July 6, 1903.

LECTURES TO POST GRADUATES.

Demonstrations of the galvanic current.

Methods of producing galvanic current.

The gravity cell -- copper electrode and zinc electrode; a saturated solution of zinc sulphate and a small amount of sulphate of copper crystal dropped in.

Ampere -- the size of the current flowing.

Coulomb -- the amount of current produced.

The gravity cell -- a good battery with which to run an electro-thermal bath, as it cannot run down readily and does not polarize readily.

Simple method of making gravity battery -- a wooden tub lined with very thin copper since it is increasing all the time, or with scraps of copper.

Voltage depends on the number of cells -- illustrate.

Connecting cells in series -- connecting multiple arc.

The Volt -- one cell approximately one volt; two cells one volt or less. Bichromate cells have ~~MMK~~ 1.75 volt. Storage batteries have two volts to the cell. I do not know of any battery constructed that has more than two volts to the cell. It makes no difference how small the battery is, it is approximately one volt.

Ohm's law $\frac{EMF}{R} = C$. This may be expressed in another way. Volts divided by Ohm's equals amperes. This means that a current with an electro-motive force of one volt operating against a resistance of one Ohm will produce one ampere in one second. This would also equal a Coulomb, because an ampere of current produced in one second is a Coulomb.

The Ohm -- What is it? The amount of resistance offered by a column of mercury one meter high and one millimeters in diameter. Or the resistance offered by a copper wire 1-1/4 mm. in diameter and 250 ft. long.

Suppose we want to get a current of 100 MA., it would be EMF divided by R. equals x 100. We will say the resistance we want to overcome is 3,000 Ohm's, so EMF divided by 3,000 equals 100, or EMF equals XXX 300.

When you have to deal with the human body you have 3,000 Ohm's resistance to overcome, that is with the dry skin. With an ordinary six-cell battery we get five or six volts. But we do not have to have 300 volts, because when we moisten the skin it greatly reduced the conductivity, so that we can get along with 1/3 or 1/4 of this voltage, from 60 to 100 volts. You can sometimes get along with 40 or 50 volts where the area is small, but you ought to have something larger.

The ordinary electric light current is very convenient for this sort of work. You can cut the voltage down by increasing the resistance.

In medical work avoid especially batteries in which nitric acid is used. For ordinary work the dry cell is very good now-a-days These are easily constructed. You can buy them very cheap. The only objection is they polarize rapidly, that is the hydrogen accumulates upon the negative electrode.

In the cell, which of the electrodes is positive, which negative? Zinc negative out of the cell, positive inside the cell; copper positive out of the cell, negative inside the cell.

The positive is the pole from which the current starts. The negative is the pole to which it travels. Zinc is the positive electrode within the fluid; copper is simply the conductor. There is nor current moving, of course, until the curcuit is closed. Now the hydrogen accumulates upon the zinc and oxygen accumulates upon the copper. The accumulations of oxygen will enterfere with the transmission of the current. This is what makes internal resistance, and this accumulations of gas is prevented about the electrodes in some batteries by the introduction of some substance which will absorb the gas and in this way hinder polarization. So when you close the current, as is necessary when treating a patient, the battery strength runs down. If you have a rheostat you must lessen your resistance continually. However, if you leave your battery over night it is ually recuperated by morning.

Now, suppose we have a case where E.M.F. equals 100 and R equals 3,000, and we want a current of 20 MA. 100 divided by 3,000 equals .033-1/3 Amperes, but we only want 20 MA. We must put some more resistance in, and thus you see why we have the rheostat.

Another word about some other sources of electricity. We might take it from an alternating current or lighting current by means of a transformer. A lighting current is 12 or 1500, sometimes 2,000, volts; sometimes as high as 20,000 volts. The ordinary street car current is about 500 volts. Now, to reduce this to a manageable current we use the transfor er.

The smaller the wire the greater the resistance.

The production of the induced current.

July 7, 1903.

LECTURES TO POSTGRADUATES. - ELECTRICITY.

Testing for positive and negative pole with potassium iodid -- brown at the positive pole.

With phenolphthalein-- red at negative pole.

With water -- bubbles at negative pole.

With wet blue litmus paper -- positive pole marked red.

With red litmus paper -- negative pole marks blue.

Apostoli found that a current of 100 MA. produces antisepsis of the tissues immediately surrounding the electrode.

The shunt -- What is it?

Methods of applying electricity.

1. Percutient or applying electricity to the surface of the skin. You read works on electro-therapeutics you will find electricity recommended for almost ever thing in the world except for fevers and acute inflamation, but it is not worth while to use electricity for everything. It is only worth while for those things in which it accomplishes something which cannot be accomplished so well in any other way.

There are somethings in which galvanic electricity is useful in percutient applications. One thing is neuralgic pain. The application should be made in such a way that the current will pass <u>down</u> the nerve from the center toward the periphery -- it should be a descending current. You should have th positive nearesr the heart, and the negative toward the extremity. This does not mean that no good will be done by a current applied in the opposite direction, but the best results come from the application of the positive near the heart so the current flows in a centrifugal direction.

In order to get the best results from these applications we must use a large electrode. In my opinion, the best way is to use a large and a small electrode. The small electrode to be applied at a motor point near the trunk of the body or the spine or the brain and the large electrode at the extreme end of the nerve distribution and covering a considerable area. On the arm, for instance, -- suppose we have pain in the large nerve of the arm. We will apply the small electrode to a motor point high up on the arm, and then the large electrode to the entire hand. The nerve as it passes down the arm is continually giving off branches, a branch to every finger, etc., so that the nerve is continually distributed as it passes along. We depend for the application of this current to this nerve upon the fact that nerves are five times better conductors of electricity than tendons, cartilage, bones, etc. By making the application of the lagee electrode about the hand and wrist and whole forearm, we will include the nerve more completely than if we use the small electrode. Remember that the nerve is five times as great a conductor as the other tissues.

The larger the negative electrode the larger application may be made. The negative electrode should be large enough so that you can apply as much current as you want to apply without producing pain. The principal embarrassment in applying the galvanic current is the pain often produced by the electrode in the skin. One way to avoid pain to have large electrodes. There is really little use for these little toys in common use called electrodes. The effect you get from their use is very slight.

Now, suppose we want to make the application for the relief of neuralgia of the arm in which the pain involves the shoulder.

Put the positive electrode on the spine and the negative electrode clear round the arm, in order to get all of the nerves of the arm, also covering the brachial plexus.

In a case of sciatica, place the negative electrode around the whole leg, calf and thigh both; the positive electrode should cover the sacroiliac symchondrosis. This electrode should be ten inches wide and a foot long for the ordinary person.

How much current would you use in these applications? We will take that up later.

Suppose we have a case of neuralgia of the fifth and sixth intercostal nerves of the left side. There are three points at which these nerves come near the surface;-- next to the spine, in the axillary line, and at the sternum. Let the positive electrode be applied at the spine and the other, a large electrode, to cover the sternum and axillary line. The positive electrode should be four or five inches in diameter and six or eight inches in length upon the spine itself.

Suppose we have a case of lumbago. This is really a case of intercostal neuralgia low down. Apply a large abdominal electrode and then a lumbar electrode of smaller size, say half as large, covering the same area verticall y and a smaller area laterally.

Facial neuralgia -- Positive electrode just in front of the ear; the negative lower down where the nerve issues. Her is a chance for small sponges.

Internal neuralgia, say ovarian neuralgia. Place a large size electrode in both places,-- positive 5 X 6 inches at the spine; the negative, twice as large, over the region of the ovaries.

Neuralgia of the stomach. The pneumogastric nerve is the chief sensory nerve of the stomach. There is a close association between the inferior cervical sympathetic and the stomach. The splanchnic nerves which supply the stomach are derived from the inferior cervical sympathetic. You can touch the sympathetic with your thumb and finger by pressing down just over the head of the sternum. If you apply your electrodes in this way, the positive covering the inferior cervical sympathetic, just over the vertebral prominence and from that point up, and then around the neck, covering the top of the sternum, and the negative pole over the stomach, you will get good results. The left vagus seems to have a much larger distribution than the right, and it is the nerve of the stomach and of the viscera in general, so it would be best to apply the positive electrode to the left side of the neck, unless you make your electrode large enough to cover both sides of the neck.

Neuralgia of the eye. Place one electrode below and the other above the eye.

Neuralgia of the ear . Positive electrode just behind the ear, over the mastoid process, below the ear and over the ear, one minute each. Or you can make a clay electrode to apply to the whole region at the same time.

In making applications to the eye and ear you must be very careful on account of the effect of the galvanic current on the brain. Many times I have known patients in former years, when galvanism was given in the bath rooms, to fall over on the floor. "Central galvanization" was very common in those days, and patients would fall head-long on the floor when the current reached the brain. 20 MA. is as much as the average patient will stand.

In applying the current my rule is to use just as large electrode as possible and just as much current as can be borne without producing destruction of the skin. You must use large electrodes so as to be able to cover a large area. You can always tell when the skin is being affected in this way. If the patient says that the current burns, you must be careful for you will often get vesication. The patient may be able to stand it without saying anything. The burning is due to the action of the acids or alkalies formed, and it is a costic burning, a chemical burning, and consequently it is not so intense; but the next day you will find you have made a burn.

LECTURE TO POSTGRADUATES. July 9,1903.

Dr. J. H. Kellogg.

E L E C T R O T H E R A P E U T I C S .

To-day we will continue the study of the galvanic current. We were discussing the application of the galvanic current in the treatment of various nervous affections. Let us study further nerves as conductors of electricity. The white substance of Schwan is not a good conductor. The axis cylinder is nearly fluid, and hence is a better conducting substance. These fibers which go to make up the nerve trunk are separated from one another by the neutilemma, or the white substance of Schwan, and trabeculae of connective tissue, and consequently there is very little opportunity for the transmission of electrical current. The galvanic current always takes the circuit of least resistance. The static current always takes the shortest circuit. A galvanic current will go around the world before it will leap a space of one-fourth inch. You see the reason for this. How many volts does it require to leap a space of one millimeter? That is, to make a spark a millimeter long? Five thousand volts. You can add five thousand volts for earh millimeter up to an inch, then it requires forty thousand volts, and for ten inches it requires more than one hundred thousand volts. You see this is a tremendous amount. The structures around the nerve fibers have a resistance five times as large as that of the nerve fiber.

I want you to be thoroughly impressed with the importance of including the entire distribution of a nerve trunk in your negative electrode. Your position electrode should be large enough so that the application of a current of proper strength will not irritate the skin. You want to center your positive electrode over the trunk at some point where it comes

near the surface. The large negative electrode should cover the distribution of that nerve as nearly as possible. Most sensory nerves, thermic nerves, pain nerves, etc., end in the skin. It is not so important to influence the motor nerves. If you apply a small electrode down here over some small area, you get very little of the effect you ought to get. You will not find a word about what I am telling you now in any book, because it is not written. Attention has not been called to it. The ordinary modes of application of electricity are of very little value, and that is why electrotherapy is so little employed by physicians. A doctor buys abattery and has great hopes. When he comes to use it, he gets very small results, and soon throws it aside. If electrotherapy gave such results as hydrotherapy, it would be as popular as hydrotherapy. When you get down to the facts, you find doctors use fomentations and hot baths and certain other hydriatic principles very largely. I do not suppose there is a doctor anywhere who does not know how to put a fomentation over a strangulated hernia. Electricity is just as positive in its results when used in an efficient way, but the ordinary methods of applicationx are not efficient.

Experience with Dr. George M. Beard, of New York.

Visceral Applications--Applications in such a way as to affect the viscera. When electricity is applied to a conducting substance, it fills the entire mass. The entire mass becomes a conductor. Suppose we have here a block of steel--a cubic foot of steel. We apply an electrode here, and another here; does the current travel right through? The entire mass becomes a conductor. The electric current forms curves. (See Fig. 1.) Now suppose I should apply my electrodes in this way, make a divided pole electrode. The same thing would be true.

These represent wires, not electrodes. Now suppose we applied a thousand of these wires, the same would be true of every one of them.

Fig. 1. Fig. 2.

What is true of each one of these wires is true of every minute point of this metallic electrode which we substitute for the wires. From every point there are stxarting out a series of curves which go through the entire electrode. This is true of every single point. That being true, where would be the greatest amount of current? It would be just where the largest number of these lines are crossing. Where do you think would be the largest numberof lines? Suppose instead of making them curves, we make them straight lines. Suppose we select here a point, there a point, and there a point. The greatest number of lines would cross practically in the center you see. Now suppose we shorten the electrode, what is the effect? With electrodes of equal length, we have the point of greatest concentration in the center. With a large and a small electrode the point of concentration would be nearest the small electrode. This shows you how to bring the point of concentration about a viscus. If you wish to concentrate the current in the center of the body, you would use electrodes of about the same size. It would not make any difference what size they were. It all depends on the amount of current. If you have 10 M. A. of current, it makes no difference whether you apply it with a small or large electrode, because it is spread out through the body anyhow. But it makes a great difference if you desire

to employ the maximum amount of current. There is rarely any any exception to the rule that you should apply just the largest amount of current the patient can stand. Say we have an electrode four inches square with ten M. A. of current, that is, two and a half milliamperes ~~fifteenths of a M.A.~~ to each square inch. Suppose the electrode is ten inches square, or one hundred square inches, with ten M. A. of current; that would be one-tenth of a milliampere to each square inch. Now suppose we should increase the amount of current until there is two and a half milliamperes to each square inch. The amount of current per square inch of skin which the patient can bear without irritation determines the amount of current you can apply. This is usually as just mentioned. Two and a half milliamperes to the square inch, and one hundred square inches make two hundred and fifty milliamperes of current. It is just as easy to apply two hundred and fifty milliamperes with an electrode ten inches square as it is to apply ten milliamperes with an electrode of four square inches. It is just the same.

Now here is an electrode of four square inches. We turn on the current and when we get to ten milliamperes, the patient says that is all he can stand. This makes two and a half milliamperes for each sqaure inch of electrode. Ordinarily every square inch can stand two and a half milliamperes. More will vesicate the skin and make more pain than can be easily endured. So, ordinarily the skin can tolerate two and a half milliamperes to the square inch. I have repeated this statement a good many times, for I want you to be thoroughly impressed with it. I want you to get it so firmly fixed in your mind that it cannot be forgotten. Thus you see the importance of using large electrodes when you want to make an application to

Now here is an electrode big enough to carry 10 milliamperes of current. Now this current of ten milliamperes is distributed, diluted, so to speak, and spread out through the whole body, so the amount in the center is very small, a mere fraction of the ten milliamperes. Now suppose we have a larger electrode, and can have a current of 250 milliamperes. We get twenty-five times as much current at the center as we did before. So, you see, it makes a marvelous difference whether or not you apply a large or a small electrode. These miserable little infinitesmal homeopathic doses commonly employed have little effect except upon the imagination.

The question of the relative size of the electrodes depends upon where you wish to localize the current, where you wish to have the point of greatest concentration. Suppose here is the spinal cord. Commonly, one electrode is placed next to the spine, and the other is rubbed up and down here. Electricity appliedin this way never did anybody any good. You can carry but little current through these small sponges. The proper way is to lay one electrode on the spin, rather a small electrode, and over the body opposite place a very large electrode. In this way, you see, the center of greatest concentration of current will be nearer the small electrode, and so affect the spine most.

There are several ways of making applications effective. One is to make the application the entire length of the spine. A narrow electrode with a broad electrode applied to the front of the body. The amount of current you can apply depends upon the size of the small electrode. How large will this electrode be? Say two feet long and six inches wide. This will be just one hundred and forty four square inches. This times two and a half milliamperes gives three hundred and sixty milli-

amperes. That is current enough for strong effects. You must have as large a current as the smaller electrode will allow, without vesicating the skin. Some skins will stand more current than others.

We might apply to the spine two electrodes, one small one here high up, and another small electrode further down. The greatest concentration of current will be just along the spine. The electrodes must be large as your hand in order to get current enough. They should have a surface of twenty-four square inches anyhow. Do not satisfy yourself with little doses of fifteen to twenty milliamperes. Make them sixty or seventy or eighty or a hundred or more milliamperes, and then you will see effects from your treatment. When you want to get a very large current, put on threebr four electrodes and connect them with copper wire.

Suppose you want to influence the stomach. Put the larger electrode behind, large enough to cover the whole back, and the smaller electrode over the stomach. That is the principle. To influence the spleen, put an ~~xx~~ electrode on the front, say double the size of the spleen, and make the one on the spine opposite six or seven times as large. You must instruct your nurses now to make these applications, and whether for stimulation of the stomach or for neuralgia. In applications to the stomach, I think it is better to make the application as I showed you yesterday, by putting the larger electrode on the spine. It is the glands and nerves of the stomach you wish to influence, and the stomach derives its nerves from the spine high up, the pneumogastric, and so an electrode applied to the upper spine and neck and a smaller electrode(negative) over the stomach will bring the best results.

LECTURES TO POSTGRADUATE STUDENTS.

J.H. Kellogg, M.D.

July 10,1903. ELECTROTHERAPEUTICS.

There are a class of pains which have been designated as transferred pains. Dr. Head of England has given a great deal of study to what he called transferred pains. Dr. Head made a study of all local pains, in relation to visceral diseases, and he found some very interesting things. He studied a great number of cases in relation to their symptoms and their pathological conditions, and the summing up of his studies may be said to be something like this:

Pain in the head means anemia, neurasthenia, endometritis, and he says, ~~xxxxxx~~ hypopepsia; but if it is hypopepsia, it is only because it is a neurasthenic symptom. I judge this point very important in experience. A vertical pain means neurasthenia, anemia, endometritis, as chronic inflammation of the womb, catarrh of the uterus. We do not know how it is, but we know it is so.

Occipital pain is connected with disease of the ear and disease of the teeth, particularly the molar teeth, pharyngitis, post-nasal catarrh when it extends back into the sphenoid cells. It is very interesting and important to know this.

Supraorbital pain is not a very common pain. It may be due in many cases to hypopepsia, nasal catarrh when the sinuses are affected, and disease of the incisor teeth, also constipation.

Pain in the abdomen and over the region of the heart is connected with cardiac disease in certain cases.

Pain between the shoulder blades and in the sternal region is due to disorder of the stomach.

Pain in the right hypochondrium is usually due to disorder of the liver.

Pain in the left shoulder blade and left hypochondrium may be connected with disease of the spleen.

Pain in the left lumbar region may be due to enteroptosis

Pain in the right and left hypochondria may be due to movable kidney.

Chronic pain in the groin is often due to spasm of the ureter.

Pain in the sacral region may be due to disease of the rectum, or disease of the uterus or the prostate.

Pain in the sacral region extending down into the thighs sometimes both the outer and the inner portion, may be due to ovarian disease. In ovarian disease there is often hyperesthesia.

There is no such thing as chronic inflammation of the ovaries with the ovary freely movable, and as it is not at all likely to be. When ovaries become inflamed, they become fixed. So-called inflammation of the ovaries is, like chronic inflammation of the uterus, rather a misnomer. It is a congestion, and a neuralgia, but not an inflammation. In these cases of painful ovaries, so-called inflammation of the ovaries, there is very often hyperesthesia. The reason for this hyperesthesia which is that the nerves are distributed to the ovaries and to this particular area of the abdominal wall are from the same ganglia, and from the same centers in the cord; so the skin is in a condition sympathetic to that of the ovaries.

Pain in the heels is due in many cases to ovarian disease, and in other cases to neurasthenia or rheumatic diathesis.

Pain on the inner side of the knee is significant of hip

joint disease.

Pain in the thumb may be due to uterine disease.

Pain in the wrist may be due to ovarian disease.

Now, as to the cause of this transferred pain, I do not know. It seems that the nerve relations of the body get tangled up somewhat. We cannot see any relation between the hands and the wrists and the uterus. There are a great many things we do not know about. There is no more reason for the boy having a headache when his stomach aches; that is to say, a stomach ache in his head, than for one to have ovarian pain in the wrist. It is not the brain that aches, it is the meninges. It is just as easy to have a headache with uterine trouble as to have a headache with stomach trouble. What it is ~~xxxxxx~~ that makes a boy have nausea when he is sick at his stomach, we do not know. We do not know why sugar is sweet either. That is one of the intrinsic properties of sugar. I think I have a very peculiar tangle of my nerves. Whenever I suddenly stub the great toe of my left foot, I have a sharp shooting pain in left side. It is absurd. I have noticed this many times in my life. I have more pain in my side than I have in my toe. The thing is very absord.

However, the thing you want to know is how to relieve these pains. The proper thing to do is to make an electrical application, as a palliative in this case. We apply one pole over the affected region, and the other pole over the painful part. If a woman has pain in her wrist because of ovarian pain, we apply electrodes over her wrist and electrodes over the ovaries; or one over the hypogastric region and another upon the wrist, clear around the wrist.

If we have a pain due to neurasthenia, we apply one pole

LECTURES TO POSTGRADUATE MEDICAL STUDENTS.

By Dr. J. H. Kellogg.

E L E C T R O T H E R A P E U T I C S . July 13,1903.

To-day we will try a little experiment. Here we have a jar of pure water, inside of which is another jar containing an animal membrane over the opening, with pure water in it also. We will place the positive pole in the large vessel, and the negative pole in the smaller one. We have now thrown on a current of two hundred milliamperes. What we want to show here is that there is a movement of liquid from the positive to the negative. I have cut out the milliamperemeter, as it is likely to be injured by the large current which we are using. Some of you do not believe this. So here is a question for you.

Take the case of a river. (Illustrating) Suppose here is a river, and I put in the positive and negative poles a mile apart. Do you suppose the hydrogen is going to travel down the whole mile of river before the current can be made complete? Suppose the water is flowing from the positive to the negative. You make the contact so that you close the circuit at exactly one, by the clock, how long before the current is established? How long will it be before the hydrogen will appear at the other pole? It certainly does not allow time enough for the hydrogen to travel a mile. If the hydrogen travels from the positive to the negative pole, it has to travel a mile in this case, and has to go up stream too, to do it. It is demonstrated here in this experiment we tried, as you know. The hydrogen does not go from one pole to the other through that membrane. Here are two separate dishes with the membrane between, yet here is the hydrogen appearing here

at the negative pole, and the oxygen at the positive pole.

Where water is forced through a fine capillary tube, an electrical current is produced. Reverse this process, and what do you find, Movement of the liquid is caused to take place in the tubes. When liquid is forced through a capillary tube, an electrical current is produced, then when an electrical current is forced through a capillary tube, a current is forced in the same direction. Have you ever looked at a muscular fiber through which an electrical current is passing? You will see that it swells at the negative end because there is a movement of the muscle substance from the positive to the negative end? Now the electrical current passing through the fluid in the capillary tube causes a movement of that fluid through the tube in the direction in which the current flows.

Let us illustrate. Here in the center we will put a test-tube of Potassium Iodid, connected on either side by pieces of blotting paper with a test-tube of starch solution. In one of the starch solutions we will place the negative pole, and the positive pole in the other. There will be after a time a blue color in the positive tube. If you reverse the current, in a little while the blue color will appear over here in the other tube, showing that the free iodin has passed all the way over. The blue color first generated will disappear, showing that the iodin has passed over here to the other tube. This proves that the iodin passes in a direction opposite to that of the current, that is, from the negative toward the positive, does it? Nothing of the sort. What does it prove then? It proves that there is a capillary action in this tube opposed to the direction of the current. Of course, it acts the same for the negative pole, but

at the negative pole the potassium is set free.

Now let us make another experiment. Here is a glass which contains some starch water. I put the two poles here, one at each sideof the glass. Experiment performed.

ELECTROLYSIS

We have acids formed at the positive pole, and alkalies at the negative pole. In the ~~xxxx~~ medical use of electrolysis, we may use either the positive or the negative pole, according to what we want to accomplish. The positive pole produces acids, produces a firm blood-clot, produces desiccation of the tissues. The negative pole produces a soft clot, or none at all, as the tendency is to liquefaction, alkalies, and liquefaction or dissolution of the tissues. You can readily see why that it. Most of the tissuesof the body are readily soluble in alkalies. Over in China the method of burying is to have a great pit constructed and filled with quick lime, and the bodies of the dead are thrown into this great pit of quicklime which gradually dissolves their flesh.

You can use very strong acids as well as strong alkalies. The alkalies produced at the negative pole operate by softening and dissolving the tissues, making a soft blood-clot, and the positivepole forms a hard clot. Now, remembering that, we will know what pole to use for a certain purpose.

Suppose we are using electrolysis for surgical purposes. It is used for nevi. Here is a baby with a nevus on its forehead. Once a baby was brought to me here at the Sanitarium, about six months old. I had nothing but a galvanic battery with I think twenty-four cells, but with this battery I was able to destroy the nevus. When I saw the boy grown up to manhood, I saw he had a

soft white scar which was hardly noticeable at all. In such an application as that, you would use the positive pole, because you want to block up the vessels and produce a firm hard clot. You apply a needle for the positive pole, and a large electrode for the negative. Pass the needle first into the center and after it has been there a little while, you will find the center drawn in, so that it will have an umbilicated appearance. Then slowly turn off the current, take the needle out, and put it into the sides of the nevus. You can do this usually at a single sitting. You can employ cocainfor this current, because the current spreads out. It is very important to remember that in employing the current for the cure of a nevus of the head, that you are also applying the current to the head. When the current has been applied for a sufficient length of time, you will observe this drawing in of the center and the dried appearance. If you go on longer the skin will be destroyed and you will have sloughing and you do not want to have sloughing. You want to destroy the bloodvessels without destroying the tissues enough to cause sloughing. You can only apply ten to twenty milliamperes. The skin bears two and a half milliamperes to the square inch. You will find if you read some authorities, that they will suggest, in treating this question, that the current should one fifth to one fourth of a milliampere to the square inch, but such little doses amount to nothing.

What kind of a needle would you use? Don't use iron, because iron will be decomposed and left in the tissues. The irido-platinum needle is the best, not so very costly, and more durable. You would not use a steel needle, because it would be oxidized and blackened, and you would tattoo your patient. You might use a gold needle or an iridoplatinum needle. I had diffi-

culty in getting needles once,, so I went to a jeweler and got some gold wire, and that answered the purpose very satisfactorily.

The negative plate may be a sponge electrode--a large soft sponge electrode. It should be far enough away from the other pole that there will not be a short-circuit. I like best to apply it on the same side of the body. Put it on the same side, and the current will not travel through the central nervous system.

Liver spots cannot be removed,as a matter of fact. The only thing to do is to tattoo the skin, making little points close together. Use two or three milliamperes of current, and make a number of tattoo points. If you go on, xxx until you destroy the whole thing, it will produce a white pit, which will itself produce as bad an effect as the dark spot in the first place. The application of the negative pole, a large spong, over the spot, covering it entirely, will sometimes lessen the intensity of the blemish, and sometimes will entirely remove it. Use fifteen to twenty milliamperes of current. This method is used for blood-stains, and birth marks.

If you wish to remove a hair, you may use the negative pole, just the opposite. A very fine steel needle is the best thing for the purpose. ~~The xaixexefxxhexhaxx~~ Seize the hair with a pair of forceps, and then pass the needle down to the root of the hair, being careful not to puncture the hair follicle. Apply the negative pole instead of the positive pole, because you want to liquefy and dissolve the root of the hair, and destroy the membranes that line the hair follicle. Continue until you see little bubbls coming out along the side of the hair. Then, if you have done this correctly, the hair will pull out easily,with a black root. If it pulls out with a white root, you know nothing has been accomplished. I hope you will, however, find something more profit-

able to occupy your time. I have removed many hundreds of these hairs, and I found it very tedious. The x-ray method had not been found to be successful. The hair is not destroyed, and there is great risk of producing sloughing.

Use from two to four milliamperes of current for this kind of work. Sometimes the patient will stand as much as six milliamperes. For a nevus, ten to twenty milliamperes will do. For a nevus a square inch in diameter, surgery is better than electrolysis. I once had a case of nevus of the tongue. The lady's tongue was so big it hung out of her mouth, projecting a couple of inches. I took a photograph of it, but have lost the photograph somehow. It was a very extensive nevus, extending even to the inside of the cheek. It required half a dozen seances but she was entirely cured. I used in this case about thirty milliamperes of current, placing one electrode upon the arm, and the other upon the tongue. I seized the tongue with a pair of forceps, put her under chloroform, and made the application. It is necessary to use chloroform anyhow, because the pain is so severe. The patient feels the current running down every nerve trunk, in every tooth, and everywhere.

In depilation, it is very important to avoid puncturing the hair follicle, for if you do, you are likely to affect the tissues. You must pass the needle in very gently, and feel that you are passing down under the shaft of the hair. The needle must not go into the tissues below the bulb of the hair.

LECTURE TO POSTGRADUATES. July 9,1903.

Dr. J. H. Kellogg.

E L E C T R O T H E R A P E U T I C S .

To-day we will continue the study of the galvanic current. We were discussing the application of the galvanic current in the treatment of various nervous affections. Let us study further nerves as conductors of electricity. The white substance of Schwan is not a good conductor. The axis cylinder is nearly fluid, and hence is a better conducting substance. These fibers which go to make up the nerve trunk are separated from one another by the neutilemma, or the white substance of Schwan, and trabeculae of connective tissue, and consequently there is very little opportunity for the transmission of electrical current. The galvanic current always takes the circuit of least resistance. The static current always takes the shortest circuit. A galvanic current will go around the world before it will leap a space of one-fourth inch. You see the reason for this. How many volts does it require to leap a space of one millimeter? That is, to make a spark a millimeter long? Five thousand volts. You can add five thousand volts for each millimeter up to an inch, then it requires forty thousand volts, and for ten inches it requires more than one hundred thousand volts. You see this is a tremendous amount. The structures around the nerve fibers have a resistance five times as large as that of the nerve fiber.

I want you to be thoroughly impressed with the importance of including the entire distribution of a nerve trunk in your negative electrode. Your position electrode should be large enough so that the application of a current of proper strength will not irritate the skin. You want to center your positive electrode over the trunk at some point where it comes

near the surface. The large negative electrode should cover the distribution of that nerve as nearly as possible. Most sensory nerves, thermic nerves, pain nerves, etc., end in the skin. It is not so important to influence the motor nerves. If you apply a small electrode down here over some small area, you get very little of the effect you ought to get. You will not find a word about what I am telling you now in any book, because it is not written. Attention has not been called to it. The ordinary modes of application of electricity are of very little value, and that is why electrotherapy is so little employed by physicians. A doctor buys abattery and has great hopes. When he comes to use it, he gets very small results, and soon throws it aside. If electrotherapy gave such results as hydrotherapy, it would be as popular as hydrotherapy. When you get down to the facts, you find doctors use fomentations and hot baths and certain other hydriatic principles very largely. I do not suppose there is a doctor anywhere who does not know how to put a fomentation over a strangulated hernia. Electricity is just as positive in its results when used in an efficient way, but the ordinary methods of applicationx are not efficient.

Experience with Dr. George M. Beard, of New York.

Visceral Applications--Applications in such a way as to affect the viscera. When electricity is applied to a conducting substance, it fills the entire mass. The entire mass becomes a conductor. Suppose we have here a block of steel--a cubic foot of steel. We apply an electrode here, and another here; does the current travel right through? The entire mass becomes a conductor. The electric current forms curves. (See Fig. 1.) Now suppose I should apply my electrodes in this way, make a divided pole electrode. The same thing would be true.

These represent wires, not electrodes. Now suppose we applied a thousand of these wires, the same would be true of every one of them.

Fig. 1. Fig. 2.

What is true of each one of these wires is true of every minute point of this metallic electrode which we substitute for the wires. From every point there are stxarting out a series of curves which go through the entire electrode. This is true of every single point. That being true, where would be the greatest amount of current? It would be just where the largest number of these lines are crossing. Where do you think would be the largest numberof lines? Suppose instead of making them curves, we make them straight lines. Suppose we select here a point, there a point, and there a point. The greatest number of lines would cross practically in the center you see. Now suppose we shorten the electrode, what is the effect? With electrodes of equal length, we have the point of greatest concentration in the center. With a large and a small electrode the point of concentration would be nearest the small electrode. This shows you how to bring the point of concentration about a viscus. If you wish to concentrate the current in the center of the body, you would use electrodes of about the same size. It would not make any difference what size they were. It all depends on the amount of current. If you have 10 M. A. of current, it makes no difference whether you apply it with a small or large electrode, because it is spread out through the body anyhow. But it makes a great difference if you desire

to ~~supley~~ the ~~maximum~~ amount of current. There is rarely any any exception to the rule that you should apply just the largest amount of current the patient can stand. Say we have an electrode four inches square with ten M. A. of current, that is, two and a half milliamperes ~~fifteenhundredths of a M.A.~~ to each square inch. Suppose the electrode is ten inches square, or one hundred square inches, with ten M. A. of current; that would be one-tenth of a milliampere to each square inch. Now suppose we should increase the amount of current until there is two and a half milliamperes to each square inch. The amount of current per square inch of skin which the patient can bear without irritation determines the amount of current you can apply. This is usually as just mentioned. Two and a half milliamperes to the square inch, and one hundred square inches make two hundred and fifty milliamperes of current. It is just as easy to apply two hundred and fifty milliamperes with an electrode ten inches square as it is to apply ten milliamperes with an electrode of four square inches. It is just the same.

Now here is an electrode of four square inches. We turn on the current and when we get to ten milliamperes, the patient says that is all he can stand. This makes two and a half milliamperes for each sqaure inch of ~~xkin~~ electrode. Ordinarily every square inch can stand two and a half milliamperes. More will vesicate the skin and make more pain than can be easily endured. So, ordinarily the skin can tolerate two and a half milliamperes to the square inch. I have repeated this statement a good many times, for I want you to be thoroughly impressed with it. I want you to get it so firmly fixed in your mind that it cannot be forgotten. Thus you see the importance of using large electrodes when you want to make an application to

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Now here is an electrode big enough to carry 10 milliamperes of current. Now this current of ten milliamperes is distributed, diluted, so to speak, and spread out through the whole body, so the amount in the center is very small, a mere fraction of the ten milliamperes.Now suppose we have a larger electrode, and can have a current of 250 milliamperes. We get twenty-five times as much current at the center as we did before. So, you see, it makes a marvelous difference whether or not you apply a large or a small electrode. These miserable little infinitesmal homeopathic doses commonly employed have little effect except upon the imagination.

The question of the relative size of the electrodes depends upon where you wish to localize the current, where you wish to have the point of greatest concentration. Suppose here is the spinal cord. Commonly, one electrode is placed next to the spine, and the other is rubbed up and down here. Electricity appliedin this way never did anybody any good. You can carry but little current through these small sponges. The proper way is to lay one electrode on the spin, rather a small electrode, and over the body opposite place a very large electrode. In this way, you see, the center of greatest concentration of current will be nearer the small electrode, and so affect the spine most.

There are several ways of making applications effective. One is to make the application the entire length of the spine. A narrow electrode with a bead electrode applied to the front of the body. The amount of current you can apply depends upon the size of the small electrode. How large will this electrode be? Say two feet long and six inches wide. This will be just one hundred and forty four square inches. This times two and a half milliamperes gives three hundred and sixty milli-

amperes. That is current enough for strong effects. You must have as large a current as the smaller electrode will allow, without vesicating the skin. Some skins will stand more current than others.

We might apply to the spine two electrodes, one small one here high up, and another small electrode further down. The greatest concentration of current will be just along the spine. The electrodes must be large as your hand in order to get current enough. They should have a surface of twenty-four square inches anyhow. Do not satisfy yourself with little doses of fifteen to twenty milliamperes. Make them sixty or seventy or eighty or a hundred or more milliamperes, and then you will see effects from your treatment. When you want to get a very large current, put on three or four electrodes and connect them with copper wire.

Suppose you want to influence the stomach. Put the larger electrode behind, large enough to cover the whole back, and the smaller electrode over the stomach. That is the principle. To influence the spleen, put an xx electrode on the front, say double the size of the spleen, and make the one on the spine opposite six or seven times as large. You must instruct your nurses now to make these applications, and whether for stimulation of the stomach or for neuralgia. In applications to the stomach, I think it is better to make the application as I showed you yesterday, by putting the larger electrode on the spine. It is the glands and nerves of the stomach you wish to influence, and the stomach derives its nerves from the spine high up, the pneumogastric, and so an electrode applied to the upper spine and neck and a smaller electrode(negative) over the stomach will bring the best results.

LECTURES TO POSTGRADUATE STUDENTS.

J.H. Kellogg, M.D.

July 10,1903. ELECTROTHERAPEUTICS.

There are a class of pains which have been designated as transferred pains. Dr. Head of England has given a great deal of study to what he called transferred pains. Dr. Head made a study of all local pains, in relation to visceral diseases, and he found some very interesting things. He studied a great number of cases in relation to their symptoms and their pathological conditions, and the summing up of his studies may be said to be something like this:

Pain in the head means anemia, neurasthenia, endometritis, and he says, ~~xxxxx~~ hypopepsia; but if it is hypopepsia, it is only because it is a neurasthenic symptom. I judge this point very important in experience. A vertical pain means neurasthenia, anemia, endometritis, as chronic inflammation of the womb, catarrh of the uterus. We do not know how it is, but we know it is so.

Occipital pain is connected with disease of the ear and disease of the teeth, particularly the molar teeth, pharyngitis, post-nasal catarrh when it extends back into the sphenoid cells. It is very interesting and important to know this.

Supraorbital pain is not a very common pain. It may be due in many cases to hypopepsia, nasal catarrh when the sinuses are affected, and disease of the incisor teeth, also constipation.

Pain in the abdomen and over the region of the heart is connected with cardiac disease in certain cases.

Pain between the shoulder blades and in the sternal region is due to disorder of the stomach.

Pain in the right hypochondrium is usually due to disorder of the liver.

Pain in the left shoulder blade and left hypochondrium may be connected with disease of the spleen.

pain in the left lumbar region may be due to enteroptosis

Pain in the right and left hypochondria may be due to movable kidney.

Chronic pain in the groin is often due to spasm of the ureter.

Pain in the sacral region may be due to disease of the rectum, or disease of the uterus or the prostate.

Pain in the sacral region extending down into the thighs sometimes both the outer and the inner portion, may be due to ovarian disease. In ovarian disease there is often hyperesthesia.

There is no such thing as chronic inflammation of the ovaries with the ovary freely movable, and xx it is not at all likely to be. When ovaries become inflamed, they become fixed. So-called inflammation of the ovaries is, like chronic inflammation of the uterus, rather a misnomer. It is a congestion, and a neuralgia, but not an inflammation. In these cases of painful ovaries, so-called inflammation of the ovaries, there is very often hyperesthesia. The reason for this hyperesthesia which is that the nerves are distributed to the ovaries and to this particular area of the abdominal wall are from the same ganglia, and from the same centers in the cord; so the skin is in a condition sympathetic to that of the ovaries.

Pain in the heels is due in many cases to ovarian disease, and in other cases to neurasthenia or rheumatic diathesis.

Pain on the inner side of the knee is significant of hip

joint disease.

Pain in the thumb may be due to uterine disease.

Pain in the wrist may be due to ovarian disease.

Now, as to the cause of this transferred pain, I do not know. It seems that the nerve relations of the body get tangled up somewhat. We cannot see any relation between the hands and the wrists and the uterus. There are a great many things we do not know about. There is no more reason for the boy having a headache when his stomach aches; that is to say, a stomach ache in his head, than for one to have ovarian pain in the wrist. It is not the brain that aches, it is the meninges. It is just as easy to have a headache with uterine trouble as to have a headache with stomach trouble. What it is xxhxxyx that makes a boy have nausea when he is sick at his stomach, we do not know. We do not know why sugar is sweet either. That is one of the intrinsic properties of sugar. I think I have a very peculiar tangle of my nerves. Whenever I suddenly stub the great toe of my left foot, I have a sharp shooting pain in left side. It is absurd. I have noticed this many times in my life. I have more pain in my side than I have in my toe. The thing is very absord.

However, the thing you want to know is how to relieve these pains. The proper thing to do is to make an electrical application, as a palliative in this case. We apply one pole over the affected region, and the other pole over the painful part. If a woman has pain in her wrist because of ovarian pain, we apply electrodes over her wrist and electrodes over the ovaries; or one over the hypogastric region and another upon the wrist, clear around the wrist.

If we have a pain due to neurasthenia, we apply one pole

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LECTURES TO POSTGRADUATE MEDICAL STUDENTS.

By Dr. J. H. Kellogg.

E L E C T R O T H E R A P E U T I C S . July 13,1903.

To-day we will try a little experiment. Here we have a jar of pure water, inside of which is another jar containing an animal membrane over the opening, with pure water in it also. We will place the positive pole in the large vessel, and the negative pole in the smaller one. We have now thrown on a current of two hundred milliamperes. What we want to show here is that there is a movement of liquid from the positive to the negative. I have cut out the milliamperemeter, as it is likely to be injured by the large current which we are using. Some of you do not believe this. So here is a question for you.

Take the case of a river. (Illustrating) Suppose here is a river, and I put in the positive and negative poles a mile apart. Do you suppose the hydrogen is going to travel down the whole mile of river before the current can be made complete? Suppose the water is flowing from the positive to the negative. You make the contact so that you close the circuit at exactly one, by the clock, how long before the current is established? How long will it be before the hydrogen will appear at the other pole? It certainly does not allow time enough for the hydrogen to travel a mile. If the hydrogen travels from the positive to the negative pole, it has to travel a mile in this case, and has to go up stream too, to do it. It is demonstrated here in this experiment we tried, as you know. The hydrogen does not go from one pole to the other through that membrane. Here are two separate dishes with the membrane between, yet here is the hydrogen appearing here

at the negative pole, and the oxygen at the positive pole.

Where water is forced through a fine capillary tube, an electrical current is produced. Reverse this process, and what do you find, Movement of the liquid is caused to take place in the tubes. When liquid is forced through a capillary tube, an electrical current is produced, then when an electrical current is forced through a capillary tube, a current is forced in the same direction. Have you ever looked at a muscular fiber through which an electrical current is passing? You will see that it swells at the negative end because there is a movement of the muscle substance from the positive to the negative end? Now the electrical current passing through the fluid in the capillary tube causes a movement of that fluid through the tube in the direction in which the current flows.

Let us illustrate. Here in the center we will put a test-tube of Potassium Iodid, connected on either side by pieces of blotting paper with a test-tube of starch solution. In one of the starch solutions we will place the negative pole, and the positive pole in the other. There will be after a time a blue color in the positive tube. If you reverse the current, in a little while the blue color will appear over here in the other tube, showing that the free iodin has passed all the way over. The blue color first generated will disappear, showing that the iodin has passed over here to the other tube. This proves that the iodin passes in a direction opposite to that of the current, that is, from the negative toward the positive, does it? Nothing of the sort. What does it prove then? It proves that there is a capillary action in this tube opposed to the direction of the current. Of course, it acts the same for the negative pole, but

at the negative pole the potassium is set free.

Now let us make another experiment. Here is a glass which contains some starch water. I put the two poles here, one at each sideof the glass. Experiment performed.

ELECTROLYSIS

We have acids formed at the positive pole, and alkalies at the negative pole. In the medical use of electrolysis, we may use either the positive or the negative pole, according to what we want to accomplish. The positive pole produces acids, produces a firm blood-clot, produces desiccation of the tissues. The negative pole produces a soft clot, or none at all, as the tendency is to liquefaction, alkalies, and liquefaction or dissolution of the tissues. You can readily see why that it. Most of the tissuesof the body are readily soluble in alkalies. Over in China the method of burying is to have a great pit constructed and filled with quick lime, and the bodies of the dead are thrown into this great pit of quicklime which gradually dissolves their flesh.

You can use very strong acids as well as strong alkalies. The alkalies produced at the negative pole operate by softening and dissolving the tissues, making a soft blood-clot, and the positivepole forms a hard clot. Now, remembering that, we will know what pole to use for a certain purpose.

Suppose we are using electrolysis for surgical purposes. It is used for nevi. Here is a baby with a nevus on its forehead. Once a baby was brought to me here at the Sanitarium, about six months old. I had nothing but a galvanic battery with I think twenty-four cells, but with this battery I was able to destroy the nevus. When I saw the boy grown up to manhood, I saw he had a

soft white scar which was hardly noticeable at all. In such an application as that, you would use the positive pole, because you want to block up the vessels and produce a firm hard clot. You apply a needle for the positive pole, and a large electrode for the negative. Pass the needle first into the center and after it has been there a little while, you will find the center drawn in, so that it will have an umbilicated appearance. Then slowly turn off the current, take the needle out, and put it into the sides of the nevus. You can do this usually at a single sitting. You can employ cocainfor this current, because the current spreads out. It is very important to remember that in employing the current for the cure of a nevus of the head, that you are also applying the current to the head. When the current has been applied for a sufficient length of time, you will observe this drawing in of the center and the dried appearance. If you go on longer the skin will be destroyed and you will have sloughing and you do not want to have sloughing. You want to destroy the bloodvessels without destroying the tissues enough to cause sloughing. You can only apply ten to twenty milliamperes. The skin bears two and a half milliamperes to the square inch. You will find if you read some authorities, that they will suggest, in treating this question, that the current should one fifth to one fourth of a milliampere to the square inch, but such little doses amount to nothing.

What kind of a needle would you use? Don't use iron, because iron will be decomposed and left in the tissues. The irido-platinum needle is the best, not so very costly, and more durable. You would not use a steel needle, because it would be oxidized and blackened, and you would tattoo your patient. You might use a gold needle or an iridoplatinum needle. I had diffi-

culty in getting needles once,, so I went to a jeweler and got some gold wire, and that answered the purpose very satisfactorily.

The negative plate may be a sponge electrode--a large soft sponge electrode. It should be far enough away from the other pole that there will not be a short-circuit. I like best to apply it on the same side of the body. Put it on the same side, and the current will not travel through the central nervous system.

Liver spots cannot be removed,as a matter of fact. The only thing to do is to tattoo the skin, making little points close together. Use two or three milliamperes of current, and make a number of tattoo points. If you go on, xxx until you destroy the whole thing, it will produce a white pit, which will itself produce as bad an effect as the dark spot in the first place. The application of the negative pole, a large spong, over the spot, covering it entirely, will sometimes lessen the intensity of the blemish, and sometimes will entirely remove it. Use fifteen to twenty milliamperes of current. This method is used for blood-stains, and birth marks.

If you wish to remove a hair, you may use the negative pole, just the opposite. A very fine steel needle is the best thing for the purpose. Seize the hair with a pair of forceps, and then pass the needle down to the root of the hair, being careful not to puncture the hair follicle. Apply the negative pole instead of the positive pole, because you want to liquefy and dissolve the root of the hair, and destroy the membranes that line the hair follicle. Continue until you see little bubbls coming out along the side of the hair. Then, if you have done this correctly, the hair will pull out easily,with a black root. If it pulls out with a white root, you know nothing has been accomplished. I hope you will, however, find something more profit-

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SANITARIUM PARLOR LECTURE, July 30,1903.

ELECTRICITY, or Lightning.

J.H. Kellogg, M. D.

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I have a rather lively subject this evening,--I propose to talk to a little while about "Lightning." When Benjamin Franklin first chained the lightning and drew it down from the clouds with a kite, he had no proper appreciation of the great use that this wonderful force would be in its (?)developed condition. He formed a conception of the electric display in lightning,-electric force in operation- and he adopted a kite as the means of bringing down this current to the earth, where it could be experimented with. Since that time, it has been found that lightning can be produced at any time; that there is always in the atmosphere a quantity of electricity which can be collected. In England there is a gentleman who has a large wire that runs round for several miles through the air,and then by bringing the ends of this wire together, he is able to bring out sparks at any time.

Electricity is being generated continually by all the operations of nature. Little drops of water falling through the air generate electricity by friction. You have sometimes noticed that rubbing a cat's back will cause sparks to fly off, and some of you have probably made the experiment of skipping along the carpet on a Winter's dayand ith your finger, lighting the gas,--that by skipping lightly over the carpet and then simply bringing your finger near the gas jet, a spark from it will light the gas, and without burning your finger.. This is a very common experience.

People sometimes say, "How much electricity there is in me."

I remember a lady at one time who said she could not take electricity, because she had too much already,--said she, "I have so much electricity in me that I can light the gas by the sparks that I throw off." This lady did not understand the physics of this subject. She thought electricity was present in her body so that she could flash lightning at any time she wanted to. But the electricity was generated by slipping her feet upon the carpet,-- the friction of her feet upon the carpet generated electricity. In the same way, wherever there is friction , electricity is generated. The formation of hail results in the production of electricity--or possibly electricity produces the formation of hail--there is a little difference among scientists about that . The friction of the leaves of the forest rubbing against each other, generates electricity.. Mr. Edison showed, some years ago, that (Not understood.) producing electricity from coal. By simply putting coal into your furnace,you can generate electricity to light your house, and turn your machinery, and carry on your household operations; that would be very convenient. He hopes that the time may come when one machine will light the house and serve as a motor for all the household operations.

Electricity is generated in other ways beside the operations of nature. It is generated in all living plants. Dr. Waller, of England, some time ago showed, by nice experiments, that every time the heart beats ,there is a little electric shock--very faint and delicate, but very real, every time the heart beats. He fixed up a very delicate apparatus, by which, on looking through the microscope you could count your heart-beats by the electric flashes. I had the pleasure of seeing that experiment. Dr. Waller demonstrated this to me, himself, in his laboratory in London. In all our bodily operations,-

digestion, the circulation of the blood, the movement of the impulses along the nerve-fibers, even our thinking, liver action and muscle action--all the movements of the vital organs and of the body result in the production of electric currents. So there are electrical currents moving through our bodies continually.

This fact gave rise to the suspicion, many years ago, that electricity is life,--that life is simply a phase of electricity; but we know thisis not true .. Electricity is not life. Some have imagined that nerve energy was electrical energy, but that is a mistake. Nerve energy travels at the rate of 200 feet a second, but electricity travels at the rate of 200,000 miles a second,--andthere is a great difference between 200 feet and 200,000 miles. But these movements are very slow compared with some other movements,--for instance the rate at which gravitation travels; gravitation travels so fast that it has been found impossible to measure.it.It.is supposed to travel from one side of the universe to the other--supposeing the universe has sides, (?)in an instant.

Now what electricity is, is a question that has been puzzled over a great deat, and there have been many theories advanced in regard to it . Electricity has been supposed to be a fluid, and it was supposed to be two kinds of fluid,positive and negative. Mr. Tyndall had a theory that electricit was simply a mode of motion,--simply a vibration; this was the theory of vibration. But more recent observations seem to show that these ideas were crude and imperfect and incorred , and that electricity is not a vibration, not a fluid, and not a motion, but rather, a condition, a strain, a stress, a state, rather than a movement, and that there is something back of it . What we call "electricity" is simply an operation of energy upon —

from some other form of energy which is behind it,--and this seems to be a consistent theory, for the tendency of physical science for many years has been to ~~simplify~~, and to bring more and more these varied forces into line with one great force; and so the present supposition of some of the most advanced scientists is, that electricity, heat, and all the various so-called forces of nature are simply manifestations of one great force; that the so-called different kinds of matter are really simply manifestations of one kind of matter; that instead of there being seventy-five or eighty different kinds of atoms, there is really but one kind of atoms.

Observations made upon radium, the new substance which has been discovered, have led to some of these conclusions, and observations made in reference to gravitation have also led to this idea. It has been shown that gravitation does not act exactly the same ,under all conditions and circumstances. For instance, a ton of ice weighs a little ~~less~~ more than a ton when melted. A Professor in the Madison University has shown that a given amount of matter is heavier when cold than it is when warm; that a bar of iron weighs more when cold than when warm, and that a ton of ice is not a ton of ice by weight when it is melted .

These observations have led to the complete overturn of theories that were suggested when we were in school, and there is now a new science of matter,--one which has just been born from radium, the new substance which I have been telling you about . The wonderful properties of this substance have, in part, led to these conclusions. This substance gives off light in such a remarkable way, that it is said that if the ceiling of a room were covered with the thinnest possible film of radium (just enough to cover it), that that room would have light for more than a million of years . It does not have to

absorb light before it can throw off light. It seems to be full of light. It seems to have power to throw off light continually,--the smallest bit of radium has power to throw off light for millions of years. More recent studies show that radium not only throws off light but emits heat; that a small bit of radium retains its temperature three degrees above that of the surrounding atmosphere. What would you think of a stove that always kept warm, no matter what the weather was? .Here is a substance which has power to give off heat continually,and without losing weight, and to maintain its temperature three degrees above that of the surrounding atmosphere. A mass of radium weighing only fifteen grains will boil its own weight of water every hour...

As I have said, this discovery completely overturns the ideas which physicists have held. Because here is a substance which is capable of giving off light without receiving light, and of giving off heat without receiving heat, and producing heat without combustion or oxidation, undergoing no change, yet continuously throwing off heat. If you were able to put coal into your stove and let it burn and keep (?)the room warm continuously, it would be a great saving in coal; but here is a substance which is capable of keeping the house warm without being consumed. But radium is pretty expensive yet. According to a French scientist, a gram of it has been quoted at $30,000; that would be a little more than $1500 for a single grain . A bit only about as large as a grain of wheat sells for about (?)30,000. Small specimens can now be obtained.

These forces are only related to electricity. I am not going to tell you all about electricity to-night, but I wish to speak particularly about static electricity; that is the form of elec-

tricity that is generated by friction or induction. ~~It~~ It does not differ, in essence from all other forms of electricity; it has certain characteristic properties which render it different from the so-called galvanic, sinusoidal and thermic currents, but in essence, it is just the same thing.

I will make some little experiments, and ~~be~~ tell you a little about what we see in some forms of electricity.. Electricity is useful in the body. This very interesting property which it has,--of traveling more readily on the nerves than on the muscles .. Some parts of the body are very impervious to electricity,--for instance, the skin. It takes 300 times as much power for an electric current to pass through the skin, that as it does to travel the rest of the way through the body. It requires 3,000 ohms for electricity to pass through the skin, which is 300 times as much as is required to pass through the rest of the body. The skin is a conductor, and the more moist it is, the better conducter it is ... There are some substances within the body which have great resistance to electricity, as, the bones. It travels five times as easily through the nerves as through any of the other tissues muscles; consequently, when we ~~gently~~ apply electricity to the surface of the body, and when it goes through the skin, it picks out the nerves and travels on them.

One wonderful feature of electricity is, that when it is applied to a nerve in this way, it seems, in a certain degree, to take the place of the natural nerve-impulse which starts in the brain or spinal cord, and thrills along the nerve-trunks, and starts up movements in the vital machinery. It will cause a nerve-impulse to travel down the arms , legs, or fingers. It will cause the hand to close or open; it will cause my arm to bend, or to extend itself--and this is all done

through the agency of the nerves.

Some years ago, an experiment was made in Paris, which showed that electricity can almost take the place of this vital force-- nerve - force. A criminal had been beheaded, and some doctors were all ready to make experiments upon him. They had their batteries ready and when his head was cut off, they immediately applied an electric current to the nerves of the face, and it made him smile, and make grimaces, and contort his face in all sorts of shapes by the application of the electrical current, although he was absolutely dead. They also applied an electrical current to his body, and it caused his limbs to move and go through all the operations of the limbs of a living being by the application of the electrical current. Here was a dead man who would spring and kick and smile, and open his eyes, and close his eyes exactly as though he were alive, although his head was in one place, and the rest of his body in another place.

This fact has been made great use of, in the treatment of disease . I had an opportunity to-day to make a very useful application of this interesting fact in relation to the electrical current and its power to influence the nerves and musoles. A lady came into the office with one side completely paralyzed,--and she had the "wrist-drop" and the "foot-drop-- the whole foot dropped down. This happened in a very singular way: She was playing on the piano, and a l at once felt a terrible pain in the back of her neck. She ent to bed, and within a week her right side was completely paralyzed. So you see how dangerous it is to play the piano (Laughter.) That is, unless you are taking treatment at our Sanitarium. A great many ladies

have had their arms paralyzed by too much piano practice. Since this lady had been paralyzed, she had not raised her hand. Now it was interesting x me--and to this lady too--that when I applied an electrical current to her arm, her fingers extended themselves, and her thumb extended itself, and the fingers went through various motions, and she was so delighted that she just laughed and laughed, and she said , "Why, they are moving! They are moving ! Just think of it !" and sure enough, they were moving. Those fingers that had not moved for a whole year shut up; and when the electrical current was applied to the arms, they were set in motion just as though they were operated under the influence of the will. When the electrical current was withdrawn, the fingers soon dropped back into their old plain position, although they did remain in their normal position for some time .

Now the interesting thing that I observed in this case was, when not that under the influence of the electrical current,these fingers were rigidly held in this position (illustrating); they were perfectly stiff, so that it was only with great effort that they could be drawn in. But under the influence of this current they were perfectly flexible, and the rigidity was gone. So there is something remarkable in the electrical current --something which restores the normal state or condition when the electrical current is applied. We have a blackboard here, and I will see if I can give you the smallest idea of how this may happen. You must know something about nerves and nerve cells. We will suppose here is a nerve-cell (diagram.) Here is a nerve-cell which has four poles. We will suppose that one of these poles is elongated. This subdivides at the end, forming a little tuft at the end. In these little fibers, when examined under the microscope, we find minute little globules, or gemmules" as they are termed sometimes termed, which are so fine that it is hard to see them,

in every direction, and they are all set to work to find that thing that we want . Bye-and-bye it makes a contact in the right place. It tries one thing and then another, but the moment we get the right contact, we recognize it. If we are trying to get a name, and we get pretty near it,--"Brown?" No, that was not it. The brain tells us when we get the right thing,--"Brown, Burnham--no. Burn--that is what we want.. T

The brain sometimes gets into such a condition that the contact cannot be made . You say that "I am so tired that I can't think of anything to-night ." What does that mean? It means that these little gemmules, as we call them, cannot quite reach so as to make the contact ; they are so contracted or drawn in that they cannot make the contact, and you go to sleep--and that is what sleep is By-and-by you get rested, and these little filaments begin to reahh out, and they reach out farther and farther, and by-and-by they reach the point where they make a contact, and you wake up, and you say, "What woke me up? Who made a noise? What happened?" Nobody made a noise. The thing that happened was this = These little nerves had taken hold again, and were ready for business, and the brain machinery had started. But by-and-by they can't hold on any longer, and so they let go, and your head drops down, the nerves and muscles let go. The stomach ~~vessel let go~~ cells let go about 10 o'clock/ at night, so you must not eat late suppers, because digestion should take place when we are awake, and you are only about half awake,with these little brain-cells going. Digestion is badly performed while we are asleep, and we must be wide awake to have good digestion...When the process is suspended, you wake up with sour stomach .

Now, to come to the conclusion that we were going to reach: When electricity is applied to the nerves, it acts as a nerve-stimulus does. It thrills along one of these nerve-fibers

and makes a little filament project and take hold. That is what happened to this young lady: There was no stimulus traveling along the nerves, and I applied electricity and the muscles contracted. At the same time the electricity went to the muscles which went back to the brain, and went to the place where the injury occurred, and a process of education must be begun to educate the brain to do its work; it has rested so long that it has forgotten how to work. The muscles and the nerves are right, but there is something wrong in the brain.. We will send an electric current through the arm, and by-and-by there will be a recovery so that the brain will be able to do its work.

We don't know exactly how electricity operates, but it is helpful to the muscles and to the internal parts. I have many times been applying electricity to the back of the neck and over the stomach and the patient has said, "Why, doctor, my mouth is full of saliva." This excessive production of saliva was a good indication, because it meant that the stomach was doing something, for if the salivary glands were more active, the gastric glands would be more active, and the liver would wake up. The stomach is sluggish, and we can wake it up by an application of an electric current over the stomach, or by passing a tube into the stomach. We can apply electricity in various ways. You can swallow the tube as you swallow ~~pills~~ a pill with a string tied to it,--it goes into the stomach, and the electric current is passed through it, and when the seance is finished, it is withdrawn.

There are various forms of electricity. There is what is known as the galvanic current. This current is generated by chemical action,--the chemical process is going on in the cells...It is a steady current, and it travels straight ahead in a uniform direction.

This was called the direct, or galvanic current. This current was used for electro-plating, and in electrolysis for tumors. Sometimes persons have superfluous hairs, and with a fine needle a current is passed through each hair, and it is killed. Sometimes blemishes can be removed from the skin in this way--by the proper application of this current. This same current is used for the destruction of large tumors in the body, mother's marks, andother blemishes of that sort.

The electric current is useful when we wish to stimulate glandular activity, and we must apply it in such a way as to excite the internal parts, stimulating the gland within the body. We can use this current to great advatage when we wish to apply electricity to the nerves.

Another current , which is still better than the galvanic current,, is known as the "sinusoidal current." This current is generated by a magneto-electric machine; this machine is a generator. These machines will generate a current, when properly constructed. ~~Th~~ This current is less expensive than the galvanic current, and it is better than that current for application to the nerves. I applied this sort of current to the lady that I have been telling you about.

Then we have the faradic current, which makes an opposing influence. This current employs the principle of induction. There is a coil of wire which generates electricity a current of electricity which is interrupted alternately by a little vibrating spring. This causes the current to pass back and forth through the body.

Then we have the "static electricity,which I am going to show you something about to-night. (Referring to machine.) This is a static machine, and in order to see its operation well, we will

have to turn the lights out. (Lights out.) By this static machine, the current is generated by friction upon plates of glass. This is one of the oldest forms of electricity that has been used. (Machine set in motion. Little boy taken as a subject.) The subject stands upon an insulated stool, and thiscurrent is allowed to connect with the stool, and the whole body of the person becomes charged with the electric current. (Boy: "Will it hurt me?") No, sir. (Machinery in motion.) Please observe how his hair stands on end. (Another subject.) Now the hair is dry,- -the whole body is charged with electricity you see. Here is a chain of lightning manufactured. (Sparks flying.) These sparks are not necessary; they are incidental; the arrangements are not quite perfect, but you can see the rising of the hair. (A lady subject.) It is not necessary to use the insulated stool now. I think your hair would rise if it had a chance. (Laughter.) Is there not a little girl here who would not mind taking her hair down and being a subject? (Little girl comes up.) The head seems to be bathed in light, showing that the whole body is filled with electricity.

I want to show you something else that is remarkable. d'Arsonval, of Paris, has constructed a very instrument by which it is possible to produce electric currents which are painless, or nearly so--you noticed we notice that it gives a little pain, for when the sparks flew, the patient dodged a little. d'Arsonval has produced an instrument by which we can get a current which will run an electrical lamp, at the same current passing through your body, and you will feel no sensation whatever. This current is known as the "High-Frequency current." I obtained one of these instruments which was brought over (lights on) for exhibition at the World's Fair ten years ago. That was the first they were seen in this country. The instrument was des-

troyed in our fire last year; so far as I know, it was the only one in the United States at that time . I have recently had the instrument reproduced, and I have it here to show you. (Machinery in motion.) The whole current of this large machine is passed through this instrument here, and it produces a powerful spark. (Lights out.) This passes down through the back,--it is entirely painless. I want you to see this beautiful color. Now there is a great stream of electricity passing into the body; you can feel nothing but a little warmth. In a little while a redness isproduced, but there is no pain. (Little boy, as subject.) You feel nothing at all , do you? ("No.") The current is applied by means of other electrodes. (Machine in motion; brilliant sparks anf flames.)and snapping and cracking.) There is no pain at all. Now this remarkable fact has not yet been thoroughly studied; it has been recently introduced , and its use is not yet , perhaps, fully understood. Professor Apostoli, of Paris, found that when this current was passed through the body of an animal ,it produced carbonic acid gas, showing that it stimulates vital activity. He saw also, that it was possible to generate heat without pain or any sensation whatever, and that thus all the vital processes might be aroused influenced. These experiments were first made upon animals, and afterward upon human beings. It was found that these currents produced various therapeutic effects without disagreeable effects being produced by a stronger current.(Lights on.)

Electricity is one of the most powerful forces of nature; we know that, but we don't know how it operates. We don't know how it causes the muscles to contract,nor how it causes the nerves to produce activity, but it is a powerful means of stimulating the processes. By the application of the electrical current,the heart may be made to work,--the whole body may be made to act, and so,

parts that have been paralyzed and sluggish and activity diminished--these parts may be made to act more effectively by means of the electrical current. When taken by itself, electricity does not accomplish much, but when combined with proper diet, exercise and the use of water, with thermic applications, applications of light and heat, and all other therapeutic means, electricity is certainly a most powerful and efficient agent adjunct.

I want to introduce to you to-night,, the largest electrical machine of this sort in the world. This machine here, is a static electric machine of the ordinary size; it produces large sparks, and has an excellent effect in the treatment of a large number of patients. We have a machine which is capable of giving a charge to all the persons in this room. It is by far the largest machine ever constructed. Before the fire, we had the largest one ever made, but this was burned up,and I have had a larger machine made, and it is the largest machine ever made for generating static electricity; it will generate a charge that will fill this entire room, so that you will feel as though the wind were blowing hard. This machine is in operation, and those of you who care to see it in operation, drop in at the third door, as you go down the aisle,

SANITARIUM LECTURE, Aug. 6, 1903.

The Philosophy of GETTING WELL.

J. H. Kellogg, M.D.

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I promised to talk to you to-night about the liver, but I understand that the announcement was made this afternoon that I was to speak on "The Philosophy of Getting Well;" so we have two subjects,--which one of them do you wish me to talk about this evening?

A VOICE: "The Philosophy of Getting Well."

DRL. KELLOGG: All right; I always like to talk about that.

The most wonderful thing in the world, I think, is the fact that the sick man can get well. It is a most surprising thing that a man who has been drifting into disease for years and years can be reclaimed and have the bloom restored to his cheeks and the sparkle in his eyes, and the ring of health in his voice. That is the reason people are going to be so surprised when you go home well and strong. They had given you up as hopeless cases. Most of you have been pronounced "incurable" by your doctors, and your neighbors have been thinking about going to your funeral; so when you come marching home with springs of steel in your step, and the light of health in your faces, it is going to be a surprise to the whole community. I recall one man who was with us a while, some time ago. When he came, he was a mere skeletom, weighing only 85 to 90 pounds, and when he went home he was a fine specimen of manhood, weighing 185 pounds,--and he was not overweighted, for he was a tall man. When the people saw him after his recovery, they said, "It's a miracle! It's a miracle!"; a from the brink of the grave and the result of that man's going home in that sound condition is going to be the means of sending twenty-five or thirty patients here.

I shall never forget a gentleman who came down here from Kenosha, Wis, some twenty years ago. When he came here, he was the color of a quadroon--more than that--he was the color of a mulatto. When he had been here three months, he had blossomed out into a Cuucasian again. He had been going up and down the streets of the city for three years, and was almost as black as a crow with jaundice, and when he went home, he had the natural color of health in his face. He was a prominent business man, and this wonderful recovery was looked upon by the people of his acquaintance as a miracle,--and they were right; it was a muracle. It wasn't very long before almost every incurable in that town was here; some thirty people came here at one time as the result of this gentleman's experience,--thy were nearly all of them turned off as "incuravles," and sent here for treatment, and they all got well with one exception: There was one poor, paralyzed man whose nerves ~~nerve~~s were so destroyed that it was not possible for him to wholly recover--and he did not entirely recover. He got some better, b but he was di satisfied because he was not entirely cured, that he said to me,"You cured such and such a man,--why can't you cure me ?" His experience reminded me of the experience of a missionary friend of mine in Mexico. A man was sick with a fever, and the missionary stood by his side and gave him treatment until he got well,--and he had been given up to die by the Mexican doctors. By-and-by there came to him a lady without eyes. She had had inflammation in her eyes, and they had suppurated and had actually run out,and the eyeball had shrunken away, and they were simply little black spots--dark colored spots sunk deep into the sockets of her eyes. She said to the missionary, "You cured that man,--why can't you cure my eyes?" "But," he said,

"I can't. Your eyes are gone; you can't be cured." "Oh, but," she said, "you cured such a man who was almost dead and in his grave, and now you can certainly cure me." "No," he said, "I cannot cure you; it would take Almighty power to cure you." "But," said she, "you are not a common man,--you are an angel from heaven; you cured these other men, and you can certainly cure me." The missionary had a very hard time; he could not persuade this lady that she could'nt be cured; he could not cure her because her eyes had run out, and were gone, and God only could make new eyes. That lady saw that it required more than human power to heal.

Now my friends, I want you to see the philosophy of this work of healing, and that thdre is nothing in it but what is superhuman,--it is all superhuman; it is not the work of man; it is not my work nor the work of my colleagues; it is miracle-working that is going on, and I want you to see it .

Now I want you to explain to me a few things : If you put a little seed of corn in the ground and let it grow, and it is nourished by the rain and the sunshine and the soil,until in the course of a few weeks, you go out and examine the result of the growth of that kernel of corn, and you find a thousand kernels --a thousand for one. The farmer carries on his shoulder a bag-full of corn into the field and he plants it in the ground, and in the Fall he comes out into that field with wagons and horses and carries the fruit of that seed-corn home again; it is the fruit of that corn multiplied. Now explain to me what caused the multiplication of that corn. Tell me how the kernel of corn becomes a thousand kernels. Tell me how a few kernels of wheat can become a bushel of wheat . Every corn-field is a miracle. Every wheat-field is a magnificent miracle; it is the same

sort of miracle as that which was wrought when the Mastr fed five thousand with five loaves and two small fishes; there was a multiplication of food as there is a multiplication of corn in the cornfield.

Now we see this going on all about ut ; but it is an everyday affair, and so we forget to recognize what a wonderful thing it is . When Springtime comes, we see the green grass everywhere,--a whole continent covered with a green carpet--a whole hemisphere suddenly blossoms into green, and buds and leaves and plants and twigs of every sort shoot out everywhere. But this is so common that we don't stop to think what a wonderful thing it is ,--we say "It is natural; each Spring is like the other Springs, so we say, "It is natural; it is nature that is doing this ."

Now what is nature. I sat with my little boys and girls by the window, one Winter afternoon, and we were repeating Bible verses--it was one Sabbath afternoon,and I had the pleasure of having an hour with my little boys and girls, and so we were repeating verses which we could remember, from the Bible; and one little girl said, "I know a very nice verse," and she repeated this , "The eyes of the Lord are everywhere, beholding the evil and the good ." I said to her, "Did you ever see the Lord looking at you? Did you ever see the Lord's eye?" "No," she said, "I never did." "Then how do you know that the Lord is looking at you and sees you?" There was nothing said until a little boy who was older than the girl, said, "God is everywhere." "How do you know? did you ever see him?" "No." I wanted to get that bought into the minds of these little ones--and it is good for us to understand it. As I looked out of the window, I saw a tree, and,--"Now," said I, "what will happen to that tree in the Spring ?"

"It will be all covered with leaves," little Robert said. I said, "Where did the leaves come from?" "Out of the tree," said George. "Yes," Paul said, "first there will be the bud, and then the leaf will come out ,--the bud comes out of the tree, and the leaf comes out of the bud; so the leaf comes out of the tree. " "Then the tree makes leaves, does it ?" "Oh, no! the tree cannot make leaves." "Then how do you know that the leaves come out of the tree?" "Because I have seen it,--last Spring I saw the buds come out of the tree and the leaves came out of the buds, so the leaf was inside of it." "And you say the tree cannot make leaves?" "Oh, no, the tree cannot make leaves." "Then if the tree cannot make leaves, who does make them?" "God makes the leaves." "If God makes the leaves of the tree, then where is God ?" Then there was a sudden silence. By-and-by a little girl raised her hand, and with sparkling eyes she said, "He must be in the tree, pa,--he must be in the tree!" You ought to have seen the children look at the tree out of the window. They had caught a wonderful glimpse of the creative process, in the making of the leaves of the tree, and pushing them out of the tree into the air and sunshine. "Now, " I said, "let us look at this boy Paul,-where did his hair come from?" "Out of his head." "Can Paul's head make hair?" "No,Paul's head can't make hair ; but his hair comes out of his head, just the same ." Then I said, "Paul, can you make hair ?" "Oh, no!" "What is your hair made of ?" "Out of the apples and potatoes and other things that we eat." "Then suppose we had apples, and potatoes etc., on the table,--could you take them and make hair out of them?" "Oh, no! Paul can't make hair ." "The hair must have been made down in his head somewhere,--now who made it?"

"God made it. " "Then if God made paul's hair,where is God ? "

There was silence again for a minute, --there was a new idea--they had never thought of it before, but by-and-by it dawned upon the mind of a little fellow, and it struck him so hard that he sprung out of his chair, and he shouted, "He is in Paul, Papa!" You ought to have seen those children look at Paul,--he was the most wonderful creature they had ever seen when they discovered that there was a divine power in Paul that could make hair and create things .

Now my friends, that is the philosophy of getting well. Every man who is sick and gets well is the subject of a miracle,--there is a miracle wrought in his case. I was talking with a lady in my office the other day, and she said to me, "Doctor, do you think you can cure me?" "Oh, yes," I said, "you will get well." "Do you really think I will get well?" ""Yes, you will get well," I said. I didn't say I could cure her, but I said, "You will get well." "Do you feel sure of it?" she asked. "Yes," I said, "I feel sure of it ." "But how about my bad stomach? I have had this bad stomach for so many years, and now do you tink my stomach can get well?" "Yes, I have no doubt of it ;—if you have no cancer or other incurable thing in it, your stomach will get well." "Well," she said, "just tell me how you are going to do it." "Well, " I said, "you have got to have a new stomach that's all." "Oh," she said,"do you mean to say you can make a new stomach for me ?" "No." "Then what are you going to do?" "There is a power in you that can make stomachs." She opened her eyes wide; she didn't really believe it for a moment. I said, "Where did you get the stomach you have got? Wher did it come from? It is bigger than it used to be when you were a child. While you have been growing, your stomach has been growing. While your body has been growing, your stomach has been growing and developing and expanding. There is a creative

power inside of you." "You say, doctor, that I have got to have a new stomach?" "Yes." "Why that would be a miracle." "Sure it would be a miracle." # Lord Herbert said, " "No man who studies the anatomy of the human body can be an Atheist. Every man who studies the phenomena of life must recognize, in all the operations of our bodies that there, is in them ,evidence of a miracle-working power. " Scientific men acknowledge that it is not possible to explain the phenomena of life on scientific grounds. Scientific men in Germany to-day have abandoned the idea of the duality of things/~~in the nature of man~~; they have abandoned the old dualistic philosophy,--this philosophy is abandoned to-day by the most advanced thinkers. There are three classes of thinkers,--those who account for everything by physical laws--and by this, they mean a blind force in operation--a force that acts without any intelligence. There is another class who believe in the duality of things,--that some things are operated by physical forces and some things are operated by spiritual forces--that there are physical forces and spiritual forces; that there are natural forces and ~~spiritual~~ supernatural forces; that there are material things and immaterial things; that these so-called natural forces are the common, ordinary forces of nature and which are in operation within the body, and that outside of them there are certain other spiritual forces; that these forces sometimes intervene and sometimes supervene (?) There is another class of thinkers,--I don't know that I can say they have arisen recently, for there have been persons of this persuasion during all time--who recognize the fact that there is only one kind of force--only one kind of power; that there is no such thing as "natural" and "supernatural;" that there is no such thing as "physical" and "spiritual", but that all is one; that there is only one power

and that is the great Intelligence that created all things in the first place; that there is no such thing as nature doing a certain line of of things, and God doing other lines of things, but that there is only one Creator in all the Universe, and that is God--although science does not use the term "God,"--Professor Bunge, of Basle, for example, speaks of God, as "this great Power that is behind everything,"--as "the thing which exists in itself"--the self-existent thing." Another English philosopher describes this power as "the Great Unknowable." Another authority speaks of this great Force or Power, as "the Non-relative." But all agree in this one thing,--that this Power is intelligent;" that it is the great Force that is behind everything, and that is the origin of everything, and is responsible for everything and controls everything.. Herbert Spencer says, in one of his works, "After we have studied the phenomena of nature, and accounted for everything so far as it is possible to account for it, we have to acknowledge, after all ~~xxxxxxxxxxxxxxxxxxxxxxxxxxxx~~ that there is behind everything and underneath everything, an unknowable Intelligence eternally at work." There is one point here in which religious people will differ from Mr. Spencer,--viz., in the thought that this great Intelligence is "unknowable," but they agree in the fact there is this great Intelligence behind and beneath everything.

Now, if we take the simple matter of the growing of grass,, the making of acorns upon a tree, and the creation of corn in great cornfields, in which we see these same so-called natural operations, we cannot account for them; they are creating in a marvelously intelligent way. Here is a kernel of corn,--if you plant it in the earth, it will grow down. If you plant it in a box (?) with a netting and

under it, the kernel of corn will grow downward, and if the box is upset, it will grow upward....

There are many marvels of this sort. When we look out into the world, we see that everything is done with marvelous intelligence. And when we look into our bodies we see the most wonderful display of intelligence . We are apt to look upon disease as some arbitrary thing that has fallen upon us. I once heard of a case of a man who was sick with typhoid fever, and a doctor and a clergyman were sent for, and they both met in the sick man's room. The clergyman proposed prayer, and the doctor reverently knelt with the clergyman, and the clergyman prayed that the Great Father would help the friends of the sick man bear this affliction of Providence, and to recognize it as a dispensation of Providence. While they were on their knees, the doctor smelled a bad odor coming up through a crack in the floor, and after a search, he made the discovery that this was not a dispensation of Providence at all, but a dispensation of dirt in the cellar. He had the cellar cleaned out and the man got well. The man was sick with a fever which came from the basement. I think there is a great deal of this srt of work in the world which is attributed to Providence. Many people entertain the notion that sickness is an affliction of Providence ; how many times we have heard this idea advanced in funeral sermons, especially of children. Perhaps a child has died because the mother didn't know how to take care of it ,--that is not a dispensation of Providence--it is a dispensation of ignorance. Perhaps a young lady has died because she didn't know how to dress herself properly, or perhaps she had been addicted to social dissipation, and took cold after going out of the ball-room in a heated condition, and not taking proper care of herself; or perhaps she has squeezed her liver half in two by

wearing a tight dress;— committed suicide--killed herself by abusing the temple of God which we call the body, so that it has fallen into decay and death,--and this is called "a dispensation of Providence." "Why has Providence taken this beautiful flower from us," they cry, charging this to Providence.

There is another class of people who charge all sickness upon the Devil. Now I want to say that it is not the Devil, nor Providence that is responsible, but it ourselves that are responsible for our sickness.

I remember, at one time in the parlor of the old Sanitarium, while I was lecturing on "Dyspepsia," there was a poor, long, lank dyspeptic si ting in one corner of the parlor, who straightened himself up and pointed a long, bony finger at me, and said, "You are too hard on us poor dyspeptics,--you are too hard on us." I had been saying that people ought to be ashamed to be sick , and tht they were suffering for their own sins, and when they are telling about their troubles to others they were like jail-birds showing their stripes to others,--"You are too hard on us poor dyspeptics; I have dyspepsia; have had it all my life, and my father had it before me,and I inherited it from him, and why am I to blame for it ?" "You say your father had it?" said I. "Yes," he said. "Well," said I, "it's all in the family, so you ought to be ashamed of it, just the same." "The fathers have eaten a sour grape, and the children's teeth are set on edge." The fact is, our sicknesses are due to our sins, or the sins of some one in the family. Oliver Wendell Holmes used to say that every man is an omnibus in which rides all his ancestors." We have bad stomachs because our ancestors abused their stomachs. We have had gluttons drunkards and lazy people in our omnibus, and that is why we are suf-

fering. The same philosopher made another sagacious remark,--that each one of us is the footing up of a long line of figures which runs back to Adam. We could tell just what the footing is, if we could find all the figures, but we know that each one is the footing up of this long column of figures,--extending clear back to the beginning of human existence. So we may suffer in our lives as the result of the wrong habits of people who have gone before us . We are simply buds of the parent stem; we are simply extensions of our parents, and we must suffer the results of our parents' transgressions. Once a fine large man came into my office with his son, a poor wizened boy; his father was a gigantic looking man, but his boy was a poor little chap--he wasn't much larger than I am (Laughter.) I said to the man, "What sort of mother has this boy got?" "One of the finest women I ever saw," he said,— "she is almost as large as I am." I said, "This is rather a poor specimen, with such fine ancestors." He said, "I can't understand it." I inquired into the matter, and I found that the man had been a smoker ever since he was a small boy, and he smoked cigarettes when a small boy, smoking twenty cigars a day when a man. I found out that explanation as to why his boy was what he was. He said, "My father died at the age of 101, and he smoked all his life, and my mother died at the age of 90, and I am in this condition." I said, "This boy's case is plain enough:"The fathers have eaten sour grapes and the children's teeth are set on edge;" and, "Visiting the iniquities of the fathers upon the children to the third and fourth generation,--" and why the third and fourth generation? Because they run out then,--they don't go beyond that; after three or generations they run out .

Now there is a good biological law that we are all amenable to and that we can't escape from,--and this law is not an arbitrary empiric-

al thing. It is simply the actual working of this intelligent power, or biological force--heredity, we call it; it is simply this divine power dwelling in every man, and which goes from one man to another; it is the law of the immortality of the race. The diseases of the parents appear , in the natural way, in the children. Why? Because children are simply extensions of the parents. The child becomes the twig of the willow tree and keeps it growing,,and it becomes another willow tree. That is what the child is,--it is a bud--it is not extended from the parent,--it is the parent; the father is actually in his son, and the son is not simply like the father,--he is the father,--it is the same ~~father extended~~ being extended;there has been no interruption. It is like the extension of a willow tree all over a field, and there is only one willow tree there. So , to-day there is only one man, and that man is Adam,--it takes all the world to make Adam.

Here is a man who is sick,--why is he sick? Because he has been counterworking this great beneficent law that is responsible for all living things. Tell us what keeps the heart beating. It beats when we are asleep and when we are awake, and it beats whether we think about it, or whether we don't think about it . Can you stop your heart beating? Try to stop it. Suppose you count your pulse, and it ~~beats~~ beats 70 a minute. "Now," you say, "it beats too fast ,--I will slow it up a little." Slow it up and make it beat 60 a minute if you can. Make it go slower if you can. Make it go slower if you can. There was once a man in England who had the power to control his heart-beat. He at one time slowed it doen until it ceased to beat altogether; he held his heart a little too long at one time, and he couldn't start it up again, and it never started again. So it is dangerous for us to use that power. The lungs keep

on breathing while we are asleep; they expand and contract hour after hour without any effort of ours. You can eat your breakfast, but you can't digest it--and some of you have found that out , to your discomfort and distress. I remember a patient who came to the office one day, and he said, "Oh, doctor ! take this stomach away from me,-- I want to get rid of it ." He was mad at his stomach,--it was bothering him, and he wanted to get rid of it and he was angry with it , and I said to him, "You couldn't expect your stomach to digest when you feel that way towards it; you must get on better terms with your stomach before you can expect it will digest." Now nobody can digest his dinner. The healthiest man on earth cannot digest his dinner. How then does his dinner digest? Let me show you some of the wonderful things that happen in the stomach in the proces of digestion. You eat yiur dinner and the stomach begins to pour out gastric juice. How does the stomach know when to pour out gastric juice? Pawlow, an eminent medical scientist, has discovered that the stomach pours out gastric juice that is adapted to the food that is eaten, and that that gastric juice differs from any other gastric juice,--it is exactly adapted to that particular meal. For instance, Pawlow has show that if you eat potatoes, the stomach peurs out gastric juice adapted to the potato; and if meat is eaten, the stomach pours out gastric juice adapted to meat. If you eat other food, or fruits, then you get gastric juice suited to that article of food. If one has been eating potatoes for some little time, and then changes that article of food for meat, at first, the gastric juice is not the best adapted to the meat, but afterwards it becomes a little better adapted to it , and each day it does a little better, and after a while , it makes gastric juice able to digest meat. Now how does the stomach ~~do that?~~ make gastric juice? Can anybody

answer that question? We have not, so far, been able to answer it . A German author on physiology,--the author of a most excellent and exhaustive work on the subject,--the most complete work in the English language (for it has been translated into English) says, in answer to that question, "Nobody knows; it is a divine intelligence," there is no other way to account for it ."
That is a wonderful thing to read in a medical text-book, and yet, my friends, we find in a medical text-book, a strictly scientific medical man saying that God makes the gastric juice,, and that it cannot be accounted for in any other way, than that it is produced by the action of a divine intelligence,— the divine or intelligent power that makes that gastric juice, and adapts it to ~~his~~ Means needs,--when we see this, it is time for sensible Christian people, it seems to me, to recongize the wonderful things happening in our bodies and all about us, and to recognize the evidence of the divine presence of the Being who is doing all these things for us . But let us go a little further:

Can you explain the reason why the stomach does not digest itself? You may swallow apiece of a pig's stomach, and your stomach will digest that . You may even swallow beefsteak, or an oyster with its stomach, liver and everything else about the oyster, and the stomach will digest it --it will digest the whole oyster. A scientific experimenter some time ago, made this experiment: He made a window in a dog's stomach, and a frog was brought and his hind legs were thrust into the dog's stomach, the frog being held in position by a bandage placed round the dog's body. Three hours after that, the frog's legs were found to be digested off..Put your finger into your stomach (if you could do so) and the gastric juice would digest it off. Why then does not the gastric kuice digest the stomach? It does sometimes. Many years ago there was reported a number of cases of per-

sons who had suddenly fallen dead, and who had perforation of the stomach. . Some of you are old enough to remember such cases, and that it was afterwards found that if rabbits were killed suddenly after eating , and ~~xxxxxxxxxx~~ opened a little while afterward, they were found to have a perforated stomach, showing that the perforation of the stomach was not the cause of .death , but that the perforation happened after death; that when the food was being digested, the gastric juice digested the dead stomach. The live stomach is not digested, but the dead stomach is digested by the gastric juice. The living stomach is not digested,--now tell me why? Nobody on earth can tell. The greatest physiologist that lives to-day cannot tell, any more than the ordinary schoolboy or peasant can tell you. We do not know why the living stomach is not digested by the gastric juice. So in regard to food, there is a miracle wrought to produce digestion, and in regard to the stomach , there is a miracle wrought to prevent digestion, for it requires creative power, in either case .

Now I don't suppose you will accept my philosophy without thinking about it; but in my little book "The Living Temple," I have endeavored to make a little more extended outline, in a simple, popular way, of this line of thought in reference to the human body, and have there given what to me is the only explanation of the reason how sick people get well. I used to sit in my office and see sick people come in, and I would ask myself the question "How can these men get well?" Sometimes I would be in despair,--a man would ask me "Doctor what do you think? Can I get well?" And I have said, "You can scarcely expect to get entirely well, but I am sure you will be a great deal better." I didn't dare to say to a man, "Yes, you can get well. But I am glad to say to you , my friends, that there is a greater hope in my heart to-day, and that I can say to the sick man,"Cert-

ainly you can get well,--" I don't say that to every sick man, but to the ordinary sick man, I say he can get well if there is no organ actually destroyed, and the tissues of his body are intact, he can get well. But we don't say that ~~we~~ every man can get well, for, if he hs lost an eye, it will not grow in again. But if a hand or an eye or the stomach have only lost their power to some extent, they may be brought back into line and do their duty to a fair degree.

But my faith in the recovery of the sick man is based on his obedience to the laws of health. God has said, "Obey and live." The sick man cannot recover, so long as he is disobedient. He must turn about and cease doing wrong, and do the things that are right, and in harmony with the great intelligence that created us ; and when we do this, that moment this great power begins to work with us . When we are indulging in bad habits and working against God, the moment we turn about and begin to work in harmony with God, putting ourselves into right relations with him, and in harmony with him, that moment we have all the creative power in the Universe working with us, because we are working in harmony with it, instead of against it . When a man is sick, God is working for him. Here is a man with a tobacco heart, and he says "Doctor, can I be helped?" "Yes," I say, "if you will stop smoking, but not unless you do." Why do I say that? Because God is doing all he can for the man all he can do for him under the circumstances, already; he has been fighting off the influence of that tobacco; if he had not been doing so, that man would have been dead. Let a boy smoke two or three cigars and it will affect him to such a degree that he would die if he smoked four or five, but he keeps on until he acquires such a tolerance for tobacco in his system that he can smoke 25 cigars in a day.

Now we have this great power that controls this man's system and enables it to acquire tolerance for, and accommodate itself to this injurious custom, so that the man's life shall not be sacrificed, and doing all that is possible to sustain the life and health and strength of this man in spite of his own evil conduct. But when it becomes impossible for the poison to be eliminated, the point is reached when tolerance is exhausted, and the integrity of the tissues is destroyed, then the man has Bright's disease of the kidneys, or some other malady which makes him conscious of his wrongdoing,--he recognizes this now, and he wants to be cured. He roposes to have his case prayed for. He is prayed for, and he wonders why he is not healed immediately. But God could not heal him while he was using tobacco. His symptoms are simply intimations of his condition, the result of wrong-doing, and he cannot continue to do wrong and be healed. If he could be healed while doing wrong, it would be a premium upon sin. Sometimes the Governor pardons a sinner, but if the man is again caught red-handed in the commission of another crime, will the Governor pardon him again? Not by any means. That would be putting a premium upon crime. So God cannot pardon a man of physical wrongdoing, by healing him (giving him a physical pardon, so to speak) until that man reforms. So the first thing this man has to do, is to reform. When we reform, there is a power within us that will heal us.

I will give you a simple illustration of this : Here is a land-crab down by the sea-shore,--he gets into a fight with another crab, and they pull off some of each others' legs. It is astonishing to see how reckless they are of legs--they will even switch them off when they get scared. A land- crab does not care if he does lose a leg or two; he knows he can get new legs at the next molting-time, for

hegets a new set of legs every time he molts. Down in the South-Sea Islands a missionary once saw a land-crab go down to the sea-shore to get his breakfast. This is a very particular kind of crab--a crab that is very neat and tidy . He does not know how to use water and soap and towels, and so , when he gets his foot or leg dirty, he just pulls it off. Well this crab made a great mistake,--hi foot slipped , andhe fell into a mud-puddle, and got dirty all over. He came out, looking very sad and distracted, being covered completely with mud. He looked around him in a sort of dazed way for a moment, and he then went to work and deliberately pulled off ever leg he had, and then laboriously dragged himself back to his hold in the rock by his nippers. The missionary watched him, and in six weeks, he came out with a whole new set of legs,--just as good az ever. Now where did he get his new legs? He has little leg-buds down undrneath his shell. We have the same thing in children. They are reckless of their teeth, and they say, "If I lose my teeth I'll get some more,--t they will come in again." They have tooth-buds. Parents are also reckless in regard to their children's teeth and let them rot. Once in a while a person gets a new set of teeth in his old age; he had another set of tooth-buds in his jaw. Now these tooth-buds represent a creative and restoring power in the body. And it is represented in another way. An eminent German experimenter some time ago, opened a rabbit's body and took out half its liver. At the end of three months , he made an examination and found that half the liver had grown in again; so the rabbit had a ~~bran new~~ liver asbig as it was before. Then the gentleman took out the ot other half of the rabbit's liver, and at the end of three moths again he made another examination, and found that that half of the liver had been replaced, so the rabbit had a bran new liver in place of the

old. There are other structures which are able to produce themselves in that way--certain tissues hich are able to reproduce themselves. Most of the structures cannot do this, but there are a few that can. In some animals mostof the structures can be reproduced,-for instance the earth-worm; when cut in two, there will a tail grow onto the part with the head, and there will a head grow onto the tail, so there will be two complete worms instead of one. Dip a little follicle up in water, and spread it broadcast on the water and every little speck becomes another complete follicle. By these illustrations you can see what a creative power there is in the animal organism.

Now we have something of that same thing in us, by which we can reproduce new organs. So I said to this lady to whom I have referred, that she must have a new stomach, and she will have one, if she goes about it in the right way. So the individual who recognizes this power can go to work and renovate his body. So when you say, "I need recreation," note the spelling of that word--"re-creation." Go and r recreate; go out in the air and the sunshine. Get into the lap of nature and lie down a while, and be re-created. This is re-creative, and the whole philosophy of getting well in the Sanitarium is to adopt nature's methods and intensify them: You go into the cold air, and you get an appetite, and that is what you want; there is recreative power in cold air,--it is vital power. Cold air increases the rapidity of the ~~vital process~~ recreative process. So we bring that principle down to a mathematical system, and we take the patient into the bathroom, and we apply cold water in connection with other means. The cold mitten friction is a small dose, and the shower-bath is the strongest kind of dose. The plunge-bath is another modified dose, but is cold water, and it is cold water which stimulates the vital proc-

esses of the body to action. So it is with sunlight, and with the electric light, which is resurrected sunlight, and which has all the properties of sunlight, and does the same thing.

In heat we have another force which stimulates and sets in operation the vital forces of the body which are creative, under the control of the ~~power~~ wonderful power which knows exactly what needs to be done. Here was a man who asked me, "What is the matter with me? What is my disease." I said to him, "Your stomach is dilated, your bowels are prolapsed, and your nervous system is exhausted." "But," he says, "What do you call my disease? My friends at home want to know the name of my disease." I said, "I have told you what is the matter with you, and you have hyperemia of the lumbar ganglia of the sympathetic nerve." "Oh," said he, "they can't understand that." "Well," I said, "tell them your disease is total depravity,--because something is the matter with every organ of your body, and you have got to be completely reconstructed. I shall never forget an interview which I once had with an Irishman who asked me to examine him and tell him his condition. He was not a very well educated man, but he was a very practical man. I looked him over and told him his organs should all be reconstructed; and he said, "Doctor, I see what is the matter with me,--I see I have got to have a whole new set of works." "Yes," I told him that was right. He was thinking of an old watch that he had taken to a jeweller to repair, and the jeweller said there was nothing good about the watch but the case. I told him that was the case with every old chronic invalid who has been for twenty years been getting further and further into invalidism. His bones, tendons, muscles, glands, brains--everything is affected with this chronic invalidism, and he has traveled about from place to

to place for relief until he had become a sort of "peripatetic valetudinarium;" He has wandered from one sanctarium to another, and from one watring place to another, and has tried to find health bottled up. But health is not to be got that way. Healing power is not to be corked up in a bottle. Healing power is found in the tidal wave, in the thunderstorm and the earthquake,--it is creative power; it is the power that upholds the world--it takes all this great power to reconstruct the sick man. Slowly, quietly working away month after month promoting growth and development , and the putting off of the old man, and the putting on of the new. Paul said we ought to put off the old man (of disease) and put on the new man (of health) for it is the same power that works this change physically as well as morally; it is the same power that recreates you that converts the poor sinner when he has turned from his evil ways. There is only one great beneficent Power, that is the great Healer of souls and bodies. It is all one thing, my friends. Religion is a common every-day affair which comes down into our every-day lives, especially in the matter of getting well. If there is anything in the world in which religion has a place, it is in the matter of getting well.

It is well for the sick to remember that there is a great healing power which is always working for us, and never working against us. You have probably read stories of boys getting struck by lightning while fishing on Sunday,--but that is a mistake. God don't strike people down for making a mistake of that kind. And God don't make people sick; he is the All-merciful Father who "pitieth his children"— He says, "Like as a father pitieth his children, so the Lord pitieth them that fear him. He is not a tyrant,--he is not, as John

Fisk once described him,--a great high desk away up toward the zenith, and behind this , a man with long, black hair, and an aquiline nose and piercing eyes, looking out and taking notes of the world. That is the idea that many boys get of God,--and they never get over it . A la at one told me this experience with her little daughtr who had this idea. One evening on retiring, she had just put out the light, and asked the little girl to say her prayers. She said, TI won't." "But you know," said her mother,"that God can see you, and he is ever present, and you must not forget to pray." "I won't do it," said th little girl, "I don't like God." "Why Mary ! What is the matter? Why do you talk in that way ?" "God has no business to be peeping round at little girls in the dark." She was angry at God because she had a wrong conception of him. Now my friends you must get away from such ideas,--you must get a better conception of God. God is the all-merciful Father, and he is so good to us that he stays with us in all our thoughtlessness and wrong doing, and he is keeping our hearts beating all the while. Some time ago a man came into my office and sat down,--andhe was the very picture of despair, as he said, "Doctor , it's no use. It's no use. God is against me,—I have been such a miserable, wicked man that God is against me; and I know there is no hope for me t to get well." I asked him if he was sure of that. "Yes," he was sure of it . Said I, "I can prove that God is on your side, and has not forgotten you." "Why, " said he, "if that were so, it would be worth all the world to me." Said I, "Put your finger here--what keeps your heart beating? Do you keep it beating ?" "I don't know as I could." I said, "There is no power in the universe that could keep your heart beating except God ; it is that great intelligent power that does it. Look here,--when I strike this table, what is it that makes the blow? It is my will acting upon the muscles of my arm,and

if my will don't go, my arm don't go. When my will says "Strike," my arm strikes. My arm beats whenever my will says "Beat." Now the heart is a muscle, like the muscles of the arm, and it beats only when there is a command,--every beat must be attended by a command; the muscle won't move without a will. But it is not your will that moves the heart,--whose will is it ? It is God's will." Well, my friends, that thought entered that man's heart, and he took courage, because he saw that he could not live a moment without this sustaining benevolent Power. Now my friends, that Power is working for you, whether you are on his side or not, and the philosophy of getting well is to get in line with God--to get in harmony with that Power that governs the universe--it must be in harmony with God. We must get into the natural order of things,--must find the natural order of life, get into it and stay in it, and work in harmony with this great benevolent Power that is ever working for us. Now if we take that attitude, we shall find ourselves climbing along toward health. Just as the acorn grows up into a tree and bears fruit, so the seeds of health are planted in our natures and by our right-doing we will see those seeds spring up and bear fruit by-and-by.

But this takes a little time . It takes about three months after planting, to reap a crop of corn. You may sometimes see improvement in a few days, but the whole harvest will not come until there has been time for growth and development .

So there is great hope for the sick man. I feel cheerful and happy now, whenever I see a sick man come into my office, for if he has recuperative power, he will get well. I can show him the road to health, and if he will follow that road, he will find health at the

other end. It is an uphill climb, but health is there. There is healt in store for you. But so many stop climbing; they don't prsevere till they get to the Pisga-top of health--and when they stop they go no down. It takes continual climbing.

The average sick man, who has been sick twenty years, cannot expect to get well until after many months have passed. He ought to get a good start in three or four months, and then go on improving month by month, month by month, for one, two or three years or four years. For myself, I am glad to say to you that I now enjoy better health than I have ever before enjoyed, although I have worked very hard, and I think I have recently endured more hardships than ever before. Still I have never had an absolute vacation. I had a heavy burden rolled on my shoulders when very young; I had to carry a man's responsibilities when I was twelve years old, and I have never been able to get the load off my shoulders to this very minute...I was always a very puny boy. I was such a puny boy that my father thought I was not worth raising, and said to me, "John, if I had thought you would ever amount to anything, I would have taken more pains with you; but I thought you wouldn't amount to much, and so I let you shift for yourself,--and so he did, after I was ten years old. Every book I bought, and nearly every expense I was at, I settled with my own labor since I have been ten years old,--and I also helped some other people. My father sent my brothers to college, and allowed me to send myself to college--and I am glad he did. Well, I didn't "amount to much" when a boy, for when I was ten, I didn't expect to live till I was ~~thirty~~ twenty; and when I was twenty, I didn't expect to live till I was thirty; and when I was thirty I didn't think it would be possible for me to live till I was forty. But now I find myself going

on fifty-two, and , it seems to me the greatest marvel,--I am enjoying better health than ever before in my life, in spite of hard work. I only mention these things so you will see that I have had some things to go through. But the simple habits of life that I adopted when fourteen, abstemious habits of eating, and being car ful to do the right thing, and the natural thing--this has been the most inestimable blessing to me . I could not have gone through what I have done, if I had followed the habits of most people.

To-day I received a letter from Mr. Horace Fletcher, the apostle of chewing. He writes me that there has just been a great conference, in New York of prominent physiological professors, and of the medical men in the United States Army, and in the employ of the United States Government, and these professors are joining in with Mr. Horace Fletcher in investigating the matter of diet, and the simple principles of living, and Mr. Fletcher tells me that there is not the slightest doubt in his mind that the findings of this investigation will be exactly in line with the principles of the Battle Creek Sanitarium. He believes that,--and I believe it, too--that if if there is a thoroughgoing scientific investigation, it will result in that way.

There is power in obedience, my friends, because the moment you get on the side of obedience, you get on the right side--on the side of truth--you get on God's side,--and God's side is sure to win.

Mrs Hamworth
Detroit Mich

"The Philosophy of Getting Well"
Aug. 6/03

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D I E T E T I C S .

FLESH FOODS.

Post-Graduate lecture by J. H. Kellogg, Aug. 13, 1903. 3:00 P. M.

Proteids are the most easily oxidizable of all food elements, so they are sometimes called quick fuel. In studying the subject you will see sometimes reference to proteids as quick fuel for the body. Proteids are more quickly, readily, and easily oxidized than other food substances.

The carbohydrates, or fats, are for producing energy. That is their specialty; proteids are said to be tissue builders. The carbohydrates and the fats are the sources of energy.

What are the tests by means of which we recognize a substance as food? --we might say, the chemical tests of foods? The chemical test determines the composition of foods. The value of foods is determined by the amounts of the different elements that they have in them. One food is called nitrogenous because it contains a large amount of albuminoids. Other foods are carbonaceous, or farinaceous, exceeding the hydrocarbonaceous. We determine that by examination of the foods. Nuts, butter, and cream are foods which are oleaginous.

Another test, and a far more important test, is the physiological test. Perhaps we will speak first of the physical test. The physical test determines the value of the food by giving a quantity to an animal, and observing how much energy is the result of the giving of this food, how much heat results from it. The food is thoroughly burned in a calorimeter, and the amount of heat thrown off by burning is determined. The same quantity of heat is thrown off when the food is burned as is thrown off in the body. The entire output of energy must be taken into account in all the different forms. It is a very compli-

cated thing to burn the food in the body. Burning in some other way, is very much more simple. By this method it has been found that different elements have different values. What are the Caloric values of the different food elements?--a gram of proteids for example? 4100 small c., or 4.1 large Calories--one gram. Xhxx tx xnx Hydrocarbons and fats, Xhxx are about the same as proteids, 9.3 C. per gram. If this is true for a gram, how much would it be for an ounce? How much would be in an ounce Avoirdupois? 7000 grains Avoirdupois in a pound; 16 ounces to a pound,--437.5 grains, exactly. How many grams in an ounce?--8 grams in an ounce. 15.4 grains to a gram. 28.4 grams in an ounce Avoirdupois.

116.44 C. to a pound. How do you work this into British thermal units? That is, into Fahrenheit heat units? How do we do it?

There are 2.2 lbs. to the kilogram.

There are 1.8 Fahrenheit degrees to a Centigrade degree. The relative xf value of the two units is 3.96--we call it 4. If we multiply Calories by 4, it will give us pound Fahrenheit units. 116.44 C. x 4 equal 466. For practical every day calculations it is near enough to call that 500. So we say that one ounce of carbohydrates has a heat unit, or food unit value of 500. 500 food units in an ounce of starch or an ounce of sugar. In an ounce of dried albymin the result would be just the same.

There is twice as much in an ounce of fat,--1056,--for practical purposes, we call it a thousand. So fats represent a thousand heat units or food units to the ounce, and carbohydrates, 500--sugar, starch, and proteids are each 500 heat or food units to the ounce. These figures are not exact, they are only approximate, but they are very handy to use.

The Caloric value of food depends not only on its chemical composition, but depends upon its availability. Some fats are very dif-

ficult to digest, consequently we can not get all the energy out of them. Some of them contain foodstuffs, materials that can be burned, but can not be digested at all, such as cellulose; so the chemical food value does not always represent the actual food value.

How much of these different food substances do we need? How much do we require in twenty-four hours? The number of units required by a man at rest is about 2.000 multiplied by 4; a man of sedentary, factory occupation is found to require about 2.500 gram Calories; a man who is doing very hard work, as a busy doctor, requires 3.500; a blacksmith will require something over 4.000; a man who is doing very, very hard work indeed, will require over 8.000. There is a great variation. Multiply by 4 and you will get the figures in British thermal units. You then have a variation from 8.000 to 32,000. The average man, like a business man, requires somewhere from ten to twelve thousand food units a day.

Let us consider the daily ration, the amount required in different food elements. That depends also upon the amount of work. When Weston was doing his great walking, at about 400 miles in six days, one of his pedestrian feats, the amount of proteids was measured by Dr. Austin Flinn, a teacher of physiology, who found that Weston used 14 oz. of proteids in a day. That is a very large amount. He lived very largely on proteids. He was using up muscle at a tremendous rate, and he ate very heartily. I do not think it was necessary. Dr. Flinn believed that proteids were a necessary food element for a man at work. Some men ascending the Alps found they consumed large quantities of carbohydrates, and were able to do hard work with even carbohydrates. Flinn believed that proteids were the muscle foods. At that time, the question was not at all settled by physiologists. Flinn believed the theory that proteids were the essential muscle food, and that urea was the product of muscle work in consuming proteids, while some others took

a different view. It is just coming into the scientific recognition that the carbohydrates, fats, sugars, and starches are the chief muscle diet. Flinn experimented upon Weston, and found he consumed 14 oz. of proteids per day. I presume he did not get much else to eat, and that is the reason why he ate so much proteids. He had the supervision of his eating during the performance of his pedestrian feats, which were performed in Madison Square Garden some twenty-seven or twenty-eight years ago. The diet was chiefly meat.

I made extensive studies of the subject a number of years ago, and we had a test made of 300 of our helpers. The food was all weighed out, the amount of nutriment they took recorded, and we made a careful study of their dietary, and had made a careful note of exactly what they ate. It was all served up to them in rations for three weeks. I found the average to be 1.2 oz. of fats, 3 oz. proteids, 16 oz. of starch. What would that amount to in Calories? 16 oz. of starch would be 8000 heat units for the starch. 1.2 oz. of fats would be 1200 heat units; 3 oz. of proteids would be 1500 heat units, or a total of 10,700 food or heat units. That is just the same as we have in the table for a sedentary man. All our nurses and doctors are persons whose occupation is not very vigorous. There is another thing to be taken into consideration: there is not nearly as much waste in these foods as there is in the ordinary diet. I concluded from this that our observations and conclusions were pretty nearly correct. These helpers gained a little. There was a maximum gain of several hundred pounds. 300 persons gained several hundred pounds. They gained some ounces apiece. There was a gain in strength. We took tests of their strength, and found there was an average increase of strength, so that there was no decrease,--what we might call a physiological ballast. The starch was pure starch. We weighed all the food given, and calculated from the

food tables the amount of starch contained.

Apply the physiological test. The physiological test of food rests upon its digestibility and its absorbability--those two things. There is a difference in food elements. Of the food elements, proteids are least absorbable, and the starch, or carbohydrates are most absorbable, but the difference is not great. On an average proteids are absorbed in the proportion of 95%; fats, 97%; carbohydrates, 99%. 99% of starch and sugar. These are not all. Much depends, however, upon the quantity taken. A very interesting fact is that a food element is more completely and perfectly absorbed if it is taken with other food elements than when it is taken alone by itself. That is, absorption is more complete with a mixed diet than with a diet made up of single articles or food elements. That is quite an interesting fact. I do not know that anybody has an explanation of it, but we know it to be true.

The proper amount of fats is 1.2; but 5 1/2 oz. of fat may be absorbed completely in twenty-four hours. If the amount of fat is doubled so that a person takes 11 oz., only about 55% will be absorbed. But there is still a little gain in giving a very large quantity of fat. If you have a patient who needs to be fattened up, you can increase the quantity of fat to five times the ordinary amount of 5 oz., and one-half of the portion will still be absorbed when the system requires it, and in many cases the system does require it.

Another interesting fact that has been observed is that diseased conditions of the alimentary canal do not, to the extent that we should suppose, interfere with the absorption of food. The principal interference is with the digestion of foods. The foods digested will be absorbed. So the thing of greatest importance with people who have

difficulty in obtaining proper nourishment is to give them predigested foods. The difficulty is not in the absorption, but in the digestion. Rubner recently pointed that out, and it is a very interesting thing. I have been cudgeled a good deal for recommending predigested foods. We never use predigested foods except when the organs are so crippled that they can not work.

The digestibility of these different elements differs. Proteids are much less easily digestible than carbohydrates. Starch is most easily digestible. Fruit sugars require no digestion at all. Starch is the most easily digestible as a class; but under carbohydrates there are some things more easily absorbed. The most easily absorbed is fruit sugar, or levulose, which requires no digestion. Fruit sugar consists of levulose and dextrose both. Experiments made with levulose and dextrose show that levulose is not absorbed quite so rapidlyas the dextrose is; but it is assimilated much more easily and completely than dextrose, so levulose is much the most important of all sugars. The sugar of grapes is levulose, of apples, is levulose. The sugar of grapes becomes dextrose when the grapes become old; but when the grape is in its native state, the sugar is in the form of levulose. I have at least one authority for that, but only one, and that is Bloxon's Organic Chemistry. In the natural fruit levulose is the essential sugar, the natural sugar; that is the sugar that is natural for man, because man is naturally a frugivorous animal.

Cane sugar is difficult of digestion because it is a grass sugar, and is found in foods which are not adapted to man. It is found in the roots of grass, in sugar cane, in corn, and in coarse vegetables. The cow's stomach has a ferment, sucrose, which is capable of digesting cane sugar. The human stomach does not digest sugar at

all; but the human intestine contains a small amount of sucrose, and contains a very large amount of maltase, , the ferment that digests fruit sugar. The intestinal canal contains a small amount of lactase, which converts fruit sugar in to lactose and glucose. The young infant's intestine contains a large amount of lactase, and readily converts the lactose of the milk into lactose and glucose. After two years of age, this lactase disappears from the intestinal canal, so that in adults, it is found in very small quantity. That is the reason why so many people suffer from intestinal flatulence when they eat milk. A lady said to me, "I can not eat sugar; I can not eat anything sweet, I just swell up like a drum, I am terribly troubled with gas whenever I eat anything sweet." I said, "Eat Malt Honey." Why? Because the alimentary canal always contains a large quantity of maltase, which is the ferment which converts maltose into glucose, and so prepares it for absorption. This is so because maltose and levulose are the natural sugars for human beings. Why? Because the saliva and the pancreatic juice converts the starch into maltose. The alimentary canal is adapted to the digestion of maltose. Maltase is present in very large amounts.

We should always take our sugars in diluted form. How is it that sugar is so little irritating to the stomach and it is so very irritating to the eye? Sugar is a reagent, because of its hydroscopic properties. We see, then, in regard to absorbability, of hydrocarbons, the reason for it,--the levulose, or fruit sugar, is absorbed at once, completely by the intestines, because it is completely digested, ready for immediate use. The same is true of glucose. Maltose is readily absorbed. It only needs to be acted upon by the maltase in the intestinal canal before it is converted into dextrose, and is readily absorbed. Lactose is not so easily digested because there is a great scarcity of lactase, the digestible ferment which converts lactose, after a person

has gotten beyond the years of childhood. Cane sugar is not easily digested because in many cases sucrase seems to be entirely absent, and it is never present in large quantity. These recent observations have explained the whole question of sugars and help us immensely in our understanding of that very difficult question. These observations clear up many of these questions which have been very difficut .

Maltose answers practically as well as levulose.

All sugar must pass through the liver before it goes to the rest of the body. It is the duty of the liver to convert the sugar into fats and proteids. Pavey's recent work on diabetes contains a whole lot of interesting facts in relation to sugar, and this one particularly is the fact that he has positively proven, and the fact is accepted by other recent physiologists, that proteids are glucosides, and that all proteids are based upon the saccharide ----------. Starch is a polysaccharid. Then we have two kinds of sugars.

We need to keep alive the chemistry of foods. It is wonderfully useful in dealing with patients, and in reading upon the subject we must keep alive the knowledge of the chemistry of foods.

Two classes of sugars, based upon the molecular constitution of the molecule--disaccharides, and monosaccharides. Starch is something more--it is a polysaccharid. $C_6 H_{10} O_5$ is the saccharide. In converting this into glucose or levulose, what do we do? Add a molecule of water. Then it would be $C_6 H_{12} O_6$. That is glucose, or levulose, either one. We have only one saccharid. If we add a molecule of water, it is a monosaccharid. Suppose we want to get cane sugar, what do we do? We will take two molecules. That would be $C_{12} H_{20} O_{10}$. $C_{12} H_{22} O_{11}$. That is the formula for cane sugar. What else besides cane sugar?--Milk sugar, malt sugar,--all three of these,--maltose, sucrose, and levulose, and lactose.

Maltose finds in the intestine a large quantity of maltase, the ferment which digests it.

Here are these three sugars. None of them can be absorbed to any extent. Sucrose, cane sugar, maltose, or malt sugar; lactose, or milk sugar. None of these can be absorbed to any extent. Before they can be absorbed they must undergo a change, they must be inverted. When cane sugar is inverted what does it become? It becomes dextrose, and levulose,--becomes fruit sugar by inverting it. When malt sugar is inverted, it becomes dextrose and dextrin. Cane sugar is inverted into levulose and glucose. Malt sugar is converted into glucose and dextrose.

There has recently been found another kind of dextrose; milk sugar is inverted into lactose and dextrose. Galactose is isomeric with levulose and dextrose, but it is physically, perhaps, a little different.

There are three different ferments in the intestine which do this work of inverting. Cane sugar, as pointed out by French physiologists, is inverted by sucrase. The inverting ferment for malt sugar is maltase. The inverting ferment for milk sugar is lactase.

The monosaccharids do not require inversion. It is only the disaccharids that require inversion. Disaccharids take two molecules of starch and one molecule of water to make a molecule of sugar. For the monosaccharids it is one molecule of starch and one of sugar; but for the disaccharids it is two molecules of starch and one of water, and that is a disaccharid. Cane sugar, malt sugar, milk sugar,--in the process of inversion another molecule of water is added, as:

$$C_{12}H_{22}O_{10}$$
$$H_2O_2$$

$$C_{12}H_{24}O_{12}.$$

(END)

GRADUATING EXERCISES

of the

SANITARIUM TRAINING SCHOOL FOR MISSIONARY NURSES,

Tabernacle, Battle Creek, Mich., Monday

August 24, 1903, 8:00 P. M.

J. H. Kellogg: Just twenty-three years ago the Battle Creek Sanitarium organized the first Sanitarium Training school for Nurses which was ever instituted. There were just two students--two ladies from New York. The daughter of one of these ladies is here in this graduating class tonight, so this school must be at least a generation old. A short generation of twenty-three years has passed since this work began, and in this time there have been graduated from this school more than a thousand nurses who have been trained in Sanitarium methods, and in the principles which are represented by this institution and by its branches in all parts of the world.

About ten years ago this training school for nurses was converted into a training-school for missionary nurses, and one of the qualifications added to those previously required, was that persons who entered this school should dedicate their lives to the work which is represented in this institution, and from that time until now every person who has entered this school has been asked to make a declaration in which he states that he dedicates his life to that of medical missionary, and to the medical missionary work wherever duty may call him. And so these gathered here tonight, men and women who have been trained for the work of a nurse, of a missionary nurse, which means much more than a similar occasion in connection with an ordinary training school, in connection with a city hospital, or some other medical institution. It means that these young men and women have, after seriously considering this matter,

and making it a subject of prayer, decided to dedicate their whole lives to work for God and humanity, and that they have spent years in training here at the Sanitarium, or in connection with its branches, in preparation for a work of self-sacrifice or devotion, not to personal interests, but to the interests of suffering men and women, of men and women who are sitting in darkness, who are dying for want of knowledge, going down to eternal ruin, to be inevitably and irrevocably lost without the light and help that these are prepared to bring them. And so we feel great satisfaction tonight in bringing together this large class of men and women, something like one hundred and fifty altogether, and representing twice the number, about three hundred in all, the rest not being able to be here tonight.

I might mention, perhaps, that this does not represent the class of a single year; but for several years there have been held no public exercises, and those who are gathered here tonight are those who are in the city at the present time who have not been formally graduated, although nearly all present have completed their courses of study several years ago, and some of them have for several years indeed passed from the ranks of an ordinary nurse and have been for several years engaged as matrons, or superintendents of departments, or as teachers even in the school, so that sitting here upon the same seats are those who have been trained, and those who have been helping to train them, and who have come here all together for the purpose of standing up here before this large audience, and making a public acknowledgment of the fact that they represent truths and principles for which the Sanitarium stands, and that they have dedicated their lives to work in behalf of these principles. So this is our purpose here tonight.

We have not a lengthy program, but one which I trust will interest you. We will listen to a hymn by the class.

(Hymn "Sound the Battle Cry" sung by class)

J. H. Kellogg: At the time the first class of this school was organized, twenty-three years ago, and for several years afterward, it was the only training-school for nurses in the world of this sort, the only training-school connected with the Sanitarium, the only training-school in which the methods of this institution were taught. This remained so for a number of years, but after the organization, or reorganization of the school as a medical missionary training school, as a missionary nurses' school, other schools rapidly sprang into existence.

About ten years ago, at a meeting held in this room, of the General Conference, the organization of the International Medical Missionary and Benevolent Association was planned and was carried out. A large committee was appointed by the General Conference to organization an association to take charge of the medical missionary work for the denomination, representing the General Conference in this work. This association was organized about ten years ago, and began the work of organizing similar training-schools and Sanitariums in different parts of the world, and at the present time, there are in this country fifteen training-schools identically the same as this one at Battle Creek, presenting the same principles, teaching exactly the same methods, and requiring of students and graduates the very same pledge of fealty to the work, and of dedication of their life and energy to this work.

There are in Europe at the present time five training-schools of this sort, and in other parts of the world altogether about ten of these training-schools, making in all about thirty of these missionary nurses' training-schools established upon this same plan.

At the present time, there are in the training-school here at

Battle Creek some three hundred nurses. In the other training-schools in the United States and in other parts of the world, there are as many more, so we have at the present time in our training-schools connected with the work of the institutions some six hundred missionary nurses; and outside of those engaged in missionary work of various sorts in various parts of the world, there are about three hundred or four hundred more; so we may say we have at the present time at least one thousand medical missionaries or missionary nurses engaged in different parts of the civilized world, and in civilized countries.

We have the good fortune tonight to have with us Dr. Paulson, who will deliver the address of the evening, and who has just returned from a tour of visitation to each one of our training schools in Europe, and will be able to tell us something about how the work goes on in those places.

(Dr. Paulson's Address.)

J. H. Kellogg: I am sure my heart has been inspired by these good words to which we have listened from Dr. Paulson. We will now listen to a quartette.

(Double quartette)

J. H. Kellogg: Dr. Morse, who has been connected with the work now for many years, and who has had an opportunity to pass through the different phases of the work, will now address the nurses from the standpoint of a nurse.

Dr. ~~MKK~~ J. F. Morse: (Applause). I am asked to speak for the nurses, and in their behalf I will say to you that I think we understand to some degree at least, the high honor of ~~kkm~~ ~~mkk~~ our calling; and that, as the Apostle Paul said of his work, so, we "are laborers together with God."

We are thankful for our training, because it has brought us into touch with the great principles that underlie the work. Our earnest desire has been to make these principles, grand and beautiful as they are, a part of our own lives. As we come in daily contact with the invalid, we may read there the beautiful story of life and health written by the greative finger of our loving heavenly Father. The more we think of them, the longer we follow in the paths in which these principles lead us, the more devoted we become to them, the more they receive our heartfelt admiration. We cherish them; and almost, I would say that they are our thoughts night and day. There is a great deal said in these training-schools about loyalty to the attending physician. We think of this also. We regard the physician as the one who has looked more deeply into the great truths that are so dear to us, with the little acquaintance we have with them, and we are loyal,--loyal to the truth, loyal to the physician, and yet behind the physician, we see the great all-wise Physician engaging in the labor of love for his suffering children; for in this work preeminently only from the Christian standpoint

may we say as the poet said, "The distant tops, which men of common stature never saw"; and whether our work or our lives shall be in the far distant field, or in the home land, we shall ever remember him who is spoken of in the last chapter of Izaiah: "He giveth power to the faint; and to them that have no might, he increaseth strength. Even the youth shall faint and be weary, and the youngman shall utter fail; but they that wait upon the Lord shall renew their strength. They shall mount up with wings as eagles; they shall run and not be weary; they shall walk and not faint."

May God keep every one of us faithful to the great truths that he has committed to us, loyal to the principles that he has given, and may many souls be saved to health, to life, and to eternity!

J. H. KELLOGG: (Music by male quartette)

J. H. Kellogg: One of the instances reported by Dr. Paulson here tonight, reminded me of a circumstance which occurred in this country a short time ago. One of our missionary nurses went out from the sanitarium a year or two ago, and has been engaged for the last year or two in missionary work in New York. She wrote me a few weeks ago telling me an interesting circumstance which occurred in her experience that I am sure you would like to know about. She said she was called to nurse a case of pneumonia, a little girl who was very sick, with the disease, and it was feared she would die. The child was the daughter of a leading banker of the city. When the little girl, through the faithful services of this nurse and the application of hydriatic principles had recovered, the father recognized that without the aid which had been rendered by this Sanitarium nurse, the child would have been buried. She certainly must have died. The doctors said the case was hopeless, and the child must die, could not live. The nurse said,

"Doctor, please allow me to give this child a hot blanket pack, and to put a cold compress on its chest." "Well," the doctor said, "the child can not live any way, and it may be as well to let you do it." So the nurse did the things which she knew were good for the child under those circumstances, and the result was that the child lived, and the father recognized the fact that these principles differed from anything he had encountered before, and had saved the life of his daughter. When the child was well, the father said to the nurse, "Miss Hughes, I want to make a thank offering. I have five thousand dollars that I am ready to give for the establishment of Sanitarium treatment rooms in this city"--the city of Middletown,--and she wrote me about it. "Now," she says, "I want somebody to come here and help me to start these treatment rooms, and I want to turn them over to the Medical Missionary Board." Here was a fine chance for a nurse to enrich her own pocket. She might have said, "Thank you, Mr. Banker, I would be very much obliged for five thousand dollars;" but instead of that she has said to the Board, "I want to have you send somebody here to organize this work for me. I am ready to help do the work, but I want somebody to come and work with me!" So I wrote to Dr. Read of Philadelphia, asking him to go there and see if this was a real, genuine thing. Day before yesterday, I received a letter from Dr. Read saying he had been there, and had met the banker, found the money in the bank, and all we had to do was simply to go and begin; so we are making agrangements to begin.

In this same way more than two hundred thousand dollars has, within the last ten years, been contributed to this work by men and women who were inspired to acts of generosity towards this work by the truth which they recognized in these wonderful principles. I have often

said, and I say it tonight more than ever before, that no people on the face of the earth have ever been so favored as we are, that no people have ever received such wonderful light, such wonderful truth as a kind Providence has given to us, a truth which is so helpful, not only to us, but which enables us to be so helpful to our fellows, to reach out our hands to save those that must inevitably perish without the help that we are able to give them through these marvelous truths.

Now these nurses sitting here tonight have dedicated their lives to go out into the great field, to humanity, and seek out those that are suffering, those that are lost, and rescue them. Every one is to be come a lifesaver, and I feel so thankful tonight for the confidence I feel in these young men and women who present themselves here tonight, and who have not only made the statement, made an affirmation, a declaration that they desire to devote their lives to this work, but by years of faithful toil and labor have demonstrated their loyalty, not only to this truth and to these principles, but to this movement, and to this work. You can not have a great work, you can not have a great movement without you have people who are associating themselves together and are loyal to the work and to the movement which they represent, and which they are a part; so it means that men and women shall set themselves apart from the rest of the world, dedicate their energies and their lives to the work in which they are engaged, taking hold of hands, as it were, all keeping step together as it were, and marching on in the path of duty, difficult duty, keeping step in the work for a lost, and suffering, sinking, dying humanity.

Now tonight there are gathered together here a number of medical missionaries, as Dr. Paulson has suggested, larger, perhaps, than ever met together before for such a purpose in the history of the world. I do not doubt that that is true; and I suppose more than that is true,-

I believe that this contribution, ~~xf xxxxx~~ that this addition to the ranks of missionary nurses that is made here tonight is a larger contribution, that it is a larger addition to the ranks of missionary nurses than all the rest of the United States is making this year. Some little time ago I had a letter from a prominent medical missionary who has been ina foreign field for years, and is well acquainted with the home field, a member of the Methodist Church, a prominent medical missionary working under the direction of the Methodist Mission Board,-- I had a letter from him in which he said, "It is a blessed thing to me that the American Medical Missionary college is doing. You are sending out every year twenty to thirty missionary physicians, while all the rest of the united states is only sending out three or four." Now if that is true of physicians, I am sure it must be still more true of missionary nurses; and here is this one hundred and fifty missionary nurses who are giving their lives to the work in any part of the world where their services are needed, while the rest of the United States perhaps may be contributing twenty. I do not believe there are as many as twenty missionary nurses going out from the United States aside from those who go out from this center, which has come to be recognized as the center for the training of medical missionaries in all the world. Here is the only missionary college. Here is the largest missionary nurses training-school, the only missionary medical college in the world, the only one ever organized, and I am glad that we have a lot of splendid young men and women in this college who are going out, and I am specially glad that we have these one hundred and fifty splendid men and women who are going out to work with them.

I was glad to hear the word that Dr. Morse said with reference to loyalty, loyalty to the doctor as well as loyalty to the principles. The doctor is almost absolutely helpless without he has a nurse to stand

by his side and help him in his work. The doctor can make the prescription, he can prescribe for the patient; but he can not do all the work, and the work which the nurse does, standing faithfully by the bedside all day long, then perhaps all night long, is certainly equal in responsibility, and requires an equal degree of vitality and devotion to service on the part of the nurse, fully equal to that of the doctor. The position of the nurse is just as noble, and just as great, and just as excellent in every way as is that of the doctor--no preeminence. The doctor spends a longer time, acquires a larger knowledge, takes somewhat broader responsibilities; but the work is in no way preeminent above that of the nurse.

I am glad that there are so many young men and women who are willing to be nurses, willing to take the toil and the hardship, and do the work, while perhaps, very often the doctor has the credit that belongs to the nurse. I have felt blessed a good many times when I have received letters from a doctor, or from a patient who has gone home, perhaps a patient upon whom I have performed some surgical operation. The patient writes me and says, "Now, Doctor, be sure to tell that good nurse that took such good care of me that I owe my life to her," and I am glad to pass that message on, because I know that so far as I am concerned all I have done is to wound, to cut a huge gash, to make a tear and a wound, and it is only the efforts of the nurse and God working together that has bound up these wounds, and restored the patient's health, while the thing I have done would certainly kill the patient, and cost the patient her life where I stop, but the faithful toil of the nurse, watching every symptom, ministering to every pain, has, with God's blessing, brought the patient back to health again. I never could endure surgical work if I did not feel confident of the faithfulness of these loyal and efficient nurses.

When I look over this company here and think of the course of training you have gone through, and the study amidst the toil , and ov what youk have accomplished, the great amount of study seems almost beyond belief; and I thought it worth while to have brought down here tonight this large pile of books that the people of this audience here might see something of the work that has been accomplished by these nurses in the preparation for their work. You can see here these large books,--one book of 1600 pages, three books of nearly a thousand pages each, another book of five or six hundred pages; and here are all these other books, and last, but not least, is the Bible, for there is a continuous course of Bible study during the whole of the two years of this course, and this is one of the most important features of the work. The graduates of this school are not simply professional nurses, but they go out as missionaries as well as nurses.

At a meeting held last night right here in this room, at which these same nurses were present, I felt very happy indeed when I found that there was a universal assent, a unanimous assent to every word that I was able to say in relation to loyalty to the work, cooperation with the Board, with whatever board of this Association that these nurses may be associated, and I feel that these nurses have well earned the recognition which we are seeking to give them here tonight, as missionaries; so I will now ask all the nurses to come up here on the platform to receive these diplomas.

(Presentation of diplomas by Dr. Kellogg.)

No greater proof of the loyalty of these nurses need be sought than the fact that they are here tonight. Dr. Paulson was remarking when the Sanitarium lay in ashes a year ago that it must have looked to a good many as though that was the end, and I know there were many people who said that the Sanitarium would never rise from that ash-heap.

There were many who said, "The work of the Battle Creek Sanitarium is done."xx Our accommodations were so narrow, our nurses were obliged to scatter out, and they went to various places, and I dare say there were hundreds of sick people xxxx who were almost thankful in the little towns and cities where they lived, that the Sanitarium burned, because they had a chance to get a nurse who came to help them, and perhaps, saved their lives. Since the new building was done, and the announcement was made that it would be dedicated on June 1, multitudes of patients began pouring in, began to come in at the rate of xxxx over two hundred a week, thirty-five or forty in a day; great numbers began to come, so that now there are about 800 under treatment, and we have sent out telegrams and letters to these scattered nurses, and we have said, "We want you to come and help us," and they began to come, sent back telegrams of response, and letters, saying, "We will come." They were not idle; they were not loafing; they were not sitting about waiting for a job. A Sanitarium nurse never has to wait for a job; there is always plenty to do. Here these nurses were, scattered from California to Texas, and all over the United States. When these nurses found there were gathered here this great multitude of sick people and we needed their help, they left their places where they were earning twenty to twenty-five or thirty dollars a week and more, and they came at once,--dropped everything and came as soon as they could possibly do so, and came in little parties, some times three or four, or half a dozen at a time; and they rallied to our help.

I do not know what we should have done if it had not been for this loyal act on the part of our nurses. Those who have arisen here tonight, who have come up here to receive these diplomas, many of them are persons who have come, not with any offer of a diploma, not with any offer of large wages,--they knew their wages would not be a quarter of what they were receiving; they knew that at the most they

would receive only about one-fourth of what they were receivingin cash where they were; but they came because they loved the old Sanitarium, because they loved the truth, and the principles here, and theywere glad to come and show their loyalty by working here day and night, toiling away in our bath rooms, by the bedsides of the sick in the wards, caring for these sick ones, and they came in from far away to help us; and we feel very grateful for this act of loyalty, and I feel that providence will bless these loyal ones; and I hope that we doctors will prove as loyal as they, and as faithful in our service, and that we will set them a good example; that this work will go on, and I am glad to feel that so long as we have these loyal nurses, and these loyal doctors standing for these principles, this work will certainly go on.

We have got a Sanitarium that will not burn down, so we do not have to think about that; that is a thing we will not have to worry about; although I thought though, it will be such a job to blow it up that nobody would care to do that. I found it would take several carloads of dynamite to blow it up, and it would take so much trouble to get it ready that we would be likely to find it out before it went off. So we have no fears of that sort, my friends; we are not afraid of anything on the face of this earth, we are not afraid of anything so long as we are standing for truth; for truth is mighty; the Creator himself, the Allmighty is behind everything that stands for truth; and so long as these nurses are loyal to the truth, no matter where they are,--whether they are here or in some little island of the sea, so long as they are holding up this standard there, they can be sure that all the power of the universe is behind them, and will stand with them, and stand for them.

This is certainly a very cheering occasion here tonight, and

I am sure that if these nurses send out a report of it, and it goes out among our medical missionaries the world over, they will all thank God that there could be such an occasion here again, and that this will be repeated here every year; and their prayers will go up for this mighty new army of splendid men and women who have dedicated their lives to this noble work; and I hope and I believe it is true that there are hundreds, that there are thousands, perhaps, of young men and women in different parts of the United States; in years, they all may be boys and girls, perhaps not old enough yet to come, but already inspired, got the seeds sown, in their hearts--they have already dedicated their lives to xxx xxxx xxxxx xxxx xx a real love of these truths, and these principles; and with the blessing of a kind Providence they will sometime be here to take your places, and to take my place when I am gone.

I thank the Lord that the time has come when we can see, when we can count up such a splendid army of men and women who are going to represent these principles throughout the whole world. If we are loyal, if we are true, we can certainly carry forward a movement that the world will be better for.

Let us all arise while Dr. Paulson dismisses us with a word of prayer.

(Benediction by Dr. Paulson.)

V

STUDENT'S CLINIC, Aug. 25, 1901.

J. H. Kellogg, M. D.

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We will recapitulate a little. This patient is suffering from chronic constipation. The first thing to be done in every case of constipation is to find out what kind of constipation the patient has, because there are different kinds of constipation. There are many different causes of constipation, aside from that, there are many different varieties of constipation; so we want to ask the question first, what kind of constipation this patient is suffering from. We must be sure, in the first place, whether she has really got constipation. We will ask this patient how often her bowels moved? ("Once a day by enema.") Suppose you hadn't had an enema,- how often would the bowels move? ("I don't know.") With every single case of so-called constipation, we must find out whether there is constipation.

Now this patient says she don't know how often her bowels move,- Have you had an enema every day? ("I have tried that.") Now if the patient is taking an enema every day regularly, they don't know whether they are constipated or not, because the bowel is compltely emptied and then the bowels will not be ready to move for two days,-- and I will show you why bytthis little diagram on the blackboard. (Illustrating by diagram) Here is the large end of the colon,-- at this point the food empties into the colon. It takes the food fourteen hours to pass from the stomach through the small intestines into the colon. This has been proven by actual experiment and observation by a person having a vistula at this point. It it found that food passed out of this vistula in fourteen hours after it was eaten, and ordinarily that length of time is required. Now the food is deposited in the lower end of the secum in a fluid form, and absorption

takes place; gradually the food is absorbed; the fluid contains the dissolved or digested portions of the food, and the solid or semi-solid portions-- the undigested food substances remain here and the fluid gets more and more of a consistency until it has become more or less thickened. Now the next meal that is taken sets up in the stomach peristaltic movements which are passed down into the intestines. These peristaltic movements in the stomach pass down into the intestines in a wave of motion , just like getting hold of the end of a rope and shaking it, and the wave of motion travels down the rope; then shake the rope again and the wave goes down further, and so on until the movement goes down to the other end of the rope. This excites the stomach and the stomach contracts and the muscles of the stomach contract. The stomach begins its work at the first contraction and these contractions pass down into the intestines forcing the food along into the outer end of the colon. I want you to understand the philosophy of the rhythmic movement of the bowels. Here are the small intestines, and here is the stomach, and when the food goes into the stomach it contracts, and the contractions are ~~considered~~ transmitted to the small intestines and the contents are forced into the colon and that forces along the mass which has been removed into the caecum for absorption. (Referring to diagram) It moves it along down here-- here is the sigmoid flexure and a little sort of valve is formed here; this is S-Shaped . The colon comes down almost like this , and forms an S.,when the valve is down at the beginning. This is especially intended to support the movements of the food while passing into the rectum. This portion of the food has been resting here since the last meal, and it has moved on down to this point. Next morning, when another meal is taken, the portion remaining here is pushed along, and

the other portion is pushed down into the rectum, and then comes the desire for the evacuation of the bowels. It is the successive movements of the intestines set up by the meal itself that moves the contents of the colon up the different parts of this depository for the absorption of digested foods .

Q. Is there a peristaltic movement of the colon ?

A. Yes. And it is set up by the small intestines, and it also helps move the food along; by moving the food along, it makes room for other room which is present and ready to take its place . Suppose a person omitted a meal,--what would be the result ? There would be no food introduced into the intestine, and there would be no peristaltic movement set up, consequently the fecal masses would remain up here, and they would not come down to the lower part . Now suppose a person takes an enema and empties the colon completely,--you can readily see that there is nothing left in the colon to stimulate the movement of the bowels the next day, because you have got to wait twenty-four hours for the colon to fill up again. Then there is another thing to be considered: The colon does not require, when an enema is administered, that the colon should be entirely empty; it is only necessary that the lower part of the colon should be empty, because this part of the colon contains foodstuffs that have not yet been absorbed. There are two reservoirs in the alimentary canal,--the stomach, which has power to receive and dissolve the food, and the colon receives the digested food, re-absorbing it. That is what the colon is for--this great absorbing-pouch absorbs the food-substances; that is what these little pouches are for. The colon is very necessary and essential for that purpose; the great share of the absorption takes place in the colon. So the stomach and the small intestines digest food , and the colon absorbs the digested food. Some portion of

the food is absorbing all the way, and when it gets to the large intestine it is in a sem-fluid state, about the consistency of gruel but in the large intestine, it is reduced to a considerablbly harder state, so that it is in the form of a mass, and the patient sometimes has a well-formed stool, the fecal mass leaving the bowel with a definite form; sometimes it is a little harder than usual, and is pressed together in the form of little pellets ,--that is because of the small ends of the pouches--the sacculated ends of the intestine. A soft stool is not a healthy stool. It may be due to the presence of undigested foods, or it may be that fermentation has taken place; or it may be that irritation is set up, and in that case a soft stool would have a ~~fetid~~ foul smell Soft stools are generally very foul smelling stools, and when the bowels are in such condition that the fecal matters in the lower part of the colon are in a fluid state, the patient will be in a state of chronic autointoxication, because, when the fecal matters are dissolved into a fluid state, then absorption is taking place very rapidly; whereas, when the fecal matters are in a hard state, only the outside is exposed, and the absorption will be very slow. Now, which way do you think a lump of sugar will taste the sweetest,--in the form of rock-candy, or in the form of sugar dissolved in water? ("Dissolved.") Yes,--and it would dissolve more readily- and the effect would be greater . It is exactly so with the fecal matters in the intestines; if in a soft state, absorption is taking place very rapidly. That is the reason patients feel faint after taking an enema, because the water dissolves the poisonous matters and carries them away, and the patient feels weak and faint from this cause--the dissolving of fecal matters.

It would take a large volume to tell all about constipation, but I will give you a few important points that you should know about.

It is exceedingly important that the patient should take a large enema completely emptying the bowels. He should not take it more than three times a week, because, if he does so, and empties the colon he takes away from the caecum a portion of the nutrient material that should be dissolved and absorbed. I have not said that patients should never take a coloclyster three times a day, or a large enema three times a day. There are cases in which it is necessary to administer a large quantity of water into the colon every day,-- for example, in liver trouble, as the parts may be suffering from gall-stones or some similar trouble.

There are other cases in which we need to introduce large quantities of water to encourage the kidneys, and so we may use the colon as a means of administering a bath to the kidneys, disregarding other things. We do that sometimes, but if you want to administer a large enema for coloclyster, emptying the colon, it should be only three times a week. If we are going to use an enema every day, it must be a small enema,-- it must be only large enough to cleanse the lower portion of the colon.

This patient has taken an enema every day-- a large enema. ("I took a pint, but it would not bring away anything.") There was nothing brought away, because there was nothing in the lower portion of the colon; it had been emptied the day before and the fecal matters had not been brought down far enough to be prepared for exit from the human body. You must understand the philosophy of the physiological movements of the bowels before you can understand the pathology and diseased conditions of the body.

The patient says the bowels have been moved every day by enema, and that she used water enough to empty the bowels. Why did you

take the enemas? ("Because it relieved me.") Because you hadn't strength to evacuate the bowels?-- When did you neglect emptying the bowels by enema? ("Before I came here; I used to wait two or three days before takingthe enema, but after I came here I attended to it every day, and when I started in I didn't do any work.") You ought to take an enema every day. You say before you came, your bowels didn't move, or you neglected it two or three days-- and then there would be a desire for a movement? ("Yes sir".) Was it a desire in the bowel itself to move which made you feel uncomfortable, or was the distress in the rectum? ("Yes sir".) And you think there was a necessity for the evacuation ofthe bowels? ("Yes.") What do you think was the reason you could not move your bowels when there there was a desire for it? ("I do not know.") What do you think was the reason you could not move the bowels when there was a desire to do so? ("I don't know, unless it was because I had got in the habit of using the enema.") When you had a desire for the bowels to move, why did they not move ? ("I could not tell you the reason.") Was the contents of the bowels hard ? ("No,but I didn't have strenth enough.") The contents of the bowels were not hard and dry, then? ("No.") Did there seem to be a contraction of the anus ? ("Yes.") And there was not power to evacuate? ("No.") Can you evacuate your bowels completely? ("No.")

Then I must inquire further,--we will talk about her habits : How long ago was it that you felt constipation? ("Twenty years.") Do you mean to say that for twenty years your bowels have not moved naturally? ("Yes,sir,--very rarely.") Practically you have had no normal movements of the bowels for twenty years? ("Yes,--perhaps longer than that.") You don't know how you became constipated? What

have you done to relieve your constipation? Have you taken laxatives? ("Once in a while I have ,--I have taken medicine .") What medicines would you take ? ("Cascara.") Did you ever take any other medicine? ("Yes, sometimes,--but not late years; so etimes I would take pills.") What kind ?— (Brandreth's ? /No; sometimes a doctor would recommend one thing, and some one else would recommend another. Sometimes I would take Liver Pills.But I never took many.") You would take pills to relieve you? ("Yes.") Were you better then ? ("Yes;But it was only for the time.") Would your bowels be better? ("No,--they would be worse off than ever, if anything .") Did you ever take salts? ("Yes.") Epsom salts ? ("Yes, sir, I think they were Epsom salts.") Have you taken mineral waters? ("Yes.") And your bowels have steadgrown worse? ("Yes.") How long have you been using enema? (" I have used it more or less for several years; once in a while I have used medicine .") Why did you do that? ("Because I didn't think I had constipation.")

Patients are very often deceived in this respect: They think sometimes that their bowels have not moved sufficiently, when they have When the bowels move they have been prepared to be moved. The amount of fecal matter that is discharged from the body depends largely upon amount of food eaten, and the kind of food eaten. Do you think you have large stools ? ("No.") Why not? ("Because there is no residue.") So the fecal matters would be small. If, on the other hand, a person were eating largely of fruit, coarse grains, vegetables and meats, there would be large stools. So the amount and kind of food eaten must be taken in consideration . Sometimes a patient will lose a meal, and they don't think, if they do that, they must expect to lose a movement of the bowels also; and if patients fast, they

must not expect their bowels to move the next day, for there will not be anything ready for the movement until the next day; so that fact must be taken into consideration. Many people do themselves much injury by taking pills, salts, mineral waters, and enemas when they find their bowels do not move till the next day.

It is astonishing how long the bowels may be neglected without serious injury. There was a man in New York who didn't have a movement of the bowels regularly once in three months; his bowels were very irregular . The eminent Dr. Austin Flint, in a lecture before a class of students, told of a case that came under his observation (and he is reliable authority): Once in three months (?) this man would have a regular movement of the bowels,--he had an awful time of it--and it lasted for two or three weeks ; there would be an evacuation -- during that time he would lose three or four pounds--and in two or three days there would be an accumulation. Now in this case there must be an enormous dilatation of the colon,--and why ? ("Because there has been a three days' accumulation stored up in the colon.") So the colon would be mehcanically stretched by this accumulation, and when that state of things has gone on for twenty years, there must be an enormously dilated colon.

We have another evidence that the colon is dilated,--there is a feeling of dilatation three or four days beforehand--a desire for evacuation. How often do the bowels move regularly in an infant ? ("Three times a day.") Yes. When the child gets older, the bowels move ~~three times a day.~~ twice a day, and when the child reaches the age of ten or twelve, the bowels move once a day, that is when the meals come further apart. I am inclined to think that the practice of eating but two meals a day has in itself a slight tendency to consti-

pation after having been accustomed to three meals a day-- because the rhythmic contraction set up by two meals causes a movement the next morning, and when the third meal is lacking, the person who has been accustomed to depend upon it is likely to suffer from constipation the next day. This difficulty may beobviated by taking a small meal of fruit at night, or even by taking the juice of two or three oranges, or still better, take a couple of glasses of cold water at bedtime; that cold water will set up contraction of the stomach and intestines just as well as a full meal will do, and a save the patient's stomach the trouble of digesting a meal.

Now let us examine this patient,-- make an objective investigation of the case and see what we can find. Now I want you all to come and see the conditions as we find them here. I will ask the patient to raise her feet and put them upon the upper part of the chair,-- now put them down again,-- what would you judge, by looking at this patient? I think we will get the patient near the window,-- now come round and see the abdomen here-- does it look alike on both sides? ("No".) What is the difference? ("It is a little fuller on one side.") Now as you look at it do you think you can make out the shape of the stomach? You can get the shape of the intestinal mass can you not? ("Yes.") Now let us percuss a little. (Percussing.) That is the samll intestine. (Percussing again.) This is the colon. (percussing.) This is the stomach. You see there is a difference in the sound. I can feel the intestines moving when I percuss the abdomen,-- this bulging is not the colon, but the colon is behind pushing up against the intestine,- this is the colon-- that has a different sound. Now you can see just where the colon begins. (Percussing.) The colon is under here, and the small intestines over it-- it is a

combination. (Percussing.) Is that the colon or the small intestines? ("The colon.") Now bring some water and let the patient drink it. Now keep very still and you will hear the movements of the water in the stmach, up and down,-- I can feel it by touching my finger down there. We have a dilated stomach havn't we? -- And when we have a dilated stomach we are certain to have a dilated colon, because th same condition will bring about a dilated stomach will also bring about a dilated colon. We want to find out what has made this stomach and colon dilated. This is a thin walled stomach. Now you can can see the shape of it,-- hold your breath; breath out and don't take any breath in. Now if you watch sharply you can see the form changing- this is visible peristalsis ; it only in a very thin-walled patient that you can see that-- and you can't always see that even in these cases The cold water that we gave her to swallow has set up a peristaltic movement and caused the intestine to move round. Sometimes you can see a wave traveling down very plainly. Now I will ask the patient to raise her head. Now look at this-- raise your head as high as you can. Here are little strings-- muscles bulging out on both sides; see how soft it is. There is only a little string of muscles there, and you can hardly feel it- you can only see a couple of little strings when she raises her head as high as she can. There seems to be no muscle there-- put your foot up high. Now these muscles are contracted,-- do you see the difference? Now put your feet down and raise you head. Please observe this-- it is almost a hernia. Lay your head down-- now raise your feet-- look at that-- it is a good thig to remember that. In order to exercise all the muscles of the abdomen you must raise up both the head and the feet. Now raise one foot,-- does that cause a contraction here? ("No.") It does not bring these

muscles into active play; she must raise both feet-- now raise both feet again-- that brings it down with the muscles tense and hard. Now put your feet clear out as far as you can, and reach your toes out as far as you can,-- now raise both feet without bending your knees-- she can't do it her feet are too large. ("My knees are too weak!") These are small slender limbs. See what a lack of devlopment there is her; these muscles are soft and weak, just as these muscles of the and consequently there is not muscular strength sufficient to raise the feet in this manner-- she cannot lift it up-- now what are you going to do in such a case? I will try to raise this chair on the end of my finger,-- it is quite a strain-- now I let it down. Now take hold of it near the upper end-- it is easier to raise it. Now sit down in the chair and sit back as far as you can-- now with my two hands I will try and lift the chair and nurse right up clear up from the floor,-- I can do it in this manner, but I could not do the same thing at arms length. That is the same situation with the patient, so she can not lift her feet so far away from her body. Now suppose we wnt the patient to exercise for the purpose of strengthening these muscles-- draw the feet close up to the body-- now we will ask her to raise her feet keeping the thighs t right where they are-- raise the feet clear up-- don't strian your legs out; bend the knees down-now push them up again. If the patient wasn't very feeble she could bring her knees down here-- push your feet right up straight, now let them doen-- she can do that. In this manner, by degrees, the feet may be raised further and further and further, away from the body until the leg can be raised perfectly straight. We see these muscles are extemely weak, because the patient has to draw her feet close up to body before she can straighten the limbs and raise them. So I think

it pretty reasonable to suppose that this weak condition of the adominal wall is caused by the dilation of the colon. The abdomen is bulged out, and that is an evidence of enlargement-- it is ballonned. With my hand I can feel a crepitance or crackling of the ligaments in the intestines-- here it is on this side-- stop breathing a moment-- you can see the change taking place.

What relation is there between this weak condition of the abdominal walls and the dilation of the colon? ("The abdominal walls help hold theviscera in place.") This is not prolapse but dilatation. A general muscular weakness will produce a weakness of the intestines as well as of the adominal walls. There is another reason for this state of things-- gas forming in the intestine; there is mor or less fermentation taking place in gaseous form; gas is being formed and thrown off and through the blood. The skin throws off carbonic acid gas, the lungs also throw off carbonic acid gas; every surface in which the blood is distributed exchanges carbonic acid gas with air or oxygen,-- it throws off carbonic acid gas and takes in oxygen..... The blood throws off carbonic acid gas and takes in oxygen, and at the same time carbonic acid gas is being formed by the fermentation, and the result is that the intestines are filled with gas, and there is nothing which pervents the continual expansion of the intestine but the pressure outside of it,-the pressure of the walls, the tension of the intestinal walls and the pressure of the abdominal walls outside. The intestines are shut up in a cage just as if they were in a box; the abdominal walls make the walls of this box which contains the intestines; this box is full,-- the intestines and the viscera absolutely fill the adominal cavity; there is not a particle of open vacant space outside of the intestines between the adominal walls

and the intestines,- the intestines fill every little crack; that is the reason that when aperson gets a weak place in the adominal wall the intestine creeps out,-- that is because there is no room to spare.

It is the tension of the adominal walls that preserves the size and form of the intestines and prevents undue expansion. The gases formed in the intestines cause a pressure until the point is reached where the pressure of the intestines and the pressure of the blood are equal to the pressure of the gas; if the pressure of the gas and the blood are greater than that of the intestinal wall the pressure of the gas becomes sufficient to balance the pressure of the blood.(?) That is the reason we have the valve at the upper end of the oesophagus closed, and the valve at ghe lower end opened, so as to regulate the pressure. When the adominal walls become weak they stretch and allow the intestines to bulge out more than they ought to and allow the gas to escape.

11

D I E T E T I C S .

HYPOPEPSIA.

Lecture to Post-Graduate Class by J. H. Kellogg, August 31, 1903. 5:00P.M.

In all cases of hypopepsia there is a deficient quantity of free hydrochloric acid so that whether pepsin is present in large quantity or in diminished quantity peptic digestion is necessarily diminished in activity because any quantity of pepsin, any amount of pepsin would not digest unless acid were present in sufficient quantity to act with it; so this is one condition which is always present in hypopepsia--deficient gastric activity.

There may be cases in which the pepsin is deficient as well as the hydrochloric acid. These will be cases in which the hypopepsia is present as a consequence of some disorder, as very marked anemia, or some impoverishment of the blood; cases of pernicious anemia; cases of cacesthesia; cases of cancer..

There is a third condition which is very commonly present in cases of hypopepsia also, that is diminished motility. This is diminished motility of the first degree, and it is what Bouchard calls latent dilatation of the stomach. Of course, you could hardly speak of such a thing as latent dilatation of the stomach; it is hardly a correct phrase, but Bouchard uses it. This condition of latent dilatation is really a condition of lost tone, of diminished tone in the stomach. We will go into this very interesting subject more fully when we talk about motility.

In this condition of latent motility, or latent diminished motility, or latent dilatation, as Bouchard calls it, the stomach refuses to contract upon itself when it is empty, or if it has not

entirely lost that power to contract upon itself when it is empty, the walls are so weakened that a small quantity of food causes an undue amount of dilatation. For instance, one glass of water would dilate the stomach to such a degree as to draw gases into it from the intestine, or air may be swallowed along with the water. Some persons always swallow more or less air with water when drinking. When the stomach is strong and vigorous, it contracts to repell that air, but when the tone of the stomach is low, the weight of the water drags the stomach down and leaves a cavity which fills with gas. Then when you make the succussion movement, of the stomach you will find a splashing sound in the stomach--it does not mean dilatation necessarily. It only means dilatation when you have given the water in the morning before the patient has taken any food or any fluid. When you have given one glass of water, that amount of water is not sufficient to cause dilatation in a healthy stomach.

As I have said, we generally have lost tone, diminished motility with hypopepsia, as well as diminished acid formation and diminished pepsin formation, and the reason why is because the same conditions which produce diminished secretion, diminished glandular activity, also produce loss of muscle tone. The thing that produces diminished nerve or glandular tone produces diminished muscle tone. The reason the muscle tone is low is because the muscle does not receive sufficient impulse from the motor centers to keep the muscle in its motor state. The same thing which produces lowered muscle tone will produce lowered nerve tone, and lowered glandular tone, for the reason that the glandular activity depends, just as the muscle activity does, on motor impulses. These three conditions come together--diminished acid formation, diminished pepsin formation, and diminished motility, or loss of tone in the stomach muscles.

Now see wht the consequences of this condition are. In the

first place there is increased salivary digestion, unless it happens that the of the saliva is deficient in quality. In certain cases the impoverishment of the blood is due to the fact that the saliva has diminished activity as well a s the gastric juice. Until we made our experiments here, it was not known that there was such a variation in the activity of the saliva. When we were making our observations of the saliva about eight or ten years ago now, there had been no experiments upon the saliva, and there had never been made anywhere such an exhaustive research on this subject as we made here. We have got the richest sort of opportunity in the statistics we have gathered for the preparation of a very elaborate scientific paper. Some time I hope to get at it and go into the thing and get out of it the rich material that we have. The study of the condition of the saliva in connection with various disorders will bring to light many important indications. I have had in mind for some time the taking up of the study of the saliva in all cases. It is easier to study the saliva than it is to study the gastric juice. To take all the cases that come here and make a study of the saliva as the means of determining the condition of the vital activity and resistance of the body; I believe that it is a valuable indicator, and I propose to make use of it. I hope we can get that started right away now. You see the ferments of the body are its choicest products. When the body begins to depreciate, the vitality is diminished, the blood is impoverished, and we know that is one of the first things that follows this deficient production of ferments. There is a certain class of internal secretions , perhaps you might say ferments--some internal secretions in the thyroid, and thymus, and lactic glands, possibly the spleen, possibly the liver, without doubt the pancreas,--internal secretions from all these structures have anti-toxic effects, increase the resistance of the body, enabling the body to destroy germs and neutralize the toxins formed in the blood.

If the saliva is deficient in activity it would be reasonable to believe that these other internal secretions are also deficient.

We find in many cases of hypopepsia, especially in cases of apepsia, we find the animal ferment, animal diastase is deficient in quality. In fact in the great majority of cases of hypopepsia which are moderate in degree, the saliva is normal in character. It is only when the flow is greatly depreciated that the saliva is deficient in quality. When the saliva is normal the first thing noticed is that salivary digestion is more complete and advances further so that the amount of sugar found in the gastric juice is greatly increased in quantity, and the salivary coefficient is very high, the conversion is very complete, and the amount of sugar found present in the gastric juice or stomach fluid, in comparison with the amount of soluble starch, imperfectly diverted starch, or maltose is greater. In cases of hyperpepsia you will find that the amount of sugar is less than half the amount of soluble starch, while in hypopepsia, the amound of sugar is twice that. This is so universal that you can tell by examination with sugar whether your patient has hyperpepsia or hypopepsia. You can tell that with a very good degree of certainty, and almost as well as by the examination of hydrocholoric acid.

The salivary activity is increased because the saliva has a longer time to act in the stomach. That is the reason. Normally the saliva has only thirty to forty minutes to act in the stomach before the amount of hydrochloric acid is sufficient to inhibit the action of the saliva further. But in hypopepsia a longer time elapses before the amount of acid accumulating in the stomach is sufficient to prevent the action of the salive, and in apepsia the amount of acid never reaches a sufficient point to neutralize the acidity or albumin of the saliva.

We are taking the average case. Suppose here are two cases--hyperpeptic, and hypopeptic, and we have the salivary digestion equally active in the two. In that case the man who has hypopepsia will have more salivary digestion because the saliva will have a longer time to act. In cases of hypopepsia the saliva varies in activity. We are talking now about the average case. You will find in the average case greater activity of the saliva. In hypopepsia you will find a greater degree of starch digestion.

Here is a case in which the free hydrochloric acid is 90. It depends more on the free hydrochloric acid than it does on anything else. The free hydrochloric acid is 90 and the starch digestion compared to normal is 20. Here is another case of hypopepsia in which the free hydrochloric acid is 30, and the starch digestion compared with normal is 99. Here is another in which the salivary activity is very great. It is 3.25. The free hydrochloric acid is 200. In that case the saliva was so lively it could do its work before the stomach fluid became excessively acid.

The first thing is to improve salivary activity in case of hypopepsia, to improve the digestion of starch. Cases suffering from hypopepsia very seldom complain of farinaceous foods. It is persons who suffer from hyperpepsia who complain of inability to digest starch.

The next thing we will notice in these cases, naturally they are not able to digest proteids, because the proteid digestion of the stomach depends upon peptic activity, and if the hydrochloric acid is deficient, the pepsin can not act very well, and if the pepsin is also deficient, the digestion must certainly fail. So these patients can not digest beefsteak well, or the albumin of eggs, in fact highly albuminous foods of any sort are not well digested. There aresome exceptions that I will mention a little later.

There is a third condition we should mention, in these cases; that is, the food remains too long in the stomach. That is partly due to the deficient disintegrating power of the gastric juice, and partly to the deficient muscular activity of the stomach. When the gastric juice is active it cooperates with the saliva in such a way as to completely break down and reduce to a pulpy mass the food that is taken into it. Take a little morsel of bread, for example; the saliva honeycombs it, so to speak by digesting the starch, so that there is left a skeleton
~~xxxxxxx body~~ of gluten behind. There comes along the gastric juice and dissolves that skeleton. Here is a mass of bread that has gluten all through it, and the gluten is the framework, and the starch is the filling. The saliva penetrates all through this mass, converts the starch into sugar, and there is left there a skeleton of gluten. The gastric juice will act upon this gluten and dissolve it, so that the whole massis reduced to a pulpy state. Now matter how good the saliva is, how active it is, if the gastric juice is not able to do its work, this process fails, and so we have masses left in the stomach which are not in a fluid state. The duty of the stomach is to reduce the food to a fluid condition, and normally the food will not pass out of the stomach, the stomach will not allow it to pass out until it becomes fluid, because the pylorus shuts itself up tight. As the acidity of the contents of the stomach increases, the muscular activity increases, and the food is continually forced up against the pylorus, and that portion which is fluid is squeezed through in drops, until by and by, after many hours, the stomach literally dumps itself into the small intestine. The contraction has become so vigorous that the stomach forces the contents up against the pylorus, and it becomes inactive in the pylorus, for the stomach forces it through, and it is passed into the small intestine. Some people can tell when this takes place, and feel immediate relief

when it happens. This is one factor in the deficiency.

There are two reasons for the two long delay of the food in the stomach: first, the deficient activity of the stomach--the deficient activity of the gastric juice; second the deficient activity of the walls of the stomach,--the diminished motility, and this condition is also usually present in hypopepsia. It is possible that there may also be a deficient salivary activity, and in cases in which salivary activity is deficient, we have an aggravation of this conditions

What is the consequence of this too long delay of food in the stomach? There are several consequences. One is an abnormal irritation of the stomach. The stomach is congested during the process of digestion, its walls are filled with blood, and it is congested while the food is retained, and there is a constant irritation in it. When food is long contained in the stomach, the excessive stimulation of the mucus glands, which are also excited as well as other secreting glands of the stomach, result in an excessive formation of mucus, and gastric catarrh is a consequence, a condition which is present in a great number of cases of hypopepsia, and is present in most all cases of apepsia--an excessive quantity of mucus. When this mucus is mixed with the food, it is a catarrhal mucus. This mucus protects the mucus membranes from irritation of the food, irritation of the gastric juice, and is also germicidal--helps to sterilize the food. All mucus is germicidal.
The mucus in the nose kills the germs which are taken in in breathing; the mucus of the eye is germicidal, and protects the eye from the constant multitude of germs which come in contact with it in that way.
It is a powerful antiseptic and germicide. If it was not for that fact, defection would be very much more marked. This germicidal action of the mucus is the only protection we have against the colon bacillus.

That is the great utility of the appendix. The appendix pours out into the lower end of the cecum a great quantity of powerfully germicidal mucus which helps to lubricate the alimentary canal, and at the same time protects it from the excessive activity of putrefactive bacteria. That is one of the most interesting things in physiology, is this germicidal activity of the mucus. These things have been gradually worked out within the last ten years. They are all rounded out now, so as to make a beautiful, symmetrical system. The men who think the appendix is good for nothing believe that man came up from further down than the monkey, that he was a musk rat or a beaver, and that this appendix was a third stomach, and as he ascended the scale this third stomach was not used and became more concentrated; and passing this point, man did not have to live on the bark of trees, and this stomach became unnecessary, so it has gradually shriveled up. The vaginal mucus is acid. The alkalinity of mucus is extremely faint. It is no more than that of the blood itself. It is due to alexins.

The serum of the blood is germicidal. Milk is germicidal. Put some typhoid fever germs into some fresh, warm milk and they will be killed. When milk comes from a cow it contains a large number of leukocytes, and the germicidal power is due to these leukocytes so long as the milk is kept warm. For some hours it retains this germicidal property. Milk is a powerful germicide. That is the reasonwhy infants can be fed on warm milk, taking it warm, direct; and you see what a beautiful thing there is in the feeding of a young infant. All infants have hypopepsia. They have not the power to sterilize their food; so they are given not only sterile food, but food which has power to destroy the germs taken into the mouth. As the mother is nursing the child, the warm milk is absolutely sterile, and the germs taken in are

actually destroyed by the milk. It is a live food, and it is capable of disinfecting the stomach. As soon as milk becomes cold, it is dead. Within three hours the first incubation has taken place. Three hours after the milk is received from the cow the germs multiply. After that time, every three hours ~~xx~~ you have another crop. Therr have been found ten millions of germs in one C.C. of milk. In Italy it is the fashion to use goats for infant feeding. In Rome, and in Paris I have seen a man going along with his flock of goats, and when some one wanted milk, he would take one of the goats, and drive it up stairs right into the sick room, and the goat is milked in the sick room, and the milk is given to the patient right away. Milk is an intestinal antiseptic because it is so completely absorbed.

Talking about the consequences of food being retained too long in the stomach: There is an excessive secretion of mucus. When the secretion of mucus becomes excessive, so that the mucus lies in the stomach it becomes a source of infection. The germs are retained in the stomach and these germs work their way down in to the mucus glands, and over-excite the glands so that there is a still greater formation of mucus.

Another evil that arises from the long retention of food in the stomach, is the fermentation of the food stuffs. The hydrochloric acid that is thrown out into the stomach does not remain permanent there, but is reabsorbed. The experiments made by Hall in winter on dogs show that the hydrochloric acid increases from the first hour until the end of the second hour, and remains in <u>statu quo</u> during the hour, and then begins to decline, and at the end of the third hour is very ~~thurr~~ ~~rapidly~~ largely absorbed. In hypopepsia what little antiseptic power there is due to the presence of hydrochloric acid, the small amount of

antiseptic or germicidal power that is there is lost because of the absorption of the hydrochloric acid, so that the long retention of food leads ultimately to the presence of food in the stomach, and germs are taken into the stomach with the salive, or with the food, and there is nothing present to undo the action of the bacteria. There is nothing there to prevent their growth, so the consequence is active bacterial growth in the stomach, and putrefactive processes. Persons suffering from hypopepsia have infected stomachs. There may be a sufficient amount of pepsin or hydrochloric acid, or mucus present to sterilize the stomach, and to prevent the action of the bacteria. While there may be in the mucus, or pepsin, or hydrochloric acid a sufficient amount of germicidal action to prevent the fermentation of bacteria, in an hour, that is not sufficient time, that is no evidence that at the end of three hours there might not be a vast multitude of bacteria in the stomach. There certainly will be unless there is some means of preventing this development, and in case of hypopepsia there is no means of preventing it/

So if there is deficient muscular activity in the stomach in connection with diminished hydrochloric acid and pepsin, there is absolutely certain to be putrefaction, bacterial development in the stomach. You will find it very interesting if you want to make some studies of that, by drawing the food from the stomach at the end of t ree or four hours. These patients have a bilious attack, and they vomit the most voul, fetid, rancid smelling stuff--not necessarily bile. It is only when a patient vomits until, as he says, he reaches the bottom of the stomach, that he gets the bile. Bilious attacks generally come on in the morning. A man takes food into his stomach and it remains there. The muscle walls of the stomach do not contract sufficiently to unload the stomach. It is the old fashioned boiled dinner, which consists of

corned beef, cabbage, and various other indigestible stuffs that are practically indigestible in the stomach, remain there--such a lot of rubbish the stomach can not dissolve it, and it can not be gotten rid of, so it simply rots. When that stays there over night, you will see an illustration of what is present in the great majority of cases of hypopepsia of low degree.

There is another thing that happens in cases of hypopepsia; the diminished motility is progressively increased; first because the hypopepsia involves a certain degree of starvation, these patients often have a lean and hungry look. Their muscles are weak, feeble, and progressively becoming weaker. The stomachs are weak, and as the arms and legs, and stomach muscles gradually become more and more relaxed, so the stomach dilates by weight of the food. Patients very often have a good appetite. If they do not have a good appetite they stimulate it with mustard, peppersauce, pepper, and ginger. That is the reason--these people who have no appetite eat these things to create an appetite, and the food is crowded into the stomach in abnormal amount, and the stomach muscles not being able to sustain the weight of the food, relax, and by and by the stomach becomes calloused. I have seen cases where the stomach was an enormous pouch or pocket. Cases of hypopepsia generally go on progressively from bad to worse.

What is the cause of hypopepsia? Probably in many cases, the most severe cases, the condition is caused by congestion in the blood, so that the blood does not supply the gastric glands with the proper material out of which to make a normal secretion. Here are some interesting experiments that we have made. Here is a man in normal health, normal gastric juice, normal degree of acidity; give that man a profuse sweat, make him sweat profusely, then give him a test meal, and he has hypopepsia? Why? Because you have removed from his blood

such a great quantity of chlorides out through his skin. Then we might take a person whose diet was diminished, who had little appetite, so his blood was taking too little food, and his blood would furnish too little pabulum for the manufacture of pepsin, gastric juice, and acid, and he has a sharp pain in the abdomen.

These cases of hypopepsia are due to anemia, depression, any exhausting disease, exhaustive labor, systematic loss of sleep. When I do not sleep I have not a particle of appetite. I absolutely loathe food, sometimes for weeks at a time I have not wanted a single meal with the least bit of appetite. I simply have to eat predigested foods, eat a little something to get along, lose flesh, sometimes ten pounds of flesh or so going through one hard pull; but I know better than to stuff myself with stuff that rots. I eat almost nothing but fruit and fruit juices and foods that can not rot. I know my gastric juice must be very low, and if I should eat a lot of stuff that would rot in my stomach, my stomach would be full of toxins, and I would soon be exhausted used up with Bright's disease, or diseased kidneys. I escape that danger.

What shall we do with these cases of hypopepsia?

As regards causes of this hypopepsia, it is an extremely common thing in women. More common in women than in men. I am becoming satisfied that one of the causes of this condition in women is their mode of dress. The constriction of the waist, the limitation of the movements of the diaphram,--the weak abdominal muscles relaxed, produces a stasis of blood in the abdominal cavity, so the abdominal pressure is diminished. Women have constipation, have to take Lady Washington pills or some other sort of pills. Laxative pills are named after great women, because it is so universal that they must use pills. The consequence of this stasis in the portal circulation is a great interference in the work of the secreting structures. It must be so.

The enteroptosis which results from this wrong dress, constriction of the waist, prolapsed viscera, brings an abnormal strain upon the sympathetic nerves, and the effect of this is to cause a spasm. I have frequently during the laparotomies had occasion to know the condition of stomachs. I have noticed cases of laparotomies where the intestines of the stomach were extraordinarily ~~xxxxxxx~~ pale. These patients had pale faces, hands, and legs. You can almost tell a patient has hypopepsia by the ~~xxx~~ looks of his tongue. These patients have cold feet, cold hands, and cold knees. They have a spasm of the stomach. They are likely to have amenorrhea for the same reason--because of a spasm of the vessels. Bouchard showed this too, that in these cases of anemia there is a spasm of the vessels of the brain, and often a degeneration of the vessels, so these patients are very likely to be injured by violent exertions. These patients are perfectly comfortable in bed, their feet are warm. Get them up and exercising, and they get cold feet right away. I did not know why until I got the idea of this enteroptosis. When they put on an abdominal supporter, the feet keep warm.

Paresthesias are associated with this condition. A large number of cases of hypopepsia are cases of paresthesia, especially in cases where enteroptosis exists. They have paresthesia of the limbs. They say, "I have burning of my hands and feet," or, "I suffer a great deal with cold." "I have a strange feeling in the top of my head." These paresthesias are due to the vasomotor changes in the small vessels of the nerves. It can not be due to changes in the vessels outside of the nerve because it would not be intimate enough. It would not reach the filaments, the outward filaments of the nerve. It is due to changes in the vessels of the nerve trunk or cell. I believe that is the cause of it, and that may be set up by the same cause, you see. It is a very common thing in a person suffering from certain forms of sciatica

to have a hot, scalding feeling all along the course of the nerve.

Another cause is the use of tea and coffee. The tannin of the tea and the toxic substances in the tea produce contraction of the vessels of the stomach, and lessen its circulation through the gastric walls, so lessens the blood supply of the glands. Did you ever hear of such a thing as putting cold tea in an inflamed eye? It is a very common prescription for sore eyes,--itis a very common thing to infuse a little cold tea into the eye. It is a very good domestic remedy, because the tea has thein which is an antiseptic of the same character as anodyne, and you can produce partial anesthesia with the thein.

The large use of sugar produces hypopepsia in a curious way. Cane sugar has a stimulating effect upon the acid secreting glands,--a powerfully stimulating effect. A great many people say, "I can not eat sugar; whenever I do I have a sour stomach right away. I can not eat any kind of sweet thing because I have sour stomach right away." When they say they have sour stomach right away, you will know it is due to the stimulating effect upon the secreting glands, because it is not time enough for the acid to be formed by fermentation; it will take two or three hours at least to do that. One man who suffered very much from hypopepsia, said, "Doctor, I notice when I eat a little candy I feel better." I did not tell him why; I was afraid he might do it again. If he kept right on with that he would soon get apepsia, which would be so bad that nothing could be done for him, because this is an artificial stimulation, and the stimulation gradually waakens the stomach, because it simply forces the stomach to pour out this secretation to dilute the sugar, because the sugar is a powerful irritant on the stomach. A ten percent solution of sugar would produce irritation. A little stronger solution would produce actual inflamation of the stomach. One of the worst cases I ever saw was the case of a woman who used to eat a great,

big, four-pound box of double extra strong peppermint drops every week. She had hypopepsia to a most extraordinary degree,--almost apepsia. She had gastritis once or twice from eating candies in large quantities. Preserves and all kinds of sweet things have the same effect.

Another cause of hypopepsia is the large use of fats. When a person eats fat freely he very soon loses his appetite. That is the reason why bread and butter is more satisfactory than bread alone. You might eat a whole loaf of bread and not feel satisfied, but when you eat butter with bread, you are soon satisfied; it produces a sense of satiety which is not true at all of any other element of food. It is only true of fats. A man could eat a pound of sugar and feel just as hungry as he was when he began. It is so with lean meat. A man tried an experiment--ate a whole can full of Liebig's Extract of Beef, a half pound or more, and he was just as hungry as when he began, because it has no power to produce satisfaction, yet that is supposed to represent thirty-four pounds of beef. So if he ate thirty-four pounds of beef, he would be just as hungry as when he first started. Fat is absolutely necessary. It is the most troublesome problem in dietetics. Everything else is pretty well settled. I am distressed about that thing every day in my life. I do not know what to do. I am trying hard to find some way out of it. I think I could settle it in a week if I did not have anything else to do. We will find some way to satisfy a man with fatwithout the use of an excessive amount, and do it satisfactorily. The amount of fat we require is only 1.2 oz. a day. An ounce and a half is sufficient to give complete satisfaction. That is the reason why people complain of our diet, and say, "Your diet is too light; I like more hearty food." Hearty food means greasy food. That is the reason why they want pie, and why they want cake, and rich gravies, because they afford a certain satisfaction, and they do not

feel satisfied with our dietary. It is a hard problem to furnish fat in a way that is easily digestible and that it will not do any mischief. People get accustomed to the use of fats, and use a great deal of it, and this excessive use of fats has the effect of making an insufficient amount of acid in the stomach; so that is a common cause of hypopepsia.

The use of rich food. These experiments of Hall have given us wonderful light on questions we had ~~xx~~ knowledge of before by experience, but did not know the reason for. Now we haveknown for thirty years--I have beenwriting about the injurious effects of rich foods, shortened foods, breads, etc., but I did not know exactly the reason why these foods ~~xxxx~~ are injurious. I sa d, because they are hard to digest, food elements difficult of digestion; but I will say there is a far more important reason than that, and that is that by their presence in the stomach they prevent the formation of the gastric juice necessary to digest their food elements; they prevent the formation of gastric juice necessary to their digestion. So when we have food that is extra hard to digest, we have less than the ordinary amount of gastric juice.

Another cause of hypopepsia is the use of tobacco in men; smoking, chewing, and all the other pernicious tobacco habits, which result in producing hypopepsia. I have met a great many people who say they have been greatly benefitxedby the use of tobacco. They say they would never have used tobacco if they had not had dyspepsia, and had sour stomachs, and they were compelled to take a smoke to cure it. Some years ago the doctors discovered ~~xxxxxxxx~~ somehow that persons suffering from acid dyspepsia were benefited by using tobacco. This narcotic has the effect to lessen the formation of acid. Of course, lessening the formation of the acid in hyperpepsia ill lessen the formation of acid in persons who have normal digestion. It lessens the secretion of hydrochloric acid, so causing hypopepsia.

Another word about sugar. The way that sugar causes hypopepsia is by exhausting the gastric glands. The glands are over-stimulated by the use of a large amount of sugar. They become exhausted so that they are unable to secrete the proper amount. They are tired out. The free use of sugar day by day in oatmeal, or coffee, or sweet cakes, candies, syrups, etc., has the effect after while to wear out the glands. The same effects are common from the free use of starch, but the change does not take place in the stomach. The reason is that the moulds produced by the action of the starch do not have this irritating effect upon the stomach. It does arouse the activity of the stomach in causing it to secrete hydrochloric acid, but it does not irritate the stomach, and produce gastric catarrh, which ultimately leads to hypopepsia as does the use of sugar. The use of sugar produces an excessive secretion of mucus in the stomach, and it in its free use, by and by, gives rise to gastric catarrh, which in itself will produce hypopepsia.

Another things that causes hypopepsia is the use of ices, ice cream, etc. These chill the stomach; and the large use of ice water is another cause. The free drinking of great quantities of fluids is still another cause. Excessive eating is a common cause,--taking into the stomach such a large quantity of food the gastric glands are over stimulated, and afterwards exhausted because of the great demands made upon them. Hot foods are also are also injurious to the stomach because they relax the stomach wall and produce a reaction. They are stimulating at first, but the reaction follows which leaves the gastric glands in an exhausted state.

The use of condiments of all kinds produces at first irritation, and later the result is hypopepsia--deficient secretion. Cases of hypopepsia in many instances, are simply degenerated cases of hyperpepsia, the gastric glands having become worn out.

Gastric catarrh always results sooner or latter in hypopepsia. In the worst cases, say those which are the result of gastric catarrh lasting for many many years, the muscle walls are somewhat weakened, the stomach is in a state of very low motility, and the gastric glands are almost entirely inactive; after a while they become entirely inactive, then the patient has apepsia. Diminished motility of the stomach, lessened appetite, lessen the normal means by which activity of the gastric glands is produced.

Hot weather is a cause of hypopepsia, for the reason that it induces perspiration; for another reason, it has a general depressing effect upon all the vital processes. Cold weather has the opposite effect. Persons employed in glass works, and other places in which they sweat very profusely, have been found to suffer from hypopepsia very acutely.

Alcohol unquestionably lessens the activity of the stomach. Pawlaw has shown that alcohol is pathogenic; but when it is taken ~~xxxx~~ ~~xxx~~ systematically in any considerable quantity, in time it diminishes the gastric activity. Twenty-five years ago I made some experiments. I obtained the gastric coefficient of a man who had a normal stomach. I gave him eight ounces of wine instead of eight ounces of water, and I found that it diminished the gastric work one-half. I gave him two ounces of brandy with six ounces of water in connection with his test breakfast, and I found it brought the digestive activity down to almost nothing at all,--almost apepsia. I published the reports. There is no doubt about the accuracy of the experiment, for I have repeated it several times. Alcohol always diminished the activity of the stomach. A person who drinks wine at his meals lessens the activity of the stomach. When this is repeated day after day, and day after day, it ultimately must result in gastric apepsia. The excessive use of salt has exactly the same effect.

Devoe showed the same thing as the result of the use of salt. He calls attention to the fact that the free use of salt not only lessens the ssoretion of hydrochloric acid in the stomach, but it also diminishes the germicidal activity of the gastric juice. That is awvery important thing. The chloride of sodium present in the stomach lessens the formation of the gastric juice. At the same time it lessens the germicidal power of the hydrochloric acid, and of the combined acid as well as of the free acid.

If water is taken in small quantities, say half a glass every hour or so, it will increase the water of the blood; but if it is taken in larger quantities at intervals of several hours, it has the opposite effect, so that the chloride of sodium will be carried out, and an unusual amount will be required artificially. When we want to keep the blood diluted and the tissues moist all the while, give half a glass every half hour. It is good to drink a quantity of water an hour after a meal, because there is poured out of the stomach a large quantity of fluid. It is best to replace that fluid by drinking a glass of water. There is really no very good rule for drinking except to drink when you are thirsty. The instinct will call for water when needed.

If you eat fruit at the end of a meal you are likely to eat fruit asa supplement. Another reason is that fruit is pathogenic; when you take it with a meal it furnishes some fluid to the system, and it is pathogenic and stimulates the formation of the natural ferment of the gastric juice, so it is helpful. Still another reason, which is a good one to me, is that when I do not have an appetite I always eat fruit. When youhave been eating fruit, it provokes an appetite; then you can relish something more substantial, perhaps. Suppose one is eating a plain meal, of bread and fruit. Suppose he has nothing but bread to eat, and eats his fruit at the end of the meal, it would be a very disagreeable, dry meal. The fruit is a relish to it.

a very disagreeable, dry meal. The fruit is a relish to it.

A lady said to me, "What is the trouble with my tongue? I see marks in it. Is it because of the position in which I hold my tongue? What is it?" She saw marks on her tongue. There is a lost muscle tone. When you see these marks in the tongue where the tongue has been lying beside the teeth, that is a sign of diminished motility. That shows that there is a constitutional loss of tone. You have got it in the tongue, in the esophagus, in the stomach, bowels--a suspicion of lost motility all the way along. That is a very interesting sign.

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