.

TREATMENT OF POISONING BY THE POISONOUS ANIMALS.

Poisonous snakes. The number of remedies which have been considered specifics against the bite of poisonous serpents, has been much exaggerated. We shall examine successively those which are worthy of consideration.

1st. *Of the Guaco.* M. M. *de Humboldt* and *Bonpland* have given the first good description of this plant. The *guaco* grows in the plains of the valley of the *Rio de la Magdelena*, *Rio Cauca*, *Choco*, of *Barbacoas* (Kingdom of N. G.). These travellers have also seen it, however, in the temperate region of *Tuffagafuga*, at an elevation of 5640 feet. The *mikania guaco* has often been confounded with the *ayapana* of Brasil.

Don Pedro Fermin de Vargas, magistrate of the village of Zipaquira, travelled to *Mariquita*, in the year 1788, to ascertain the surprising effects of the guaco against the bite of the American serpents. The account he published furnishes us with the following results. A negro brought one of the poisonous snakes

known there under the name of *taya-equiz*. Vargas took one or two spoonfuls of the juice of the guaco; and having caused six incisions to be made on himself, namely, one on each foot between the toes, another between the index and thumb of each hand, and finally, two others on the sides of the chest; a little of the juice was inoculated into the wounds, and as the blood came out, more of the juice was dropped into the wound, which was also rubbed with the leaf of the plant. He then, at three different times, took in his hands the poisonous snake, which appeared a little uneasy, but showed no inclination to bite. Several other persons who were present repeated the same experiment, with similar results, except *Don Francisco Matiz*, who was bitten on his right hand, because the reptile had got angry; but the negro who had remained present, wiped the blood off, and rubbed the wound with leaves of the guaco; Matiz breakfasted as usual, and nothing occurred.

The negroes are in the habit of continuing the use of this plant every month, during three or four days, so as to run no risk in handling these reptiles. *Vargas* considers this custom as useless, and thinks, that it is sufficient to rub the hands with the plant before touching the animals; for he believes, that the disagreeable smell is alone sufficient to torment and make the animal fall asleep. M. de Humboldt is of opinion, that the inoculation of the guaco gives to the cutaneous perspiration a certain modification, which the animal is afraid to encounter. He doubts the efficacy of leaves merely carried about the individual; the natives assert that he must be inoculated. When the bite has taken place, the leaves of the guaco must be bruised and mixed with saliva, and then applied to the wound. The juice of the plant must be taken internally at the same time.

2d. *Arsenite of potash, and arsenious acid.* These two substances have both been used with great success, as antidotes to the bite of the poisonous serpents. The second volume of the Medico-chirurgical Transactions of London, contains several cases in support of this opinion.

CASE.

Jacob Course, a private in the York regiment, was bitten on his left hand by a serpent that was taken for the *coluber carinatus* of L. The middle finger was so much lacerated that it appeared necessary to amputate it, immediately at its junction with the bones of the metacarpus. Ten minutes after the wound, this man was in a state of stupor and insensibility. His hand, arm, and breast, on that side, were much swelled, and of a black purple and livid colour; he was vomiting, and appeared to have taken a strong dose of poison; the pulse was hard and active; he scarcely perceived the operation. The wound being dressed the patient was put to bed, and purgative injections and the following preparation were prescribed. *Arsenical liquor** 2 *drachms*, *tincture of opium* 10 *drops*, *peppermint water one ounce and a half. Half an ounce of lime juice* was added to the preparation, which was swallowed during the slight effervescence this mixture produces. He kept it down very well, and it was repeated every half hour during four successive hours. In the mean time, the wounded parts were frequently anointed with the following liniment: *oil of turpentine, and liquid ammonia, half an ounce each; oil of olives, an ounce and a half.* The purgative injection was repeated twice before it produced any effect. The arsenical potion was then discontinued. He had already recovered his feeling, and his other faculties gradually returned; he then took some food, and slept several hours. The next day he was very weak and fatigued. The fomentations and the liniment were continued. The swelling was disappearing, by degrees and the skin resumed its natural tinge. A few days attention to the state of the bowels, and proper dressings to his wound, soon restored him to perfect health.

A soldier of the 63d regiment, was bitten on his finger by a small serpent of Martinico; the mode of treatment we have just indicated, was used with complete success; and the patient recovered in a few days.

* This liquor is the arsenite of potash; 2 drachms contain a grain of arsenic and as much potash.

Russel, in his work on the serpents of India, relates experiments which he made with arsenious acid, with the intention of combating the accidents produced by the bite of poisonous serpents. But his results are insufficient to fix our ideas on this subject. It will not, however, be amiss to relate two of them.

Experiment 1st. A small dog was made to swallow a pill of *tanjore*,* immediately after he was bitten by a *cobra de capello*, and one half of another pill dissolved was applied to the wound. The animal for the ten following minutes was in a profuse salivation. About an hour after, he began to whine, lie down, and had some slight convulsions. A second pill increased also the secretion of saliva. Four hours after he was perfectly recovered.

Experiment 2nd. A chicken swallowed the half of one of these pills; ten minutes after he was bitten by the same *cobra de capello*. The animal soon died. Another chicken experienced the same fate; but the ingestion of the pill appeared to retard death.

3d. *Ammonia and eau de luce*. These two liquids have been considered for a long time as specifics against the bite of the poisonous serpents. *Bernard de Jussieu*, in 1747, cured with this remedy a young man who had been bitten by a viper in three places: on the thumb, index of the right hand, and on the thumb of the left hand. Several authors have related similar facts. But *Fontana* is of opinion from numerous experiments, that these preparations used internally and externally, are more hurtful than useful. Mr. Home also combats the opinion that ammonia and eau de luce are specifics against the bite of serpents. We coincide perfectly with this celebrated surgeon; but we think that the prudent administration of volatile alkali cannot be injurious, nay, we think that it may become very useful in exciting perspiration†.

* An Indian preparation, in high repute for the cure of the bite of poisonous animals. *Russel* does not inform us of its composition; but states that arsenious acid forms its basis; and that six grains contain a little less than three quarters of a grain of arsenious acid.

† One of the last numbers of the Journal General de Médecine for 1816 contains the extract of a memoir by Dr. Mangili, professor of Natural History

Caustics. The utility of the prompt application of a caustic, upon the wound of a poisonous serpent is universally acknowledged. *Fontana* has concluded from his experiments, that caustic potash was a specific against the bite of the viper, but Russel's experiments with the serpents of India induce the belief that this substance is not constantly attended with success, especially when employed fifteen or twenty minutes after the accident. He further states that caustics have often proved useless, even when employed at the distance of four, six, eight, twelve, or fifteen minutes after the bite had been made. Whenever they were resorted to at a later period they were constantly useless.

Oil of olives. Hunault and Geoffroi have demonstrated that the oil of olives was not a specific against the bite of the viper. They have however found, that fomentations with fat substances were useful.

According to Fontana, acids, cantharides, theriaca, the fat of the viper, leeches, and succin so much used by the Psylli and Marsi, do not, in any way, counteract the dangerous effects of the viper's poison. Scarifications are more injurious than useful. Warm bathing diminishes the dangers, which cease by the early amputation of the wounded part. Finally, ligatures sometimes repel the accidents.

We will now show the course, which the physician in a case of this nature ought to pursue. This course will no doubt be modified, by a due regard to the effects of the *guaco*, and arsenious acid.

A ligature should be made immediately above the wounded part; this ligature ought not to be too tight nor applied during too long a time, for it might produce gangrene. The wound is to be cauterised with a red iron, the lapis infernalis, or the butter of

in the university of Pavia; relating some experiments on the poison of the viper, and on opium, musk, and ammonia, considered as antidotes to this poison. He infers from his experience that ammonia alone is a specific remedy against the bite of the viper; and supports his assertion in relating his own case, and subsequent trials. In performing some experiments relating to his chair in the university, he was accidently bitten by a viper; and to the proper administration of the ammonia, he ascribes his recovery. J. G. N.

antimony, and care will be taken, lest too many incisions be made, which often aggravate the accidents. It will be proper to apply to the swollen parts linens, dipped in a mixture made with one part of ammonia and two of oil. When the swelling becomes too intense, and the ligature cannot be borne, it is to be removed, for the object, for which it was placed, that of preventing the circulation of the blood, is then attained. The internal treatment consists of the means of favouring perspiration and sleep. With that intention, the patient will take every two hours a glass of the infusion of orange or elder flowers, containing two, six, ten, or twelve drops of liquid ammonia ; or even more if the patient is robust. Exciting drinks, and antispasmodics, such as madeira wine, old wines, and potions of ether, have often proved useful. The patient is to be kept in a bed well covered, and when he perspires, care must be taken to prevent his being exposed to cold air.

If spasms, jaundice, bilious vomitings appeared, it would be proper to give ipecacuanha or the antimoniated tartrate of potash. Finally, in case mortification should make rapid progress, recourse should be had to powerful antiseptics.

Scorpion. The remedies to be resorted to, in cases of sting from the scorpion, are the volatile alkali, both internally and externally, the plants of the family of the cruciferæ ; mild and emollient tonics, and oily applications.

Spiders. In cases of this kind, the wounded part is to be washed with brine ; theriaca is to be applied, and one or two doses to be taken internally. Applications of vinegar may also be useful.

Tarantula. The local means of combating inflammation and tumefaction, must be used ; and as the charms of music have been so much extolled in the cure of what is called *tarentisme*, and as it cannot be productive of any bad consequences, it may also be resorted to.

Bee and Drone. If the physician was called for a case of this kind, he must follow the advice of *Swammerdam*, which consists of the extraction of the dart sunk in the flesh, taking great care not to press too hard on the wound ; because the poison of the vesicula would be forced deeper into the wound. This extraction

may be difficult, and therefore may require that all the outside of the wound, should be be carried away with scissors ; the dart may then be taken out. *Dioscoride* advises, that the wound should then be washed with salt or sea water. Some anodyne application on the wound, will also be very useful afterwards. The embrocations of oil, lead water, and wine may also be very serviceable.

Wasp and Hornet. The treatment is exactly the same as that above described.

Poisonous fishes and muscles. The physician called in to cases of this nature, will find it advisable to administer an emetic, a purgative, or an emeto-cathartic, according to the time that has elapsed, since the deleterious substance has been swallowed. By these means he will procure its expulsion, without which the symptoms would become more intense, and might terminate in death. The patient is then to take pieces of sugar with from ten to twenty-five drops of ether upon them ; a few spoonfuls of some antispasmodic julep, and for usual drink, vinegar and water. In cases where symptoms of inflammation in the abdomen should make their appearance, the antiphlogistic system must be pursued. Such are the precepts suggested by experience as far as it has reached us. It is to be hoped that learned travellers through the countries where the cases are most frequent, will attempt to determine the nature of the poison of these animals ; as well as the mode of opposing their effects.

Malignant pustula. We have distinguished, in the description of this disease, four periods, when the disease is left to pursue its own course ; but by means of a methodical treatment, the accidents may be foreseen ; and they may be dissipated if they are already developed. This treatment consists in determining an inflammation of a good kind, limiting the progress of mortification, and facilitating the separation of the eschar: these ends may be obtained by means of incisions and caustics. Incisions, according to Mesrs. *Chaussier* and *Enaux*, open the way for caustics, and these concentrate in the eschar, the septic poison, producing at the same time inflammation and suppuration. Extirpation performed in the living parts, as well as deep inci-

sions, are cruel and dangerous methods. Caustics, so efficacious in the first periods, are of little service in the last; when the disease is accompanied with mortification, the use of tonics capable of renovating the parts, remedying the putrid dissolutions, and giving more consistence to the eschar, is then to be insisted on. Bark united with camphor, answers these purposes. The internal remedies chosen from the class of tonics and antiseptics, become absolutely necessary in the fourth period of the disease. Relaxing tonics, as well as bleeding, purgatives, and all the other means which contribute to weaken the organic action, are injurious in every case; they dispose the parts to mortify, render suppuration more laborious, and the cure more difficult.

Animals affected with hydrophobia. The first question which presents itself is to know, whether animals affected with hydrophobia, whether spontaneous or by communication, fully developed, can be cured. Several authors answer in the affirmative, and relate cases in support of their assertion.

M. Nilloughby speaks of a child, who became affected with the disease, forty-eight hours after being bitten by a dog. An excessive dose of calomel was administered, and he was cured.

M. Schoolbred a surgeon of Calcutta, affirms having cured, by copious bleedings, a servant twenty-five years old, who presented all the characteristic symptoms of hydrophobia, seventeen days after having been bitten by a mad dog.

Mead, *Boerhaave*, *Rutherford*, and some other practitioners, were also of the opinion, that bleeding might be very useful in this disease.

The recent experiments of *Drs. Dupuytren*, *Majendie*, and *Breschet*, on mad dogs, are far from confirming the results obtained by the authors of the preceding observations; they have used venesection until it produced fainting, without the least success. Nevertheless, it would be incautious to reject bleeding until some further proofs of its inefficacy are obtained.

Opium exhibited in various modes has also been extolled. We have seen Dr. Dupuytren use it here, without the least advantage, whether administered in injections or introduced into the veins. The experiments made upon mad dogs by the authors above quo-

ted, confirm these results; they merely observed, that animals in this disease required a much larger dose of this medicine to act upon them, than when in health.

Dr. Alibert relates the case of an individual, who was cured by galvanism.

These facts lead us to conclude, that in the actual state of science, we know no medicine which can constantly cure hydrophobia when it is well ascertained; and consequently that it is indispensable to cauterise the wound with a hot iron in order to stop its progress. The good effects of this practice will depend upon the time at which it is done.—If delayed too long they will be null.

SECTION II.

OF POISONING GENERALLY.

CHAPTER I.

OF THE PROPER MEANS OF ASCERTAINING WHETHER AN INDIVIDUAL HAS BEEN POISONED.

ARTICLE I.

OF THE DISEASES WHICH MAY BE MISTAKEN FOR ACUTE POISONING.

In tracing the history of the different poisons, we have observed, that they all participate of one common character, that of giving rise to a series of symptoms, more or less serious, a short time after their arrival in the stomach, or their application to an excoriated surface. There are, on the other hand, a number of spontaneous diseases, which, by their invasion and symptoms, are similar to poisoning. It follows, therefore, that ignorance, interest, or guilt, may blend, or cause to be confounded, these spontaneous diseases with the true poisoning, endangering thereby the safety, and even the existence of the most respectable members of society. We have often seen, in our time, lawsuits resulting from

such errors, frequently grounded on the professional relations of men who are honoured with the title of Doctor. These self-styled physicians, require nothing more than a sudden death, preceded by vomitings, colics, &c. to pronounce it a case of poisoning. How different is the course of the wise and well informed physician! Instructed by a numerous series of cases, and by the works of the great masters of the art, he observes attentively the phenomena of the disease before him ; he compares its nature and progress with all those which are spontaneously produced in this or that other season ; he takes into consideration the age of the individual, his constitution, the climate he inhabits, the affections to which he may be liable, and the passions which influence him. To these scrupulous inquiries he unites the regular inspection of every organ ; he describes with precision the change of form, size, and texture ; he collects the matters which may be left in the digestive canal, studies with care their physical properties, determines their composition by numerous chemical operations, and thus supported by morbid anatomy, physiology, and chemistry, he arrives at forming impartial conclusions, calculated to present truth in its full light, and to form grounds of judgments for magistrates to pronounce.

The preceding observations will suffice to show the importance of discriminating between poisoning and other affections. The spontaneous diseases which may be confounded with poisoning, are *indigestion*, *cholera morbus*, *black vomitings*, *black diarrhœa*, *putrid fever*, &c.

Indigestion. It often happens that individuals in perfect health experience, a short time after their meals, an irritation in the stomach and small intestines, colics, nausea, and vomitings of matters of different colours, sometimes greenish ; and spasmodic constrictions ; these phenomena are observed more especially in weak persons, who are subject to pains in the stomach.

M. Alexander Gérard relates the case of a young man, who had taken in the morning a glass of wine, and a few ounces of bread, and who was seized, at about four in the afternoon, with an exceedingly acute pain in the region of the stomach. Medicines became useless, and the patient expired twelve hours af-

ter the invasion of the disease. On opening the body, the stomach was found to contain, at its small curvature, about an inch from the pylorus, an opening of one-eighth of an inch in diameter: this hole, which was surrounded by a red narrow circle, gave passage to the liquids of the stomach into the abdomen.

The observations of *Bonet*, *Morgagni*, *Lieutaud*, *William Hunter*, *Lecat*, *Chaussier*, *&c.*, attest, beyond the possibility of doubt, that these eschars and perforations may be suddenly formed, and occasion death in a very few hours; and that they solely depend upon an internal cause.

Cholera Morbus. Individuals of a bilious temperament are sometimes suddenly affected with a series of accidents, more or less serious, which may be terminated by death. These accidents are, almost continual vomitings of matters of a different appearance, generally bilious, and of a green, blue, or purple colour; excruciating abdominal pains, especially in the right hypochondria, or in the hypogastric region, often accompanied by a retraction of the abdomen; bilious and abundant alvine dejections, acid eructations, continual hiccup, convulsions, vertigoes, delirium, spasms in the limbs, and particularly through the tendons; the lineaments of the face are decomposed, there is a general prostration of strength, the pulse is small, accelerated, sometimes almost imperceptible, perspiration is suppressed, or cold sweats occur; the internal heat is burning, and the extremities cold, the urine is muddy and scarce. After death, the gall-bladder, and the ductus communis choledochus, are distended; sometimes, however, they are quite empty; the duodenum and pylorus are often gangrenous, the veins of the stomach are in a state of turgidity; this viscus as well as the liver are sometimes inflamed; but neither inflammation nor gangrene ever attack simultaneously the whole extent of the intestinal canal.

The progress of this disease is generally rapid; it often terminates in a few hours, but sometimes continues for several days. Either the patient recovers at once, or gangrene of the intestines causes death.

Of black vomiting and diarrhœa. Our only object is to establish, that in some cases the black vomitings, attended by some

other symptoms, may be confounded with those of poisoning. We conceive it is out of our limits to state the differences between *hematemesis*, *intestinal hemorrhages*, *and melæna;* the vomitings only will occupy the attention of the physician in this case.

Putrid fever. A recurrence to the mode of action of some of the poisons on animal economy, will be sufficient to convince the practitioner, that the symptoms of putrid fever may resemble those of poisoning: this case requires much care and attention.

We will now attempt to lay down such precepts, as the physician ought to have present to his mind, when he is about to form his opinion.

1st. The diseases which are prevalent, and the season of the year, are to occupy his attention; for cholera morbus, for instance, prevails usually about the latter part of summer and even in autumn.

2nd. He will inform himself of the habits, and preceding mode of living of the individual; he will, especially, ascertain whether he was a valetudinarian, whether he had been afflicted with any disease improperly treated, or whether he did not labour under some hidden affection (as is frequently the case).

3rd. When the accidents are caused by some internal disease, they are seldom unaccompanied by fever: the physician will therefore ascertain whether there be any fever; because, in cases of poisoning, fever is frequently not to be perceived, at least during the first moments of their action.

If the diseases we have just enumerated, have presented many points of resemblance with those produced by certain poisons, there are many others which do not present any analogy, and which ignorant pretenders endeavour to confound with poisoning. These are principally polypi, aneurisms, internal abscesses, congestions of blood in one of the principal visceræ, angina pectoris, internal hœmorrhages, the rupture of certain organs, &c. Death sometimes occurs suddenly in these cases. The practitioner, called upon to pronounce upon the true cause of death, in a case of this description, will be at no loss to ascertain that it does not depend upon the action of a poisonous substance: 1st, because death is never preceded, in such cases, by the symptoms to which poi-

sonous substances give rise ; 2nd, because on opening the body he will discover grave lesions produced by the diseases we have just enumerated, and which are never the result of the action of a poisonous substance. It must be observed, however, that in cases where death is caused by some strong passion, such as excess of pain or of pleasure, no particular alteration will be found ; but the history of the case, and the absence of the symptoms which characterize poisoning, would be sufficient to enable the physician to form his opinion.

ARTICLE THE SECOND.

OF THE COURSE TO BE PURSUED TO DISCOVER THE NATURE OF THE SUBSTANCE WHICH HAS CAUSED POISONING.

In examining each particular poison, we have endeavoured to exhibit their physical and chemical properties, in such a manner as to facilitate the distinction of one from the other. In the mineral kingdom, chemistry enables us to trace this distinction with great precision, but it is only by physical properties that we can distinguish vegetable substances ; submitted to chemical analysis, they have almost uniformly produced the same results.

We think, therefore, that stating under one head the course which the physician may pursue, in a case where he can obtain no satisfactory information, will be found advantageous to practitioners.

FIRST PROBLEM.

To find out the nature of the poisonous substance with which poisoning has been effected; when the whole has not been swallowed, and the residue can be procured.

To resolve this problem, may require the aid of three different classes of means : 1st, those which constitute *analysis*, and which appertain to chemistry ; 2nd, those furnished by pathology, and

the principal object of which are *the symptoms;* 3rd, those which belong to morbid anatomy, the object of which is to consider the healthy or diseased state of the organs.

1.—CHEMICAL ANALYSIS.

Among the numerous poisons which will become the subjects of our investigations, some are under a solid and others under a liquid form, and others, finally, are in a state of gas.

Solid poisons. The first question to be examined, is whether the poison belongs to the organized or unorganized bodies. With this view, a small quantity of the substance is to be put upon a red hot iron; if it is an organized substance, a decomposition will ensue, and the smoke it gives rise to, will be analogous to that of burnt sugar, vinegar, or that of burnt horn; and it will leave a residue of charcoal; others, being a mixture of vegetable and mineral substances, will leave their residuum, such as lead, and other metals. The unorganized bodies, placed in the same situation, will present various phenomena; some are volatilised, with a smoke of a peculiar odour, different from those we have mentioned; but the greatest part of them undergo no alteration whatever, and none of them leaves charcoal as a residue.

If it be ascertained that the poison belongs to the organised substances, the next question to be examined is, whether it be a vegetable or an animal body. Vegetable substances generally produce a smell similar to that of burnt sugar, but the smell peculiar to burnt horn, which animal substances generally give, is not as positive.

When an organized substance, upon which this first trial has been made, diffuses a smell of burnt sugar, and appears in the form of a powder, or of crystals of a white or blueish colour, the chemist will ascertain whether it be emetic, oxalic acid, tartaric acid, acetate of lead, acetate of copper, or verdegris. These are the most common poisonous vegetable substances, and those which can be distinguished by the re-agents. A small portion of this substance will therefore be dissolved in distilled water, and sulphuric acid poured upon the solution.

This acid precipitates	*This acid does not precipitate*
Emetic	Oxalic acid
Acetate of lead	Tartaric acid
	The solutions of acetate of copper and verdegris.

If the sulphuric acid creates a precipitate; a soluble hydro-sulphate is to be poured upon another portion of the solution; emetic will be precipitated, of a red orange colour+, and the acetate of lead of a black colour+.*

In case the sulphuric acid should furnish no precipitate, a few drops of ammonia ought to be added to the liquid, which would precipitate the solution of copper of a blue tinge+, whereas it would produce no such effect with the solutions of tartaric or oxalic acids.

The following characteristics would serve to distinguish the oxalic from the tartaric acid.

1st. It leaves very little charcoal, when exposed on a metallic plate heated red hot; the tartaric acid on the contrary, leaves a great deal.

2d. The oxalic acid decomposes the solution of sulphate of lime, with which it forms a white precipitate; the tartaric acid does not trouble this salt.

When it has once been ascertained, that the matter to be acted upon is not an organized body, a portion of it should be dissolved in distilled water, which is to be boiled for a quarter of an hour, if the solution had not been performed while cold. As a general rule, we consider it advisable to use as little water as possible, in order to have solutions as concentrated as possible.

* We make use of this sign + to designate that the presence of the poison is ascertained, and consequently, that it will not again be considered here. But supposing the existence of lead proved by this trial; it is the duty of the physician, to place this beyond any doubt, by having recourse to the re-agents enumerated at the article *Lead*.

Substances wholly or partly soluble in water.	*Insoluble substances.*
1 Corrosive sublimate	1 Red precipitate, or oxyde of mercury
2 Arsenious acid	2 Black oxyde of mercury
3 Muriate of antimony	3 Turbith mineral
4 Sulphate, muriate, and nitrate of copper	4 Red and yellow sulphurets of mercury
5 Muriate of tin	5 Peroxyde of antimony
6 Sulphate of zinc	6 Kermes, golden sulphur
7 Nitrate of silver crystallized and lapis infernalis	7 Peroxyde of tin
8 Muriate of gold	8 Oxyde of zinc
9 Nitrate of bismuth	9 Sub-nitrate of bismuth (blanc de fard)
10 Potash, sub-carbonate of potash	10 Carbonate of barytes
11 Soda, sub-carbonate of Soda	11 Carbonate of lead
12 Sub-carbonate of ammonia	12 Cinnabar
13 Barytes, muriate and nitrate of barytes	
14 Lime	
15 Nitrate of lead	
16 Nitrate of potash	
17 Sulphate of iron	
18 Muriate of ammonia	
19 Sulphuret of potash*	

Having now determined the degree of solubility of the substance, the liquid will be filtered with care, and a small portion of it poured into an experiment glass; a few drops of hydro-sulphate of ammonia, potash, or soda, will form precipitates with some of these solutions.

* The muriate of antimony, one species of the muriate of tin, and the nitrate of bismuth, do not entirely dissolve. The arsenious acid does not easily dissolve, and requires more liquid and more boiling than the others.

Solutions which are precipitated by the hydro-sulphates.	*Solutions which are not precipitated by the hydro-sulphates.*
Corrosive sublimate—of a black colour	Arsenious acid
Muriate of antimony—of an orange or red colour	Potash ; sub-carbonate of potash
Soluble salts of copper—of a black colour	Soda ; sub-carbonate of soda
Muriate of tin—of a black, chocolate, or red colour	Sub-carbonate of ammonia
Sulphate of zinc—of a white, yellowish, or deep brown colour	Barytes, muriate and nitrate of barytes
Nitrate of silver and lapis infernalis—of a darkish brown colour	Zinc
Muriate of gold—of a deep chocolate colour	Nitrate of potash
Nitrate of bismuth—of a black colour	Muriate of ammonia
Nitrate of lead—of a black colour	Sulphuret of potash
Sulphate of iron—of a darkish green colour	

It is now ascertained that the solution forms a precipitate with the hydro-sulphates; this precipitate is to be carefully laid by. Another portion of the solution is to be poured into another experiment glass, to which will be added caustic potash, purified by alcohol, and dissolved in distilled water.

Solutions forming white precipitates with caustic potash.	*Solutions forming coloured precipitates with potash ; or which do not form precipitates at the usual temperature.*
Muriate of antimony	Corrosive sublimate of a yellow citron colour+
Muriate of tin	Salts of copper of a blue colour+
Sulphate of zinc	Nitrate of silver of a dark brown colour+
Nitrate of bismuth	Muriate of gold; no precipitate while cold+
Nitrate of lead	Sulphate of iron, either of a green or red colour+

Among the solutions which are precipitated of a white colour, by potash purified by alcohol, there is one which may be decomposed by muriatic acid: a portion of the solution is therefore to be poured into another glass, and mixed with a small quantity of this acid.

Solutions which are precipitated by muriatic acid.	*Solutions not precipitated.*
Nitrate of lead+	Muriate of antimony
	Muriate of tin
	Sulphate of zinc
	Nitrate of bismuth

Those solutions which do not form precipitates with the muriatic acid, are next to be treated by distilled water.

Solutions forming white precipitates with distilled water, or which assume a milky appearance.	*Solutions which are not altered.*
Muriate of antimony	Muriate of tin
Nitrate of bismuth	Sulphate of zinc

Among the solutions which have been precipitated, that which forms a black precipitate with the hydro-sulphates, is the salt of bismuth+; that which forms an orange reddish precipitate is the muriate of antimony+.

If the solution has not been changed by water, the oxyde is to be separated by potash, then washed and heated with nitric acid; if the oxyde dissolves in this acid, we may conclude that it did not belong to a salt of tin+; if it does dissolve, it will be a reason to believe that it belonged to a salt of zinc+; to be convinced of this, the poison is to be examined as described at the article *sulphate of zinc*.

We must now recur to the solutions which have not formed precipitates with the hydro-sulphates; we see that some of them turn the syrup of violets green; which may be ascertained by using another portion of the original solution.

Solutions which turn the syrup of violets green.	*Solutions which do not turn it green.*
Potash, subcarbonate of potash	Arsenious acid
Soda, subcarbonate of soda	Muriate and nitrate of barytes
Subcarbonate of ammonia	Nitrate of potash
Barytes	Muriate of ammonia
Lime	

The subcarbonate of ammonia is among the solutions which turn the syrup of violets green ; but this may be easily distinguished, by the pungent smell of volatile alkali. The others are to be divided into two sections, by the solution of subcarbonate of potash, which will precipitate two of them.

Solutions which are precipitated by the subcarbonate of potash.	*Solutions which are not precipitated by this re-agent.*
Barytes	Potash, subcarbonate
Lime	Soda, subcarbonate

If the solution is precipitated by the subcarbonate of potash, sulphuric acid is to be poured upon another portion of the original solution of the poison.

Barytes will be precipitated+. Lime will not be+.

If the subcarbonate of potash has not created any precipitate; muriate of platina is to be added to a new portion of the first solution, which will precipitate the potash and subcarbonate of potash of a citron yellow colour+, but which will precipitate neither the soda, nor the subcarbonate of soda+.

Supposing the solution has not been turned green by the syrup of violets, it is to be treated by lime water or by the hydro-sulphuric water.

These re-agents precipitate	*These re-agents do not precipitate*
Arsenious acid, of a white, and of a yellow colour+	The muriate nor the nitrate of barytes
	The nitrate of potash
	The muriate of ammonia

If the solution presents no precipitate ; subcarbonate of ammonia is to be added to another portion of the first solution.

This re-agent precipitates	*This re-agent does not precipitate*
The soluble salts of barytes	The nitrate of potash
	The muriate of ammonia

To distinguish the nitrate of potash from the muriate of ammonia, a portion of pulverised quicklime is to be added; the first of these salts will undergo no alteration+ ; the muriate of ammonia will be decomposed, and will emit the peculiar smell of ammonia+.

Let us now suppose that the poisonous substance did not dissolve in distilled water ; its colour will then occupy our attention.

Poisonous, solid, and insoluble substances of a white colour.	*Poisonous, solid, and soluble substances of various colours.*
Peroxyde of antimony	Red precipitate or red oxyde of mercury
Peroxyde of tin	Black oxyde of mercury
Oxyde of zinc	Yellow turbith mineral
Subnitrate of bismuth	Yellow and red sulphurets of arsenic
Carbonate of barytes	Brown, red kermes
Carbonate of lead	Golden sulphur
	Cinnabar

If it is a white substance, a portion should be put in contact with pure nitric acid ;

Substances soluble in pure nitric acid.		*Substances insoluble in pure nitric acid.*
Oxyde of zinc	without effervesence	Peroxyde of tin
Subnitrate of bismuth		Peroxyde of antimony
Carbonate of barytes	with effervesence	
Carbonate of lead		

If the solution in nitric acid has been made without effervescence, a little distilled water is to be poured upon it : that of the nitrate of bismuth will produce a white precipitate+ ; that of the nitrate of zinc will undergo no alteration +. In case efferves-

cence had occurred during the solution ; it is to be brought in contact with pure ammonia ; the solution of lead will form a white precipitate +, that of barytes would continue transparent +. Besides, we think it necessary to repeat that the precepts that are here inculcated can only be considered as indications : it will be necessary to ascertain whether these different fluids possess the other properties which their chemical histories will enumerate.

If the white solid substance should be insoluble in nitric acid, it should be dissolved in muriatic acid : the peroxyde of tin would furnish a muriate which would not be precipitated by distilled water, whereas the solution of peroxyde of antimony would form with this liquid a very abundant white precipitate+.

Let us now suppose that the poisonous solid substance insoluble in water, should be coloured ; it must be ascertained whether it be of a red colour.

Red Substances.	*Different coloured substances.*
Red oxyde of mercury	Black oxyde of mercury
Cinnabar	Yellow turbith mineral
Red sulphate of arsenic	Yellow sulphate of arsenic
Brown red kermes	Golden sulphur

Two of these red substances do not dissolve in the hydrochloric (muriatic) acid.

Red substances soluble in hydrochloric acid.	*Red substances that are insoluble.*
Red oxyde of mercury	Cinnabar
Brown red kermes	Red sulphate of arsenic

The red oxyde of mercury will dissolve entirely and rapidly at a cold temperature ; and the solution will not be affected by distilled water+. Only part of the kermes dissolves rapidly ; it emits the smell of rotten eggs ; and the solution forms with water, a white or a yellow orange coloured precipitate, according to the manner in which it has been made+. If it was necessary to distinguish cinnabar from the red sulphuret of arsenic, or the other two red powders ; the dry powder must be heated with solid caustic potash, in a small glass tube : cinnabar will produce

globular mercury+, and the sulphuret of arsenic will form metallic arsenic.

If the substance is not coloured red, or if it is black; there is strong reason to believe, that it is the black oxyde of mercury; this may be ascertained by pouring upon it hydro-chloric acid, which will not dissolve it, but will combine and transform it into calomel. If it should be of a yellow or of a yellow orange colour, it might be turbith, golden sulphur, or yellow sulphuret of arsenic; then by heating it till it becomes red, for a few minutes in a small glass tube, turbith would produce metallic mercury +; the others would not be decomposed; but by treating them with the hydro-chloric acid, the sulphuret of arsenic would remain undissolved, while the golden sulphur would form soluble muriate of antimony, precipitated by water.

Liquid or dissolved poisons. In this case as in that of the solid poisons, the first question to be resolved is, whether the poison be an organised substance or not. Among the organised substances there are scarcely any except vegetables that can arrest our attention. These substances are generally coloured, whereas the greatest part of the liquid poisons that are not organised are white; they are often odorous; the others are almost always the reverse; their taste is acrid, bitter, or astringent; the poisons which are not organised have a salt, acid, or styptic taste. These liquid vegetable poisons, when left to themselves, are decomposed, become musty, and emit a disagreeable odour; the others do not undergo any alteration: finally, when the vegetable liquids are evaporated, they furnish a solid product which is decomposed by a red hot metallic plate; a character which will distinguish them from unorganised bodies.

There is a great variety of poisonous unorganised substances which are met with in a liquid state. Independently of those already enumerated as being soluble in water, there are several acids, and some other substances, which are usually in a fluid state; to resolve this part of the problem can present no difficulty, when we recur to the details already entered into. Two or three drops are to be poured into an experiment glass to as-

certain if the poison will turn the tincture of tournesol of a red colour, and will be precipitated by ammonia.

Liquid poisons which either constantly redde nor destroy the tincture of tournesol, and which are not precipitated by ammonia.	*Liquid poisons which do not redden the infusion of tournesol, or else redden it slightly, but in this case are precipitated by ammonia.*
Sulphuric acid	Corrosive sublimate
Sulphurous acid	Arsenious acid
Nitric acid	Muriate of antimony
Nitrous acid	Soluble salts of copper
Muriatic acid	Muriate of tin
Phosphoric acid	Sulphate of zinc
Fluoric acid	Nitrate of silver
Chlore	Muriate of gold
Hydro sulphuric acid.	Nitrate of bismuth
	Potash, soda, and their subcarbonates
	Subcarbonate of ammonia
	Barytes, soluble salts of barytes
	Lime
	Soluble salts of lead
	Nitrate of potash
	Sulphate of iron
	Sulphuret of potash

We shall not take into consideration the liquid poisons which redden or otherwise change the colour of the infusion of tournesol, and which are not precipitated by ammonia; because they have already been described. Three of these substances may soon be discovered by their smell, which is generally known; sulphurous acid, the odour of which is the same as that of burning sulphur+; hydro-sulphuric acid, which emits the infectious smell of rotten eggs+; finally chlore, the odour of which is suffocating, and which, far from reddening the infusion of tournesol, destroys it, and colours it yellow+; as to the others, they are to be treated with lime water.

Those which are precipitated by lime water.	*Those which are not precipitated by this re-agent.*
Phosphoric acid which, does not corrode glass+	Sulphuric acid
Fluoric acid, which corrodes glass to such a degree, that it must be kept in metallic vases+	Nitric acid
	Nitrous acid
	Hydro-chloric or mnriatic acid

Among the liquid poisons which are not precipitated by lime water, there are some that are rapidly decomposed by metallic copper.

Those which are rapidly decomposed by copper while cold.	*Those which are not decomposed while cold.*
Nitric acid	Sulphuric acid
Nitrous acid	Muriatic acid
There is effervescence and emission of yellow orange coloured vapours	

It is useless for medical jurisprudence to attempt to distinguish nitrous from nitric acid; sulphuric acid cannot be confounded with muriatic acid; for it forms, with a very slightly concentrated water of barytes, an abundant white precipitate+, whereas when the solution is slight, muriatic acid produces no precipitate+.

Gaseous poisons. If the physician was obliged to pronounce upon the nature of a gaseous poison which had produced fatal effects, he would proceed upon the following rules, admitting that the deleterious gas is one of the following: chlorine, nitrous acid, ammoniacal hydro-sulphuric acid, sulphurous acid, protoxyde of azote, azote, carbonic acid, oxyde of carbone.

He will examine whether it be coloured or not.

Coloured gases.	*Transparent gases.*
Chlore is of a greenish yellow colour	All the others above mentioned.
Nitrous acid gas of a yellow orange colour+	

The odour is next to be ascertained.

Gases with a very strong smell.	*Gases that are inodorous or that have but little smell.*
Ammonia, odour of volatile alkali+	Protoxide of azote
Hydro-sulphuric acid, odour of rotten eggs +	Azote
Sulphurous acid, odour of burning sulphur+	Carbonic acid
	Oxyde of carbone

To come at the nature of these inodorous gases, a glass bell is to be filled, and a lighted taper plunged into it;

The protoxide of azote will quicken its flame+.

Azote will put it out, and will not precipitate lime water+.

Carbonic acid gas, will also put it out, but will form a white precipitate+.

The gazeous oxyde of carbone will inflame, burn with a white blueish flame, and the residue of the combustion will be precipitated by lime water.

2d. OF THE INDICATIONS WHICH THE PHYSICIAN MAY PERCEIVE IN THE SYMPTOMS WITH WHICH THE PATIENT IS AFFECTED.

We have endeavoured throughout this work to impress upon the minds of our readers, the importance which ought to be attached to the various symptoms of poisoning; and in each partilar subject we have enumerated not only the symptoms, but also the inferences and conclusions to be drawn from them; it is therefore supposed that a mere repetition of these phenomena, will be of no use to the intelligent practitioner.

3d. OF THE INDICATIONS WHICH THE PHYSICIAN MAY PERCEIVE IN THE STATE OF THE ORGANS, AFTER THE DEATH OF THE POISONED PATIENT.

Morbid anatomy enables us to draw many important conclusions, from the state in which the organs are found after death.

There is no subject which can excite more interest in the mind of the well informed and observing physician, than an attentive investigation of the alterations which have been produced by the poisons, in the different parts of the human frame. The information to be derived from this source greatly depends however upon the accuracy with which the examination has been made, as well as the reflection which will always be suggested by the ravages discovered.

We have attempted to establish the various characters of the morbid lesions produced by the different classes of poisons while treating of each substance in particular, and, with a view to render these observations more useful, we here recapitulate the result of our preceding considerations.

1st. Corrosive, acrid, astringent, and a part of the narcotico-acrid poisons, always create an inflammation of one or more parts of the digestive canal, when they have been taken in sufficient quantity; the case is different with the narcotics, and a part of the narcotico-acrid poisons.

2d. It is, however, clearly proved, that some of the corrosive and acrid poisons, have produced death under certain circumstances, without leaving the smallest alteration in the digestive canal.

3d. The juridical physician called in to a case of poisoning cannot deny its existence on the sole absence of alterations in the digestive canal; it being possible that death should have resulted from the use of narcotics, certain narcotico-acrids, &c.

4th. After the sudden death of an individual, seized all at once with serious symptoms, the digestive canal will be found inflamed, corroded, ulcerated, &c.; in such a case the introduction of a poison may be suspected, but not affirmed; for we have already observed that several spontaneous serious diseases might assume the appearance of poisoning during life, while the inspection of the bodies after death has exhibited lesions analagous to those produduced by the corrosive poisons.

5th. Generally speaking, the lesions of the lungs, of the brain, of the heart, and of the other organs, may be produced by too great a variety of causes, to be considered as proofs of poisoning.

6th. The physician cannot affirm, that there has been poisoning, unless he can prove in a positive manner, by chemical analysis, or by its physical properties, the existence of the deleterious substance.

7th. In case it should be suspected that the poison was in too small a quantity to be discovered; if there were serious lesions in the digestive canal; and if all the information induced the belief that poisoning had taken place; the physician can only state to the magistrate, that there are probabilities in favour of poisoning, but that he cannot prove that fact.

It is very important in the inspection of the lesions of the digestive canal, to distinguish the red or violet colour of inflammation, from that which is dependent upon a particular drink or any other cause.

We have just examined all that relates to the lesions of the bodies of individuals who have been poisoned: we have supposed that the examination has taken place a few hours after death; but it may happen that this examination should not be made until fifteen, twenty, thirty, and even forty days after burial. In this case the body may be putrefied, and exhibit purple spots, sometimes black, or other changes, which would not have been observed if the opening had been made a short time after death. Under such circumstances, the physician cannot be too cautious; he ought not to pronounce without mature reflection, and taking into consideration, the unimpaired or corrupted state of the body, the season, variations of temperature, &c. &c.

SECOND PROBLEM.

To pronounce upon the nature of the deleterious substance with which poisoning has been executed; when it has not been entirely swallowed, and is mixed with tea, wine, or some other alimentary substance.

If a pulverised or crystalline matter be found at the bottom of the liquid that has been drank; the fluid is to be poured off to separate it, and the solid portion is to be investigated in the manner we have already pointed out. A poison might have been dissolved at a warm temperature, and might be deposited

in cooling, or it might not have been entirely dissolved while cold.

In case this deposit was not poisonous, a portion of the liquid is to be examined by the re-agents as we have also mentioned while speaking of the dissolved poisons; and if, after having made the proper trials, the physician obtained precipitates of a satifactory nature; he would conclude that there has been poisoning. But if the re-agents produced precipitates differing from those we have mentioned, while resolving the preceding problem, it would be imprudent to conclude that the liquid is not poisonous. In fact how often have we not demonstrated that poisons, by their mixture with alimentary substances, lose their property of forming with the re-agents precipitates similar to those they exhibit while pure.

Previous to the forming of any conclusion, this drink must be introduced into a retort connected with a receiver; slow heat is to be applied, until the liquid is reduced one half, then the nature of the portion that is volatilized* is to be ascertained and it must be also examined whether, after cooling, a pulverised or crystalline deposit is not formed, which is to be analysed as we have already said above. If the fluid continued transparent, it ought to be put into a capsula, and evaporated nearly to the consistence of syrup, in order to obtain under the form of powder or of crystals the solid poison which might have been dissolved; then it should be examined as we have mentioned in the first problem. If, notwithstanding these various operations, it were impossible to obtain it under that form, we may admit the belief that it has been decomposed and transformed into a species of magma, or that it is of a vegetable nature. It should then be evaporated, until it became dry, and a part of the product should be calcined in a small glass tube, with pure potash and charcoal. If globular mercury is obtained, we may conclude that the poison was mercurial: it would be arsenial if, instead of globules, it were volatilised in shining blades, possessing all the properties of metallic arsenic.

* It is easily conceived that a certain number of the poisonous substances will pass into the receiver; such as ammonia and the subcarbonate of ammonia, nitric acid, hydro-chloric or muriatic acid, and sulphurous acid.

In case this calcination should not yield any information on the nature of the poison, it should be done again by placing the mixture in a small crucible which must be heated red hot for some time. By this method a metallic brilliant substance may be obtained; the nature of which may be ascertained by the process we are going to describe, after having enumerated the metals which are most likely to become the subject of these researches. These metals are, besides arsenic and mercury, which we may now consider as taken from the number, antimony, copper, tin, bismuth, zinc, silver, gold, and lead. The metallic substance is to be treated by pure nitric acid, which is to be heated; five of these metals would be dissolved by the acid; the copper, the zinc, the bismuth, silver, and lead; two would be transformed into white oxydes, tin and antimony; gold would undergo no material alteration.

Nitrates formed with the metal and nitric acid.	*Oxydes formed by the metal and the oxygen of the nitric acid.*
Nitrate of copper, blue+	Peroxde of antimony
Nitrate of zinc	Peroxyde of tin
Nitrate of silver	
Nitrate of bismuth	white
Nitrate of lead	

The colourless nitrates may easily be distinguished from one another: that of bismuth is the only one which is abundantly precipitated white by distilled water+; there is only that of lead that forms a white precipitate with weak sulphuric acid+; that of silver formed with lime water, potash, or soda, a brown olive-coloured precipitate+, whereas that of zinc forms a white precipitate with all these alkalis+. As to the two oxides of tin and antimony, they are to be dissolved in muriatic acid, and the solution treated with distilled water and the hydro-sulphates; water will form with the muriate of antimony a white precipitate+, and will not form any with muriate of tin: the hydro-sulphates will form an orange reddish coloured precipitate with the antimonial salt, and a yellow one with the salt of tin.

It is evident that in resolving this problem, the same conclu-

sions as those we have related in the preceding problem, might be drawn from the symptoms and the lesions of the body.

The same course is to be pursued in case *the poison had been entirely swallowed, and the substances vomited, otherwise those which may be found in the digestive canal after death, are the only ones to be acted upon.* We ought, however, in this last case, to make the analysis of the textures themselves, if all the researches on the fluid and solid aliments have been unsuccessful in discovering the poisons.

ARTICLE THE THIRD.

OF EXPERIMENTS ON LIVING ANIMALS, CONSIDERED AS THE PROPER MEANS OF ASCERTAINING THE EXISTENCE OF POISONING.

It is generally admitted, that among the different means used to ascertain the existence of poisoning, that which consists of making dogs swallow the liquid found in the stomach of individuals who are thought to be poisoned, deserves the preference over all others. If the animal dies or experiences serious symptoms, it is considered as proved that poisoning had taken place, whereas, if no accident ensues, it is readily admitted that no poisoning could have been practised. This opinion has existed from time immemorial; it has been maintained by men who understood but little chemistry, and who have avoided, under frivolous pretences, endangering their reputation, in attempting the analysis of the liquids: it has also met with support among the well informed physicians, who have felt the impossibility which existed of determining the nature of vegetable poisons, and who have therefore advised to try, whether the substances contained in the stomach of an individual who was thought to have died of poison, could suddenly destroy animals in perfect health. On the other hand, some juridical physicians have inveighed against such experiments, as tending to lead the judges into error, and make them commit enormous faults. Even supposing, say they, that these experiments are performed with the greatest nicety, may it not occur that an individual should be seized with one of these spontaneous disea-

ses, by which the animal fluids undergo an alteration, acquire a remarkable acridity, become poisonous, and necessarily cause the death of the animals that have been made to swallow them? Would it not be absurd in such a case to pronounce that the individual had been poisoned? But how often, add they, have not the conclusions drawn from these trials been erroneous, because the experiments had been badly made! Animals have been made to swallow liquids in no way deleterious; these animals have, notwithstanding, expired a few minutes after, because the liquid had run back through the larynx into the lungs; under other circumstances, extraordinary movements similar to convulsions, and an extreme agitation, have succeeded very early to the swallowing of the poison; these phenomena have been attributed to a poisonous substance, whereas they were frequently dependent upon the efforts which were made to hold the animals, the anger which had resulted, or upon a peculiar susceptibility. The preceding considerations induced us to undertake some experiments on this subject, to appreciate the value of a trial so generally admitted. The following are the results of our labour.

In case the suspected substance at the disposal of the physician has been correctly analysed; the remaining portion is to be introduced into the stomach of a small and robust dog while fasting; but he is not to swallow it, nor is it to be mixed with his food, as has been usually done until now. In pursuing this course, we not only run the risk of losing the greatest part of it, by the animal's throwing it up, but the aliments with which it may be mixed might produce upon it a chemical action, and decompose it in such a manner as to change its nature entirely.—Besides, in six cases out of ten, it would occur that a portion would run back through the larynx into the lungs, and the animal would perish by asphyxia.

The best means to be used, consist of separating the œsophagus, making a small opening in it, introducing a glass funnel through which the liquid will reach the stomach: when this is done the œsophagus is to be tied above the hole. It would be imprudent to prefer to this method the use of the gum elastic tube adapted to a syringe, because several animals bite the tube, make holes in it,

and the liquid then runs out of the mouth; besides, pewter syringes might decompose certain poisonous fluids.

If the suspected substance, instead of being fluid, was in a solid or soft shape, and it was impossible to introduce it into the stomach by means of the funnel; the physician would first squeeze it in order to obtain all the fluid parts, which are to be introduced as we have just said; the solid portion, wrapped in a small piece of fine paper, should then be pushed into the stomach by an opening made in the œsophagus, then the ligature of this canal is to be made. This mode of proceeding presents immense advantages. It is the only way of preventing vomiting, which would free the stomach from many poisonous substances immediately after being swallowed, and which thus retained may produce the symptoms of poisoning and even death.

But, it may be objected, the operation on the œsophagus constantly destroys life, and frequently occasions alterations of the textures; how can we know whether death is the result of the suspected substance, or of the operation itself? This objection is not grounded, for either the suspected substance is in sufficient quantity to destroy the animals, or else it is not sufficiently abundant. In the first case death will happen during the first forty-eight hours, and will be preceded by more or less serious symptoms, phenomena which are never observed after the simple ligature of the œsophagus*. If the substance is not sufficiently abundant to cause death, the experiment will not be more conclusive than if the œsophagus had not been tied. Let us suppose a case in a point of view the most unfavourable to our opinion; for instance that in which this substance should give rise to variable symptoms which would disappear in two or three days; these symptoms, it may be said, would be ascribed to poison if the œsophagus had not been tied; whereas, in the contrary case, we might be induced to believe they depended upon the operation. We shall answer that by remarking, that as this

* The symptoms resulting from the corrosive poisons might be confounded with the dejection produced by this operation, but the opening of the body would remove all doubts, and if a corrosive poison had been taken, inflammation of the membranes of the stomach would be visible.

ration itself does not produce during the first forty-eight hours, any other symptoms than a slight dejection, we have a right to ascribe to the venemous substance all the other morbid phenomena which are exhibited. Besides, would not the physician be liable to blame, if he pronounced upon the existence of a poison because the animal which was made to swallow the suspicious substance had appeared indisposed for two or three days. These experiments can be considered as valid, only inasmuch as they furnish a decisive result, that is to say an acute disease followed by a sudden death ; or when they give rise to particular accidents, and when besides they agree with the results obtained by chemical analysis, if the deleterious substance belongs to the mineral kingdom. In doubtful cases, the physician should always incline in favour of the accused.

If the suspected substance caused the death of the animal, it would be necessary to ascertain, previous to the forming of the conclusion that there has been poisoning, whether the individual in whose digestive canal it was found did not perish by one of these spontaneous affections of which we have spoken ; for it might occur in this case, that the animal fluids and particularly the bile had acquired deleterious properties capable of producing all the symptoms of poisoning.

In case the animal should experience no remarkable symptom from the suspicious substance, we should not feel authorised to conclude from this single fact that poisoning has not taken place. In fact a multitude of causes may prevent the liquids contained in the digestive canal of an individual who has really perished by the action of a poison, from being poisonous. 1st, The deleterious substance may have been decomposed in the stomach, by the aliments, the drinks, or the animal textures. Thus for instance, 12 grains of corrosive sublimate are swallowed by a man in perfect health : he experiences the symptoms of poisoning and dies ; the opening of the body is made thirty-six or forty-eight hours after. A dog is then made to swallow the substances contained in the digestive canal, and is not affected by them. We have very frequently observed this phenomenon. It would be very wrong to conclude that the animal has not been poisoned. It is

evident that in this case the sublimate has been decomposed by the aliments, and even by the membranes of the stomach, transformed into an insoluble substance, which cannot produce any bad effects on the animal economy. The same effect would be produced if verdegris had been taken before or after the swallowing of albumen and some other animal substances ; the same reasoning might be applied to the muriate of tin and some other poisons. 2nd, The poisonous substance may have been taken in a strong dose, then vomited, and notwithstanding have caused death ; in this state the digestive canal contains mucosities and bile, which do not exhibit an atom of poison, and which consequently will not cause any accidents if swallowed by dogs. 3rd, It may occur, that the poisonous substance be of the class of those that are easily absorbed ; that the individual has taken a sufficient dose to occasion death, but that a very small part of it only is left in the digestive canal ; then the negative result that is obtained upon dogs, would be more calculated to lead to error than to instruct ; we believe therefore that experiments of this kind, abstractly considered, are valuable, only inasmuch as they present a positive result, that is to say, death ; but we repeat it, they can only be considered, even when correctly made, as a secondary mode of corroborating the inductions drawn from chemical analysis, the symptoms, as well as the lesions of the bodies.

ARTICLE THE FOURTH.

OF THE MEANS PROPER TO DISTINGUISH WHETHER THE POISON HAS BEEN INTRODUCED INTO THE DIGESTIVE CANAL, DURING LIFE OR AFTER DEATH.

Among the crimes which have been committed by man, there is none which inspires so much horror as that which consists in introducing into the rectum of a corpse, a poisonous substance, with the intention of accusing an innocent person of being the author of the poisoning, thus endangering his honour and his existence. We were far from believing the existence of such an atrocity, until the proceedings of the criminal court of Stockholm,

which mention a case of this nature, had reached us. Medical jurisprudence embraces few questions of so important a nature.

Let us suppose that an individual is suddenly seized with a serious spontaneous disease, which carries him off in the course of a few hours; and in whose rectum a corrosive preparation is injected a few instants after death. The rumour spreads that he has been poisoned, and the magistrates appoint a physician to verify the fact. This physician proceeds to the opening of the body, finds the poison by chemical analysis; and an inflammation of the textures to which the poison has been applied. If he does not reflect that this poison may have been introduced into the rectum after death, and is ignorant of the mode of ascertaining this fact, he will declare that the individual died by poison, and thus sacrifice an innocent person to the revenge of a vile assassin.

It has therefore appeared to us important to establish the characteristics that will enable the physician to discern, whether the poison has been introduced into the digestive canal before or after death. Our experiments have been made upon the bodies of men and of dogs; they have been varied and numerous; the poisonous substance has in some cases been introduced immediately after death, while in others it has not been introduced before half an hour, an hour, two hours, and even 24 hours, in order to establish the deteriorations which the textures undergo, under these different circumstances. We have thought proper to limit our trials to the corrosive substances; the narcotics and narcotico-acrids producing after death no local lesions, or if any, a lesion that is very slight, and analagous to those of corrosive substances.

It results from our researches on this subject,

1st. That corrosive sublimate, arsenious acid, verdegris, and the sulphuric and nitric acids, when introduced into the rectum a few minutes after the death of the animals, give rise to alterations of texture which imitate to a certain degree, those which are produced by these same substances when swallowed during life.

2d. That it is always easy, however, to distinguish them by the following characters: in case the poison has been introduced after death, it is found in a pretty large quantity not far from the

anus, unless it had been used under the form of a solution ; whereas, if it has been introduced during life, only a small quantity will be found, as the greatest part would have been expelled by the stools it produces. The alteration of texture never extends further than a little above the part on which the poison has been applied after death ; a line of *demarcation*, therefore, very apparent, will be betweeen the affected portions, and those which are not—a phenomenon that is never met with in the other case. In fact, these poisons act upon the living body by producing a strong irritation, succeeded by inflammation of a variable degree of intensity, but which always extends much farther than the spot to which they have been applied, and which abates insensibly as the distance from the most inflamed point increases, so that no *visible line of demarcation* is ever observed. The redness, inflammation, ulceration, and other lesions, extend much further when the poison has been introduced during life, than in those cases when it has been applied after death ; therefore, if upon examination of the body, the rectum or stomach were found covered with a quantity of one of these poisons, there would be strong reasons to believe that it had been applied after death.

3d. That among these poisonous substances there are some which produce such characteristic lesions, that it is impossible to mistake them ; of this number are the corrosive sublimate and nitric acid.

4th. That when introduced into the digestive canal twenty-four hours after the death of the individual ; these substances produce neither redness nor inflammation, because life is entirely destroyed in the capillary vessels, and consequently these cases cannot be confounded with poisoning which has taken place during life.

5th. Finally, that these poisons may yet give rise to inflammatory phenomena, if applied one or two hours after death ; but the considerations we have just stated are sufficient to form a correct opinion on this subject.

It is intentionally we omit speaking of the experiments of Savary, relative to the application of causticks upon the skin du-

ring life and after death: their results do not appear to us to apply directly to the subject which occupies our attention.

ARTICLE THE FIFTH.

OF THE POISONING OF SEVERAL PERSONS AT A TIME.

Instances of poisoning of several persons at a time are not unusual, and they appear at first sight to present but little interest to the juridical physician In fact, if during a repast several people ate of a dish that has been poisoned either intentionally or through error, and that all of them experience some time after similar symptoms sufficient to characterise poisoning, the physician must be guided by the principles we have hitherto laid down. But the case will be different, if some of the persons are simply affected, while others feel no inconvenience; if some experience nothing but slight accidents, whereas others are dying or are a prey to alarming symptoms, &c. It is evident that this disparity of effects where there seemed to be but one cause, must render this case of medical jurisprudence more intricate; since it will be necessary to reconcile a multitude of apparent contradictions which will present themselves. Previous to the laying down of the precepts which ought to guide the physician, in these difficult cases, we will relate a case of the celebrated Morgagni, calculated to throw some light on this subject.

In the month of May 1711, four persons, namely a priest, two women, one of which was sister-in-law to the priest, and another individual, all in good health, travelling, stopt at a tavern to dine. Having all set out again after dinner, the priest soon felt so much pain in the abdomen that he was obliged to alight from his horse. Notwithstanding the copious dejections both by the mouth and anus, the pains increased from one moment to the other, and it became necessary to carry the patient to Cesena, where they had dined, and where the priest arrived half dead. The physician who was sent for, thinking that he had to do with a case of common colic, used fomentations, injections, purgative and anodyne potions. Although he saw that one of the women was also strong-

ly purged, and that the other individual complained of pains and a weight at the stomach, he never suspected that poisoning had taken place, because the other woman was not affected, and the tavern-keeper assured, with many oaths, that his dinner contained nothing dangerous ; but the evacuations saved the patients, and the symptoms having somewhat abated the next morning, they were removed to the vicinity of Morgagni, who was immediately called in. This great practitioner having inquired whether the woman who was well had ate of every dish on table ; learnt that she had not ; and that the only one of which she had not tasted was a dish of rice which had been served first, whence he concluded that it was this dish that contained poison. But the difficulty was, that the priest, who had eaten the least, and who had been very sober in other respects, was the first and most violently affected : that the woman, who had ate more than the priest, had not been so sick as him, and that the other individual, who had ate more than all the others, was the one who had suffered the least. Was there not some rasped cheese on the rice ? asked Morgagni. Yes, answering they, and the priest, who was dainty, ate scarcely any thing else. In this case, said Morgagni, you already conceive that there was arsenic " among this cheese, which had probably been prepa- " red to kill rats, and that it has been put on the rice, in the hurry " of preparing your dinner." These conjectures were verified by the acknowledgement of the tavern-keeper, who upon learning that the patients were out of danger, was not afraid of confessing that such had been the cause of this unfortunate accident. Morgagni was only astonished that they had not found any bad taste in the cheese ; and, he succeeded in curing these three patients by the use of milk, whey, and the oil of sweet almonds ; but the priest was affected with various symptoms, which it is useless to enumerate here.

The physician cannot form a correct opinion under circumstances of this kind unless he pays attention, 1st ; To the state in which was the stomach of the different persons that have been poisoned : those who have taken much food or drink must have experienced less serious symptoms than the others. 2nd. To the nature of the food and of the drink, as well as to the quantity

which each individual has either eaten or drank. 3rd. To the presence or absence of the vomitings and alvine dejections. It is evident that it may happen that individuals should have eaten pretty abundantly of a poisoned dish without the manifestation of serious symptoms by the very circumstance of the dish, being copious, and that it has easily produced abundant evacuations, by which means the poison has been expelled.

ARTICLE THE SIXTH.

OF POISONING AS AN ACT OF SUICIDE OR HOMICIDE.

IT is easily conceived, that chemical analysis, and the inferences drawn from the lesions of texture and the symptoms, are insufficient to resolve this difficult question. We can only attempt to gain information by the aid of moral circumstances. "The "practitioner will observe attentively," says professor Fodéré,

1st. Whether the individual had been affected for any time with melancholy or delirium; whether he has met with any loss, whether his hopes have been deceived, whether he be a prey to sorrow.

2nd. If any of the persons with whom he lived or whom he frequented, or with whom he had any relation whatever, were in any way interested in his death.

3rd. The season of the year may also be considered; for I have observed, without pretending to account for it, that suicides were more frequent during the time of the solstices and equinoxes.

4th. If the patient, instead of complaining, remains quiet, seeks solitude, and refuses the help of physicians and remedies.

5th. Any writing whatever, as is generally left by those who kill themselves before they begin, in order to express their last sentiments in their last will, is one of the most convincing proofs that they alone are guilty of their destruction. Remnants of poison found in their pockets or in their apartments are very equivocal indications, which may belong as much to homicide as to suicide.

CHAPTER II.

ARTICLE THE FIRST.

OF SLOW POISONING.

INDIVIDUALS sometimes swallow, during several days, a small quantity of poison, incapable of producing sudden death, but which occasion more or less serious accidents, and which may, in the end, be productive of the most fatal effects; the reunion of accidents resulting from such a cause, constitute *slow poisoning*, which must not be confounded with consecutive poisoning. This latter is in fact occasioned by the swallowing, at one time, of a certain quantity of poison, giving rise to all the symptoms of acute poisoning, which do not immediately destroy the patient, but which are followed by numerous consecutive phenomena, varying in their duration.

We do not admit that any slow poisons are known, by means of which death can be occasioned at a limited time. This assertion, advanced by ignorance, and maintained by absurd prejudices, is wholly contrary to the laws of organized nature. How is it possible to determine beforehand, the resistance which will be opposed by the vital strength, to the cause which tends to destroy it, a circumstance without which it becomes impossible to fix the period at which the symptoms will arise, or will be followed by death? May not this opportunity be improved to combat with success one of the opinions most universally received among a great number of physicians, and which has some relation to the question now before us, namely: that in several species of disease, there are fixed and constant days, wherein the patient is much more affected? It requires but little reflection on the diversity of causes, that may produce these diseases, or their intensity, and the different degrees of re-action, &c. to be convinced, that of two individuals labouring under the same affections, one may exhibit serious symptoms on the same day that the other may be much better.

The following facts will throw some light on the history of slow poisoning.

CASE.

A sailor, twenty-six years old, of a pretty good constitution, but weakened by long and frequent sea voyages, was admitted into the hospital of Land . . . , the 5th Fructidor, 7th year, for a syphilitic affection, which he had laboured under for three months. The first symptom of the disease had been a gonorrhœa, suppressed in about eight or ten days, by injections of brandy and water into the canal of the urethra. No new symptoms having succeeded to those which had just disappeared, he thought himself entirely cured, and sailed with the ship in which he had embarked. He informed me that on the very day on which the ship sailed, he had felt pains in the groins, at first slight; that these pains increasing every day in intensity, he had discovered a small tumour on each side, which he took for buboes (these were his expressions). He then consulted the surgeon of the ship, who made him apply a poultice made of flaxseed on each groin; and that besides this he came every day to drink a glass of ptisan, which left in his mouth a very bad taste. I have since learnt that it was a solution of corrosive sublimate.

The buboes having continued to increase for several days, became at last softer on their summit, and an incision made in each gave issue to a very small quantity of thick and bloody pus. The patient, in the mean time, continued to take his supposed ptisan, paying but little attention to his regimen, although he had been expressly forbidden to drink brandy and wine.

The buboes were dressed with lint, covered with a mixture of mercurial ointment, and simple cerate, the whole covered with a poultice of the flower of flaxseed.

As soon as he was delivered from the violent pains which he had felt for several days, this man resumed his laborious occupations; he was then allowed his rations of wine and of brandy, and he assumed entirely the regimen of sea-faring people; the dressing of his buboes was neglected, he drank but seldom of the ptisan which had been prescribed for him, and thus almost forgot his disease. The campaign was a long one, and many reasons concurred to make it painful and fatiguing. This man, uneasy about

his situation, obliged to labour hard, in want of good food, of linen, having his clothes almost constantly wet, obliged to pass from a hot and humid atmosphere, to one that was constantly rendered cold by various winds, soon felt the first symptoms of a disease so fatal to sea-faring people, and against which so little care is taken—I mean the scurvy.

A sense of weakness, pains in the limbs, fatigue, prostration, unwillingness to work, distaste for his usual occupations, swelling of the legs, frequent hemorrhagies of the gums, diseased state of the mouth, the increasing difficulty of chewing biscuit; all these united symptoms indicated a disease, with which he was already familiar, having been several times affected with it.

He remained in this afflicting situation during the rest of the campaign. The ship on board of which he was arrived at Brest, whence he was sent in a few days to the Hospital of Land . . . . It was there that I saw him for the first time.

He told me that he had never been sick before his first campaign, which lasted five months, three of which were passed at sea, and two at Cape Francois. The ship on board of which he was, having put into Rochefort in the month of September, he was admitted into the hospital to be cured of a incipient scurvy. He was there seized with the disease which is endemic to that country, and which he kept for four months. He left Rochefort in a convalescent state, came to Brest, and made several voyages, whence he always returned in pretty good health, with the exception of a little scurvy, which was always dissipated by a few days treatment on shore.

The following is, as far as I could collect, the situation in which he was, when he first came under my observation.

This man, who was tall, and of a dark complexion, presented the traces of a good constitution, but which many causes had contributed to deteriorate; his complexion was pale, of a bad colour, the eyes dim, sunk in their sockets, the cheeks protuberant, the skin of the face drawn, the lips tumefied, and of a pale red colour; the gums were loose and blackish, and issued a bloody like liquid; he was extremely thin, the legs were somewhat tumefied. The patient had on the right groin an ulcerated tumour, whence issued a very

small quantity of purulent matter. The bubo on the left side was healed, but there remained still some engorgement of the glands on that side, and the patient complained of pains in the limbs.

This man was first put under an antiscorbutic course of medicines, with vegetable food, frequent insolation, pure air, which soon produced a considerable change in his situation. Six weeks after entering upon this mode of treatment, the patient had gained flesh, the swelling of the legs was entirely removed, the state of the mouth had improved, the skin had resumed its natural colour, and the pains had abated: his strength daily increasing, seemed to indicate a prompt convalescence; but, as the buboes did not get better, the surgeon, to whose care he was confided, thought proper to make him undergo an antivenereal course; he took, consequently, twice daily, a table-spoonful of the solution of oxygenated muriate of mercury, Van Swieten's liquor, in a glass of milk; he used also a sudorific ptisan.

The patient took ninety or one hundred spoonfuls of the solution, without producing any visible effect, except the loss of some flesh. The bubo on the right side continued to suppurate, and the tumefaction on both sides was yet considerable; the surgeon therefore thought proper to persevere in the use of the muriate of mercury; but from that period its effects began to manifest themselves in a terrible manner. The patient complained of colics, at first slight, but which soon became violent and continual. Digestion was extremely laborious, and he was reduced to the eating of rice cream exclusively. He was continually tormented by nauseæ, and nidorous eructations. Any solid aliment whatever introduced into the stomach, was attended with hiccup. It soon became impossible for him to sleep in any position except on his back: fever made its invasion, with slight paroxysms in the evening, followed by copious sweats of the chest and neck; the bubo on the right side became painful; an abundant suppuration of a fetid smell, acquired a causticity, which corroded all the surfaces where it remained, and gave rise to numerous small ulcers, which, increasing daily, united to form a single one of a prodigious extent which covered all the groin, and a part of the abdomen on the right side.

At the solicitation of the patient, the use of the muriate of mercury was at last discontinued: but it was too late, the ravages of the poison had extended to the organs in a fatal degree; the situation of the patient became daily more distressing, the leanness increased, and this unfortunate man, a prey to the most violent pains, and reaching the last period of emaciation, expired the hundred and thirty-sixth day after his admittance into the hospital. The excessive smell of his corpse prevented our opening it.*

We have known an instance of the exhibition of repeated small doses of arsenious acid, which produced alarming effects, but which were relieved by the skill of Dr. Beauchesne.

Dr. Majendie, in his memoir on emetics, relate a very interesting case of the effects produced by tartar emetic, taken in repeated doses to procure vomiting.

Some experiments have been attempted upon dogs, with the intention of determining the mode of action of the repeated exhibition of small doses of poison; but it is easily conceived how fatiguing and difficult this labour must be, nor have our results been so satisfactory as we could have desired. We have remarked, however, that the disease produced by poison given in small doses, presented the greatest analogy with that which followed the introduction of a larger quantity; the same observations were made on the lesions of textures.

If the juridical physician should be called, therefore, to pronounce upon so delicate a question, he must avail himself of a multitude of moral and physical circumstances to obtain information. Thus for instance, he will examine whether the disease under consideration is not more dependant upon the bad constitution of the individual, than the slow action of a poisonous substance; whether it has not some connection with an hereditary or other organic affection; with the reigning epidemic or endemic disease, with an injudicious habit of taking medicines, and more especially cathartics, the abuse of venesection, violent exercise, or any other error of regimen, the violence of passions,

* Lavort Dissertation (citat.)

a valetudinary state, hypocondriasis, melancholia in certain individuals, &c.

ARTICLE THE SECOND.

OF THE CONSECUTIVE ACCIDENTS OF ACUTE POISONING.

It sometimes happens that individuals poisoned by an active venemous substance, are affected with the most serious accidents, which are not always followed by prompt death. The state of these patients ameliorates for a few days, but the invasion of alarming symptoms, the duration of which varies, and which usually terminate in a fatal manner, is not long delayed. We will relate a few facts on this subject.

Case.

Mary Ladan, fifty-three years old, drank about a spoonful of *aquafortis*, under the impression that it was common water. She soon rejected the greatest part of it. Immediately hiccup, copious eructations ; half an hour after she was bled in the arm, and a solution of gum arabic and milk were administered. The first accidents ceased gradually, but an excessively obstinate constipation, which had appeared from the first invasion of the disease, continued. After ten days treatment, and visible decrease of the symptoms, the patient ate for the first time a little vermicelli, but threw it up immediately. Since her accident, she had been much salivated, and her breath was remarkably fetid ; but she did not reject among the vomited substances any membranous portion ; she only complained of the presence in the bottom of her throat of a foreign substance, which fatigued her incessantly, impeded deglutition and respiration, changed her voice &c. &c. The twentieth day after the poisoning she voided by the anus, with much difficulty, a long membranous bunch, all in one piece, rolled and folded up, representing the form of the stomach and œsophagus, with all their dimensions, and which was nothing more than the internal coat of these organs, which had been detached, in one piece at a time ; it was about the twenty-fourth

part of an inch thick, and of a very apparent brown colour. The portion which corresponded with the large and small curvatures of the stomach, were much thinner than usual, and had several holes. From this moment the sensibility of the digestive canal became excessive, the vomitings were oftener repeated, and no aliments could be kept on the stomach; milk, which had been the only food for 15 days, was rejected quite turned. A few days after, the patient was better, and ate soup, eggs, and cakes, and rejected them but seldom. She had lost much flesh, but preserved considerable colour, and could walk a little; pains in the stomach; a most obstinate constipation, was an incessant obstacle to her recovery. These accidents increased, a copious salivation, which tormented her from the beginning, daily increased, all that she took was thrown up; the intellectual faculties were in their natural state; the mucous lining of the lips and of the interior of the mouth, apparently healthy, rubbed off with the slightest contact; the patient was exhausted by useless efforts to vomit; finally, two months after the accident, she was seized with vertigoes and died.

Opening of the body. The cardia and pylorus were visibly diminished in size; the internal surface of the œsophagus and stomach, very even and smooth, spotted with various tinges of a red colour, did not present the usual appearance; this last organ was singularly diminished in size. The intestinal canal was not much smaller than usual, and the other abdominal visceræ were nearly in their usual state.

Dr. Tartra, from whom we borrow this case, says, that in cases of this kind, the accidents produced at first by nitric acid abate insensibly, but that the patients preserve a disposition to vomiting. A short time after, the internal coat of the digestive canal mortifies, and is rejected either wholly or by portions, which are rotten or disorganized. When death is retarded, the patients fall into a state of marasmus, because digestion can no more take place; they are tormented by violent desires to go to stool, but evacuate nothing; three whole months will sometimes pass without their voiding in one or two stools any thing but small lumps of fecal matters, in the form of small pills; emaciation becomes ex-

cessive, the expression of the physiognomy forbidding; they expectorate every moment, are constantly vomiting eschars, or portions of putrefied membranes of an infectious odour, resulting from the exfoliation of the œsophagus and the stomach, the forms of which they sometimes preserve. In some cases, these substances are brought away by the stools. The skin becomes dry, scaly, nearly dead, and similar to that of old age; the physical faculties are destroyed, the moral faculties sometimes degenerate in a singular manner, there remains nothing but their appearance. Those ravages, which, according to nature, ought to be the progressive result of many years, are produced in a few months; every thing indicates, in these subjects, accidental and premature decrepitude. The individual is still existing, but the interval separating him from death is scarcely perceptible, and its ravages are daily anticipating on the domain of life.

After the death of these individuals, the digestive canal is reduced to a very small diameter; the human hand might hold it. The intestines are not larger than the little finger, and sometimes they are scarcely of the size of a quill; their substance is very thick, there is little or no cavity left, which contains only a little mucosity. In some cases, the stomach has been found adhering to the liver, spleen, and diaphragm. These adhesions are sometimes simple, but the coats of this viscus are most usually disorganized and exfoliated: in these cases the organ in contact with the stomach, forms one of its sides, or rather its exterior coat, fills up the opening of the stomach, it thickens a little, but continues sufficiently transparent, to allow the colour of the viscus which it covers to be seen. The orifice of the pylorus is so narrow, that it is sometimes impossible to introduce a small probe. There are often seen smooth and vermillion coloured spots, or scars produced by the regeneration of the mucous membrane, on the internal surface of the stomach in its large curvature, near the pylorus and cardia, in the œsophagus, back part of the mouth, and pharynx.

APPENDIX.

OF IODINE.

M. Courtois lately discovered in the *soda* of Vadec, a particular substance, the principal properties of which Mr. Gay Lussac has rendered public, and proposed to be called *Iode*, in French (and which has since been named *Iodine* in English), on account of the violet colour it assumes when reduced into vapour.

The experiments we have made upon dogs, and upon ourselves, leave us no doubts of this new body being endued with poisonous properties, capable of poisoning animals to which it is given, in doses of 2 or 3 drachms. Before we examine its action upon animal economy, we shall lay before our readers the chemical and physical characteristics, which appear to us necessary to distinguish it from other poisonous substances.

CHEMICAL HISTORY OF IODINE.

At common temperature, *Iodine* is solid: it is found in the shape of thin blueish plates, of a metallic gloss, and weak tenacity, having the appearance of plumbago (carburet of iron): its smell is like that of oximuriate of sulphur—its specific gravity 4.946.

If a thin plate of iron be heated, and a certain quantity of Iodine be poured on it, it will immediately evaporate, sending forth beautiful violet vapours. If these vapours be collected under a glass bell, they will be observed to condense, and again form themselves into the crystalline plates we have mentioned.

Iodine communicates to water a yellow tint of amber, and only dissolves in a small quantity. If water mixed with this new body is heated in a phial, it soon evaporates, as it passes through the liquid, while it emits a beautiful violet vapour.

Iodine has a powerful affinity to hydrogen, which it takes from several bodies :—The product of this combination is a new acid ; which has received the name of *hydriodic acid.*—Oxygen may also be united with it in the state of rising gas, and form a particular acid, which has been called *iodic acid* : thus, for instance, when a concentrated solution of barytes is brought into contact with Iodine, soluble ydriodate of barytes, and insoluble iodate of this base, are instantly formed; which proves that the water of the dissolution has been decomposed, and that the hydrogen formed hydriodic acid with the Iodine, whilst the oxygen transformed a new portion of this new body into *iodic acid.*

When a mixture with distilled water, Iodine, and metallic zinc, is made, and the temperature is ever so little elevated, *hydriodate* of zinc is formed—the oxyde of which may be separated with potash, no gas escapes.

Theory.—The water is decomposed ; the oxygen unites with the zinc ; whilst the hydrogen brings the Iodine to the state of hydriodic acid, which dissolves the oxyde that has been formed.

The action of *Iodine* upon animal and vegetable substances has hitherto only been examined generally. It is only known that almost all organic substances are decomposed by this new body, which robs them of a great part of their hydrogen, that it may be converted into *hydriodic acid.*

ACTION OF IODINE UPON ANIMAL ECONOMY.

Experiment 1st. At 12 o'clock, a middle sized dog was made to swallow 2 drachms, 48 grs. of *Iodine* : the dog had soon after his mouth full of yellowish froth, and made several efforts of deglutition often repeated.—At 3 o'clock he had had no evacuation. He afterwards had several, all tinged with yellow, and on the 7th day he expired, without exhibiting any signs of palsy, convulsions, or vertigoes.

We must conclude from this, and many other experiments, that Iodine gas, introduced into the stomach in small quantities, acts as a slight stimulant, and produces vomiting; 2dly, that when given in a dose of one drachm, it constantly causes death in four or five days, producing at the same time ulcerations on every part of the

mucous membrane with which it comes in contact. 3dly. That when the œsophagus is not tied, a dose of two or three drachms acts in the same manner upon animals, which do not vomit for several hours, even when part of the poison has been evacuated by stools. 4thly, That it seldom causes death, when administered in the dose of one or two drachms; and that the animals throw it up shortly after, by repeated vomitings. 5thly, That when externally applied, it does not destroy life. 6thly, That its action upon man is the same as that on dogs. 7thly, That it should be classed among the corrosive poisons.

Corrosive sublimate. The idea of the absorption of this substance has been opposed by *Dehorne* with great animosity; he further asserts, that when applied upon wounds and the cellular substance, this body cannot occasion death. Our experiments having produced different results, we have affirmed, that death could ensue from the imprudent application of this caustic to the exterior. We were not yet disposed to admit the idea of absorption, in consequence of the experiments and observations of M. M. Brodie and Lavort, but we are now perfectly convinced, not only of the dangers which follow from the exterior application of the corrosive sublimate, but also of its absorption. Our friend and pupil, Dr. Smith, has established this assertion beyond a doubt, by numerous experiments, performed in our presence, and recorded in his excellent inaugural dissertation, Paris, May 15, 1815.

Sulphate of iron. The same physician has discovered in this salt, active poisonous properties. Two drachms, applied to the cellular texture of the internal part of the thigh of two dogs, killed them in the course of twelve or fifteen hours. On opening the bodies, the stomach of one of them was found to contain, on its internal surface, a number of petechial spots; the folds of the rectum were numerous and black; the liver of a whitish aspect, with livid spots on its convex surface. The stomach of the other animal contained a great quantity of black fluid blood, which had tinged the membrane with the same colour; the duodenum and small intestines contained also a considerable quantity of the same fluid; the heart had also some black grumelous blood, and some slight echymosis in its two ventricles.

Two drachms of the same salt introduced into the stomach, caused death only at the expiration of twenty-six hours, without any other apparent symptom than general insensibility ; the interior of the stomach presented red lengthened spots ; the small intestines contained some blackish ulcerations, and the upper end of the rectum offered some red folds.

Muriate of ammonia. Dr. Smith has also considered the action of this salt when applied externally. A drachm and 20 grains were laid on the cellular texture of the thigh of a small dog. An hour and a half after, the animal felt a visible uneasiness, was weak, and vomited frothy mucosities. In the course of two hours he became so weak that he could scarcely stand ; he appeared intoxicated. Five hours after the application had been made, he could stand a little better on his legs ; the vomitings had disappeared, but the weakness increased, and he died twelve hours after the poison had been applied. The skin of the thigh operated upon, presented no traces of the poison. The mucous coat of the stomach contained some red spots ; the rest of the alimentary canal contained black fluid blood ; and the heart and lungs also presented here and there some red spots.

ON THE LIGATURE OF THE ŒSOPHAGUS.

This operation has frequently been performed in the course of our experiments, because we are of opinion that it is absolutely necessary to obtain precise results. Several learned men, both French and foreign, in giving an account of the first volume of our work, have advanced that so painful an operation may give rise to serious accidents, and consequently that the results we have obtained are not as conclusive as they may appear at first sight. But previous to the beginning of our labours, the influence of this operation was ascertained by rigorous experiments. They demonstrated, 1st. that the conclusions we have formed are in no way modified by the ligature of the œsophagus ; 2d. that it is impossible to write a complete work on poisons without often performing this operation. It is useless to mention, that we are speaking of the operation performed with address ; in this case it scarcely lasts more than a minute or a minute and a half.

Twelve experiments performed on dogs, enable us to assert,

1st. That the ligature on the œsophagus of dogs produces no other effect than a slight fever, and a little dejection ; inadequate to the production of death, in so short a time ;

2d. That animals killed at that period present no apparent lesion.

It is therefore evident, that an animal which swallows poison a moment previous to his œsophagus being tied, and which dies in the course of the two subsequent days, after having experienced vertigoes, convulsions, pains, or insensibility, vomitings, &c., is destroyed by the effect of this poison. When the same dose of poison has been administered to a dog, placed exactly in the same situation, but the œsophagus of which has not been tied ; death has happened in a similar manner.

We will now endeavour to demonstrate, *that this operation is indispensible, in order to study the effects of poisonous substances in all their relations.*

If we wish to ascertain the action of poisonous substances upon the animal economy ; they must necessarily be brought into contact with the stomach and cellular texture, in order to draw conclusions. Their effects cannot certainly be estimated, if they be vomited immediately. We should never have known the action of emetic, so generally used, if Dr. Majendie had not forced this poison to remain in the digestive canal by tying the œsophagus.

Medical jurisprudence also derives advantages from this operation; but in no case is it so useful as when the properties of antidotes are to be ascertained. It is the only mode we have of forcing the poison to remain in contact with the supposed antidote, in order to ascertain the effects it shall produce. No conclusion can be correct on this subject, when both the poison, and the antidote have been vomited together.

These reasons appear to us sufficiently conclusive, to dismiss the further consideration of this operation.

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