result from exhaustion in consequence of the protracted anæmia, and the gastro-intestinal disturbance, which prevents the retention and assimilation of food. Recovery may ensue after several weeks of dropsy, vomiting, and diarrhœa, interspersed with eclampsia, the convalescence being very slow. Three months or more may be occupied in the return to health.

The Acute Parenchymatous Nephritis of Pregnancy.—There are points connected with this disease requiring special consideration in respect to its course and terminations. It is usually considered due to two factors—to the relatively poor quality of blood of pregnant women, and to the pressure of the enlarging uterus on the renal veins, causing passive congestion. As Bartels shows, the renal veins occupy a position which secures them against pressure, and, as so large a proportion of pregnant women escape the complication of albuminuria, it can hardly be due to either or both of the factors to which it is usually ascribed. There must be some special predisposition, and as the condition of the kidney is precisely the same as in the acute parenchymatous nephritis, and as it not unfrequently assumes the chronic form, pregnancy is merely an exciting cause. The change in the kidneys may take place in the early months of pregnancy, when visual disturbances, dropsy, and miscarriage will ensue, or later, when to the visual disturbances and dropsy must be added eclampsia. Œdema of the face and limbs and frequent micturition are often the first symptoms, but, in the author's experience, visual disorders, especially hemiopia, double vision, and amblyopia, are very frequently the first departure from health.* Again, persistent huskiness of the voice may be the first indication. In other cases no symptoms are felt but disorders of digestion, and, as they are like those of the first months of pregnancy, little attention is paid to them, or there may be persistent headache with vertigo. Sometimes the first symptom to attract attention is an attack of convulsions, the health being apparently good. The urine usually contains an excessive quantity of albumin. The œdema is usually not great. The important point in these cases is the violence and acuteness of the uræmia, whether manifest in the form of convulsions or maniacal excitement. The relative frequency of eclampsia in proportion to the whole number of cases of albuminuria is about one fourth, and of those attacked by eclampsia about one third die. The symptoms usually quickly subside on abortion or delivery, but a considerable proportion become chronic and prove fatal in subsequent pregnancies.†

Treatment.—As the kidneys are in an irritated state, all stimulants to them should be avoided. To give them rest, vicarious functions need to be stimulated to the highest activity—notably the skin and

* See "Die Albuminurie in ihren ophthalmoskopischen Erscheinungen," by Dr. Hugo Magnus, in which the changes in the retina wrought by albuminuria are well depicted.

† Elliot, "Obstetric Clinic," chapter iii, New York, 1868.

intestinal mucous membrane. When the symptoms are urgent, the skin may be excited by pilocarpine nitrate ($\frac{1}{12}$ to $\frac{1}{8}$ gr. for an adult), or by the vapor-bath or warm pack. As Barker, of New York, has recently shown, pilocarpine must be used with caution in these cases on account of its depressing effect on the heart. Those purgatives are used that produce free watery evacuations. If the stomach is very irritable and the symptoms not urgent, small doses of calomel ($\frac{1}{6}$ grain), frequently repeated, act extremely well. In acute uræmia, the most active cathartics are required—as elaterium, croton-oil, gamboge, etc.—since it is necessary to procure abundant watery evacuations. If the case does not require immediate active interference, the compound jalap powder is probably the most generally useful of the purgatives in this disease. It is best administered in the early morning, so that the disturbance produced by it may be ended before the time for the administration of the other remedies directed during the day. To relieve the kidneys of congestion, and to remove obstructions from the tubules, diluents must be freely used. The most important diluents are milk and cream-of-tartar solution. If the stomach is irritable, milk may be given with lime-water, one fourth to one third of the latter. Infusion of digitalis may be given with cream-of-tartar solution, or alone ; but it is more effective in combination. If the stomach will not bear digitalis, it acts surprisingly well in the form of a poultice applied to the back or abdomen. Nitro-glycerine is very useful : it lessens the congestion of the kidneys, and diminishes the amount of albumin present in the urine. It is best given in the form of the centesimal (one per cent.) solution, commencing with one drop every four hours and adding a drop at each dose until the characteristic effects are produced.

If eclampsia occur, what treatment is most effective? If the subject is plethoric, the superficial veins full, the conjunctiva injected, bleeding, by venesection, may be practiced with advantage. Chloroform, by inhalation, can be used to abate the violence of the symptoms, but as soon as possible a hypodermatic injection of morphine should be given according to the method of Dr. Loomis, of New York, who has shown that large doses are remarkably effective in arresting the convulsions of uræmia. Half a grain of morphine can be given at once, and it may be repeated in two or three hours, if necessary, until two grains have been taken. He shows that, if the first large dose is without effect, other doses should be administered fearlessly until the desired effect is produced. Warm baths and active purgatives are indicated, and must be energetically used. Excellent results have been obtained by the use of chloral by the stomach (gr. xv to gr. xlv) : it is even more effective by the rectum. Bromide of potassium may be given in full doses, with or without chloral, by the stomach or rectum, according to the condition of affairs. The same principles hold good in the treatment of the puerperal mania arising from uræmic intoxication.

CHRONIC PARENCHYMATOUS OR CROUPOUS NEPHRITIS.

Causes.—It is comparatively rare for the chronic form of parenchymatous nephritis to succeed to the acute. It is a disease of youth, and is rare after forty. It arises from those causes which depress more or less permanently the vital forces, as syphilis, chronic malarial poisoning, protracted suppuration, chronic alcoholismus, chronic mercurialismus, and other chronic poisoning by metals, etc.

Pathological Anatomy.—To this form of diseased kidney is the term large, pale, or white, smooth kidney, especially applicable. One or both may be affected. The capsule is thin because of prolonged stretching, and, when divided, flies apart and is easily detached. The cortex is a dull, rather yellowish-white color, and is anæmic, while the pyramids are full of distended vessels and are dark red. The enlargement is due chiefly to an increased thickness of the cortical part. The epithelial lining of the tubules is not simply affected with "cloudy swelling," as in the acute form, but has undergone important changes—has been either detached, or is far advanced in fatty degeneration, the cells being filled with fat-globules. The tubules contain a detritus, the product of the destruction of the epithelium, and consists largely of oil-globules, and they also are seen to be blocked in places by large casts. The intertubular matrix is also greatly thickened—a change due to hyperplasia of the connective-tissue elements, to the migration of the white corpuscles and their subsequent multiplication and fatty transformation, and to a quantity of fluid exudation, the product of the increased pressure in the veins. The Malpighian tufts and arteries are sometimes affected, according to Bartels, with the amyloid change in cases arising from chronic suppuration.* Undoubtedly, many tubules are rendered entirely and permanently useless, but restoration may take place when extensive changes have occurred in the kidneys. But, when the changes are too far advanced to permit recovery, the increase in the intertubular connective tissue and its subsequent contraction bring about an atrophic degeneration.

Symptoms.—The approach of this form of kidney-disease is insidious. There is some decline in strength, the body is more easily fatigued, the mind is rather sluggish, and the appetite is poor. A condition of anæmia is evident, and the face has an earthy or fawn color, but it is not until œdema appears about the eyelids and ankles that advice is sought and the real nature of the case made apparent. The accumulation of fluid now proceeds rapidly, and in a short time the whole body is greatly swollen. The cellular tissue, the penis, and scrotum are immensely distended, and afterward the cavities fill up to their utmost capacity, and death may be soon caused by œdema of the

* Rindfleisch, while admitting the existence of amyloid change, regards it as "infrequent." (*Op. cit.*)

lungs or paralysis of the heart. The dropsy in this form of nephritis assumes much greater proportion than that of the acute, or indeed of any form of nephritis. As the accumulation of fluid increases, the amount of urine discharged diminishes, but the urine falls off with the beginning of the renal lesions, although the change is not enough to attract attention. When the disease attains its maximum, the quantity of urine passed in twenty-four hours becomes exceedingly small, and may not exceed four ounces, but there is considerable fluctuation, due to the variations in the amount of water. The urine has a darkish, smoky-looking color, which deepens as the quantity lessens. As the urine cools, it becomes thick with urates, epithelium, casts, etc. The

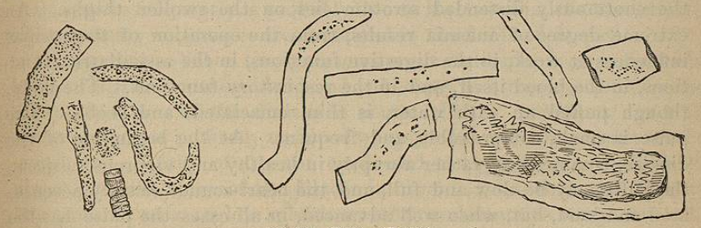

Fig. 39.—Casts. (Beale.)

sediment, which falls in great quantity, is composed of urates, uric acid, casts, white blood-globules, and granular detritus. The casts at first consist of pale, delicate hyaline cylinders, dotted here and there with oil drops or granules, either long, narrow, and curved, or broad and shorter. The casts change in character with the progress of the case, becoming more granular, fatty, and the broad replacing the narrow casts. The specific gravity of the urine changes with the variations in the quantity of urinary water, rising to 1035, even 1040, when the amount of urine discharged is very small. If, from any cause, there is a considerable increase in the quantity of urine, the specific gravity falls correspondingly, and below the normal. Albumin is always present, but not in very great quantity, and fluctuates in amount with the variations in the specific gravity. The same fact is true of urea, which, while constantly and absolutely below the normal, varies with the changes in the specific gravity of the urine. The uric acid is increased, and probably in the ratio of the diminution of the urea.

Fig. 40.—Casts becoming fatty.

When the dropsical accumulation has reached the maximum, the fluid is not limited to the subcutaneous tissue and the cavities. The mucous membranes become similarly affected. An early symptom may be a husky, even toneless voice, and dangerous laryngeal stenosis, from œdema of the glottis. The lungs become more or less œdema-

tous at the height of the disease, and life may be terminated by the accumulation of fluid in the lungs. The gastro-intestinal mucous membrane is also dropsical, and the epithelium, swollen, sodden, and degenerating, is cast off in large quantity. The result is vomiting of a quantity of serous fluid and profuse serous evacuations from the bowels, not only exhausting in themselves, but causing, ultimately, greater depression by interfering with digestion and the assimilation of food. The external integument is similarly affected. The epidermis is sodden and detached; the skin cracks in places, permitting the water to drain through; and the true skin, irritated and exposed, becomes exceedingly painful. This process takes place especially where the enormously distended scrotum lies on the swollen thighs. An extreme degree of anæmia results, from the operation of the various influences at work, in the digestive functions, in the assimilative functions, in the blood itself, and in the respiratory functions. The body, though puffed up with water, is thin, emaciated, and feeble. The pulse is small, compressible, and frequent. At the beginning of the disease, commencing rather abruptly in healthy and vigorous subjects, the pulse may be slow and full, and the heart-sounds sharply accentuated and loud, but, when well advanced, in all cases the pulse has the characteristics just mentioned, and the heart-sounds are feeble and obscure. When œdema of the lungs takes place, the respiration becomes embarrassed; but, if large serous accumulations occur in the pleural cavities and in the pericardium, the breathing becomes very difficult, the patient is unable to lie down, and is tormented by a feeling of impending suffocation. Uræmia does not occur so frequently in the chronic as in the acute form of the disease, but amaurosis, muscular twitching, and partial and general convulsions do now and then take place.

Course, Duration, and Termination.—Commencing insidiously, it is not until dropsical symptoms are manifest that the nature of the case is declared. Rarely does the disease come on with boisterous symptoms, the body becoming rapidly distended. When the œdema is observed, there is no long interval in any case until the dropsy is general. When the maximum distention is reached, life can not long continue without relief. Dropsy, however, does not appear at once in every case—albuminuria may exist for months without any effusion, but, when this is the case, there may properly be a suspicion that an error of diagnosis has been committed. In favorable cases the dropsy will not be so great, and the kidneys will manifest a disposition to activity, and will respond to the action of medicines. Those are unfavorable cases in which the dropsical accumulation is extreme, and the kidneys are sluggish, but little urine passing, and in which these organs can not be induced to act efficiently. When there is pronounced dropsy, if the urine increases and the effusion diminishes, a year or more must be expected to pass before recovery can ensue. A complete recovery is by

no means a rare event. Usually, when the dropsy disappears, and convalescence is apparently established, there are yet albumin and casts in the urine. If this is the case, the recovery is not real: there may be a slow return of flesh, the cachexia may diminish, and the strength improve, but a return of the dropsy may be confidently expected. Usually, when the albumin persists in the urine, the health is not restored when the dropsy disappears, but the body continues emaciated, and the pallor and anæmia remain. Death may be due to some intercurrent malady—to an acute serous inflammation, to a low grade of pneumonia, etc.; or the patient may be worn out and die by exhaustion; or death may be due to uræmic coma. That the last-named accident does not occur more frequently is probably due to the fact that the excrementitious urinary substances are contained in the fluids of dropsy.

Diagnosis.—When the symptoms occur suddenly, there is feverishness, the urine contains blood and pale casts, and there is pain in the back, the form of the disease is acute. If the symptoms come on slowly, there is no fever, no blood or epithelial cells are present in the urine, the quantity of albumin small and the specific gravity high, or over 1030, the form of the disease is chronic. In contracted kidney, the urine is pale, of low specific gravity, and contains waxy casts; in chronic parenchymatous nephritis the urine is dark, of high specific gravity, and contains abundant large granular casts and epithelium: in the former there is but slight or no dropsical accumulation; in the latter the dropsy is extensive.

Prognosis.—Although rather unfavorable, the prognosis is not hopeless. Cases have recovered in which there had been very pronounced dropsy, and in which albumin had remained in the urine for months after the disappearance of the effusion. The more acute the symptoms and sudden the accumulation of fluid, the more favorable, provided the kidneys exhibit any activity. The prognosis is the more favorable, the shorter the duration of the disease, the less the urine departs from the standard of health, and the smaller the percentage of albumin. When the probable cause is remediable, as syphilis, or marshmiasm, or lead-cachexia, the prognosis is favorable in proportion to the degree in which the morbid changes are due to the action of these causes.

Treatment.—A dry, unchangeable, and warm climate exercises a most favorable influence on the course and termination of chronic parenchymatous nephritis, and is a remedial agent of the first importance. When a suitable climate can not be obtained, the conditions which render it so useful should be applied to the patient, if practicable. He should be confined to bed, and remain between blankets, to secure warmth and uniformity. Free diaphoresis should be produced by warm air and by the administration of pilocarpus. If the accumulation of fluid is excessive, free purgation will be necessary, but this measure can not be continued for any lengthened period, since the implication of the mucous membrane is such that, without purgatives,

there occurs a highly irritable state of the intestinal canal. Besides diaphoresis, the only resource now remaining is, to stimulate diuresis. The choice of diuretics is restricted to those which do not increase the blood-pressure in the kidneys—as the free imbibition of fluids, milk, bitartrate-of-potassa solution, etc. The infusion of digitalis, notwithstanding the theoretical objections to it, is often very serviceable in exciting free diuresis. Combination with the bitartrate or acetate of potassa increases the action of both agents. If there be great distention of the cavities and increasing difficulty of breathing, the aspirator may be used freely to draw off sufficient fluid to afford relief, but it is not desirable to empty the cavities. The removal of the fluid in the peritoneal cavity usually suffices, since the upward pressure of the ascites is the chief factor in the difficulty of breathing. Puncture of the skin may be necessary when the penis and scrotum are greatly distended, but care must be used lest sloughing follow. A small sewing-needle is employed to puncture the skin, but Southey's trocar may be used, as it is a neat, elegant, and efficient instrument for the purpose. If the fluid can be removed by the application of these remedies, iron should now be used to correct the anæmia. Combination with iron increases the action of diuretics. As the presence of albumin after the disappearance of the dropsy indicates the persistence of the mischief in the kidneys, it is then necessary to employ remedies to check the waste of material and to remove the cause on which it depends. This is a difficult if not an impossible task. The author has had promising results from the careful administration of tincture of cantharides—five drops *ter in die*, and continued, if the results are favorable, for several months; still more valuable has proved the chloride of gold and sodium, with or without a minute quantity of corrosive sublimate—$\frac{1}{15}$ grain of the former and $\frac{1}{30}$ grain of the latter *ter in die*. Recent reports have favored the use of methaniline, but the author's experience has not been confirmatory. Good results have also been claimed for the *Blatta Orientalis*—the cockroach—a new remedy which comes to us from Russia.

INTERSTITIAL NEPHRITIS—SCLEROSIS OF THE KIDNEYS.

Definition.—Interstitial nephritis is one of the chronic forms of Bright's disease. Various designations have been applied to it: fibroid kidney, renal cirrhosis, contracting kidney, granular kidneys, etc. The terms above given—*interstitial nephritis* and *sclerosis of the kidneys*—are correct, since they designate the seat and character of the morbid change—an inflammation of the connective tissue of the kidney, the subsequent atrophy being due to the contraction and pressure of the new elements.

Etiology—This disease, like its congener, sclerosis of the liver, is a malady of middle life, according to Dickinson occurring with greatest

frequency at fifty, and rarely before twenty. As regards sex, this disease is twice as frequent in men as in women (Dickinson *), and, according to German writers, four times more frequent in men (Bartels). Social condition does not appear to have any relation to its production, as it occurs under all circumstances in life. Gout seems to have an important position as a cause; in sixty-nine fatal cases there were sixteen due to or accompanied by gout (Dickinson). The gouty condition is produced in a considerable proportion of those exposed to emanations from lead, and gouty kidney or granular kidney occurs in an astonishingly large number of such subjects. Out of forty-two workers in lead, dying from various causes in St. George's Hospital, twenty-six had granular kidneys (Dickinson). Lead-poisoning ranks first as a cause of this disease. It is in a high degree probable that chronic poisoning by other metals may exert a similar if not so predominant an influence in the production of this disease. Drs. Da Costa and Longstreth, † in a paper on "The State of the Ganglionic Centers in Bright's Disease," demonstrate the existence of degenerative changes in the renal ganglia. The ganglia undergo fatty degeneration and atrophy, the connective-tissue hyperplasia and the new elements pass through the same process. These lesions appear to the authors of the paper to stand in a causal relation to the renal affection. These observations have been confirmed by Dr. Saundby ‡, except that he regards the change as one of pigmentary degeneration.

The author has maintained for many years that interstitial nephritis frequently follows gonorrhœa in consequence of the injurious action on the kidneys of the oils and balsams used in its treatment. Liebermeister and Bartels have lately suggested that this relation between gonorrhœa and nephritis exists, but they suppose a transference of the catarrhal process from the bladder to the kidneys.

Pathological Anatomy.—When the disease is far advanced, the kidneys, usually both, are very much reduced in size, from six or five ounces to three or two. From this extreme to a size equal to or a little greater than the normal, the gradations are numerous. Usually both kidneys are equally affected, but it sometimes happens that the disease is more advanced in one. The capsule is thickened, opaque, and somewhat adherent. The surface of the kidney presents a granular aspect, due to the formation of a great number of spherical prominences, one tenth of an inch in size generally, but they may be either larger or smaller than this figure. These prominences are grayish in color and without vascularity, but the depressions between them are very vascular. Cysts of various sizes and in varying numbers are seen here and there on the surface; they are clear, transparent, and of a straw-color. On

* "The Pathology and Treatment of Albuminuria," p. 124.
† "The American Journal of the Medical Sciences," July, 1880.
‡ "The British Medical Journal," January, 1883.

section, the tissue of the kidney is found to be tough and resistant. The cortical portion is thin by reason of atrophy, a line or two in thickness only remaining. The color is dark-brownish, or reddish-brown, or a yellowish-gray or fawn color, the variations being due chiefly to the amount of blood present in the organ. On microscopic examination, the connective tissue about the Malpighian bodies and the blood-vessels and beneath the capsule is thickened, and the tubes are compressed into mere threads. Here and there may be a tube complete, its epithelium intact, but large spaces exist between, consisting exclusively of fibrous tissue, with the mere remains of wasted tubes. The glomeruli are grouped in bunches owing to the wasting of the intermediate tubes, and lie imbedded in the fibrillated connective tissue. Cut off from the tubular connections, in some of them fluid accumulates, forming cysts. Interior cysts as well as those on the exterior are, however, chiefly developed from obstructed tubules.

The changes are not always general, but may take place in parts of the organ; one extremity may be small, contracted, granular, the other presenting its normal appearance; the hilus may be the seat of the change and the rest of the organ be affected in patches. These examples of irregularity in the development of the sclerosis are further irregular in the fact that the kidneys are unequally involved in the morbid process. The pathological alterations are not limited to the kidneys. The left side of the heart is hypertrophied, and this succeeds to or is associated with hypertrophy of the muscular fiber of the arterioles throughout the body. The retina undergoes a form of inflammation resulting in atrophy of the optic disks, known as *retinitis albuminurica*. The changes in the vessels are an influential factor in the production of the cerebral hæmorrhage with which this disease not unfrequently terminates.

Symptoms.—The development of this disease is so slow and from such small beginnings that it is usually far advanced before any symptoms arise indicating the nature of the malady. There may be, indeed, no symptom referable to the kidneys. A patient dies from a cerebral hæmorrhage, and after death granular and contracted kidneys are found. Another has convulsive seizures, partial or general; the urine is then examined, and albumin is found in it. Another has headaches, his nose bleeds, and he suffers from indigestion, acidity, and flatulence, to which his other troubles are referred. Another passes water more frequently than seems natural, gets out of bed frequently at night, and seeks relief for these symptoms. Another suffers from attacks of difficult breathing—asthmatic they seem—or he gets out of breath on ascending the stairs or making any considerable exertion; he has also attacks of palpitation and a stridulous cough, and finds that he must elevate his head and chest to lie with any comfort at night. And still another has vertigo, headache, and disorders of vision, which come on without apparent cause. The solution of the problem is at once

afforded by an examination of the urine and the discovery of albumin. Of all these initial symptoms, frequent micturition, especially at night, is the most usual. The urine in typical cases is pale, of low specific gravity, and is large in quantity. The color is faintly yellow, or it is colorless, of very feeble acid reaction or neutral, and the specific gravity falls to 1003 to 1010. While the daily quantity passed by a healthy adult is about forty ounces, in this disease the urinary discharges amount in twenty-four hours to a gallon or more. It is an ill-omen when the urinary discharge falls off considerably, for this indicates still greater damage to the kidneys, and bodes the onset of uræmia. The urine, as a rule, contains more or less albumin, but it may be absent for days together, and indeed may be absent for much of the time throughout the disease. Hence frequent examinations must be made, and at longer intervals, in doubtful cases. The amount of albumin discharged is not large at any time, and in the beginning of the morbid change in the kidney may be very small, so as to produce but a faint cloudiness, and requiring the utmost nicety of observation to detect it. The quantity of albumin is affected by diet, mode of life, and by the amount of the urinary discharge. The solid constituents of the urine, especially the urea, are much reduced; uric acid is also present in very small quantity, the saline constituents are equally light, and the phosphoric acid is especially very much below the normal. Hence the urine appears clear, like water, and deposits little sediment. There may be seen some octahedral crystals of oxalate of lime, an occasional epithelial cell, and hyaline casts. The last-mentioned constituent in the sediment is most important. The casts are few in number, and hence the sediment should be collected from a considerable quantity of urine. They are pale transparent, their outlines not easily discerned, and without structure, except an occasional adherent granule or fat-globule. These pale hyaline casts must be distinguished from the pale yellow and highly refracting casts which appear in the urine in parenchymatous nephritis.

Sufficient facts have now been accumulated to render it certain that there is a form of chronic interstitial nephritis without the presence of albumin in the urine. All the other symptoms are, however, quite distinct: the copious flow of pale, watery urine of low specific gravity, the high tension of the vessels, the hypertrophied arterioles, the enlarged heart, the disorders of vision, retinal changes, the headache and other nervous phenomena, the neuroses of the respiratory organs, the disorders of digestion, the failure of nutrition, and the general decline in health and strength—indeed, all the characteristic symptoms, except the presence of albumin, are encountered in full severity.

At first, in this disease, the appetite and digestion are good, and the nutrition of the body continues unimpaired. Thirst is an early symptom. More fluid is taken at meals, and at other times a quantity of water, which seems to the patient to pass through the body without