

the second or third attack the patient will perish. Other cases, not marked by intermissions, run a more continuous course for several days before the fatal termination or gradual recovery. The writer, many years ago, when the neighborhood of Kansas City was quite malarious, witnessed a number of deaths from pernicious fever, chiefly of the comatose form. One woman, after three or four apparently simple intermittent attacks during the week, for which she had taken small doses of quinine, fell into the most profound coma and lay in that condition for seventy-two hours. She was "as yellow as gold"; the insensibility was so great that the conjunctiva could be touched with impunity; the pupils were moderately dilated and fixed; the breathing was slow and stertorous; the urine, drawn by catheter, was very scanty, loaded with urates but not albuminous; the bowels were not to be moved by enemata nor by means of the calomel given her; it was almost impossible for the patient to swallow anything; the surface of the body was hot and dry, the temperature in the rectum remained steadily at from 105° to 106° F.; the pulse was slow. In spite of her apparently hopeless condition, under the persistent hypodermic use of quinine and whiskey this patient rallied and finally recovered.

Pathological Anatomy.—In addition to the blood changes found in all forms of malarial infection the pernicious forms give some tolerably well-marked local lesions. In the comatose form the leptomeninges are intensely hyperæmic as is also the cerebral substance, besides being very melanotic. Punctiform hemorrhages into the white substance are common. The endothelium of the capillaries is often swollen and in a state of fatty degeneration, the lumen of the vessels being closed by the swollen endothelial cells. In other cases there are actual thrombi of pigment matter, free parasites, and parasite-laden corpuscles. The same changes have been found in the spinal cord. The conditions in the spleen and liver are exaggerations of those found in malaria generally, the spleen substance is softened, the liver may present small areas of necrosis. In the choleraic form of fever the mucous membrane of the stomach and small intestines is swollen and of a dark-red, sometimes chocolate color. The capillaries of the mucosa are filled with parasites and sometimes its tissue, especially in the villi, is the seat of a superficial but extensive necrosis. Thrombosis of parasites and phagocytes in the intestinal capillaries is not uncommon.

Treatment.—The treatment of pernicious attacks is the same as that of remittent fever, except that there is more urgency in the former and more vigorous interference is demanded. The early recognition of æstivo-autumnal intermittent paroxysms, by means of blood examinations, should so put the practitioner on his guard as to enable him to forestall the graver seizure. When the attack is on, the important points are, first, not to mistake it for ordinary apoplexy or cholera, and, second, to begin early with full doses of quinine, hypodermically, and to keep this up to the last, no matter what else is done, even under the most discouraging circumstances.

TROPICAL MALARIA does not differ, in kind, from the malaria of more temperate regions. The severe, frequently fatal malarial fevers of Panama or West Africa, which sometimes take the pernicious forms described above and sometimes drag out a longer and more continuous course, are found to depend on the same æstivo-autumnal parasite as the milder fevers of more temperate climates. An admirable work on æstivo-autumnal fevers by Charles F. Craig, Acting Assistant Surgeon, United States Army, published in 1901, gives many points of interest with regard to these fevers as occurring especially in Cuba and the Philippines and the blood conditions found in soldiers who have returned from the Philippines.

MALARIAL CACHEXIA.—This is a condition very often met with in malarial regions; sometimes in those who have suffered with innumerable paroxysms of intermittent fever, sometimes in those who have never had a chill, but have long been subjected to malarial influences.

Persons so affected may complain of every imaginable symptom known to medicine, but they will almost all agree in the following: loss of appetite, a bad taste in the mouth, indigestion, a constant sense of weariness, unrefreshing sleep, dragging pains in the loins or small of the back, shortness of breath on exertion, and vague pains in the joints or muscles of the extremities. Such persons are usually more or less emaciated, pale, and fallow. The pulse is a little rapid, there is no elevation of temperature, and generally there is nothing periodical about the case. The spleen is greatly enlarged, hard, and somewhat tender on pressure, or may even be spontaneously painful in certain positions of the body, or after lying in one position for some time. In leukemia there is also an enlarged spleen, although not so hard, and in malarial cachexia there is no increase in the number of white blood cells, so characteristic of leukemia. In addition to the presence of malarial parasites, especially in the blood of the internal organs, the most striking lesion in malarial cachexia is a profound secondary anemia which may readily be distinguished from an essential or pernicious anemia by a blood examination. In the severer forms the sallowness is greater, amounting to actual jaundice, the urine is scanty and often icteric, the bowels are irregular, the abdomen is often greatly distended, and finally there may be edema of the face and extremities, while the general feebleness of the individual and his cachectic appearance are most marked.

Much more might, and perhaps should, be said on this subject, but I must content myself with only a few words concerning treatment. Many such cases still need quinine along with their other treatment, but most of them will be found to have lived on this drug for years, as well as to be thoroughly familiar with the domestic use of calomel or blue mass, and various cathartic "liver pills." They will, however, be greatly benefited by the judicious administration of arsenic in ordinary, not in antiperiodic, doses, combined with iron and nuxvomica, or by the use of the mineral acids, especially the dilute nitro-hydrochloric acid. Iodine preparations also do them good for a while. Care must be taken to aid the digestion, and to insure a sufficiently varied and nourishing diet. Above all things, if possible, such people should be induced to move away, even if only for a time, and if only for a short distance, from the place where they have become thus contaminated with malaria.

Edward W. Schauffler.

MALARIN, acetophenone phenetidin citrate (C₁₄H₁₇OC₂H₅.N.C.CH₃.C₆H₅.CH₃), is a condensation product of acetophenone and parphenetidin, and is a crystalline insoluble powder of acidulous taste. As another of the phenetidin combinations, malarin resembles phenacetin in its antipyretic and antineuralgic properties, but Erdmann reports it as dangerous on account of the untoward effects of acetophenone. The dose is stated to be 0.3 to 1 gm. (gr. v.-xv.).

W. A. Bastedo.

MALIC ACID.—(C₄H₆O₅.) An organic acid widely distributed among plants, especially in fruits, and more especially in those related to the apple. It occurs in odorless and colorless crystals, deliquescent in the air, freely soluble in water, and of a pleasant acid flavor. Its general properties are much like those of citric acid. It has been very little used.

Henry H. Rusby.

MALIGNANT GROWTHS, THE STARVATION OF.

—The attempt to control the advance of cancer and sarcoma by depriving them of blood supply is not a new thought. Ligation of the chief vessels, for this purpose, has not infrequently been tried in instances in which the growth is too far advanced to permit of extirpation. The carotid system seems that best adapted to test the principle. In 1878 Dr. John A. Wyeth, of New York, collected and analyzed all the cases then obtainable of ligation of the carotids, and he claimed that a large number of malignant tumors had thus been cured. But a careful study of these cases and his own clinical experi-

ence confirm the writer in the belief that by ligation of the nutrient artery alone tumors of this class are never permanently checked in their advance. They appear for a few weeks to cease growing, but after this brief interval of time they again resume active development.

Some idea of the difficulty of shutting off the blood supply of any part fed by arterial branches of the carotid system may be gained by simply considering how many of the eight branches of the superficial carotid freely intermingle blood with other arterial systems—*e.g.*, that of the internal carotid and that of the subclavian.

In order to overcome the difficulties just referred to and to secure a more permanent anæmia of the new growth which it was hoped in this way to subdue, the writer, about seven years ago, began his search for some method which would effect these results. The idea of completely extirpating the external carotid then first suggested itself. It was feared, though, that if this plan were carried out, the patient might lose his nose, tongue, or some other part through sloughing. In order to obtain more light upon the effects of such a serious interference with the blood supply of the head and neck, the writer made repeated trials upon dogs; tying the external carotid first upon one side of the neck and then upon both sides. As a result of these experiments one fact became perfectly clear, *viz.*, that the normal tissues can continue to live even when supplied with a surprisingly small amount of blood—an amount much smaller than that which is required by so vascular a thing as a malignant tumor, if it is to continue growing. In no instance, during these experiments, did any normal part thus deprived of a large share of its usual nourishment undergo sloughing.

The first opportunity for testing the matter upon a human being presented itself in June, 1895. The patient, who was affected with a round-celled sarcoma of the naso-pharynx, had previously been subjected by me to a simple ligation of one external carotid. On the occasion of which I am now speaking I excised the external carotid of the other side. A rapid shrinking of the tumor followed this operation, and for a period of several months the shrinkage thus gained persisted. In the following January, however, I was compelled—as the tumor had again begun to grow, and as the patient would not permit me to excise the carotid which had previously been ligated—to excise the superior maxilla, in order to remove what I could of the tumor.

Since the date named above I have had the opportunity of testing thoroughly the safety and the beneficial effects (upon malignant growths in this region) of a complete extirpation of both external carotid arteries. The operation has now been performed in over eighty cases (over forty of them by myself). Among those who have performed it may be named: Drs. Keen and Da Costa, of Philadelphia; Drs. Weir, Brewer, Bristow, Blake, Johnson, Meyer, Erdmann, Gibson, Collins, Lilienthal, and Woolsey, of New York; and Nicolson, of Atlanta, Ga. All of these operators agree in the statement that the operation presents no special difficulties. Upon an average a half-hour easily suffices to complete the carotid excision upon one side of the neck. If the operation is properly done, the loss of blood is almost nil; and hence the danger is so slight that, were not many of these patients already advanced in years and cachectic from having a malignant growth too far advanced to warrant its ablation, the mortality from the operation might rightly be expected to be insignificant. As it is, we may estimate it roughly, for cases in which there are no complications such as adherent masses of diseased lymph nodes, or in which no attempt is made to remove the tumor itself, at from one to two per cent. In no case yet reported has the pulse ever returned in any of the branches of the excised carotids—a result in striking contrast, as to permanency of the anæmia, to the speedy return of pulsation always observed after double ligation of the same vessels. In Zuckerkandl's "Operative Surgery," Dr. Da Costa, the American editor, states (2d edition, p. 48) that he has verified my observation that the shrivelling of the malig-

nant growth which follows extirpation of the artery is greater than it is after mere ligation.

Technique.—The external carotid is exposed from end to end. The incision in the skin is made fully 2 cm. nearer the median line of the neck than commonly is taught; this being a gain in both safety and speed of work. A ligature is passed about the external carotid, close to its origin, but is not yet tightened, as it is easier to expose and recognize its branches when large, being full of blood, than when collapsed and reduced to mere threads. Each branch, in order, from below upward, is tied twice, as far from the carotid as possible, and divided between the ligatures. The veins draining the same regions are also treated similarly, in order to increase thereby the difficulty of restoring anastomoses. When all but the terminal two branches are controlled, the parent trunk is tied twice and cut, as near to its origin as seems safe. The distal stump of the external carotid is now made to dive beneath, and reappear above, three structures: the twelfth cranial nerve, the posterior belly of the digastric, and the stylo-hyoid muscle. By this manoeuvre the work of reaching the terminal two branches—the internal maxillary and the superficial temporal, buried in the parotid gland—is facilitated; and by stretching the gland tissues surrounding the end of the external carotid with the jaws of a slender pair of dressing forceps, the artery is freed and its bifurcation exposed. In this way the danger (incident to the use of the knife) of establishing either a facial paralysis or a salivary fistula is avoided. In some cases, by drawing down firmly upon the carotid terminal stump, we can slip a ligature over this vessel high enough up to shut off the supply of blood to the branches just named. Usually, however, we can tie off only the external carotid just below them.

Results.—These have been encouraging; in sarcoma, surprisingly so. Several cases of subperiosteal and extremely malignant sarcoma—of the sort deemed practically hopeless by Butlin—have now remained shrunken far beyond the three-year period of Volkmann, after which we may with less hesitancy claim permanency of results. The tumor, it is of course understood, does not wholly disappear. It is, as we assume, too large to be cut out, or it is so placed that this is not practicable; but, by the plan here advocated, it is caused to undergo great shrinking and then remains inactive. Furthermore, the operation is not a deforming one. Only two thread-like vertical lines, one on either side of the neck, remain to indicate that any surgical work has been done. As to carcinoma, the results are less strikingly good. Nevertheless, we may confidently expect that the operation will, in every case, add several months, perhaps even a year, to the patient's lease of life. It should be remembered, however, that only the very worst—the most advanced and hopeless—cases have been thus far subjected to this plan of treatment. If we consider the nature of sarcoma as contrasted with that of carcinoma, we shall be able to understand why this plan of attack by starvation should be more successful in the former disease than in the latter. In sarcoma the growth depends for its extension chiefly upon the blood-vessels; the lymphatics commonly are not involved, sometimes they even stop at the surface of the tumor. In carcinoma, on the other hand, extension occurs mainly through the medium of the lymphatics. Lack of space prevents amplification of this important subject.

About eighteen months ago (in April, 1901) Dr. Wyeth suggested to the writer the idea that perhaps it might be of value either to replace excision of the carotid, or to supplement it, by injecting into the lumen of the vessel, and into that of its branches, boiling water, to cause an obliterating endarteritis; or else to inject some plastic material which, upon setting, will permanently obstruct the calibre. In following up this suggestion I have spent months of time and experimentation upon dogs and cadavers, and I have even applied the principle in a few patients. Dr. Bristow, of Brooklyn, N. Y., and the writer are the only surgeons who have, up to the present time, made use of it in actual practice. Briefly, it

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may be said that to inject all the branches of the external carotid is not a safe procedure. Thus, for example, if in dogs the superior thyroids are plugged, they permanently lose the use of the vocal cords. If the linguals are plugged, the tongue either sloughs or at best it can no longer be moved at all. Hence, when the act of swallowing is performed, this organ fails to push back the epiglottis, as it should, the entrance to the larynx is left uncovered, and food, drink, and saliva then enter the air passages, often giving rise to a fatal pneumonia due to the entrance of foreign matter (*Schluckpneumonie*). Obstructing the posterior auricular artery causes sloughing of the ear. We must remember that the normal tissues demand some blood in order to live. However, it does seem to the writer worth while to try this idea, very cautiously, upon those three branches which chiefly anastomose with outside systems—the occipital, and the two terminal arteries in the substance of the parotid—and then to excise the external carotid as usual. At the same time I am convinced that the use of boiling water in the manner suggested would be likely to end fatally, either through the establishment of multiple venous embolisms, or perhaps by producing serious shock. But both Dr. Bristow and I have tried successfully a mixture, which I suggested, of one part of hard white paraffin and nine parts of white vaseline. This remains solid at or below 108° F. If injected at say 125° F., it will not set, if the work be done expeditiously, before its completion. In the full-sized adult, with blood-vessels of ordinary capacity, not more than 1.5 to 2 c.c. of this mixture should be injected distally into the external carotid at a point say from 2 to 3 cm. below its entrance into the parotid gland, thus obstructing its two terminals and preventing a renewal of blood supply through the internal carotid system; and from 2 to 4 c.c. may be injected into the occipital at its point of departure from the external carotid. Upon reflection it will readily be recognized that although time may prove this particular method of injection a valuable addition to the technique of vascular extirpation, through its power to effect an anemia of a somewhat more permanent character, yet so far as obstructing the internal maxillary and the superficial temporal arteries is concerned, an overdose would certainly be most perilous. Running like any fluid in the direction of least pressure, the mixture would enter not the capillaries of those arteries (if too much were thrown in) but first their free anastomoses. For example, the infraorbital, or main continuation of the internal maxillary, would empty the excess of the paraffin mixture into the ophthalmic branches of the internal carotid. Here, if yet a little more should be injected, the arteria centralis retinae would be plugged (blindness); and, if still more should be thrown in, the vessels at the base of the brain would be filled,—with a prompt death from respiratory failure! Obviously, such a weapon calls for caution in its use. Nevertheless, we are fighting a savage enemy that grants no quarter, and therefore serious measures are abundantly justified. Besides, the operation is the patient's *dernier ressort*. The dose recommended above has more than once been safely injected upon the human subject by both Dr. Bristow and by myself. But experiment upon the cadaver proves that a much larger dosage would be unsafe.

Recently, the Roentgen and the Finsen rays and Coley's antitoxin injections have each given us remarkably hopeful results in certain cases of malignancy. But, unaccountably as yet, there are instances which do not yield to any of these means. For such as these it is well that the profession should know that the limit of our armamentarium has not been reached, and that in the carotid region the starvation plan is abundantly worth a trial. Within the brief compass of this article we can but outline the subject. For fuller details the reader is referred to the author's Gross Prize Essay upon the "Starvation of Malignant Growths," published in 1902 by the F. A. Davis Co., of Philadelphia. *Robert H. M. Dancbarn.*

MALIGNANT JAUNDICE. See *Liver, Diseases of: Acute Yellow Atrophy.*

MALIGNANT OEDEMA. See *Gangrene. (Surgical.)*

MALIGNANT PUSTULE. See *Anthrax.*

MALPRACTICE.—Medical malpractice is usually understood to mean bad or unskilful practice on the part of a physician, surgeon, dentist, or midwife, when, as a result of such bad practice, death ensues or the patient's health or efficiency is impaired. Malpractice may be wilful, negligent, or ignorant, and either criminal or civil suits may be brought. As a rule, criminal suits for malpractice are brought only in cases of criminal abortion, or when a physician or other individual gives some drug or performs some operation which is contrary to law. He may perform an unlawful operation, or one which is in itself lawful in proper hands or under proper conditions. Civil suits for the recovery of damages on account of injuries supposed to have been experienced as a result of wilful negligence or ignorance on the part of a practitioner are much more common.

The responsibility of a physician or surgeon should be clearly understood, and while the rulings of the courts of various States and countries differ materially, they are fairly well set forth and may be, as a rule, easily followed. Unless there is proof to the contrary, it is assumed by the courts that no contract was entered into, and, provided reasonable care, skill, and diligence are used, the practitioner may not be held responsible for the result; in other words, it is generally understood that the physician or surgeon does not guarantee either a cure or any definite result, but he is expected to use his best endeavor to accomplish a favorable result.

Malpractice may be either active or passive. Negligence which allows the death of a patient from failure to control a hemorrhage, or to furnish other suitable emergency treatment, is as reprehensible as a more active malpractice which brings about that death by causing a hemorrhage through carelessness or negligence in operating. Errors of omission are as great as those of commission, but the former are apt to be less harshly judged than the latter.

The physician, surgeon, or other practitioner, when called upon to treat a case, is expected to exercise reasonable and ordinary skill, care, and diligence, and it is usually held by the courts that this is sufficient, provided he is possessed of and uses that amount of knowledge and skill which might reasonably be expected from one engaged in similar practice in the neighborhood in which he lives. By this ruling the general practitioner in a small country town, living far from the centres of population and medical education, is not expected to possess or to exercise as much knowledge and skill as would be expected from a specialist in one of the large cities near the centre of medical education. He is, however, bound to exercise the average degree of skill possessed by persons of his profession in his location. It must be remembered that this does not necessarily mean the average skill of the whole number of practitioners in his district, for a considerable number of such practitioners may be of extremely low grade, while, on account of education and experience, he might well be expected to possess a much higher degree of intelligence. It must be the average skill of those living in his district and under his conditions. In Pennsylvania it has been held by the courts that "such a degree of skill is required as a thoroughly educated surgeon ordinarily employs"; in the majority of the other States, however, the position taken is rather that which has been before described.

While the professional man is supposed to exercise his best judgment and skill, it is not supposed that he is infallible, and it is appreciated that errors in judgment may be made even by the best and most conscientious, and no one will be held responsible for such errors provided ordinary and well-established lines of diagnosis and treatment are followed.

If the methods of diagnosis and treatment are unusual and differ from those which are commonly accepted as proper and well established, he may be held responsible

for bad results following such unusual methods. For this reason new or unusual methods should not be attempted unless one is prepared to withstand criticism if the results are not all that might be expected. If such new or unusual methods are to be used, the patient, or his representative, should be informed that such is the case, should thoroughly understand the reason for such changes from well-established lines, and should agree to their use. It probably would be acknowledged by the courts that progress in medicine and surgery depends upon modifications in methods, and if such modifications are reasonable and based upon sound premises, it is probable that judgment would not be very severe.

Conditions may be such that a greater amount of skill would be expected from the medical man or surgeon who has been called from a distance than from those practitioners who live in the district in which the case occurs. In such cases, where a specialist from a large city is employed, he would be judged by the methods employed in the community from which he came. He may use methods which are not common where the patient is located, but he will be expected to have and use that degree of skill and knowledge which might reasonably be demanded from those having like opportunities.

When a contract has been entered into by which a cure, or some definite result, has been pledged, the practitioner will be held responsible for the fulfillment of such a contract.

Gratuitous services do not exempt the practitioner from action for malpractice if either ignorance or carelessness in his attendance can be proved. The trained physician is expected to use the same care and diligence in the treatment of charity cases that he does in those from which he receives a large fee. This does not mean, however, that in cases in which advice is sought and given, responsibility for the result is involved if the person whose advice is asked is not a professional and does not claim to have the knowledge of one. He will not be held responsible for bad results if he has given as good advice as might reasonably be expected from one in his position.

CONSULTATIONS.—Cases frequently occur in which, on account of lack of experience or for other reasons, physicians feel themselves incompetent properly to diagnose or treat a given case. When this condition exists, it is the duty of the physician to call in consultation with him some other more fitted than he to judge in this particular case, and, if he appreciates that this condition exists, then he is responsible if he fails to do so. Such rulings follow the lines already mentioned by which he is expected to use due care, diligence, and skill in cases in which new or unusual methods of diagnosis or treatment are employed. When capital operations are performed, it is always safer, and usually wiser, that a consultation should be held, and the consultant who is called should be, if possible, one who is recognized as particularly well fitted for judgment in such cases.

CONTRIBUTORY NEGLIGENCE.—When it can be proved that the patient refused to carry out the physician's instructions or failed to exercise due care, the physician or other practitioner is relieved from any responsibility which may follow as a result of such negligence. The practitioner is supposed, however, when giving instructions or outlining the treatment, to consider the personality of the individual and his surroundings, and only such instructions should be given as it is possible to follow out.

When a medical practitioner has recovered compensation for his services through the courts, such recovery will interfere with any future suit for malpractice on the part of the patient. Partners in medicine or surgery are held jointly liable for malpractice by any member of the partnership.

SUMMARY.—A practitioner of medicine or surgery will be guilty of malpractice when serious results follow on account of his gross ignorance or neglect; when he uses medical or surgical methods that are prohibited by law; when he makes use of unusual methods which are apt to endanger the life of his patient; and when he neglects

to use such means as may be necessary for the safety of his patient. He is liable for any bad result which may depend upon a want of knowledge or lack of care on his part. He is required to exercise the amount of skill which can reasonably be expected from one under his conditions. Gratuitous treatment does not relieve him from responsibility for the result. He cannot be compelled to assume the care of any case unless he so wishes; but, having accepted it, he cannot withdraw without giving suitable notice of his intention. An action for malpractice cannot be brought after he has recovered in court for his services. He is relieved from responsibility when the patient fails to follow his advice. He is responsible for negligence or ignorance on the part of his assistants, but not for criminal acts on their part. He is not responsible for errors of judgment in uncertain or difficult cases. *Edwin Welles Dwight.*

MALT.—(*Maltum*, U. S. P., 1880.) The official directions given in the United States Pharmacopoeia for the preparation of this product are as follows:

"Malt, in coarse powder, not finer than No. 12, one hundred (100) parts; water, a sufficient quantity. Upon the powder, contained in a suitable vessel, pour one hundred (100) parts of water and macerate for six hours. Then add four hundred (400) parts of water, heated to about 30° C. (86° F.), and digest for an hour at a temperature not exceeding 55° C. (131° F.). Strain the mixture with strong expression. Finally, by means of a water-bath, or vacuum apparatus, at a temperature not exceeding 55° C. (131° F.), evaporate the strained liquid rapidly to the consistence of thick honey. Keep the product in well-corked vessels in a cool place."

The almost universal employment of malt preparations, especially liquid malt extracts, by physicians and by the laity, warrants a critical study of their value from a therapeutic standpoint. This naturally implies an investigation of the composition of malt, its properties as a food substance from a physiological point of view, and finally, an estimate of its virtues alone, or combined with other medicaments, in the treatment of disease. And, inasmuch as there is a popular demand for these products, some reference should also be made to adulteration, and the addition of foreign substances, principally antiseptics, to prevent fermentation.

COMPOSITION.—The manufacture of malt consists essentially of four different processes, viz.: *Steeping, couching, flooring, and kiln-drying*, which result in decreasing the weight of the grain (about twenty per cent.), but are attended with an increase in bulk (three to eight per cent.). The entire manipulation should be considered to be successive steps of the same operation, since malting merely effects the transformation of the substances of the grain, through the influence of heat, moisture, and the amylolytic action of *diastase* (which see). Through the action of diastase—manifested within an hour after grain is put to steep—the insoluble starch of barley is converted into dextrin and glucose—sometimes called grape-sugar. Thus, the outline of Proust (*loc. cit.*) shows that malt contains nineteen per cent. less starch and cellulose than barley, ten per cent. more sugar, eleven per cent. more dextrin, while the amount of gluten is lessened by two per cent. It should be stated in this connection that, while the object of "malting" is to produce the maximum of sugar by the action of diastase, it is not desirable that this action should be entirely exhausted, and therefore, at a certain stage of the operation this process is arrested by kiln-drying; under favorable circumstances—heat and moisture—this fermentation is re-kindled.

Qualitative tests for *diastatic activity* are extremely simple. A quantity of malt is added to hot water, and dissolved by constant stirring; then a small portion of starch is added in like manner, and in the course of a few minutes the iodine test is applied.

The *soluble extract* in a good malt suitable for brewers' use, is, according to Ure, 66.8 per cent.; it contains, in addition, insoluble matter, 26.7, and moisture, 6.5 per cent. To determine the proportion of *insoluble matter*,