sickness and others at varying stages of advance towards perfect recovery, the patients severally and literally "working out their own salvation."

At the present moment—and this is a pretty usual distribution—I find that more than one-third of the patients have already reached the two highest grades of activity, namely, III C, and III D. Taking the male patients, who happen to number 47, I find that no fewer than 17 have reached these higher stages. I have before me a detailed report of the progress of these individuals. I shall not trouble you with all the details, but content myself with the statement that every one of them has made a remarkable increase in muscle value, and all have put on weight, from a few pounds up to 21 lb. While on admission the record of the patient's condition commonly includes one or other of the following phrases: "weakness," "hectic flush," "quite unfit for work," "very thin and delicate," "very great weakness," "worn-out appearance," "easily tired on exertion," "quite done up," "thoroughly run down," etc., with corresponding involvement of lung (in all patients both lungs having been affected), the present record runs somewhat as follows: "symptoms have almost entirely disappeared," "feels splendid," "looks very fit," "general and local symptoms have entirely passed away," "able to do a full day's hard work," "enjoying very hard work which he has never been able to do before, with no feeling of tiredness," "never felt better in his life," with corresponding improvement of the local condition within the lungs.

We have, of course, our disappointments. Tuberculosis strikes different persons unequally. At times the course of illness is so acute that no help is of avail. At other times treatment, from one cause or another, has been delayed too long. Sometimes the resisting power of a patient is unduly low. But given a patient of ordinary resisting power, in whom the disease has made slight inroad or, at most, only moderate advance, there is good expectation that under sufficiently prolonged treatment by aërotherapy, rest, and carefully graded activity, a return to health will be achieved. In many instances, the physiological value of the procedure is such as to place the individual on a higher plane of health than he ever reached hitherto.

REFERENCES.

¹BRITISH MEDICAL JOURNAL, December 1st, 1906. ²*Transactions of the Sixth International Congress on Tuberculosis*, Washington, 1908, vol. 1, part 2, p. 922. ³*Transactions of International Medical Congress*, Washington, 1887, vol. 1, p. 205.

A Lecture

ON

"EYE" IN SPORT.

DELIVERED AT ST. THOMAS'S HOSPITAL BEFORE THE MEDICAL AND PHYSICAL SOCIETY.

BY

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My attention was first particularly drawn to the subject by an article in *Fry's Magazine* in 1908 by "R.A.M.C." It purported to describe the physiology of sight in games, and was entitled "The Eye in Sport." The article was well written and interesting. I feel convinced that "R.A.M.C." is a sportsman and a good fellow. This impression will give me grounds for hoping that he will forgive me for attacking his article, and for pointing out that there was scarcely a correct explanation throughout.

When we speak of "eye" we do not mean the two portions of one's body that are situated on each side of the nose. They have, indeed, a very important share in establishing "eye," but nothing more. "Eye" really exists in the brain. It is, in fact, a very compound thing, a subconscious brain judgement involving many other organs than the actual anatomical eyes. It involves knowledge, experience, very largely the sense of touch, and sometimes the sense of hearing or smell. This important fact is generally lost sight of, and it is the pitfall in which "R.A.M.C." hopelessly flounders. He and others, among whom are particularly gunmakers, are

obsessed with ideas of the power of the so-called master eye. It is the use of the master eye, they say, that enables you to shoot straight, to hit a golf ball, to smash a tennis ball, to pot the red, and such other things in the same category that call for the use of "eye." "R.A.M.C." emphasizes this mistake at every turn, and it is the main object of this lecture to explain what is the real meaning of "eye," and to remove the false impression that the master eye in the normal individual is of the paramount importance that is usually attributed to it. I wish to point out, among other things, why in golf the phrase "Keep your eye on the ball" should be (*pace* "R.A.M.C.") "Keep your eyes on the ball"; why in shooting your gun should not be twisted into all sorts of fantastic shapes at the will of the gunmaker; why in cricket the more modern position of standing square to and facing the bowler generally produces the best bats, and why in billiards you should use both eyes as most do, and not only the master.

There is no doubt of the fact that there is a master eye, and this can be proved in numerous ways. In right-handed people, where the acuity of vision in each eye is equally good or nearly so, it is usually the right eye. When, however, the visual acuity of one eye is defective, then the other eye, whichever it may be, is selected for the mastership. In certain pursuits, rifle shooting for instance, the use of one eye is essential, for it is a physical impossibility to align backsight, foresight, and the target with each eye at the same time, and if you do not mentally grasp this point, it is easily illustrated by a rough drawing. Place two dots side by side to represent the two eyes, put another dot as far off as you like to represent the target. Now draw lines to represent the lines of vision from the two eye dots to the target dot. Let a fourth dot represent the sights of the rifle and it is obvious you cannot place it in both lines of vision at the same time. You can place it in one or the other, but not in both; and here I may explain what is the stock argument of gunmakers and others who advocate cast-off guns when the left eye is the master. They point out that, if he fires from the right shoulder, the left master eyed man places the breech end of the barrels which corresponds to the back sight of a rifle in the line of vision of the right eye and the bead at the end of the barrel in the line of vision of the left eye, and consequently the shot goes wide to the left; and this is perfectly true if the individual tries to shoot in this way, but the cure is not to make a distorted monstrosity of his gun, but to teach him to shoot properly, which, as I shall presently point out, is to disregard his gun altogether so far as direct vision is concerned.

Destructive criticism is very cheap; therefore I propose now to devote my attention to constructive criticism and to explain in greater detail the meaning of "eye." I am fully aware that I shall lay myself out in turn to a vast amount of adverse criticism, but in my arrogant belief in the correctness of my views I am prepared to meet all and sundry on this ground. I have taken a good deal of trouble, not being an expert at games myself, in talking over the subject fully with those who are experts, and I have found that in nearly all cases they are ready to discuss freely the points of the games in which they are proficient. There is only one class of men that I have found an exceeding great difficulty, and they are in other matters, I should think, the most genial, the most interesting, and come more universally than others into the category of "good sorts." I allude to artists. Knowing nothing about art myself, I have always approached them with great humility and simply as a learner. I am armed with a certain amount of physiological knowledge, and I wish to ascertain how this is dealt with from an artistic point of view. I remember once trying to get some information from a member of my club, a good artist and one of the most genial men at other times whom I have ever met, but all I could get from him was flat contradictions, not on the question of art, but on the facts of physiology of vision, of which presumably I ought to know something. He is not by any means the only one, as I have said before, from whom I have found it impossible to learn. Artists seem to think that one is attacking their art and that no outsider has any right to assume any knowledge that concerns the question of their art. But, of all problems, I think "eye," where it concerns art, is the most interesting, for it is so obviously the mental eye that they use and not merely the

anatomical eyes. However, the question of art does not come within the range of my lecture. Now "eye" is, as I have before suggested, one of the highest products of the brain, and it involves brain stimulation in various centres and in very delicate degrees. "Eye" is not a definite anatomical part of the body, as I have said before, but a judgement of supreme delicacy, and the more delicate the judgement the greater is the proficiency of the performer in the particular direction to which he has given his attention. One must always remember, therefore, when speaking of "eye," that it is the brain potentiality that one has to consider and reckon upon, and not the visual acuity of the anatomical eyes. High visual acuity is, of course, a detail of some importance, but it is not nearly so important as is popularly supposed. One of our best-known cricketers of the present time, who has never worn glasses for playing games, has only one-tenth of the normal visual acuity, and would have been at once rejected from the army on the score of his sight had he wished to enter. It is an interesting fact, but quite true, that when any one boasts that he has far better sight than his friends, his visual acuity is generally below the normal, and sometimes a very considerable degree below the normal. Visual acuity is so relative a thing that a person whose vision, previously good, has fallen to two-thirds of normal acuity will declare that he is going blind, whereas it is frequently the case that a patient who never had more—at any rate, since childhood—than one-tenth the average normal visual acuity will claim to see practically as well as other people; and though possibly he may allow that some may see distant details a little bit better than he does he will not admit that there is much in it. Those who are experienced in sight testing will readily endorse what I say, but to those who are not experienced the statement will seem almost incredible. That veteran ophthalmic surgeon and most genial of men, Henry Power, used to say that a Red Indian with bad sight will see a snake in the grass long before a European whose vision is good. Such things are so much more the result of experience and brain judgement than of actual visual acuity. In the same way a keeper will be able to tell three fields off that there is a hare feeding, whereas a pure cockney might see some little brown patch and not know what it was, though the actual visual acuity of the latter might be better than that of the former. Some years ago, when the notorious cattle maiming case occurred in the Midlands, it was brought forward by some, who I was surprised did not know better, that the fact that the accused had rather a high degree of short sight and had never worn glasses was proof that he could not have seen well enough to have gone about at night and to have done the maiming. Now the fact that he had never worn glasses was the very reason why his short sight should not prevent him finding his way about under such conditions. His brain judgement being trained to draw correct conclusions from imperfect images, he would be the better able to find his way about in uncertain light than one whose brain judgement had been trained to require clear retinal impressions; in the same way a shortsighted person in foggy weather will often more readily recognize acquaintances across a street than one who has normal acuity of vision. In the one case they are trained to establish facts from very indefinite images, and in the other case they are accustomed to rely upon definite images, and miss them to a greater degree when they are not attainable. The myope, besides, recognizes people by their gait, the way they carry their heads, and so on, while a person whose sight is acute is trained to depend on details of features which are not visible under unfavourable conditions.

As regards the cattle maiming case, I am not expressing any opinion as to the guilt of the man who was convicted. I only point out that the fact of his short sight would not weigh one way or the other.

Now, to apply myself more to concrete instances than to abstract ideas, I will point out that judgement of distance by the average sighted person is obtained, not by action of the master eye, but by the action of the two eyes in forming the angle that the line of vision of one eye makes with that of the other by means of the muscles that turn the eyes towards the object—in other words, the muscles that cause the eyes to converge on the object looked at. It is only those who are one-eyed or who have only one useful eye that rely upon the state of the focussing muscle.

This is an alternative method, and is a comparatively successful one in those who have never had, or never since childhood, the use of both eyes, but the degree of success is in the inverse ratio to the age of the individual when the second eye was lost. If it requires proof that this method is not ordinarily adopted, it can be obtained in many ways. As everybody knows, a man who has lost one eye has great difficulty, especially at first, in judging distance. In pouring out a glass of wine, he is apt to pour it over the edge, and things of that sort. It is illustrated, too, by failure in the parlour game of walking across a room with one eye bandaged, and attempting to knock over with a side stroke of the finger a cork placed in some conspicuous position; or again, by putting a prism before one eye, base inwards, and thus altering the direction of the rays of light so that the eyes have not to converge so much on looking at any particular object, which will then look as if it were rather further off. Judgement of distance, then, except in a few rare instances, is estimated by the brain effort that has to be sent to the muscles that converge the eye upon the object, and this information is essential to the judgement of how fast an object is travelling, which can then be estimated as relative to its stationary surroundings, but unless you have formed a judgement of the distance of the object, the movement of the eyeballs in following it will not give you any trustworthy information whatsoever. There is another point to which I must allude, and that is the plane in which we use our eyes. It must necessarily, from the position of our eyes in our heads, be the horizontal plane, but when we have fixed the object, our mental judgement, in other words "eye," is exercised in both vertical and horizontal planes, though perhaps more readily in the vertical plane. With these facts before us we may proceed to explain why "keep your eyes on the ball" in golf is more correct than "keep your master eye on the ball." In order to avoid striking the ball untruly you have to possess a subconscious brain knowledge of the exact distance the ball is from you and the exact length of your club. With these two facts impressed on your subconscious mind you must practise the muscles that you use in golf to work in accordance with these two facts, and it is accordingly of very great importance that you should not swing your head too far round to avoid cutting off with your nose the view of the ball with one eye—either the master eye or the other, it does not matter which. If it were essentially necessary to keep only your master eye on the ball, you should strike it as truly when the other eye is covered. Let any one who doubts what I say tie up his non-master eye and see how he strikes the ball. I maintain that in the usual normal-sighted person you can only get a true appreciation of the distance of the golf ball by using both eyes, and you can only strike it truly when you have a proper appreciation of the length of your club, again by the use of both eyes. These are the two factors necessary for training yourself to be successful in driving. As regards putting, these points come out rather clearly. I understand from those who play that it is correct in putting to keep the eyes fixed on the ball and the whole body stationary, except the arms or wrists, many particular judgements having to be made, and the brain being better able to make them the more simple the process that is involved. Thus in giving the exact force that is needed, as well as the proper direction, the fewer muscles that are employed the easier matter it is for the brain to estimate it, and though not a golfer myself I rather fancy all the strokes in golf, some of them no doubt requiring the most delicate judgement, depend mainly on the subconscious "eye," and it has seemed to me that the wriggling movements some players go through in addressing the ball may tend to prevent the "eye" becoming "stale" as regards aim.

Now, passing on to billiards, "R.A.M.C." goes fatally astray because he points out that the principle of the master eye aligning the cue and ball in the vertical plane of the master eye is the keynote of the principles the advocates throughout his article. Now, if he will watch any billiard player, professional or otherwise, he will be able to observe that nine times out of ten, or nineteen times out of twenty, the player does not align with the master eye or the other, he uses the brain "eye," and the line of vision of this mental eye represents a line drawn at right angles from a point midway between the two eyes, and when I speak of this line

of vision of "eye," this is what I mean. A great deal has been said about whether you should look at the object ball or the cue ball, the actual fact being that, in ordinary strokes, once you have the correct aim, which is, as I have said, a matter of brain judgement, you do not need to look at any spot in particular but take in the table generally. In billiards the use of both eyes is especially important. The game continually involves the estimation of distance and angles, and the stroke has to be made after such estimation, and it would seem an obvious inference that if the estimation of distance and angles required both eyes for such mental process involved, the further delivering of the stroke should be made in the same way. And as a matter of fact that is nearly always the case.

Now, as regards cricket, there are many interesting problems, and they are nearly always matters of brain judgement rather than of visual acuity. I have often tried to get from expert cricketers how soon they form a judgement of what kind of ball they are going to receive. There is no doubt that it takes place very soon after the ball leaves the bowler's hands, of course long before the ball pitches. If this requires proof, the fact that a batsman moves out of his ground to a certain distance to take a ball half volley, shows that before he moves he has estimated where he has to go, and for that purpose he has to make up his mind where the ball is going to pitch. The wicket-keeper's job, too, is a matter that concerns brain judgement. He has the whole thing in train beforehand, so that, although the ball is hit away, his hands close as if upon it at the exact moment and position that he has prepared himself beforehand to receive it. The same sort of judgement is needed by tennis players, and I have often asked them how soon they form a judgement of where the ball is going to pitch and what it is that guides them to the conception. This is a very complicated act, and illustrates the many points that are concerned in making a good player, besides the actual power of getting the ball over the net when it comes within reach. The earliest sign that I have found that anyone recognized is the position of the face of the racquet possibly a moment before the ball is struck. But there are, of course, other things upon which the expert player depends. He places the ball in such a position that his opponent can only return it in a certain direction, and again he relies to a certain extent upon the eyes of his opponent and the position of his head, for a player may often be deceived by his opponent turning his head and looking in one direction while he hits the ball in another direction. I only bring these points forward as illustrating how involved a process it is, and not so simple as the onlooker might think, and that one becomes the best player who has the power of making observations in all these different directions.

Now, returning to cricket, "R.A.M.C." says that the man who makes a catch does so by means of his master eye, and the master eye, his hands, and the ball will all be found in the same vertical plane. It is not much of an argument to say that it is not so; I will merely suggest to any one, if he has any doubt upon the point, to try it, when he will find out the importance of using both eyes. As a matter of fact, the fielder uses the horizontal plane of both eyes to fix the ball and to form a mental judgement of the vertical plane. In other words, he forms his judgement as to how fast the ball is travelling and exactly where it is going to arrive very early in the flight of the ball, and has his hands ready long before the ball has arrived, as in the case of the wicket-keeper.

Let me now speak of the blind spot of cricketers. This is one of the most interesting investigations I have made, and I confess that I was for a long time completely baffled by it. Of course any one with any knowledge of the physiology of the eye will admit that it is ridiculous to suppose that the difficulties depend upon the image of the ball coming upon what is known anatomically as the blind spot. I will not even discuss the question, but if it is not that, what is it? At first I must confess that I was more or less in agreement with "R.A.M.C.," not in that it might be due to the master eye being shut out, as he suggests, by the nose, but because one or other eye might be so shut out, the data for judgement from binocular vision then being destroyed; moreover, the more modern position of facing the bowler and using the horizontal plane of the eyes by the batsman would lead colour to this view. I have conversed with many

expert cricketers on this subject, and I will now clear up the point in a way which answers every physiological requirement. The so-called blind spot occurs with a well-pitched ball. And, as I have said just now in speaking of a half-volley, the judgement of where a ball is going to pitch is made very soon after the ball has left the bowler's hand, and, relying upon that judgement, the batsman has prepared himself to deliver his hit, the bat will be uplifted and ready to strike in the position he has estimated that the ball is going to arrive. Now, as regards a well-pitched ball, he has formed the estimation of where the ball is going to pitch, and prepares himself to act upon it. He may play forward to the pitch of the ball or he may play back to it. Now if he plays forward to the pitch of the ball, not having recognized that it has a twist upon it, he may miss it and be bowled. Therefore, if he is in any doubt as to the twist on the ball, he has to cast overboard the judgement he has made of the ball from data soon after it left the bowler's hand and form a new judgement from the pitch of the ball, and there is a moment, when he has given up his old judgement and before he has formed his new one, of mental blindness. That would account for it from the physiological point of view, and all the cricketers to whom I have spoken on this subject have agreed with me that it would answer the description of their blind spot. There is a true moment of mental blindness which would correspond to what the batsman experiences.

There is, however, another kind of blind spot which is due to faulty estimation of where the ball is going to pitch, the batsman strikes at the ball and misses it clean, and, in explanation says it got on his blind spot.

There are two other instances of blind spot occurring in games that I may mention, the one again in cricket, and the other in tennis, and the two conditions are really identical. When a bowler has delivered a ball—it occurs usually in the case of a half-volley—and the batsman strikes the ball directly back to him, there is often a moment of mental blindness during which he does not know where the ball is coming. The explanation of this is that, as I have pointed out, the individual to whom the ball is coming forms very early in its flight a conception of where the ball is coming, he takes subconsciously a point in its flight and relatively to surrounding objects forms his opinion, but if a ball is coming straight back at him, it may seem to be motionless, and his brain does not readily get an impression of its relation to surrounding objects, from which, as a rule, he gets his estimation of its pace and flight.

The second instance is at tennis, when the ball is hit hard and straight back to the opponent. These conditions are the same, and the explanation is the same. The data for forming judgement are insufficient, and the process becomes delayed, and, until a judgement is formed, the individual is mentally blind as to the exact direction of the ball, although he realizes generally that it is coming towards him.

Now, the subject that interests me most of all is that of shooting, and here I am prepared for a large amount of opposition. Gunmakers would join in a howl if they concern themselves at all with my remarks. All this master-eye business is worked to the uttermost, not, I admit, with deliberate intention to deceive, but from incorrect appreciation of the physiology of vision. Just as you estimate the pitch of a ball in cricket, or any of the other instances I have mentioned, so again you should shoot with your brain and not with your eye. I am not, of course, now speaking of rifle shooting. Actually, in shooting, the mind should not be concerned consciously with the position of the gun. The position of the gun should be due to a subconscious effort brought about by training. The same conditions should always be capable of being readily fulfilled, and, to put this concretely, it is above all things essential that a gun should be well fitted and come up easily to the shooting position. It should not catch in the shoulder or press unduly against the chest muscles. It should be able to come up smoothly and evenly and relatively always the same way, and this is the essential point in a good gun. Some cast-off is useful for a purpose that I will mention, but it is from a wrong conception of vision altogether that a gun is cast off enormously, so as to secure alignment with the left eye when it happens to be the master eye. In shooting, as in other things, the process is the result of a mental judge-

ment, and the eyes should not be directly concerned with the gun, but with the object that is being fired at. You require both eyes fixed on the object, in order to judge of its distance, and that is an essential datum for forming a judgement as to the rate at which it is travelling past stationary objects, and the angle the eye has to travel through in following it. Now, if it be granted that the sportsman does not look exactly along the barrel of his gun with his master eye, there must be another requirement, and that is estimation of the angle of deviation of the gun from the line of vision, not of the master eye, but of the two eyes; and, as I explained just now, that is from a point halfway between the two eyes. There is usually a certain amount of lateral or horizontal deviation, because the head cannot be got sufficiently over so as to bring the vertical plane of the line of vision over the vertical plane of the gun. There will also be a certain amount of vertical deviation, and the head is accordingly inclined to the gun to reduce these angles of deviation to the smallest degree, for the smaller the angle of deviation the easier it is to estimate, and a certain amount of cast-off helps this. The same process is gone through with people who shoot rabbits from their hip. They do not try to force their master eye down in a line with the gun. They look at the rabbit with both eyes. They estimate the lateral, if any, and vertical deviation that is required; and this process of rabbit shooting from the hip is not different from shooting from the shoulder, though there is more difficulty in estimating the correct aim. In shooting, then, you require to have a gun well fitted that will always come up to the shoulder true. When you have a gun that will come up readily, and you have trained it to come up true with your mental line of vision, then all you have to do for the purpose of a good shot is to estimate the distance and secondarily the pace of the object and to make due allowance for them. Your gun should subconsciously feel the line of vision and swing slightly in front of the bird as you fire. If you begin to concern yourself greatly about the position of your gun, you begin to poke and miss by shooting behind; poking is produced by trying to make quite sure that your gun is aimed truly and then a brain impulse is sent down to the muscles of the forefinger to pull the trigger—in other words, trying to align with one eye along the barrel, and then when you think you are well on the mark sending a brain impulse down to the muscles of the forefinger to pull the trigger. Now, there is always a latent period before the muscles respond to the brain impulse, and during this latent period the bird or whatever it is at which you are shooting has moved on. I must, however, point out that there are some, and a few who are quite good shots, who do not shoot in the way I have described. They add another estimation to the process, namely, the point in front of a bird that they have to shoot at in order that when the latent period required for pulling the trigger combined with the flight of the bird is allowed for, the bird will arrive at that point at the same moment as the shot. They do not swing on to the bird but fire at a fixed spot in front of the bird. Though, as I have said, some few good shots adopt this method, they must rely upon a human factor that is notoriously variable, and that is the latent period, the latent period being, as I have said, the time the muscles take to act after the impulse has been given to pull the trigger. This latent period has been shown by physiologists to be delayed by alcohol, hastened by tea or coffee, again delayed by fatigue, and this mental process being entirely subconscious, the individual considered cannot allow for the variation. As regards rifle shooting, the matter is different; no immediate judgement is needed for distance, that is estimated beforehand, and allowance for movement is not required to any very great extent; nearly the whole question at the moment of pulling the trigger is one of keeping the aim true—a question of extremely minute detail. Aim like this of such extreme exactitude cannot be estimated by brain judgement or experience, it has to be made anew each time the rifle is aimed, and can only be secured with the exactitude that is required by direct alignment, which can only be done by the use of one eye.

I said at the beginning of the lecture that the eye very largely involved the sense of touch. This is so especially in the case of fencing, where touch is actually of more importance in establishing "eye" than the anatomical

eyes themselves. It is generally supposed by those who do not practise the sport that very acute sight is required. So little is this the case that it is by no means difficult to fence with the eyes bandaged, either of one or of both the combatants.

I have briefly skimmed over some of the points in which "eye" is involved in several sports. Of course, I have attempted no more than a sketch, but such as it is I hope you will accept it as a sporting attempt.

THE INFLUENCE OF DIET UPON THE FORMATION AND HEALING OF ACUTE ULCER OF THE STOMACH.*

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THE present research is one of a series which was initiated in order to inquire into the exact part played by the gastric juice in the production and healing of acute gastric ulcer. For many years the hypothesis has been prevalent that the gastric juice plays an important rôle in the pathology of gastric ulcer, mainly because ulcers having the characters of those found in the stomach are almost entirely limited to the parts of the alimentary canal which are directly exposed to the action of the gastric juice. Many experiments indirectly bearing upon this problem have been performed in order to substantiate this hypothesis, but, it must be confessed, without much success. I have no intention in this short communication of discussing the relative merits of these experiments, because I have already referred to most of them in various other papers, and because they have no particular bearing upon the subject of this discourse. In all my experiments acute gastric ulcers have been produced in animals by the injection of gastro-toxic serum, the preparation of which I was able to demonstrate some years ago.¹ By means of this method of producing gastric ulcer I have arrived at the following definite conclusions, which have been already published in various papers:

1. That acute ulcer fails to appear if the gastric juice be put out of action, although the animal may die from the effects of the poison.
2. That the ulceration produced in the presence of hyperacid gastric juice is much more extensive than that produced in a stomach secreting juice of the normal acidity.²
3. That the gastric juice is able to attack the gastric cells and produce an ulcer, although the cells are not actually killed by the poison. It is merely necessary to damage the cells to some extent.
4. That hydrochloric acid of the various strengths found in the condition of hyperacidity in the human subject is able to act as a poison for the gastric cells.
5. That acute gastric ulcer heals equally well, whether the gastric juice be increased or diminished in acidity to the extent usually found in man, provided that the stomach empties itself in the normal time.³
6. That acute ulcer is more easily produced in the digesting than in the resting stomach, and that in the former case it is much more extensive in character.
7. That undue retention of food in the stomach delays the healing of acute ulcer for at least twice the normal time, because the prolonged action of the gastric juice irritates the base of the ulcer, and may cause necrosis of the granulation tissue in the early stages, and excessive formation of fibrous tissue in the later stages. The growth of the new mucous membrane over the base of the ulcer is thus delayed, and there is produced more inflammatory thickening than usually occurs in the condition of normal healing.⁴

Since motor insufficiency of the stomach prolongs the period of healing of an ulcer, it follows that food which is retained for a considerable time in the stomach, and which excites a copious secretion of gastric juice, should be more

* A paper read before the Pathological Section of the Royal Society of Medicine.