CHAPTER XII.

THE TEETH AND THEIR DISEASES.

ODONTALGIA.

UNDER this common head are to be studied the various pains in the teeth, however induced. The term comes from the two Greek roots, *odons*, a tooth, and *algos*, pain,—odontalgia, toothache, or pain in a tooth.

The causes of toothache are to be classed under the following heads:

1. Sensitive dentine.
2. Direct or indirect exposure of the pulp to sources of irritation.
3. A diseased state of the periodonteum.
4. Confinement of pus and gas in a pulp-cavity.
5. Granules of osteo-dentine in a pulp.
6. Sympathy.
7. Recession and absorption of the gum and alveolus.

1. *Sensitive Dentine.*—Some teeth, immediately on the breaking down of the enamel and the consequent exposure of the dentine, become exceedingly sensitive; in other words, exhibit themselves as peculiarly susceptible to the influences of irritating agents. This impressibility is attempted to be explained by the most dissimilar hypotheses, few subjects connected with the teeth having elicited more discussion and controversy.*

* An observation of the pulps of certain teeth which have been exposed to irritation in cavities unopened as well as open will exhibit the existence of fungoid excrescences. Only very lately it has happened the author to open several teeth which had been partly destroyed by caries, the pulp-chamber, however, being intact; in two of these cases a magnifying-glass of very ordinary power exhibited thread-like excrescences of most minute and fibrilla-like appearance, passing in clusters from the surface of that portion of the body of the pulp adjoining the cavity of decay. These excrescences were in each instance of a pearly-white color, and might well have been likened to bundles of the delicate cobweb. It is suggested to the attention of the microscopist that it is possible that such excrescences passing into the tubular structure have been mistaken for nerve-fibrillæ. Without qualification, however, the author believes that exception may be taken to the doctrine that nerves pass from the pulp into the tubuli. It scarcely seems to need the microscope to demonstrate the correctness of such an opinion. That fibrillæ, however, may be found in teeth of loose structure, being intertubular, may readily be received as a fact, but their origin is to be sought in the enamel membrane and not in the pulp. One explanation at least of sensitive dentine would seem to be found in the relation of the dentinal circulation to the pulp through the medium of the halitus of the chamber; this finds (at times) demonstration in the marked relief so commonly gained through absorp-

In teeth thus sensitive, the operation of excavation is occasionally found so painful as to be quite unbearable, and is only to be accomplished through the employment of means that lessens such sensibility. Even sweets taken into the mouth, or cold or hot drinks, or acids, the latter particularly, will occasionally provoke pain in such teeth. Instances quite numerous exist where such dentinal sensibility is continuous, the pain being of a dull annoying character existing quite independent of foreign agents of offence. In these latter cases the exciting cause must be looked for in some irritative condition existing in the oral fluids: these may be too acid or too alkaline. Tests, however, are here easily made with the aid of litmus or turmeric paper. Specific remedies, accordingly, may have immediate employment.

As direct applications to teeth sensitive from the nature of their organization, medicinal obtunders in great variety are suggested. Of these perhaps the most permanently effective is arsenic: this application, however, possesses an objection in ill results almost certain to accrue to the dental pulp which renders the use of it entirely inadmissible; it is, nevertheless, very frequently employed.

Chloride of zinc is a favorite preparation, and where used immediately preparatory to excavating will be found commonly to answer most satisfactorily. In the employment of this agent, as in that of arsenic, care is to be exercised that such impression be not produced as shall unduly irritate the pulp. The application of the chloride of zinc is variously made. A common mode is to take a deliquesced preparation, dropping it, when it may conveniently be done, from the point of an instrument into the cavity, which cavity has been previously dried; the parts being protected from any inroad of moisture by means of napkin or dam. Another mode consists in employing a pellet of cotton saturated with the zinc. Still another manner, and the one to be preferred, consists in using the crystals direct, a few of these being placed in a cavity and allowed to liquefy. This last plan is to be commended above the others.

The almost immediate result of an application of zinc to a sensitive cavity is the production of quick, sharp pain; this, however, commonly disappears in from one to two minutes, when, the sensibility being found obtunded by the action of the agent upon the superficies of the cavity, excavation may painlessly proceed to that extent of depth to which the salt has acted. Reapplications are to be made as found necessary, although it is to be recognized that the fewer one can get along with the better for the subsequent health of the tooth.

Chloride of zinc in full strength obtunds immediately the part to which it is applied; diluted, it simply irritates and worries, increasing the very sensi-

tion from the cavity of all moisture, and the preservation of such dryness during the process of cutting. That entire dryness in a dental carious cavity is among the best antidotes to sensibility has come to have such common practical recognition that a large class of the most experienced operators rely exclusively upon it.

bility it is intended to destroy. Where the pain attendant on an application of the zinc is objectionable to the patient, it is to be in great part antagonized by a preliminary employment of the extract of belladonna.

Agents having no ulterior ill influence, and which frequently render all required service, are found in such preparations as creasote, chloroform, an ethereal solution of the terchloride of gold, aconite, oil of cloves, London paste, nitrate of silver, glycerole of thymol used warm, etc. It is sometimes found that by sealing up in a cavity for one or two hours portions of sulphate of morphia, excavation may be accomplished with entire absence of pain. Cauterizing the cavity with a point of the nitrate of silver frequently answers the same end. A similar mode of treatment, the actual instead of a potential cauterant being used, is a suggestion by Dr. Stellwagen: this operator using a live coal secured by igniting the point of a hickory stick. A mixture of equal parts of tincture of aconite and a saturated solution of iodine is highly recommended as an excellent cauterant and obtunder. Still other obtunders are chloride of calcium, carbonate of potassium, and ethylate of sodium. A combination highly commended by Dr. Flagg is prepared by mixing up fifteen grains of carbonate of potash with an ounce of glycerine; it is applied by means of a pointed stick or on a delicate pellet of cotton-wool. Another, a favorite application with many, is found in rubbing up together equal proportions of sulphate of morphia and gum camphor. The value of any or all of these agents is not, however, to be overestimated, as a very little experience will be sure to make evident that what is found to answer satisfactorily in one case is seen to be of little effect in another.

A means of overcoming the difficulty which is perhaps more reliable than the employment of obtunding agents, consists in using very sharp excavators and by rapid motion making deep cuts, which sweep the circumference of a cavity.* In acid mouths, where the carious mass is mostly made up of semi-

* In a paper read before the Pennsylvania Odontological Society by Dr. Guilford, attention is called to the important fact that burs, used with the engine, are obtunders or producers of pain, according to their sharpness or dulness. The author alludes to the three forms manufactured,—the hand-cut, the stoned, and the machine-made; commending warmly the second, criticising severely the others. A dull bur he condemns as one that should never be used, and certainly the evolution of heat out of such an instrument in rapid motion might not be overlooked by the most careless. Recut burs are also exhibited as necessarily imperfect, for while a workman can sharpen them after a fashion, he cannot equalize the height of the teeth, some of which have been broken or been worn more than others. In order to enable his class at the Philadelphia Dental College to observe and distinguish critically, Dr. Guilford has arranged an appliance and fitted it to the microscope in such a way as to bring a bur head into the field of vision, and there revolve it so that every point may be seen in a magnified form, as shown in the diagram.

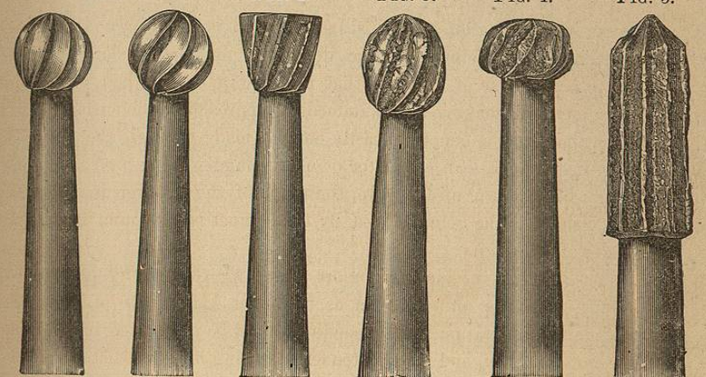
In examining the stoned bur (Fig. 1), the polished sides of the teeth and the clear and keen cutting-edges are to be noticed. Even the bottom of the furrows between the teeth is smooth and polished, enabling the bur thereby in the very best manner to clear itself in the act of cutting. This latter point is one not to be under-estimated, for when a bur is in a condition to favor the retention of the débris in the furrows, these soon fill up, and thus practically lessen the depth of the cutting-edges. The general appearance of the head of the stoned bur shows the care, skill, and labor necessary to its production.

In direct contrast to this most perfect of cutting-tools, notice the ordinary bur (Fig. 2). When this instrument is well made, the teeth will be of uniform height and shape, and it will be as perfect as the file can make it before tempering; but in the latter process, by the

devitalized animal matter, such treatment commonly proves so satisfactory that on the removal of a superficial horny layer all sensibility is found to

FIG. 80.

FIG. 1. FIG. 2. FIG. 3. FIG. 4. FIG. 5.



oxidizing of the metal, its entire surface is covered with scales, making it rough and irregular, where, before tempering, it was comparatively smooth. No doubt the file-marks, fine as they are, favor the retention of this scale upon the surface of the metal. It is perceived that not only are the furrows rough from this scale, but the cutting-edges are also made dull and uneven by it. It is easy to decide as to the relative value of the two instruments.

In the recut bur (Fig. 3), similarity is remarked to the new plain bur (Fig. 2) so far as roughness from scale is concerned. Its teeth, however, are of unequal length, caused by some of them having been previously broken and their being filed to an edge in their present shape. This fact makes it one degree worse than the ordinary bur as a pain-producer.

Attention is called to the worn bur (Fig. 4). Some of its teeth are broken, while others are worn down so as to more closely resemble a burnisher than a cutting-tool. These worn and smooth edges, together with the irregularity of the teeth, make it an instrument that, by heating and thumping the tooth, would cause more pain and do less work than any other. It denounces itself as worthless.

In the machine-cut bur (Fig. 5), in addition to the scale, a general roughness, not only of the cutting-edge, but of every part of the furrow, is to be noticed. All its surfaces present the appearance of having been coarsely draw-filed. This is no doubt due to the rough face of the tool used in cutting them. It is also noticeable that pieces have been chipped or broken out of some of the cutting-edges. This is probably due to the hard temper of the bur and the lack of delicacy of the tool cutting it. Of the specimens shown in the diagram all are entirely new and have never been used, except, of course, the worn bur and the recut one; the latter has not been used since coming from the instrument-maker's hands.

From examination of the diagram it is readily seen what qualities a bur should possess, in order to commend itself to favor as a minister to a patient's comfort. In the first place,

have disappeared. The success of this manner of treatment does not, however, apply so happily in alkaline mouths or in the case of very hard teeth. Indeed, it may be said that with dense teeth zinc is the only agent yet known which invites any special reliance. Perfect dryness is to be associated with the cutting. Dry heat, or the chloride of calcium applies.

Sensibility of dentine is also at times found to be dependent not on a strictly localized nor on a general hyperæsthesia, but, on the existence of true inflammation. Here the indication suggests precisely the treatment required for inflammation in general.

In directing medication to a sensitive cavity, it is necessary to distinguish between common sensibility and that depending on exposure of the dental pulp; note being made of the fact that the cornuæ of this body are not infrequently met with making a very immediate approach to the surface. Such distinction, however, is generally easily enough made through the aid of an exploring instrument,—an excavator or nerve-plugger being used; if at any point there be exposure of the pulp, the touch of the instrument cannot fail to distinguish it, as the pain induced by the contact is not found to apply to other parts of the cavity.

Another condition of similar import exists where a cavity of decay so nearly approaches the pulp-chamber as to render each stroke of the instrument an agent of irritation. This condition is to be recognized in the depth of the common cavity, and in the tenderness being most associated with the deepest part. These cases require great delicacy in manipulation, as an inadvertent cut would most likely plunge into the substance of the pulp.

Etherization, as a means to enable an operator to excavate a sensitive tooth, is not infrequently nor objectionably resorted to, it certainly effectually answers the purpose, and where a patient is easily affected, as is occasionally found to be the case, a few inhalations inducing insensibility, there is no

it is to be made of the best steel, and so treated as to give it the best qualities possible. Next, it is to be most carefully made, with keen, even, and regular cutting-edges, and perfectly smooth furrows. It is to be well tempered and must be perfectly true. The tool-holder or hand-piece in which it is carried must also necessarily run perfectly true.

In selecting burs an operator should use a magnifying-glass, in order the better to examine the various points. Having succeeded in getting the proper quality and kind of burs, they are to be employed properly. For the excavating of living dentine a new and sharp bur is always to be used, lifting it frequently from the surface operated upon to prevent heating. The best results are generally obtained by running the bur rapidly. The tool is to be watched that it does not become clogged; an accident is less liable to occur, however, in a dry cavity than in a wet one.

Another matter, hardly less important than sharpness in the bur, relates with the hand-piece that carries it. If this tool be not true, as pointed out by Dr. Guilford, the bur, in its revolution, will not describe a perfect circle, but, rather, an ellipse, by travelling in an eccentric way. The result of this would be that the head, in its motion, instead of touching the dentine all the while, as it should, would alternately touch and leave it, thus giving a series of raps or blows, productive of very decided pain. The operator might not be conscious of these blows, but the patient would be, although, not unlikely, there might be ignorance as to the cause.

objection to its employment. Anæsthesia need not, of course, be carried to any profound extent.

The administration in hyper-sensitive cases of morphia subcutaneously is a practice that an annoyed practitioner need not hesitate to adopt. To an adult from an eighth to a quarter of a grain may be given half an hour before commencing the excavation. Bromide of potassium answers also at times a reasonably reliable purpose; twenty-five grains may be administered, by mouth, in a wine-glass of water. Syrup of lactucarium is another agent not without virtue; it is to be prescribed in tablespoonful doses. All of these means affect the local by diminishing the general sensibility.

Viewing sensitive dentine as a cause of odontalgia, the operator finds his most satisfactory means of cure in the introduction of a filling into the cavity. Another means resorted to, as a temporary treatment, is the excavation and polishing of the surface. Still others, the cauterization, as above suggested, with the solid nitrate of silver, or the use of the various other agents mentioned. A method where the parts are very sensitive consists in introducing into an unexcavated cavity a filling of oxychloride of zinc. The filling is allowed to remain three or four weeks, or even longer. This practice the writer commends as one of the most desirable and reliable that is to be pursued. The sensitive grooves so often met with across the neck portion of the face of the teeth are frequently to be most happily obtunded by an occasional repetition of polishing the surface by means of a burnisher. Such means, just here, is greatly to be preferred to the use of zinc.

2. *Direct or Indirect Exposure of the Pulp to Sources of Irritation.*—Reference to the anatomy and relations of the dental pulp exhibits it as a body composed of the most delicate connective tissue, in which ramify nerves, arteries, and veins. This body is lodged in a bony cavity, sufficient only in size for its comfortable accommodation, and for the halitus, or fluid, which surrounds it. Any undue congestion will therefore at once be perceived to result in a pressure, which, from the presence of nerve-matter, must cause acute suffering. This appreciated, the pains resulting from an inflamed pulp must be admitted to be alike in general character.

A pulp need not, as suggested in connection with applications employed to obtund sensitive dentine, be fairly exposed to be the subject of irritation.

Cases not infrequently occur where the plate, or floor, of a cavity is so thin, and so altered in structure, that it yields or bends. In these instances the agencies of mastication may and do readily enough force the plate down upon the pulp. As a consequence of such pressure we have irritation, and, it may be, inflammation.

Irritation of a pulp is much more apt, however, to be associated with exposure of the organ. Here everything entering the cavity is a source of offence, and the lesion is always plainly enough discoverable; foreign particles coming in contact with such an exposed pulp give instant and perhaps exces-

sive pain. This pain may quickly subside, or it may continue for hours or days; in the latter case, inflammation will be found to have established itself.

A free and open break into a pulp-cavity is attended with much less pain in inflammation of the organ than is the more limited exposure. In the first case, the swelling pulp has plenty of room, and consequently less pressure is exerted on the nerve-filaments. In the second, the protruding, congested organ quickly becomes strangulated, and thus pain of an acute and severe character results.

The treatment of an exposed pulp is of a twofold character,—palliative and radical. The first consists in the employment of soothing and quieting applications, and is employed principally for the relief of children. The second implies the destruction of the part; this being generally effected through the instrumentality of escharotic applications. To quiet an irritated pulp, attention is to be directed first to the removal of every source of offence. If the fluids of the mouth be irritative, the character of the condition must be sought for and corrected. If foreign particles have found their way into a cavity of decay, they are to be carefully syringed away with warm water. Such attention may be all that is needed. If not, and the excitability continue, recourse is to be had to soothing applications: the tincture of hamamelis applied warm, or the oil of cloves, or creasote much diluted, or chloroform, aconite, and laudanum, in equal parts, will sometimes act very happily; particularly in such cases as depend on excitation unattended with inflammation. Where evidence of congestion, or vascular excitement of any grade, exists, lead-water and laudanum frequently acts like magic.* Persulphate of iron and tincture of iodine are found sometimes to serve very happily in similar conditions, constringing the vessels, and thus breaking up, or aborting, as it were, the congestion. In the odontalgia of first dentition, it is well that parents be provided with some order of general prescription. A very good one is as follows: the obtunder to be applied by saturating a small piece of cotton and laying it loosely in the cavity:

℞.—Creasoti, gtt. vj;
Tincturæ iodinii, ℥j;
Liquoris plumbi subacetatis, ℥j;
Chloroformi,
Tincturæ opii, āā ℥ss. M.

Such a prescription is suggested on the principle of Dewees' carminative, and is found apt to meet, in some one of its ingredients, the single or various indications that may be present.

In severe inflammation of a pulp, it may be necessary to conjoin with the directly local the more indirect means of medication: blisters upon the nape

* ℞.—Plumbi acetatis, gr. v;
Tinct. opii, ℥ss;
Aquæ, ℥j. M.

of the neck frequently result in speedy relief; hot pediluvia; saline cathartic medicines, as the sulphate or carbonate of magnesia; diaphoretics, as the spirits of Mindererus, or Dover's powder; or diuretics, as the nitre preparations. An inflammation of the dental pulp, if not too far advanced, will almost invariably be broken up by the administration of from five to forty grains of bromide of potassium, the application of a mustard poultice to the back of the neck, and a hot foot-bath continued from twenty minutes to half an hour.

The atropiæ sulphas is also to be relied on as a valuable agent in soothing, or obtunding, the pain of an irritated pulp. If severe inflammation have not supervened, and if the trouble be taken to syringe from the cavity any agent of offence, the instances will be found few indeed where it will not afford almost immediate relief.

℞.—Atropiæ sulphatis, gr. i;
Aquæ destillatæ, ℥j. M.

To be marked "poison" for safety, and to be applied precisely as the immediately preceding combination.

A cause of odontalgia from an irritated pulp frequently exists in the case of plugged teeth, from proximity to this organ of the material used in the filling. In these instances a constant irritation is kept up by thermal impressions induced by the presence of the metal. If inflammation supervene, the pain, because of the perfectly enclosed condition of the pulp, becomes of an acute throbbing and unbearable character; relief is generally obtained by the removal of the filling; or, if that should not succeed, the pulp may be treated as shortly to be described. Where several teeth are in a state of irritation from such a cause, and confusion as to distinct location is thereby induced (as is not infrequently witnessed), the affected teeth can be made clearly to designate themselves by holding cold water in the mouth; or, what is even better, by touching each particular filling with some cold steel instrument. The increase in sensation will commonly be thus made very marked. An operator may frequently cure such teeth by removing the plug, and before reinserting it introducing between the filling and floor of the cavity some non-conducting substance,—a piece of ordinary quill, a particle of asbestos, a layer of gutta-percha, a portion of the Hill stopping, or a cap of platinum. Oxychloride of zinc prepared very dry is an admirable article to employ.

Still another source of irritation to the dental pulp is found in wearing down of the teeth. This is particularly observed in persons who use tobacco freely, or in such as have the upper and lower teeth directly articulating. Happily, however, in the generality of such cases, nature antagonizes the external influence by depositing, in quantities as needed, secondary dentine within the pulp-cavity, at the same time contracting this organ, so that, in proportion as a tooth wears away on its cutting face, the pulp recedes, and casts out, for its protection, this secondary material. It is a beautiful and wonderful process of offence and defence, and commands admiration.

In some cases, however, and these not a few, this reparative or protective power does not seem to exist; where this happens, the pulp, of course, soon becomes the subject of irritation. The writer has seen some of the severest cases of odontalgia result from such a cause. The only cure is found in the destruction of the pulp. To apply arsenical paste under such circumstances (see radical treatment of pulp), there being no cavity of decay, it will be sufficient to lay it in the cup-shaped depression commonly existing on the cutting faces of such teeth (the result of the more rapid wearing of the inner dental structure than of the outer enamel wall), keeping it in place with a covering of wax. When possible, however, it is much better, and more speedy practice, carefully to drill an opening into the pulp-cavity, and with a delicate needle pick the arsenic directly into the organ. The death of the pulp secured, the part is to be removed from its cavity by means of a barbed broach, and its place supplied later with gold or other material. Another mode of devitalizing the pulp of such a tooth will be found described in connection with the setting of pivot-teeth (which see).

Improper union of metals in the filling of a tooth is another not infrequent source of irritation to the dental pulp. Tin foil is sometimes placed in the bottom of a cavity, and the operation finished with gold. In many instances (depending not unlikely on lack of solidity in the overlying plug, thus admitting moisture) this combination produces a galvanic action, which, if not corrected, will quickly enough destroy a pulp.

Still another source of irritation is the employment, in cavities more or less in proximity to the pulp, of the preparation later described as oxychloride, or tooth bone; the chloride of zinc used in excess in the compound will not infrequently, within a very few hours after its application, produce an inflammation in the parts almost, if not entirely, uncontrollable. Few preparations require to be used with more judgment.

A tooth so irritated is to have the filling removed, and perhaps it will always be found the best practice to finish the death of the pulp as speedily as possible. As a reverse to this, it is to be recognized that the use of this material, as has been explained, will sometimes be provocative of just sufficient irritation to excite the secretion of secondary dentine, thus proving the best practice that could have been pursued. Experience is to direct the practice.

A pulp may give every evidence of being in an irritated condition where the osseous integrity of the tooth is perfect, or seemingly so. Here the cause may be still strictly local, on the other hand it may be constitutional. Blows received by a tooth often result in such irritation. Atmospheric changes sometimes account for the condition. Pieces of ice brought and retained in contact with teeth of loose structure are the frequent source of such trouble. Cracks in the enamel, induced from whatever cause, and permitting the impression of external influences upon the dentine, is another explanation. In a constitutional direction, rheumatism is, perhaps, the most frequent source; after this, gout. Reflex or radiated irritability is a frequent manifestation. This is, perhaps, most observable in the hysterical female. In these cases no special practice may be directed. It is only necessary to discover the cause of offence, wherever and however situated, and, if possible, remove it. In the odontalgia of gout, dependence is to be placed on the exhibition of colchicum; twenty drops of the vinum colchici radicis, three or four times a day, according to the urgency of the symptoms, may be given. In rheumatism, there is, perhaps, no better combination than the following: administration, in the plethoric to be preceded by free purging with a saline cathartic:

℞.—Potassii iodidi, ℥ss;
Tincturæ colchici radicis, ℥ss;
Extracti belladonnæ, gr. vj;
Tincturæ guaiaci compositæ,
Aquæ cinnamomi, āā ℥vj. M.

Sig.—To the adult give a tablespoonful three times a day in a little water; if it act too freely on the bowels, add opium q. s.

Functional derangements of the stomach as the origin of reflex, or radiated, odontalgia, are to be considered. Any one who has ever observed the relationship existing between the pneumogastric and the third nerve, as manifesting functional stomachic derangement in the enlargement of the pupil of the eye, will be at no loss to associate the fifth and the ninth nerve. Pure neuralgia, as the term has common signification, is a very rare affection; an aching nerve will generally be found to have some lesion outside of a so-estimated idiopathic condition, and the lesion can generally be discovered by closely looking after it.

Passing now to a consideration of the same conditions as reference is had to a tooth required to be filled, we will be impressed with the intelligence and observation which have enveloped the subject with the light of a large common and reliable experience.

We consider first the condition of a tooth with the pulp-chamber nearly exposed,—a very thin lamina of dentine existing between the two cavities. A pulp in this state and relation has, as the result of its subjection to irritating influences, one of three sequelæ. It may maintain, just as it normally exists, its integrity unaffected by the association: second, it may accept just that extent of stimulation which re-excites the formative capacity, increasing the distance between it and external relations by a secretion consolidating the overlying dentinal structure, and not unlikely attaching a secondary deposit between itself and the original boundary of its cavity: third, it may succumb to the irritation.

Of the probable result in all such cases, a reasonable experience enables the observing practitioner to form a fairly reliable estimate. To maintain that all pulps in such relation are to be saved is to maintain a very foolish