gap left by the removal of the bone is filled with a thick, firm band of fibrous material, which takes the shape and general direction of the removed bone, and is in many cases sufficiently firm to support artificial teeth.

Closure of the Jaws may exist in one of two forms, viz., temporary or spasmodic, and permanent or organic.

Spasmodic closure of the jaws is most frequently due to firm contraction of the masticatory muscles, especially the masseter and the internal pterygoid, superinduced by prolonged irritation of branches of the third division of the fifth pair of nerves.

The most common cause of this condition is the difficulty that sometimes attends the eruption of the wisdom tooth, either from the fact of its being misplaced or because the space between the second molar tooth and the ramus of the jaw is insufficient. Among other causes of spasmodic closure may be mentioned alveolar abscess in the vicinity of the last two molars, suppurative tonsillitis, necrosis of the jaws, etc.

Treatment.—The treatment of this affection is obvious, viz., to remove the cause. When the condition arises from difficult eruption of the wisdom tooth, the patient should be thoroughly anæsthetized and the jaws forcibly separated by a screw-gag or lever, in order that access may be had to the seat of trouble. If the wisdom tooth is presenting normally, it may be sufficient to incise the gum freely or to extract it. Generally it is necessary to remove the second molar, in order that the wisdom tooth may have room to emerge. The cause of the irritation having been removed, the function of the jaw is in a short time completely restored.

Permanent or Organic Closure of the Jaws is a far more serious affection than the spasmodic form, the management of which often taxes the patience and skill of the surgeon, as well as the endurance of the unfortunate sufferer, to the utmost. These cases may be conveniently divided into two classes, namely: those arising from diseases of the temporo-maxillary articulation, and those which have their origin in ulcerative action and cicatricial contraction in the perimaxillary soft tissues.

The Diseases of the Temporo-maxillary Articulation which, by causing fibrous or osseous ankylosis, lead to permanent closure of the jaws, are acute and chronic arthritis.

Acute Arthritis may follow mechanical injury—for example, blows upon the side of the face, dislocations, or fractures that extend into the joint—or it may supervene upon the exanthematous fevers in connection with diseases of the middle ear.

Symptoms. — The symptoms of acute arthritis of the temporo-maxillary articulation are pain, redness, heat, and swelling and stiffness of the jaw, sometimes amounting to entire closure of the jaws. If suppuration occurs, the pus may escape through the external auditory meatus or by means of an opening in the overlying skin.

Treatment.—The treatment of this condition should be rest to the joint by causing the patient to abstain from mastication, the application of leeches over the joint, hot fomentations, and evacuation of pus as soon as formed.

Chronic Rheumatic Arthritis of the temporo-maxillary joint is essentially a disease of old age, fortunately, however, rarely met with. It may affect one or both sides, but is more frequently unilateral.

Symptoms.—The symptoms are gradual enlargement of the condyle, which may often be plainly felt beneath the zygoma, pain on opening the mouth, and a peculiar creaking in the joint on moving the jaw, plainly perceptible to the patient. The neighboring lymphatic glands are enlarged. The face is distorted, the chin being inclined to the sound side when the disease is unilateral, carried prominently forward when bilateral. The pathological changes are the same as those of chronic arthritis of any other joint—the articular cartilage undergoes disintegration and absorption, the glenoid cavity is enlarged, the interarticular cartilage disappears, the eminentia articularis is levelled down so as to permit of partial dislocation, and the neck and head of the jaw are thickened and enlarged. The muscles are in a state of tonic contraction in the effort to keep the inflamed joint surfaces in contact, and, as a consequence, stiffness of the jaws is always present to a greater or less degree.

Treatment.—In the treatment of this disease little is to be hoped for from the action of medicines, though active counter-irritation over the joint and the exhibition of increasing doses of the iodide of potassium have been recommended.

In the Transactions of the American Medical Association of 1881, Dr. D. H. Goodwillie, of New York, describes an ingenious method of making extension in the treatment of this disease, which in his hands yielded the most encouraging results. The apparatus consists of an interdental splint which separates the posterior teeth while the anterior remain free, and which is made to act as a fulcrum when the chin is elevated by means of elastic straps attached to a skull-cap, thus serving at the same time to keep the joint surfaces apart and to hold the jaws immovable.

Ankylosis of the Jaw, the result of arthritis, may be fibrous or osseous. No matter whether the disease is unilateral or bilateral, mastication is impossible.

The diagnosis between the fibrous and osseous varieties can be ascertained only when the patient is under the influence of an anæsthetic.

If the ankylosis is dependent upon the presence of fibrous tissue, the jaws may be forcibly separated, and the adhesions broken up by means of a screw-gag made for the purpose, or of levers and a wedge introduced between the teeth to keep the jaws apart. The tendency of the parts to become fixed again renders the daily repetition of this process necessary for months, and even for years. Even with the most constant care on the part of the surgeon, and the fullest co-operation of the patient, the result is very seldom satisfactory, and at the present time is rarely resorted to, except as after-treatment to more radical operations.

Division of the fibrous bands by a tenotome passed through the mouth into the articulation has been frequently done, with some showing of better results.

In both fibrous ankylosis, in which so little is to be hoped for from mechanical treatment, and in osseous ankylosis, or synostosis, the method which promises the best results is excision of the condyle with a portion of the neck of the jaw, and establishment of an artificial joint. Less radical measures, as Esmarch's operation, in which a wedge-shaped segment of the bone is removed, and that of Rizzoli, in which simple section of the bone is made—both with a view of establishing a false joint—are occasionally practised for the relief of ankylosis, but not with the same measure of success that follows excision of the joint.

Esmarch's and Rizzoli's operations are more applicable to the variety of closure of the jaw which depends upon cicatricial formation in the buccal mucous membrane, and will be described later on.

The operation of excision of the joint is performed as follows: "An incision is begun at the lower margin of the zygoma, close in front of the temporal artery where it adjoins the ear, and carried forward along the zygoma one and a quarter inches, the tissues being divided, layer by layer, until the bone is reached. A second incision, involving only the skin, is then carried from the centre of the first directly downward for about an inch. The soft parts are carefully separated with elevator and knife from the margin of the zygoma and the outer surface of the joint, and drawn downward with a hook, thus preserving the parotid nerves and vessels from injury. The neck of the condyle is then freed by working around in front and behind with a small elevator, keeping close to the bone so as to avoid injury to the internal maxillary artery, and finally divided with a chisel. If there is bony union between the condyle and temporal bone, the chisel must be again used to separate them, its edge being kept directed somewhat downward so as not to break through into the cavity of the cranium."[3]

Permanent Closure of the Jaws may be due to cicatricial contraction following extensive ulceration and sloughing of the buccal mucous membrane.

This condition may be the result of cancrum oris, profuse ptyalism, or necrosis. In reference to closure of the jaws from the excessive employment of mercury, Gross says: "Such an occurrence used to be extremely frequent in our Southwestern States during the prevalence of the calomel practice, as it was termed, but is fortunately diminishing. Children of a delicate, strumous constitution, worn out by the conjoined influence of mercury and scarlatina, measles, or typhoid fever, are its most constant victims; but I have also seen many examples of it in adults or elderly subjects. In the worst cases there is always extensive perforation of the cheeks, permitting a constant escape of saliva and inducing the most extensive disfigurement."[4]

When the mucous membrane of the cheek, from one alveolus to the other, is involved, the cheek is bound so closely to the jaw that all movements of the jaw are rendered impossible, and often the space between the teeth and the cheek is so limited as scarcely to admit the passage of a probe.

Frequently the new tissue has bone developed in it, which occasionally is present in the shape of an osseous bridge extending from one jaw to the other, thus serving to bind the bones even more closely together.

The condition of the patient is pitiable in the extreme, as food can be carried into the mouth only in fluid form, or by being rubbed against the teeth.

Treatment.—Attempts at relief of this condition by division of the cicatricial tissue and forcible separation of the jaws have proved unsatisfactory, since as soon as healing had taken place contraction of the new cicatrices occurred.

Excision of the nodular tissue entirely, and transplantation of healthy mucous membrane, as proposed by Dieffenbach, or of healthy skin, as practised by Jaesche, is nearly always impracticable, on account of the difficulty of obtaining healthy mucous membrane or skin near enough to be utilized.

To separate the adhesions from the bone, and, in order to prevent readhesion, to adjust metal shields worn over the teeth to keep the surfaces apart, and at the same time to keep up forcible separation, is a method of treatment that is not only most trying to both surgeon and patient, but one that has never, even when fairly tried for a long time, given satisfaction.

Dieffenbach's operation of making an artificial joint behind the contraction, by simple section of the bone, has proved inefficient on account of the liability of the divided bones to reunite.

The operation proposed by Esmarch, of Kiel, in 1855, of establishing a false joint in front of the contraction, by excising a wedge-shaped piece of the bone, is the most rational treatment yet devised for closure of the jaws depending upon contraction of cicatricial tissue. Of course this operation is applicable only to cases in which the disease is limited to one side.

Esmarch's operation is superior to the method of Rizzoli, which consists in the establishment of a false joint in front of the contraction by simple division of the jaw, on account of the tendency of the divided bones to reunite.

Esmarch's operation is thus performed: "An incision is begun at the angle of the jaw and carried two inches along the lower border. A narrow strip of bone is then cleared on both sides up to the edge of the gum, a tooth drawn if necessary, the chain-saw passed around the bone through the incision, and the section made. The anterior fragment is then depressed and protruded through the wound, and a wedge-shaped piece, from one-third to one-half an inch in width at the widest part, cut off with cutting forceps."[5]

Dr. J. Ewing Mears, of Philadelphia, in vol. i. of the Transactions of the American Surgical Association, reported a case in which he made a false joint for closure of the jaws from a gunshot wound by resection of a portion of the ramus of the jaw, together with the coronoid and condyloid processes, and obtained a good result.

In the discussion that followed Dr. Mears' paper, Prof. W. T. Briggs reported a case of closure of the jaws from double synostosis resulting from arthritis, caused by a fall upon the chin, in which he removed the anterior portion of the body of the jaw. In this case the object of treatment was to obtain an avenue into the stomach, and excision of the jaw was the only method by which this object could be effected, inasmuch as the cause of the condition existed on both sides—the lower jaw was undeveloped, and occupied a position some distance behind the upper jaw; the lower teeth were buried in the mucous membrane of the palate, and the masticatory muscles had degenerated into fibrous tissue from long disuse.

In such extreme cases of closure of the jaw, excision of a portion of the bone is the only resort of the surgeon.

Charles S. Briggs.

Bibliographical References:

[1] Hamilton: Fractures and Dislocations.
[2] Gross: System of Surgery, vol. ii., p. 415.
[3] Stimson's Manual of Op. Surgery, p. 190.
[4] System of Surgery, vol. ii., p. 405.
[5] Stimson's Manual of Op. Surgery, p. 191.
[6] Stimson: Fractures and Dislocations.

JECORIN.—Jecorin is a complex organic body containing phosphorus and sulphur, and which resembles in many respects lecithin. It was first prepared by Drechsel[1] from the liver of the horse in the following manner: The liver was extracted by cold dilute alcohol; the alcohol was evaporated at a low temperature, and the residue shaken several times with absolute alcohol, by which many impurities were removed while the jecorin remained undissolved. The jecorin was then taken up in ether containing water and precipitated by absolute alcohol; by repeating these operations several times the jecorin was finally obtained in pure form.

By drying in vacuo over sulphuric acid jecorin is obtained in the form of a light yellow, amorphous mass, which is so hygroscopic that when exposed to the air it becomes soft and sticky. On the addition of more water it swells and finally forms a turbid solution; after evaporation on the water-bath it is insoluble in ether as well as in water.

Jecorin is precipitated from its solutions by concentrated hydrochloric acid, copper acetate, and silver nitrate. The silver precipitate is soluble in an excess of jecorin, the solution being opalescent; on adding ammonia and warming the solution becomes ruby red.

Drechsel found the following elementary composition for the jecorin from the horse's liver: C 51.4, H 8.2, N 2.86, P 3.5, S 1.4, Na 2.72. Drechsel proposed the following formula from the above analysis: $C_{182}H_{185}N_3SP_2Na_3C_{16}$.

Baldi[2] isolated a substance having properties very similar to those of Drechsel's jecorin from the liver of the rabbit and dog; analysis of the latter preparation gave results somewhat different from those obtained by Drechsel: C 46.88 to 46.89, H 7.81 to 8.09, N 4.36 to 4.88, S 2.14 to 2.70, P 2.29 to 2.75, Na 5.72.

These analyses show that jecorin may be regarded as the sodium compound of an acid closely related to the "protagons."

When jecorin is boiled with sodium hydroxide and copper sulphate the latter is reduced, showing the presence of a sugar-like substance. When jecorin is warmed with sodium hydroxide alone, stearic and other fatty acids are split off; the soaps so produced form a gelatinous mass on cooling.

On boiling jecorin with barium hydroxide, cholin and glycerin-phosphoric acid, as well as fatty acids and a sugar (probably dextrose), are formed; this decomposition shows that jecorin is very similar in composition to lecithin.[3]

Baldi, making use of the method of Drechsel, found jecorin in the spleen, muscle, and human brain, and in

the blood. The jecorin from the blood seems to differ somewhat from that obtained from the liver; when the former is saponified the solution does not set to a jelly on cooling.

Recently Manasse has found in the suprarenal gland of the beef and horse a substance having many of the properties of jecorin; it did not, however, reduce alkaline copper-sulphate solution, except after prolonged boiling with sulphuric acid, and it did not lose its solubility in ether by drying. Analysis showed that it differed considerably in composition from the liver jecorin: C 41.43, H 7.16, N 0.3, S 1.8, P 4.44.

From the various facts stated above it seems probable that there are several jecorins.

Baldi's discovery of jecorin in the blood has aroused considerable interest among physiologists and physicians. It had been shown by Otto[4] that the blood contains a reducing substance in addition to dextrose; since Baldi's discovery of jecorin in the blood it has been customary to attribute all, or the greater part, of the reducing power of the blood (after removal of the dextrose) to jecorin. Some authors[5, 6] have gone so far as to suppose that jecorin is really simply a combination of lecithin and dextrose; that very little dextrose occurs free in the blood, but that it may be split off from the jecorin under special conditions. Bing[7] states that the blood of animals in which the "diabetic puncture" was made showed a considerable increase in the amount of jecorin in the blood, while the sugar showed no constant increase. Extirpation of the pancreas was followed by an increase of both jecorin and sugar. Kolisch and Stejskal[8] at one time held that in cases of diabetes mellitus the sugar of the blood was not increased, the apparent increase being due to an increase in the quantity of jecorin.

In most of the experiments in which the significance of jecorin in the blood has been discussed, the jecorin was not determined directly; all the reducing substances which were not extracted by water, but which were extracted by ether, were reckoned as jecorin. Mayer,[9] however, has recently shown that normal blood contains glycuronic acid. The combination of glycuronic acid occurring in the blood is soluble in ether, is not fermentable, but reduces Fehling's solution on boiling, *i.e.*, it gives the reactions which have usually been held sufficient to show the presence of jecorin. As all previous observers have neglected the possibility of the occurrence of glycuronic acid in the blood, it is evident that much more work is necessary before any conclusions can be drawn as to the significance of the occurrence of jecorin in the blood in either health or disease.

In making determinations of both lecithin and sugar in the various organs, it is necessary to take account of the jecorin. Thus the quantity of lecithin in an organ is usually determined by the phosphorus in the ether-alcohol extract; such extracts, however, contain jecorin, and as the latter contains phosphorus the results are too high for lecithin. In a similar manner the jecorin may vitiate the quantitative estimations of sugar, especially in such an organ as the liver, where it occurs in such abundance.

Reid Hunt.

[1] Drechsel: Journ. f. prakt. Chemie, N. F., 33, p. 425, 1886.
[2] Baldi: Archiv f. (Anat. u.) Physiol., 1887, suppl., p. 100.
[3] Manasse: Zeitsch. f. physiol. Chemie, 20, p. 481.
[4] Otto: Archiv f. d. ges. Physiol., 35, p. 467, 1885.
[5] Jacobsen: Skand. Archiv f. Physiol., 6, p. 263, 1895.
[6] Henriques: Zeitsch. f. physiol. Chemie, 23, p. 244, 1897.
[7] Bing: Skand. Archiv f. Physiol., 9, p. 336, 1889.
[8] Kolisch u. Stejskal: Wien. klin. Woch., 1897, p. 1101.
[9] Mayer: Zeit. f. physiol. Chemie, 32, p. 518, 1901; also Verhandlungen d. Cong. f. inn. Med., 1901, p. 403.

JEMEZ HOT SPRINGS.—Bernalillo County, New Mexico.

Post-Office.—Archuleta.

These springs are located in the beautiful Jemez Mountains, 45 miles from Albuquerque, with which they are connected by daily stages during the summer months. There are two groups of springs, known as the upper and the lower. The upper group at Archuleta is most frequented. These springs are located in the San Diego Canyon, 620 feet above the level of the sea. They are forty in number, and range in temperature from 70° to 105° F. They are chiefly saline in character. The lower group, two miles south, are ten or more in number, and have temperatures ranging from 94° to 168° F. They are also saline.

James K. Crook.

JEQUIRITY.—*Abrus, Love Pea, Prayer Beads, Jumble Beads, Crab's Eyes. Abrus* L. (fam. *Leguminosæ*) is a genus of six species, related to the lentil and the pea, known to medicine by the species *A. precatorius* L., which is indigenous in British India and very widely distributed in the tropics of both hemispheres. The plant prefers a light or sandy soil, and its slender, woody stems climb high over shrubbery in the edges of forests. The fruit resembles a miniature pea-pod, a little more than an inch in length, and containing from four to six seeds. The roots have been employed as a substitute for licorice under the name of wild or Indian licorice. The leaves possess the same property, containing considerable glycyrrhizin. The seeds are better known than the root, under the name jequirity. They are a quarter of an inch in length, elongated-globose, smooth, shining, bright scarlet, a black spot surrounding the hilum. A black form, with white spot, and a white form with black spot, occasionally occur. They are largely employed for rosaries, ornamental beads, children's toys, and in India, under the name of *retti*, for weighing. They have also been used in India for criminal poisoning, usually of cattle. For this purpose the seeds are crushed and worked into a paste with water. This paste is rolled into a needle-pointed form, mounted upon a stick and used to prick the skin of the fated animal, which quickly succumbs to heart failure.

In South America originated the practice of painting a watery infusion upon granulated eyelids, by which suppuration was induced and the granulations were removed.

The active agent was at first supposed to be the bacteria which appear after a time in the infusion. Later, this theory was disproved, and the properties were reported to reside in an albuminous substance called *abrin*. This was later found, by Drs. Sidney Martin and R. Norris Wolfenden, to be a mixture, and was by them separated into two albuminous bodies, a globulin one-fifth as poisonous as the venom of the common adder and an albumose one-sixth as strong as the globulin. These poisons are destroyed by heat. Their effect resembles that of snake venom, the temperature falling greatly and the blood remaining semi-fluid after death. It is by no means certain, however, that this resemblance is not superficial.

Jequirity has been recommended only for local use. It acts as a powerful irritant to mucous membranes. If taken internally, uncooked and concentrated, it produces vomiting and purgation, the fæces being often bloody. Forty seeds produced these symptoms, with partial collapse, but recovery followed. If it is applied to the eyelids, inflammation quickly ensues, with suppuration usually on the third day. The inflammation is characterized by great swelling and pain. If the applications are continued, there is great systemic disturbance also. The applications have been continued by most practitioners for from three to ten days. Upon their discontinuance, the symptoms usually subside quickly and then disappear, with the removal, or great reduction, of any previously existing pannus. The effect upon conjunctival granules is not so great. In unfavorable cases, ulceration of the cornea and sometimes loss of the eye have resulted, and in severe cases the inflammation has extended over the entire face and even to the salivary glands. Most of such accidents have resulted from the use of too concentrated or bad preparations, or from careless treatment. Nevertheless, the remedy has come to be regarded as a heroic one, and is now not frequently employed. Either an infusion or a powder may be employed, the strength ranging from three to six per cent., and it should be freshly made. The powder should be dusted

upon the inner surface of the lids, or the infusion applied with a camel's-hair brush, or even dropped into the eye.

Henry H. Rusby.

JOINTS, CHRONIC DISEASES OF.—Chronic diseases of the joints can for the most part be considered under one of the two following headings:

I. Diseases affecting the synovial membrane.

II. Diseases affecting the bone.

Other affections, such as those accompanying constitutional affections and miscellaneous conditions demand separate consideration which will be classed for convenience as

III. Miscellaneous.

I. Diseases Affecting the Synovial Membrane.—Chronic inflammation of the synovial membrane is either a continuance of the inflammatory process described under acute synovitis (see article on *Synovitis, Acute*), or it may be, primarily, subacute or chronic. After persisting it is characterized by thickening of the synovial membrane, an increased secretion, and retrograde metamorphosis of the connective tissue. This metamorphosis may develop granulation tissue and attack the cartilage and bone in a degenerative and destructive process, or it may terminate in an alteration and cicatricial change of all the tissues (these have been described in the article on *Arthritis Deformans*), or the process may be chiefly limited to the synovial membrane.

Fig. 2989.—Double Chronic Synovitis of Knees.

(*a*) *Chronic Serous Synovitis* (Dropsy of the joint, Hydrarthros, Hydrarthrosis, Hydrops articulorum chronicus).—The pathological appearances of chronic synovitis vary much, but an increased amount of fluid is always present. Certain cases show no pathological changes beyond this increase of fluid for a long time, and these are the cases which have given rise to the names hydrops, hydrarthron, etc.

The change coming next after the increased vascularity and thickening of the synovial membranes which occurs in acute synovitis is an hypertrophy of the synovial fringes. This varies from a slight hyperplasia to a condition in which fibrous tissue change has set in, and solidified them into a multitude of small fibrous polypi. Meantime the subsynovial tissue has hypertrophied and thickened, to even an inch in some cases, and if the fluid has been long in the joint the synovial membrane and the parts below it look light yellow, pulpy, and boggy. If the effusion has been extreme the capsule has either become enormously thickened or has given way and become much distended. If so, the lateral and internal ligaments, weakened by the continual tension and soaked by the contained fluid, have also stretched, and lateral motion may be found in the knee-joint, even to the extent of 60°. When thickening of the capsule has predominated, cartilaginous and even bony plates may be found in the tissue. The synovial membrane in certain cases begins to encroach upon the cartilage. Normally, it runs into the cartilaginous border for 2 or 3 mm., but now the hypertrophied membrane sends out processes which creep in still farther, as pannus does on the cornea. It may go on to the formation of granulation tissue, but it is not likely that it will. Purulent cases generally follow another type, as will be seen later (Fig. 2990).

Chronic serous synovitis, which begins slowly and not from an acute affection, and which is characterized by the slight pathological changes mentioned above, is an affection whose cause is wholly obscure. It occurs oftenest in young men; it is not associated ordinarily with the rheumatic or any other diathesis, and any attempt to assign a cause is mere speculation. Such cases are oftenest marked by the occurrence of pronounced hypertrophy of the synovial fringes, and a tendency to connective-tissue formation. One phase of the affection is represented by the intermittent form in which the effusion occurs at more or less irregular intervals without obvious cause.

Arthrite Plastique Ankylosante.—There is a form of acute and subacute synovitis which has been described under the acute forms as dry synovitis. This condition is sometimes found as well in the chronic class. It represents an inflammation with a small exudation very rich in fibrin. It is apt to be associated with an infectious cause, as in gonorrhœa. The destruction of the cartilage is slight, and the ends of the bones are soldered together directly by the organized exudation.

II. Joint Affections Beginning in Bone.—The type of degenerative ostitis can be described in a very few words — hyperæmia of the vessels, infiltration from the distended capillaries, and the formation of large spaces (lacunæ of Howship), with absorption of the trabeculæ; fatty degeneration of the bone cells, and their final replacement by embryonic tissue. The mechanism is, then, at hand for any amount of destruction. The greater part of degenerative ostitis of the ends of the long bones follows one type, which is now called tuberculous.

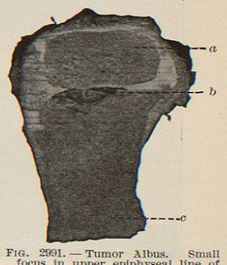

Fig. 2991.—Tumor Albus. Small focus in upper epiphyseal line of tibia. Synovitis of joint but no tuberculous process apart from focus as noted. Death from miliary tuberculosis. *a*, Epiphysis; *b*, primary focus; *c*, shaft. (Nichols.)

This type of disease presents itself ordinarily in the spongy tissue of the epiphyses of the long bones, oftenest near the line of junction with the shaft, sometimes very close to the articular cartilage, however, and sometimes in the