Begin to copy here.
Copy between red curves only.
End on pp. 22

Mas e

SANITARIUM PARLOR LECTURE. Jan. 7,1897.

# WHY WE ARE CRIPPLES.

J. H. Kellogg, M. D.

-----oOo ---

Good evening, Ladies and gentlemen : Can you imagine why we are nearly all of us cripples? Some years ago I happened to be driving a fine horse; he pranced proudly along and held his head high. Just ahead of me there was a man driving a span of horses who were poor, miserable old hacks. Having occasion to look back, I saw a man driving another poor old hack,--I think some people would call it a "plug." I very soon passed the man who was driving the two plugs, and as I did so, I said to myself, "Why is it that almost all horses are plugs? Why can't they be all good horses?" The next thought that came was, "Why is it that nearly all human beings are plugs, hacks, poor miserable crippled creatures? Why are we not all strong? Why do many drag themselves along in a very wretched sort of way, hardly knowing what it is to be full of animation and activity and vim. You go out in the country and you will see a little colt running in a field prancing and kicking up its heels, and really knowing something of the joy of living. It is not a hardship for him to live. He does not wake up in the morning and say, "Oh dear, I've got to drag myself through another miserable day!" He is happy every minute. In like manner you can see other animals, such as the calf or the squirrel enjoying life.

How many civilized people are there who really feel the joy of living,--who feel something in them that seems to be a well-

spring of life? How many get up in the morning feeling as though they would like to jump ~~ten feet high~~? Probably there are not many such in this room, for this is not that kind of an audience, so we wouldn't expect any one here to give expression to that sort of feeling. Some of you, however, will get there after a while. But why is it that there are so few such people outside of these institutions for the promotion of health? The reason is easily found. It is because of our artificial conditions of life, especially in large cities and towns. You go out in the country on the wild prairie where you find herds of deer, and do you find a lot of plugs among them? They are all nimble, beautiful and gay in their appearance. It is only in the service of farmers and on the streets, in civilized countries, that you find these poor, wretched looking creatures. Notice the herds of wild horses; every one of them is swift and strong and proud; he holds his head high and prances along with gay step. There are none of them poor miserable shacks. You go among the wild people of the earth, and you find there that it is much the same thing. When Capt. Cook discovered the Sandwich Islands, he says he found the men all Apollos and the women all Venuses; he didn't find such a thing as sickness among them; they did not die of disease but of old age. It was not until civilization reached them that they became consumptive and miserable. At the present time there is not one fifth as many inhabitants on the Sandwich Islands, under the influence of civilization, as when Capt. Cook discovered them. The same thing is true of the North American Indians. When this country was discovered, the Indians were as strong and hardy and as

deer; at the present time they are a dying race. There are very few left, and those who are left are being rapidly decimated by consumption. About thirty-five miles south of this place there was once a little settlement of Indians. Some thirty or forty years ago they were ordered to go west. When the old Pottawatimies were here, they fought a battle down by the creek here, which was the cause of the name "Battle Creek" being given to this town. They were then ordered to go to Illinois,--they were driven out by the government. There were about a thousand of them that settled down near Chicago. Some of them came back again and settled down in this locality, about twenty miles south of here, and every summer they would come to town with whortleberries during the season of whortleberries. They were dressed up in white man's clothing; they were then living in the white man's style of house, they were cultivating their fields in civilized fashion and living on a civilized diet. They had adopted the white man's fashions as far as possible, and were rapidly dying off by consumption. There are very few of them left now.

Some time ago I noticed a little thing in a newspaper which I think originated with the Burlington Hawkeye man, which was rather irreverent, but at the same time a pretty true commentary on the state of things existing in wild countries, --on the fact that as soon as they become civilized they begin to die off--they become unhealthy and die off rapidly. This fact is testified to by a missionary who went to Alaska to labor. He testifies that it is his experience that the civilized Indians soon become sickly; that as soon as the native adopts ~~the~~ civilized habits he deteriorates rapidly. We have testimony of this sort from missionaries

in all parts of the world, that it is uniformly the case that when natives who have lived in a primitive state become civilized they pretty soon become sickly. The Burlington Hawkeye man found this out, and he tells the following story (which I think he invented, however; I don't think it is true): He represents a correspondence as having taken place between a foreign mission board (or home mission board) that there was great interest among the natives among whom they were laboring, and they wrote, saying, "Send us a shipload of Bibles, five hundred corsets, a couple of hundred barrels of pork, a thousand hams, " and some other things of the same character. These things were reported as having been sent to the missionaries. About six months later they wrote the board again,--"The interest is still good. Send us some more pork, some more hams, some more sausages, a few more corsets and some more Bibles." Six months later there was another order came from the missionaries, saying, " The interest is not quite so good as it was, but we still want a few more Bibles, a little more pork,--and five hundred coffins, quick!" The natives had already begun to feel the effects of civilization. This is only a story, but there is quite a moral contained in it, and the moral is this: that the missionary, when he goes with the Gospel to the heathen, while he teaches many good things, he teaches some things which are not so good and introduces health-destroying habits,--habits which are deteriorating and which are certain to make an invalid of the native convert. There are ~~We find also~~ among civilized peoples ~~causes~~ of deterioration which have been at work for hundreds of years, which are so utterly opposed to the

natural laws of life, ~~so opposed~~ and to the normal functions of the body that it is the greatest wonder that ~~we are~~ any of us are alive. The only reason that any of us survive is, that ~~the human race is tough, that~~ man has greater ability for endurance than any other animal. Weston often tired out a horse in walking. When drilled up to his highest speed and power of endurance he tired out several horses a day by walking. He was able to walk a hundred miles in twenty-four hours,--and that is what no horse can do. Horses can travel a long distance in one day, but on a long-distance trip, walking five hundred miles a week, Weston tired ~~them out~~ any horse that could be found. (The fact is, man has more natural endurance than any other animal; ~~he has, naturally, more fortitude,~~ more real constitutional vigor; ~~as healthy, vigorous, primitive man~~ than any other animal that lives) ~~and it is because of this wonderful~~ toughness of constitution that a human being is able to live. (It is not because of the bad conditions of life over which we have no control; ~~it is not because of bad atmospheric conditions which we cannot control,~~ that we deteriorate, but by reason of our evil habits.

~~Now I want to call your attention to a few things~~ One of the chief causes lying at the foundation of the deterioration of the race. ~~First of all, I must mention~~ bad air.) At this time of year people have the habit of shutting their houses up so that they are air-tight. (As soon as Jack Frost begins to appear, people bank up their houses with straw and earth; the windows are corked,--and I have known people to go so far as to put little pledgets of cotton in the keyholes so that there should not one little breath of air get in.

And so then people wonder why they lose their appetite and get bilious in the spring. ~~So that when spring comes they have to take somebody's "bitters" for spring biliousness.~~ It is winter suffocation that causes it. ~~this biliousness.~~ It is a wonder that we survive this smothering process which they civilized people subject themselves to every winter. ~~Why~~ The North American Indian or the South American monkey would die of consumption in three months by that sort of usage. (But human beings ~~are proof of~~ seem after a time to become, as it were, vaccinated with bad air so that they can ~~stand it~~ endure it, yet at the same time they are leading a miserable sort of life.) You know a person can become so accustomed to the use of bad water that he can drink it without much harm resulting. Snake charmers first inoculate themselves more and more with poison until they develope a resistance to snake poison, -- just as a man develops resistance to tobacco. As the snake charmer in some way inoculates himself with virus, so we inoculate ourselves with bad air more and more until we can endure it.

~~At the same time, we are living a miserable sort of life.~~ In the summer time you will hear the frogs croaking in some stagnant pool. Notice the frog and see what kind of life he lives. He comes up to the surface of the water and sticks his nose out of the water; you can see a couple of valves working by which he takes in air; he takes in a mouthful of air and pumps it down into his air-bag. He has no ribs by which to expand his chest; he has simply a big throat and he pumps the air down into that. After taking air, down he goes into the mud again, for he sees you watching him, and he sees that you have a hungry eye for frogs, so he goes down into the mud, and he will remain there for an hour or perhaps half a day. The fact is that a frog can get along with

a very small amount of air. He can get along without any air for awhile. Physiologists have shown by experiments,--by removing the lungs of a frog that he can live a day and a half without air, because he requires such a small quantity of air. Why does he use so little air? For the same reason that a stove with very small activity in capacity of (?) combustion requires but little draft. The locomotive requires a tremendous draft because there is so much air passing into the chimney and so much more combustion and greater heat and activity. It is precisely so with the body of an animal. The frog leads a very slow, sluggish life; he lives on a very low plane,--down in the slime. Now consider the nightingale as he soars in the sky, and continually singing. Examine him and you will find that his lungs reach down to the tips of his toes; his very bones are hollow, hence his whole body is full of air. Nature has given him this arrangement so that he can fly, and also in order to give him greater facility for oxidizing his blood. What a beautiful life is that of the bird. He sails along by the side of the railroad train, keeping right up with it without the least difficulty; he does not seem to make the slightest effort while keeping up with the swiftest railroad train--a train going eighty feet per second--a mile in a minute.

Now the difference in the manner of life of the frog and the bird is the difference in the amount of air that these two individuals breathe. The bird breathes through his big chest,--more than half his body, framed upon his great wishbone; he pumps air out and in his lungs with tremendous velocity,--like the blacksmith's bellows formed for heating a great mass of iron. The frog, on the other hand, is content with swallowing air as we

swallow water, and then he goes down into the mud and remains there for an hour without missing the air. ~~A great amount~~ of air and plenty of oxygen gives bright eyes, rosy cheeks, pure blood, and a clear skin and a clear brain.. This comes from purity of blood resulting from a great amount of oxygen taken in. But a person who lives a life of confinement,--shut up in a room--lives on a level with the frog, if you please. If you wish to live on a higher ~~atmosphere~~ level than the frog you should live as the bird does,--if you wish to live in the higher atmosphere, you must live as the bird lives; but you can live as the frog does by being confined to your rooms and keeping the air out of your houses. (How strange it is that people wish to keep fresh ~~out~~ vitalizing ~~fresh~~ air out of their houses, when it gives bright eyes, rosy cheeks, pure blood, a clear skin and a clear brain! If we had to pay a cent a barrel for it, ~~we should be~~ how greedy we should be of it,--we couldn't get a large enough supply, ~~of it. If the government should put a tax on it, then how we would want it; there would be great competition in the fresh air business; we wouldn't be content with a reasonable supply.~~

A human being requires 3000 ~~feet~~ cubic feet (750 barrels) of pure air every hour, and in order to secure that, we ~~have to~~ must have a great quantity of fresh air rushing through our houses all the time. A house requires two openings for ventilation,--one for the fresh air to come in at, and the other for the foul air to go out at. There is no use in trying to ventilate through one large hole; this will not do, unless the whole window is out. ~~If you want~~ In order to have a proper supply of air, ~~you~~ then must ~~have~~ be two openings in ~~your house~~ the room, so as to have a current ~~going in~~ coming in and a cur-

rent going out.) We might stop here and make a drawing on the blackboard of an arrangement of this kind. (These openings must be so arranged as to avoid drafts. ~~[illegible]~~) The air which comes in should be heated, and then it goes ~~straight~~ direct to the ceiling, and the impure air ~~is~~ accumulates at the floor,--not because this air is carbonized, for carbonized air is pure air--but because it is so mixed with air from the lungs that has mingled with the heated air which goes to the top, and then gradually cools and settles to the floor; for when fresh air comes into a room it is heated and goes to the top, ~~as I have said,~~ and then it gradually cools and settles more and more until it finally reaches the floor, in which there should be an opening to take it out. It should be taken out at the farthest point where it falls; and it falls most at the outer side of the room; so the opening should be at the outer side of the room. A perfectly ventilated room ~~would be a room~~ one in which the fresh air ~~should~~ comes up in the center of the room, and the foul air is taken out at the outside of the room.) There is a double advantage in taking the air out at the outer side of the room; one is, it takes it out as it falls; and the other is, it takes it out before it passes over the floor, and not take out the warm air otherwise every one who sits between the outer wall of the room and the opening in the center will have their feet cold, because if there were no opening at the outer wall there would be a current of cold air passing over the floor. Do you observe this floor to be cold? Have any of you remarked about this floor in the parlor being cold, when the doors are closed. It might be cold when the doors are open and the cold air rushing in; but if the doors are

kept closed the room will be warm because the foul air is taken out under the windows where it falls, ther being registers under every single window. We have here a supply of 5000 cubic feet per hour, or about 75 cubic feet per minute for each person; that is enough to give us an ample supply of ~~air~~ pure air. We have ducts leading up through the roof of this building equivalent to a space 10 feet wide by 20 feet long; that is, we have 200 square feet of ducts. We have an aggregate of ducts amounting to a sectional area of 200 square feet or a space 20 feet long by 10 feet wide, and there is a strong draft going up through these openings all the time. We have two large ~~openings~~ spaces, each of which is 4 feet wide and 28 feet long into which the fresh air is rushing all the time.

¶ Now in our homes we neglect to supply ourselves with an abundance of this fresh air. We introduce somebody's patent furnace which is guaranteed to heat your house with less fuel than anybody else's furnace will do. It is generally put up in a house in this way: (Diagram.). They have a trick like this,--suppose this is a part of the house; here is the front hall, and here is one of the living rooms,--the parlor, or dining-room, we will say--and here is the basement. Now your furnace is put down here. Now the man who puts in the furnace ought to bring into it a pipe from out doors; the pipe should go out doors some distance from the ground, and here the fresh air should come in and pass up after being heated in the furnace; passing around the hot box the air should be heated and pass into the rooms above. But the man who puts in the furnace wants to supply heat with the least possible amount of fuel,--with less fuel than his opponents can do;

so he puts in a damper or flue to be shut up, and a register opening into the front hall. This register is always open, but the man shuts up this damper, leaving the register open. The consequence is that the air comes in through the front door into the hall and comes into the rooms and is breathed, and then it pass out back again as it came in, going round in a circle. Instead of having the air come in by ventilating ducts and pass out through registers under the windows, you are simply living in this stream of air that comes in through the hall doors and that is heated and breathed and that circles round and round, organizing a vicious circle by which the air becomes more and more impure. This requires but little fuel, but when the air outside is zero a temperature of 60" or 70" must be added...

A large share of ~~furnaces~~ the furnaces put in are put in in just that way,--the register being put in in the hall, the fresh air coming in through the front door--but suppose the front door is closed, as it often is, --then how are you going to get your air?

To make this subject a little more graphic, I am going to make you a few figures, and you will see how important it is to ventilate properly. Some years ago I read something in "Hall's Journal of Health,"--I mention this journal so as to warn people against it. Hall's Journal of Health is anything but a health journal. Dr. Hall is now dead, but when he was living he recommended tea and coffee, and the wearing of corsets "so as to develop the upper part of the lungs. Dr. Hall denounces us as "ventilation cranks"--I am sure he meant me, because I exchanged journals with him, and so he must have read my views upon this subject. He told a good

story on "the ventilation crank," substantially as follows :
A certain man was suffering from asthma (or supposed he was) which was so bad one night that he thought he wasn't going to take another breath. He begged his friend who was with him to open the window. His friend, after making several efforts, found what he supposed to be the window, but for some reason the window would not come open; it seemed to stick fast. The sick man cried out, "Break out a light of glass." So the man protected his hand and broke out a light of glass; the sick man immediately felt better, and thought if his friend would break out another pane, it would be suffid ent. His friend broke out another pane and he was completely relieved, and slept till morning and found that his friend had broken into the glass door of a bookcase. The air which had so relieved him was simply the foul and musty air of the bookcase. The doctor told this story to show how silly it was for people to "live in a house with a hurricane blowing through it ." he says there is air enough for you in the smallest bedroom you can find--in an 8 x 10 room. But he says day air is the best. He recommended people to open their doors and windows during the day time before the pernicious night air arrives, and At night they should shut their doors and windows until morning so as not to get any of the pernicious night air. He figured it in this way: Take a bedroom 8 x 10 on the floor, and 10 feet hight; that would be 800 cubic feet. Now one-fifth of this air is oxygen, that is 160 cubic feet of oxygen. In one cubit foot of oxygen there is 1728 inches of oxygen. We require one cubic inch of oxygen for each breath Now suppose we breathe 17 times a minute,—we would have enough

air in one cubic foot to breathe 100 times provided it were all oxygen, but there is only one-fifth of it oxygen; so dividing 100 by five gives us 20; so we thus have enough air for 20 minutes if we breathe seventeen times in twenty minutes,--we have enough oxygen in one cubic foot of air to last us twenty minutes. Now let us see how long 800 cubic feet of air would last,--just twenty times 800, or 16000 minutes, or 266 hours. Now suppose we spend 8 hours in sleep (and that is long enough), that will be 33 nights. So according to Dr. Hall's theory, when a tight room 8 x 10 is filled with air, there is enough oxygen to last a person a month of nights, and three nights to spare. So there is more than enough oxygen ~~for~~ in such a room to last two persons two weeks of nights. So, "What is the use," Dr. Hall says, "after we find this to be the fact, of sleeping in a bedroom with a hurricane blowing through it." Now these figures are all right and proper, but there is one mistake in the theory upon which they are based, and that is this: We cannot use all the oxygen in the air and we do not ventilate for the purpose of getting more air, but ~~there is air enough, but the reason we ventilate is~~ for the purpose of ~~carrying off the~~ exchanging the air that is spoiled by breathing for pure air. We will illustrate by a soiled garment. We will say the garment is just big enough to fold it into a common wooden pail (using a very simple illustration). Place this article in a common wooden pail. Now fill another wooden pail full of water,--the soiled garment just filling the other pail. Now will that one pailful of water cleanse that garment? Suppose there is just as much volume of water used as there is bulk in this garment? Will that water

cleanse that garment ? You will have to use a great many pails of water to cleanse the garment, because the process is simply one of diluting the dirt more and more; by repeated applications of water there is less and less dirt adherent to the garment until it is finally cleansed. Now when we breathe a breath of air out into the air in a room, it cantaminates it,--and how much does it contaminate it ? Dr. Parkes and Dr.-- Smith, Dr.-- Smith and others have found that every breath of air we breathe, while it consumes but one cubic inch of oxygen, it spoils three cubic feet of air, rendering it unfit to breathe. As one soiled garment might render impure a whole barrel full of water , so one single breath of air spoils three cubic feet of air. And we want pure air in place of this spoiled air.

Now let us see what the difference would be between Dr. Hall's figures and the true figures would be. Dr. Hall supposes one cubic inch of oxygen at each breath to be sufficient, but from what has been stated, we require for each breath three cubic of air,--in other words we require three times 1728 cubic inches of air at every breath; so that practically we require five thousand cubic inches of air instead of one cubic inch of oxygen. Instead of using up one cubic inch of oxygen at every breath we spoil five thousand cubic inches of air at every breath. We require five cubic inches of air at every breath according to Dr. Hall's theory, but it appears that we require five thousand,--in other words, we require one thousand times as much air for breathing purposes as Dr. Hall supposes.

These statements are not based upon theories but actual ex-

periments made by Dr. Smith, Dr. Parkes, Surgeon General in the British army. (We need a liberal supply of the lifegiving oxygen contained in pure air. How strange it is that we barricade ourselves against this pure air! How strange that we should be as fearful of air as if it were poison! There is such a sort of airophobia among us that in recent years we are making our houses more and more tight. When we were young we had air enough, because at home there was a great fireplace with its enormous throat that was all the time carrying out a hurricane of air, and other air all the while pouring in through the doors and windows, ~~and~~ the cracks, chinks, and even the keyholes. ~~When I was down south~~ while travelling ~~on the cars~~ through Northern Alabama I noticed some well-ventilated houses near the railroad; I noticed that they had no windows, or nothing but board shutters. ~~but I saw several pairs of eyes looking through the cracks~~ Such houses ~~had~~ afforded plenty of ~~room~~ opportunity for ventilation. Our houses, on the contrary, are made air-tight, or built as nearly so as possible, and then made air-tight by painting. Ordinary brick and plaster walls admit air, so that the house is said to "breathe;" an ordinary house will admit enough air to supply two or three persons. ~~Nature will ventilate a house to some extent,--so that~~ The air will come through the ceiling, if it has the ordinary plastered ceiling. ~~By the way~~ you have probably often noticed when in such a house that on looking up to the ceiling, you can ~~see~~ could where the laths are--or rather, where they are not. The circulation of air between the lath has left the dirt on the plaster; that is the reason you can see the spaces between the laths; so the house breathes, as you and I do. Nature, as ~~I have said~~ already stated, will ventilate a house for

two or three persons provided it is not air-tight; but when we paint a house on the outside and kalsomine it within, ~~the house is~~ it becomes impervious, and we must have artificial ventilation.

It is most remarkable that we are so afraid of fresh air that we barricade ourselves against it while the great billows of air on the outside are rolling and fairly roaring in a hurricane voice,--roaring and shrieking and howling and begging to come in--but we keep it out. ~~If we had to pay for it, as I have remarked, we would be sure to get in a good supply. We don't~~ Many people do not seem to be as well posted on the truths of physiology as a certain schoolboy, who was asked ~~He was~~ to write a composition on the subject of ~~given him~~ by his teacher ~~was breath--the teacher asked him to~~ write a ~~composition upon~~ "Respiration" ~~so He~~ called it a ~~composition~~ on "Breath." He said : "Breath is made of air. If it wasn't for breath, we couldn't live a week. The lungs and breath keep life goin' through the nose while we sleep. The breath contains a poison poisoner than mad dogs, called carbonicide. Boys' breath is very poison; hence boys ought to go out of doors when they want to breathe. Down in Calcutta once there was some carbonicide got into a black hole and killed 420 men before morning. Girls can't breathe much because their corsets squeeze their diagram. If I was a girl, I would rather be a boy so I could run and holler and have a big diagram." This boy ~~you see~~ had mastered the principles of physiology ~~pretty well~~ to a remarkable degree. He knew there was something poison in the breath; it is not the "carbonicide", as he called it, or the carbonic acid, but it is another poison which

is combined with carbonic acid; hence we need fresh air to take away this poison, not to supply oxygen to breathe but to carry off the poison by which we contaminate the air in breathing. And this boy recognized the fact that we need room for breathing,-- that we cannot get a good supply of air unless our breathing ~~bellows~~ apparatus ~~have~~ has room to act.) How absurd it is to see how many persons try to breathe when the breathing apparatus is confined. I will call your attention briefly to the formation of the chest. (Diagram.) Here is the sternum. Now these ribs are attached to the back-bone and come around here (I mustn't get too many of them; a lady asked me the other day how many ribs Adam had, and whether he had eleven or twelve, as he was supposed to have lost one). These seven ribs are attached to the sternum; three more are attached to the last of the seven ribs, and two more are not attached here at all. As a consequence of this arrangement, the upper part of the chest is rigid, as it is surrounded by this bony circle. The rest of the ribs are flexible; they are rendered so by these muscles by which they are attached. This is a perfect arrangement of nature for expanding this portion of the chest; you can readily see that the chest can swell out down here and then fall together again, but it cannot do that in the upper part, because these seven ribs, being attached to the backbone and the sternum make the bony circle complete. If it were not for the flexibility of the lower ribs a woman could not compress her waist,--as they often do. Men sometimes compress their waists, but not so often as women. This part of the body can be compress-

ed, because, as I have said, all the ribs are not completely attached and rigid. (Nature has constructed the body ~~in this way~~ so that there must be an expansion of the lower part of the chest; in other words, the chest is ~~constructed~~ very much like a pair of bellows,-there are handles; and there are certain muscles which take hold of the bellows and draw out the handles. When these handles come together, the air is forced out through the trachea. Thus we breathe out and in.

Now to undertake to breathe with tight clothing about this part of the body, with clothing that does not allow of the free expansion of this part of the body--to attempt to breathe in that way is like getting up on some cold, frosty morning and tying up the handles of the bellows before undertaking to build the fire, and then seizing the bellows by the belly ~~of the instrument~~ and wrenching it out and in to get a breath of air against the coals ~~so as to make them blaze~~.) That is exactly what women do. Everybody knows that women wear their clothing too tight. We can demonstrate that fact very easily. When a woman faints in a crowd, or in a church, for instance, some one will whisper, "Cut her corset strings!" Now you never heard anybody say, when a man fainted, "Rip up his vest!" (Laughter.) People don't suspect men of wearing their clothing too tight; we can't induce a man to do so; but everybody knows that women do it,--it is an open secret,-that ~~nearly~~ all women (I can't exactly say all women; I can't say that of all women here, but I mean to say, all women in some places), almost every woman wears her clothing too tight, hence every one knows that if a woman faints away, it is because she

needs breath. The little boy knew that "their corsets squeeze their diagram" and that those things should be taken out of the way.

~~There are many things which I might mention, but I wish particularly to call your attention to the evil which deteriorates the people in every civilized country.~~ This great evil of air starvation is something that should be brought to the attention of the people in every civilized country. It results, in cities and towns, in the production of a poor, weakened, stunted population. This is not the case in the country, because the children there have an opportunity to get plenty of fresh air, and hence they have bright eyes, rosy cheeks and a vigorous growth; They walk to school and have an abundance of vigorous outdoor exercise; while city boys and girls go to school in the street-car, and ~~they~~ live, when at home, in furnace-heated houses, or else ~~they~~ live in some poor, ~~miserable~~ unventilated tenement-house; and the consequence is that city boys and girls have pale faces, languid eyes and stunted bodies, and the majority of them are growing up to be puny, weakly men and women, who are chronic invalids from the time they ~~were~~ are in their teens.

We need to have a crusade preached against impure air more than against any other thing. ~~The people need the gospel of health.~~ We need ~~people~~ some one to go out into every home and preach the gospel of health. As a race, We are going down; we are sinking. ~~We are not "getting better," as people imagine,--and~~ we are not living longer than formerly, as is supposed by some. The fact that we live longer on an average than people formerly did ~~used to do amounts to nothing for this~~ is simply for the reason that more epidemics are averted ~~kept away~~ than

by the vigilance of the health officers.



formerly, -it is because the cholera is quarantined--the health officer says, "You can't come in here, Mr. Cholera; and ships with cholera cases on board must stay out until the period of incubation is past. It is the vigilance of the officers that keeps away these great epidemics, and this has the effect of prolonging the average length of life. The effect of this sanitary vigilance has the effect of keep alive a great ~~mass~~ of weakly sickly people. There is a phrase which the evolutionists have made us familiar with, which has a great deal of truth in it,--I do not believe in all their conclusions, but the fact is exceedingly interesting, and one which they have discovered, and that is, that there is a principle in the world which secures "the survival of the fittest." ~~the fittest survives, and the unfittest goes to the wall, in the natural order of things.~~ Now the plagues, cholera, black death, etc., were great pestilences that used to prevail throughout the world, and were means by which the unfittest were weeded out; that was one of nature's methods of weeding out the unfittest, because when a great epidemic came around, the dyspeptics, the drunkards, the weak and the feeble people--those having but little vital energy--went down. People have dyspepsia before they have the cholera. People with good digestion can swallow cholera germs with impunity, for ~~his~~ their stomachs will destroy ~~get~~ them, and will digest them. But the man whose stomach becomes diseased so that he does not secrete this disinfecting gastric juice,--when this man swallows cholera germs they are not destroyed, they developed, and he is overwhelmed with them and falls a prey to cholera. The gastric juice will digest anything that ~~is alive~~

is alive Some years ago a physiologist arranged a frog with his hind legs in a dog's stomach and in a few hours they were found eaten off by the gastric juice of the dog's stomach. He also made a similar experiment with a rabbit, arranging it so that ~~its~~ one of its ears was exposed to the gastric juice in ~~the~~ a dog's stomach, and in a short time the ear was eaten off. The gastric juice when in a healthy state is able to digest live things. People sometimes complain of having live animals in their stomachs, but I have never known of live animals in the stomach, except oysters which go into the stomach alive and kicking. But nobody has lizards ~~in their stomachs~~ and such things in their stomachs, because they could not live in the stomach,-- the gastric juice would eat them up. The same thing is true of any ~~and all~~ kinds of ~~germs~~ germ. So long as you are healthy you are safe against any kind of germ. When Prof. Koch brought out his germ theory, a rival doctor cast ridicule upon his theories and brought them into doubt and disrepute by swallowing half a pint of beef tea that was swarming with cholera germs, and it didn't do him any harm. This was because his stomach was sound enough to digest them, otherwise he would have died of them.

(Now, ~~as I have remarked,~~ the effect of this sanitary vigilance in keeping away the cholera and other great epidemics is to keep alive ~~the sickly~~ those classes of people who have but little vital energy, and thus the average length of human life is increased. ~~But the worst of it is, that~~ These feeble people are not only kept alive, but they have feeble children to follow them, and these children have worse stomachs, livers, lungs, etc. ~~and bodies~~ that their parents had;

so ~~they are~~ getting ~~worse, getting weaker~~ and deteriorating. It is ~~claimed~~ a proverb that "We are ~~getting~~ growing weaker and wiser." We are certainly getting weaker; but are we getting wiser ?

Now it is only by recognizing the fact that this deteriorating influence is at work ~~and that the human race is deteriorating~~ and that deliverance from it ~~this deteriorating tendency~~ must come from the cultivation of health ~~by each~~ individually, that ~~a remedy for~~ this state of things can be ~~found~~ remedied. It cannot be brought about by public health bodies by quarantine bodies, by State Boards of Health, etc. That won't answer the purpose. There must be attention given to individual health. We must learn how to breathe, and how to ventilate our houses, also how to dress, how to eat, and how to relate ourselves in every way to the laws of health; we must learn to recognize these laws of health as being the laws of God, and as being binding upon us; that it is as really our duty to observe them, as to observe the Ten Commandments; that they are a part of God's great Decalogue.

# PHYSICAL BASIS OF FAITH.

A lecture delivered before The Young Men's Improvement Society, Jan. 8, 1897, by

J. H. Kellogg, M. D.

---oOo---

My friends, I am very happy to meet you here to-night. I am happy to know there is such a society as this in Battle Creek. I am glad to know that your society is not devoted simply to the ~~self-~~ improvement of its members--to self-improvement--but to the good of others as well, and that you seek to employ the best means of self-improvement in seeking to help others. Not long ago I was reading, in the writings of a man whose words we all respect, the thought that the only way in which that transformation of character which is so essential to all of us, can ever take place, is by an effort on our part to assist others,--to help others to secure for themselves that transformation of character which we ourselves desire; it is only in that way that we ourselves can ever hope to become transformed.

The speaker who has just addressed you remarked that the scientific world in general see very little room for faith. I think that was entirely true twenty years ago, and perhaps is, to a very large extent true at the present time,--and yet I think it must be said that among scientists, or professed scientists, those who believe that science affords no foundation for faith but rather fosters a spirit of skepticism and infidelity and disbelief in God must be regarded as superficial scientists. I was reading, not very long ago in a New York journal ( a religious journal) an art-

icle upon the prevailing opinion of the world as regards faith, and the writer (Hon. Mr. Mabie), remarked that the infidels were all dead;— that the skeptics were all dead. I wish this were true, but it certainly is not true. However, it is true that science as presented at the present time by those most eminent in scientific research (I don't include myself in that class, notwithstanding the remarks of the speaker, for I have very little time for climbing up the rounds of the ladder of science; my time is devoted to practical things; what little knowledge of science I have is borrowed from others),--as I remarked, those who are most eminent in scientific research, who have had the best opportunity of becoming familiar with the latest thought,--with the latest data of science, with the most recent researches and the most recent conclusions in scientific research--these men unhesitatingly state that they find no room for infidelity,--no basis for infidelity in science.

Mr. Herbert Spencer has expressed this fact most clearly in his little work on "Ethics" which contains much that is not exactly in harmony with what we understand to be religion,--Mr. Spencer is not a church member; he is not a believer in any creed that I know of, but he makes the statement that after we have most thoroughly investigated all the natural phenomena, and accounted for everything which we can account for, we are finally compelled to admit that there is, behind and beneath ~~all it~~ all, an unknown and unknowable intelligence unceasingly at work.--I hope you will all get the benefit of these remarks of Mr. Spencer,--he says that after we have explained all natural phenomena so far as it is possible to do it, we are obliged to admit that behind all and beneath all

there is unceasingly at work an unknown and unknowable intelligence. Mr. Spencer recognized an intelligence,--an infinite intelligence--every where and all the time at work, as the real foundation of all natural phenomena. The difference between Mr. Spencer and the Christian is, that Mr. Spencer thinks this intelligence is an "unknown and unknowable intelligence, while to the Christian this intelligence,--this infinite, ever-working intelligence IS known. This intelligence is unknown to Mr. Spencer because he lacks that personal acquaintance with God which comes from a personal experience of living faith. He has a faith but it is a kind of dormant faith,--a cold, scientific faith--and he had never undertaken to bring it into active practical use. He believes because he is compelled to believe, but he has never undertaken to make a practical use of his faith; he has never undertaken to walk out on one of the promises of God, and so he has never come, so to speak, in personal touch with God, and has not had that personal acquaintance which the Christian has which enables him to say that this God which once to him was unknown, is known. The man who lives a true Christian life and a life of faith gets an acquaintance with this intelligence,--God is no longer "an unknown intelligence" to him.

I purpose this evening to present to you in a very brief, and of necessity, a very imperfect way, some of the evidences afforded by the scientific world,--afforded by the phenomena of nature-that there is a God, and that this God is an ever present God, and an ever-working God--a God that is always working in us and in everything about us, and working intelligently, working kindly, working thoughtfully, and that this same God that is working ~~about~~

in the world about us is ready to work in us and ready to do for us whatever we need to have done for us .

Now the justification which we have for looking into nature for God we find taught abundantly in the Bible. In the 19th Psalm we read : "The heavens declare the glory of God, and the firmament showeth his handywork." —Job said, "Oh that I knew where I might find him! That I might come even to his seat." We have evidence that Job himself knew much of nature,--he knew perhaps moreof it than any of us know; he had certainly a considerable knowledge of nature of which he had been a very close observer ~~observer;~~ he knew something of astronomy, and he makes this exclamation: "Oh that I knew where I might find him; that I might come even to his seat !".. Now the Psalmist says "The heavens declare the glory of ~~the Lord~~ God, and the firmament showeth his handywork, --" and more than that: "Day unto day uttereth speech and night unto night sheweth knowledge. There is no speech nor language where their voice is not heard. Their line is gone out through all the earth,and their words to the end of the world. In them hath he set a tabernacle for the sun, which is as a bridegroom coming out of his chamber, and rejoiceth as a strong man to run a race. His going forth is from the end of the heaven and his circuit unto the ends of it; and there is nothing hid from the heat thereof." So we see that the existence of God is made plain by nature because even the heavens declare him. "Day unto day uttereth speech and night unto night sheweth knowledge." You go out some clear night and study the starry heavens and you see the wonderful power of God displayed, but you don't appreciate it until you come to study this Psalm.

We look at the sun, but we do not really appreciate what the sun is until we come to study it a little. When we appreciate the fact that the sun is sending out light at the rate of about 150,000 Drummond lights, each one as big as the apparent surface of the sun itself--suppose the sun is apparently a foot in diameter--then 150,000 Drummond lights wouldn't any more than equal the light of the sun ... And the light of our sun is very small compared with the light of other suns. You look out into space, and every bright star you see is a sun; each one of these bright stars is a sun having satellites revolving around it, although its light is too dim to reach us. There is a bright star in the heavens known as Sirius,- the brightest star we see in the heavens except the sun, moon and planets. This bright star gives out one hundred times as much light as our sun , and yet it is so far away that to us it is a mere point in the heavens. It is so far away that its distance is reckoned to be more than eighty millions of millions of miles away from the earth. This is too much for us to comprehend. It is also reckoned that this star is so far away that the light travelling from ~~this star~~ it to us requires fourteen years to reach us. So when we see the light of that star, it is not its present light that we see, but the light that shone forth from it fourteen years ago, and which has been travelling all that fourteen years and which has just reached us; the light of that star which we now see, so far as we can estimate it, came into existence fourteen years ago; light requires time to travel. The very nearest of all these "fixed stars" which appear to be circulating about us requires three and one-

years for its light to reach us. So that the light of all the stars might have been blotted out three years ago and still we would see their light shining just the same ; we should not know that the stars had been blotted out, because the light that shone out from them three and a half years ago continues to shine. It has been shown that light requires a certain definite time to pass from one point to another. It has also been shown by delicate instruments devised within the last few years what time it requires light to pass through short distances,--the distance of a few miles.

Now the sun does not afford light simply as a thing which is convenient for us to use, but this light has a marvelous energy; it is the real source of all the energy in the world. Suppose we try to comprehend what the light of the sun is, and to consider what an enormous amount of heat comes from it,--so great that if you concentrate its rays upon a half-inch surface in the center of a burning-glass, the heat is sufficient to ignite combustible material. You can take a piece of ice and whittle it into the shape of a sphere and hold it over some combustible material, and the heat of the sun's rays focused upon a half-inch surface in the center of this piece of ice will ignite the combustible material. So the amount of heat from the rays of the sun when concentrated in this manner is enough to cause combustion.

Light and heat coming from the sun is the source of all energy and life upon the earth. Our own bodies get their heat originally from the sun. The sun shines upon the plants which spread out their leaves. The ~~area~~ foliage of the vegetative earth is reckoned

to be equal to about 35,000,000 square miles of leaves; these all receive their light from the sun, and these rays are each engaged in chemical activities upon the plants and in building them up. The gases decompose the vegetable matter and nourishing material is brought to the roots of the plant or tree to form the sap of the tree; the materials are all rearranged and the sap is brought up into the tree under the heat of the sun and solidified into the tree. When we find, in various partsof the earth great masses of coal we know that the sunlight has been buried with the trees that have been converted into coal. Now we bring that coal out, put it in the furnace and burn it, and by making an electric light apparatus we can make the same sunlight shine out again,--that very same light which was buried hundreds of years ago in fields of coal is shining out to-day. From the same source of heat and energy that shone forth hundreds of years ago--the light which was buried in coal-fields centuries ago is now converted into gas and the gas burning again the light shines out again, and this light has precisely the same properties as the sunlight that shone hundreds of years ago, as is shown by the fact that plants and trees grow under this light; vegetables grow under it; leaves get their coloring from it, as from sunlight; fruits ripen by it; and by various experiments we know that the brilliant gaslight possesses the same properties as the sunlight.

Now from vegetation animals get their food; their blood is made and their tissues are built up by it. And our bodies and brains also are made of what we eat, and our very thoughts are performed by what we eat, so that all our activities are, in a certain sense derived from the sun. And this great central body keeps all the routine of life in operation upon the earth. Plants

and animals die and return to dust; the dust is again organized into animals and plants, and then to dust again, and all this routine is taking place and all the activities of life are kept alive by the sun. The same is true with regard to all the objets in nature; we do not comprehend them until we come to study them.

What a wonderful arrangement we have,--the sun to give light and heat by day, and the moon by night, but shining with a weakened and borrowed light. It would require five thousand moons to give a light equal to one sun. If the whole sky were covered with moons there would be only about 240,000 of them, and that would be only enough to make a light equal to that of the sun. Why the light and heat of the moon is so little that if an ordinary tallow candle when lighted is placed three feet away the heat of the candle is fifteen times that of the moon; so there is an opportunity for rest from the more powerful influence of the sun for aimals and plants during the night,--and the same is true of all living things; they need this rest from the stimulating influence of the sun. Then when daylight comes the quickening activities of the sun begin again.

Now we have, in these natural things about us, according to the Scriptures that whih is continually teaching us something about God. In Romans, first chapter, 20th verse we read, "For the invisible things of him from the creation of the world are clearly seen , being understood by the things that are made, even his eternal power and Godhead, so that they are without excuse." ~~Here~~ God shows us ~~that~~ invisible things ~~are taught~~ by things which are made; so that through the things which we can see

we can learn something of God.

Twenty years ago there was a very general disposition among scientific men to maintain that there is no God, and that all the things that we see about us originated themselves. There was, in England, Prof. Bastian, who was an advocate of spontaneous combustion. He claimed that all life began by some sort of electric shock that went through the water; he claimed that the molecules of water could be orgainzed into life under certain conditions, and he experimented upon this subject. He boiled some water in a flask and put in some chemical substance, and he put the flask in an ordinary room for a few days, and at the end of a week or two it was found to be swarming with living things; it was full of life. The experiment was made many times with a like result, and for a time it was believed by Prof. Haeckel and others to the development of spontaneous life; that life could come from no life,--that it came from spontaneoud ~~combustion~~ and development. That was not a new idea, for Pliny and the old naturalists all believed that things would originate spontaneously. Pliny believed that rats, mice, etc. originated spontaneously,--and he gives a recipe for making rats--get together a lot of old rags, a few kernels of corn, a few bits of cheese, bread, etc., and at the end of a few weeks you will have rats and mice; that they originated spontaneously; he thought this was the case because he ~~didn't~~ see them come.. And so scientists anciently supposed that germs originated spontaneously, because they didn't see them come. But Prof. Pasteur, the eminent French chemist made a more thorough investigation of this subject. He showed that if the water in

a flask were boiled at a temperature of 240° no living form would appear in it. So that all that Prof. Bastian's theory showed was that there were some molds or spores in the water that were so resistant or tough that they were able to resist the temperature of boiling water, 212 °, and it required a higher temperature to kill them. Prof . Pasteur showed that when water was boiled at a sufficiently high temperature no life was found in the water,--and every housewife demonstrates the same thing when putting up fruit. She boils her fruit at a temperature sufficiently high to kill all the germs, puts the fruit into cans and seals them up, and there is not a living thing in the fruit; if there were, decomposition would take place, and fermentation, and the cans would burst. Prof. Tyndal made some different experiments upon the same subject. He showed that if a glass box or other receptacle were filled with air, exposed to the rays of the sun and kept quiet for a time that every living thing in the box would be killed and fall to the ground, and that the air would not be contaminated; he showed that if a glass box were shut up and left in this way for a week, no sunbeam could pass through it; this proved that it was perfectly pure,--there was nothing there to reflect a sunbeam--for the sunbeam depends for its existence upon impure air, minute specks, etc,--when the rays of light become absolutely pure, then the rays of light cannot be seen through them--no sunbeam is visible. Prof. Pasteur demonstrated beyond all possibility of doubt that there is no such thing as spontaneous generation, and has laid the foundation or basis for the theory that all life comes from some previously existing life; that there is no such thing as life without some previous life, and that there is no such thing as life originating itself; that de-

life depends absolutely upon previous life for its existence, and the Bible tells us that if we follow that back far enough we shall that all life depends upon God.

Now we have about us in the world of nature numberless illustrations of this power that is constantly in operation,--not only the power that created in the first place, but the power that is upholding all things. Let me call your attention to Acts 14 : 17. — "Nevertheless he left not himself without witness, in that he did good and gave us rain from heaven and fruitful seasons, filling our hearts with food and gladness." Isn't that true,--that God gives us the rain. When I used to read that, I read it as being a sort of figurative expression,--that is, that he allowed the rain to come. I remember a time when I supposed that all things that are occurring about us in the natural world are occurring in obedience to law, and that law was supreme; I supposed that "nature" did this and that,--it is common hear people talk in that way--of "nature's " doing this and that; that it is by a law of nature that the sun shines; that it is a law of nature that keeps the world going around the sun in its orbit, etc. I used to suppose that that was all that it was necessary to say in explanation of these phenomena,--that it was all done in obedience to law; that there were forces in operation that produced these results; that these forces existed from all eternity, and, consequently they were not dependent upon God; that God was not superior to nature, but that he must be a part of nature. Now I didn't get any good from that sort of speculation. The more I followed that line of thought the less faith I had, the less I could see ~~for~~ the necessity for prayer, and the less I could see

the necessity of leading a religious life. By and by the Lord sent me some information that was of very great help to me, and I have been following a different line of thought in regard to these things for the last fourteen or fifteen years, and the more I think in that line, the more thoroughly I am inclined to believe that what we call "nature" is God himself, and what we call "law" is God working in nature; that the law of nature is the order and harmony of God in his acts. God is infinite in this, just as he is infinite in mercy, in power, and in every other way. Some time ago, I was talking with a doctor, who, I suppose must have been in very much the same state of mind that I had been. We were talking about the Bible. He wanted to join our people as a medical missionary and I asked him a few questions,--said I "You believe the Bible, don't you?" "Oh, yes," said he, "I --believe the Bible." Said I, "How do you believe the Bible? Do you believe the whole of it? Do you believe the Bible as a whole to be an inspired book, or do you believe it as you believe any other book,--as a history, etc.?" "Oh, well," said he, "there are some things in the Bible that I hardly know about--I don't know about those miracles, --for instance the miracle of healing the blind man: the Bible says that Christ mixed up a little clay and applied it to the man's eyes and he could see. Now" said he, "if I could know that there was something in that clay that was good for blind eyes, I would believe the story of the healing, otherwise I could hardly credit it." Then said I, " Let us look into this a little: You say that if you could be assured that the clay had some medicinal qualities which were good for the eyes of the man, that you would think the story of the miracle might be credible; why do you say that ?" "Because the medicine

contained in the clay might heal the man's eyes. " "Why would it cure his eyes?" "Because it might be astringent, for instance, and you know we put astringents on the eyes when congested and it relieves the congestion; so that the vessels will contract but he might not be able to see , and yet other medicinal qualities contained in the clay might finish the work and might restore his sight." "But, " I said, "that does not explain it: Explain to me how medicine can make the congested vessels contract and cure the eyes." "Oh," he said, "you know how it is,-- all astringents make the ~~conge~~ bloodvessels contract--" "Yes," I said, "I know it is a fact,--I know it is true--but I don't know WHY it is true ." "O," he said, "It is because the astringent acts upon the nerves and they communicate with the nerve centers and they contract and thus they act upon the bloodvessels and cause them to contract." "But," said I, "how do the nerves know when to contract and what to do when the medicine is brought to them, and how do the nerves communicate with the nerve-centers, and how do the nerves make the bloodvessels know what to do ?" "Oh," said he, " we don't understand the ultimate mysteries of things,--we don't any of us know that. " "Yes," I said, " we know they are facts but we cannot explain the simplest things--" I then dropped a book and asked him to explain why the book fell--said I "Why does it go down?" He said it was the law of gravitation that caused it to fall. "Well, what is gravitation? ""Why it is the power that attracts avery particle of matter in the universe to every other particle of matter in the universe." "But how does one particle of matter know that there is another particle of matter to attract? If this book is attracted by the particles of matter ~~under~~ in the table how does it know there is any table there,-- it has no [illegible]

it has no eyes; it can't see; and it has no brain; it cannot think,--how does it know there is any table there?" "Oh," said he "you can't explain that." So you can't; it is simply something that happens; when you come to ask for an explanation for these things, you can't find it. When a boy hits a ball with a bat, force travels from his hand to the bat and from the bat to the ball and the ball flies off through space, he can tell what happens, but he cannot explain how energy got from the boy's arm into the bat, nor how the energy got from the bat into the ball. Nobody can explain that; it is one of those things that are inexplicable; we only see it happen,--we only know that it happened under certain conditions, and that such a thing might happen under certain conditions--but we don't know about the ultimate cause of things; we don't know how to explain them if we leave God out of the question.

Take, for instance, this law of gravitation,--see what a wonderful thing it is--every particle of matter in the universe attracting every other particle of matter in the universe. Here is this sun, Sirius, whose light is fourteen years away from us--so far away that if it were blotted out fourteen years ago we would not have found it out until now,--and yet if that planet, or if a planet were born so far out in the great realm of space that it would require twenty thousand years for its light to reach us, this earth would feel the pull of that new planet the very instant it was born, because this law of gravitation acts throughout the whole universe instantly. Light travels at the rate of 180,000 miles a second--seven times around the earth in a second of time--twenty-one times around the earth in three seconds,--and yet that same light is a very slow coach compared with gravitation, for, as I have said, gravitation acts throughout the uni-

verse instantly,--and how great is the universe? Here, we will say is a sun so far away that twenty thousand years would be occupied by its light in travelling to the earth; then there is another sun as far away from that sun as that sun is from us, and another sun as much farther away, and so we might ~~might~~ in thought go on and on and on, till we had passed millions of such suns,--it makes one giddy--it makes one reel at the thought. If you should go out and look at the sky on some clear night and try to count the stars, you might count 6000 visible stars,--you might count that number if you counted long enough--but when Herschel turned his great telescope toward the sky he saw something so marvelous that he fainted away upon the spot. He turned his telescope towards what he supposed were clouds in the sky, and these clouds turned out to be stars; they were so thick that they had appeared like one white mass or spot and when they turned out to be stars as he saw them through his telescope he instantly fainted away, because it opened up to him the thought that these stars were solar systems,--that there are other systems of stars away out in the universe. His telescope revealed twenty million stars, but telescopes developed in later times bring into view an immensely greater number of stars, each new ~~new~~ telescope opening up another vast area in the starry heavens. and so if he were placed on the verge of the visible heavens and had other telescopes, the astronomer could look beyond and see boundless heavens beyond those that we see with our telescopes.here upon this earth. So we might go on to the utmost limits of imagination, and millions and millions of miles beyond that there may be a little atom no bigger than a speck of dust,and

yet that atom feels every little movement of every speck of dust on this earth and in every other corner of the universe; the whole universe is instantly thrilled with the movements of every part of of it by this force that binds them all together. We call this force gravitation and it cannot be anything else than God because it is omnipresent; it acts everywhere, in all space and without any loss of time.

One of the most wonderful illustrations of the power of God which we can see, is the great astronomical clock, as we might call it,--here is our earth going round the sun while this great clock is keeping such perfect time that the earth while turning over on its axis daily and traveling in its yearly circuit, and yet the most careful observation for the last two thousand years does not show the loss of a hundredth part of a second. These observations have been so carefully made that if there was a hundredth part of a second's loss of time, it would be discovered, but the earth has not lost the hundredth part of a second in two thousand years. Now in our local clocks the wheels get tarnished and dirty and the bearings get rough and they begin to lose time,--they don't often get to gaining time, but they get to losing time. Now you might think the earth was growing old, and that its energy was growing less and less,--that it would get to be like a top which you spin and as the propelling force becomes less the top ~~would~~ goes slower and slower and slower until by and by it collapses and falls down, and you might imagine the earth would do the same thing, but during these ~~six~~ two thousand years astronomers have made careful estimates and not a hundredth part of a second has been lost.

Now see how much energy it requires to propel this earth in its orbit,--in to order to do that, let us see how much gunpowder it would require to send it off into space. The gunner can tell you exactly how much powder to put into a gun to propel a ball of a given weight for a certain number of miles--he has a formula, and he can tell by that just how much powder to put in Suppose we apply this formula to our earth: The earth, if I remember rightly, weighs some five thousand billions of billions of tons. Now we find that it will require 700 times as much ~~as that~~ gunpowder as that to start the earth off on its journey through space around the sun at the rate of 19 miles a second, which is nearly 1200 times as fast as the lightning express; at that rate the earth is rushing along through space around the sun! The sun also is moving through space; it is going through space at the rate of 27 miles a second, about 1600 times as fast as the lightning express. Now what keeps up that energy? To keep the sun going at that rate would require an amount of energy equivalent to a continual explosion of a tremendous amount of gunpowder. To keep the earth going at such a rate as it is propelled through space without losing time you would have to have continual renewals of this power--continual explosions of this vast amount of gunpowder to keep it going--and it would take seven hundred times five housand billion billion tons of gunpowder to start it off. Now we see the earth moving all the time,--keeping up that velocity all the time--maintaining its speed of nineteen miles a second with such accuracy that it has not lost a hundredth part of a second in two thousand years. What keeps it going? Mr. Spencer says it is an unknowable intel-

ligence unceasingly at work.

Now what is the character of this intelligence that gives attention to this whole world, which is a mere little particle of dust compared with the great universe--a mere little microscopic speck. Just think of the character of that intelligence that is capable of keeping such close watch of our little world and of our sun and moon so that they have not lost the smallest particle of time,--not the smallest fraction of a second in all their evolutions. We have the same thing illustrated away down at the other end of the scale of existence,--we find the very same thing illustrated there. If we could examine every little speck of sand by the aid of the microscope, taking the smallest particle and magnifying it so that it appears to be as large as an apple and we might divide it indefinitely, if we could only bring the proper means to bear upon it,--suppose we take a mass of matter as large as an apple and magnify it until it appears to be as large as the earth, the atoms or particles or molecules of which that mass is composed might be made to appear as big as an apple still, and this is composed of what might be termed the ultimate particles of matter,--and it is a very difficult thing to believe that they exist, because we can't understand how they exist.

If we could go up far enough, we would find that the atmosphere disappears and there appears to be a great void between the atmospheres of the earth and the sun which is occupied by nothing; it is an old theory that this is a vacuum,--but we can scarcely suppose that. Modern science, however, shows us that this space

is filled up with a substance called ~~the~~ ether; and this ether is composed of atoms, and that we have in these atoms other atoms the same sort of power manifested as in other matter. We will show you pretty soon the substance of ether. I have here in this little glass bulb, a vacuum,--can you see something inside looking like little fans--little fans like those of a windmill? I will light this match and then you can see a little windmill. I will hold it nearly still,--now it has nearly stopped, I will hold this match close up, and then you can see it starting off. I blow this and it stands still,--this little glass bulb is simply a vacuum--it is closed absolutely tight; this is an absolute vacuum; the air is all pumped out. Now I hold it up again now it is standing still,--now it is starting again,because the match is near it. I bring the match down here,--now see it go,--it is a windmill, you see,--a windmill without wind! It is spinning aaway here with great velocity. Now what makes it spin? The light and heat,travelling through the match travels in and is transmitted from the glass up the inside and falls upon the wings of this little mill and causes it to revolve. The air having been pumped out,the ether fills the vacuum. Ether is in an almost solid state everywhere, and the heat and light disturb the ether and cause a bombardment of ether particles, andthese particles strike upon these little arms of this little mill inside,--they react upon the arms and drive them around; they are made of aluminum or mica, and they are brightened on one side, and darkened on the other with soot. The fans back up, because the ether rays striking upon the soot radiate upon the glass and the reaction causes the fans to back up; they travel away from the light; so it looks as though the ether drives the light away as the wind drives

the windmill.

These forces of nature are continuously at work. Suppose you gather up a snowball weighing half a pound: Now the amount of force that is represented in that snowball,--the amount of force required to evaporate the water and to carry it up into the air and turn it into snow and to make that snowball--the amount of force repsesented in that transaction would be sufficient, not simply to throw that snowball a distance of five or ten rods or farther, as one of you might throw it, but to send that snowball all the way from Chicago to Detroit. And if we should consider the amount of force that is required to make the water and the snowball and to hold the atoms together,--the oxygen and the hydrogen that make the water that would be required to take that snowball and melt it and convert it into vapor and afterwards convert it into oxygen and hydrogen, that amount of force would be sufficient to send the snowball 1500 miles, or half way across the Atlantic ocean. Or, if ~~the~~ another snowball weighed a half a ton and were lifted up into the air,--we will say, onto a precipice half a mile ~~into the air~~ high, the amount of force generated by that half ton of ice in falling down to the ground a distance of half a mile, or ~~the~~ an amount of force necessary to carry it to the top of a hill half a mile high, and deposit it there, that would be the same amount of power as that deposited in the first snowball. These forces of nature are tremendous.

Think of the force represented in an ordinary ~~thunderstorm~~ rainstorm. Suppose a rainstorm falls over a surface of a square mile six inches deep,--there ~~will~~ would be four hundred thousand tons of water on that one square mile. Now think of a rainstorm that would

cover the surface of a hundred miles square. That would not be a very great storm; it would reach only about two-thirds of the way to Chicago a mile in width; a hundred miles square would be an area ten thousand times as great. Just see what that would be,--ten thousand times four hundred thousand equals four billion,--it would be something like four thousand million tons of water. Now the amount of power required to vaporize that water and send it up into the sky so as to come down again,--that amoun of force would be enough to run more than a forty million horse-power steam engine; it would be enough to run all the steam engines in the world; it would require the consumption of several hundred million tons of coal to evaporate all that water and convert it into steam. But we get all that force from the sunlight This is only one of the many evidences of power that we see going on about us.

I mention this to show the power there is in everything about us. There is an immense amount of power locked up in this little drop of water. From what I have told you about the snowball, you can reckon up this power. There is not a man here that is strong enough to lift the weight that would be heavy enough to represent the power that is locked up in a single little drop of water.

Now there is a source of all this power. It does not originate in itself, but this energy is being continually sent out from God, the great invisible source of all power. God is himself continually upholding everything. Now let us see if that is not true. In Is. 45 : 12, we read, "I have made the earth and created man upon it: I, even my hands have stretched out the heavens, and all their host have I commanded." So you see it is God that is

keeping everything in order. He don't send the sun and moon and all the planets and their satellites into the world to take care of themselves, but he is continually upholding them. In Is. 40 : 20, 26 we read, "It is he that sittith upon the circle of the earth, and the inhabitants thereof are as grasshoppers: that stretcheth out the heavens as a curtain, and spreadeth them out as a tent to dwell in.... Lift up your eyes on high, and behold who hath created these things, that bringeth out their host by number: he calleth them all by names by the greatness of his might, for that he is strong in power; not one faileth." God has all these stars numbered; all this infinite number of planets, suns, moons and stars and the earth,--all the host of heaven which we can comprehend or count--God has them all numbered; "he bringeth out their host by number; he calleth them all by names,"--he has a name for all of them. We don't know the name that God has given to this world, or to Venus, Mars, Saturn, etc. We give them names, but God has a name for each of them. We cannot comprehend that, for there is an infinite number of worlds to have names, and yet God does it by his might,--he recognizes them all; he sees them all; he counts them all; he upholds them all, "for that he is strong in power; not one of them faileth." God does not lose track of a single one of them. "Not one of them faileth,"--they cannot fail, because it is God that upholdeth them. In Col. 1 : 17 we read, "And he is before all things, and by him all things consist." In the marginal reference you will see the meaning of the word "consist," which is, to hold together,--by him all things hold together. So you see it is God that holds all things together; andthis law of gravitation is the power of

God.

We have a most wonderful evidence of God's care, in the constant regulation of things,--in the steadiness of things. Here is the earth travelling around the sun at the rate of 18 miles a minute; by a slight increase of this speed we would all fly off into space. If the speed of the earth were increased somewhat we would be bounding up into the air, and would find it hard work to get back again. But things are so delicately balanced in this world that this does not occur,--everything is exactly adjusted. We have also an exact adjustment between the clouds and the earth. What is a cloud ? A current of air goes up,--if you were up in the air and could look down upon a pond or river that sends up a current of air; when it reaches a certain height, it is condensed by the cold atmosphere and forms a cloud. Some of you have noticed a cloud forming in the sky; these clouds are constantly forming. This continual formation of clouds is an interesting phenomenon. You see one cloud formed; it is carried away and another cloud forms,--there is first one body of water forming into clouds, and then another and another and so on. The balance of the clouds and the earth is wonderful. If the air is lighter than usual, down comes the cloud and we have a fog, but the adjustment of the atmosphere is such that clouds are formed at a sufficient distance from the earth as not seriously to interfere with us; if it were not for this adjustment there would be so much fog that we couldn't see. I have been in London when we had to carry a lantern, it was so dark by reason of the fogs,--you couldn't see the street-lamps, and actually had to carry lanterns. It was so dark that you couldn't

go into some places without a lantern at midday,--and the whole earth would be in the same situation if it were not for this balance between the clouds and the earth. There is a wonderful balance in the temperature, too. Did you ever stop to think what would happen to us if it were not for this adjustment? There is a great range of temperature. The temperature has been raised thousands of degrees above zero, and hundreds of degrees below, but we live within a small range of zero. If the temperature should fall 50° (?) below zero and remain there, doubtless few could survive long; if it should go up 150° probably very few would survive long,--unless they had ice to cool themselves. If the temperature should rise to 150° and stay there for a few days, the whole population would be swept off. So we are living within a range of about 1 00°, while the total range of temperature is thousands of degrees. So it requires the nicest adjustment of things to keep the temperature within an endurable range. But God is arranging these things for us all the while; if it were not for this, we should find it impossible to live. Here is another beautiful verse,--"Praise ye him, sun and moon; praise ye him all ye stars of light." Ps. 148 : 3. They praise God because they are the works of God, and are constantly obeying him. Here is another beautiful verse,--"He telleth the number of stars; he calleth them all by their names." Ps. 147 : 4. God numbers the stars; he knows them all,--recognizes them all. Then in Jer. 31 . 35, we read, "The Lord giveth the sun for a light by day and the ordinances of the moon and the stars for a light by night; which divideth the sea when the waves thereof roar: The Lord of hosts is his name." Also, Job 9 : 9.,--"Which maketh

Arcturus, Orion and Pleiades, and the chambers of the south." In psalms 91:1 we read "He that dwelleth in the secret place of the most High shall abide under the shadow of the Almighty." It is this Almighty God --this God who is all-powerful--that is capable of looking after the various needs of nature, who is also caring for us. If we can get this into our minds,--that God is in every little flower--that he is in every insect and every seed,--that he is in everything--we should have some comprehension of God's greatness and of His omnipresense.

Just take this thought,--that God is in ourselves; that our hearts beat because God is in our hearts making them beat,--that this same God is keeping our hearts beating: What could we do if our hearts should stop beating one single minute? Death would be the almost certain result.

(Lights turned down.) Now I want to make another little experiment. I have called your attention to some of the visible forces of nature and now I will call your attention to some of the invisible forces of nature which are constantly at work: We have, under this table a small battery, and here is just simply a coil--some copper wire rolled up into a coil ; we pass this electric current from this battery opposite through this copper coil, and then one end of this coil is placed at the top of this little glass flask of tube and the other end of the wire through which the current passes is connected with the bottom of this flask here. Now if you will turn all of the lights down you will be able to see something quite remarkable. I have been telling you about ether,--that it falls all of the space between the planets,--it is supposed to have the properties

of solid substance like steel--not steel but like steel; then it has the properties of a liquid; liquid, you know is very irregular, and flows,--it does not retain the form of the vessel containing it and like gas it expands indefinitely. A solid retains its form and ether retains its form, so we are living in a kind of solid; the planets are moving through a sort of solid and the atoms of this solid are making a continual bombardment upon the substances around them as I will show you by this apparatus in which there are arms which are blown around by ether,--the arms spin around with wonderful velocity because of the bombardment of these ether atoms; they are comtinually bombarding our own bodies, but the bombardment is equalized. The bombardment upon the walls of this room, or even of a much smaller one, has been supposed to amount to millions of horse power--the power exerted by millions of horses is used in this way upon an ordinary room. (Experiment with lights out.)

We will turn on an electric current here and you will see a display which is due to the disturbance of this ether in the flask. This flask has had the air all pumped out of it, and it contains nothing but ether; now you let the air in, and you will see this display; the current is attached to the top and bottom; the ether disturbs the air. Now I will disconnect it. Now we have this wire passing off into the air--it is discharged into the air through my body; now there is not so much as there was before, but there is some. Do you see this little streak? That is my finger;as I touch it, there is a display,--so you see that there is some ether in me. Now we will disconnect this lower wire--now it is entirely disconnected. You

notice that I am not touching the wires at all. Now observe, I will pass this down,--it does not touch it--it is only near by it. I will make this experiment so that you will see that the disturbance is taking place in the air of the room; Now this is the same thing that you saw take place in the flask when the current was connected, and which is now taking place in the entire room,--the ether is in the room and the disturbance is taking place. I will bring this up near the end of the wire; it does not touch the wire, but comes up several inches from the wire,--you see the light in the flask is just the same. Now that comes within half an inch of it, and it passes through the flask,--and it passes through me--the ether in this entire room is disturbed. You can see here the principle of the Aurora Borealis.

Here is another observation--here is a little vane in the top,--now you see it revolving. You see this light burning--it is simply the electrical rays; the ether strikes upon this little vane and causes it to revolve around upon the principle of a windmill. Is ether light or heat ? You might think it was heat, but you see from this experiment that it cannot be heat .

We have one more experiment that I would like to show you . Now I want to tip this over so you can get a clear view of the beauty of this display. These are simply mineral substances--they are simply stones--but under the influence of ether you see how briliantly they burn; they seem to be red hot , some of them; this illumination occurs through the influence of ether.

Now the fact that I get from this is that there are beau-

ties in nature that we do not appreciate. Some of you have seen the flashing light of the Aurora Borealis,-- the air is so dilute that ether may be used-- some of this energy may be stored up; these flashes are the same thing as those of the Aurora Borealis --simply a disturbance of the ether in the atmos-phere.

The purpose of this object lesson is to give you the thought that there are unseen agencies in operation that we do not see with our natural eyes,--that we do not comprehend--and these forces are continually operating before us; they are illustrations of how God is continually at work. God is continually at work in unseen ways in forces that we do not comprehend. Just think of the force of ether bombardment which is taking place in this room,--the force that drove this little vane --that same power is pounding upon the ceiling and the walls and the floor with a force equal to millions of horse power--a force equal to that exerted by millions of steam engines--and it seems to be an incomprehensible thing--and yet it must be true, from the facts elicited by researches which show us that the power of God which is manifested in this world is beyond our conception; that it is not simply the power of driving the sun around a center, and that around other centers; it is not the power simply that upholds the world, rears the plants and trees, and piles the mountains and which is displayed in the hurricane; it is the mighty power of God which is also displayed in the raindrop , and in the air about us in which we move freely--there is this mighty power at work which is continually directing and upholding all things. These experiments bring out the important lesson, it

seems to me, that this same God whose wondrous power as manifested in nature is so great that we cannot comprehend it,--that the same power is in us--in every one of us ; the same God that paints the lily and the rose and that builds up the tree and takes care of every little blade of grass, is in us , and keeps our hearts beating, gives our brains the power of thought, gives us power of action, gives us the power to digest food and convert it into muscles , nerves and brains and gives us the power of thought.

If we could look through a microscope and see the method of constructing a cell-- the marvelous work of making a new cell-if we could see the inferior particles moving about from one point to another, dividing and subdividing and moving around with as perfect order as though they were a company of soldiers marching under the commands of a captain,--if you could see that, as it is possible for the microscopist to see it, you would have a wonderful evidence of the power of God. We have the promise of God that there shall be seed time and harvest --that every little seed shall grow, under proper conditions. So we also have the care of God over all things--even for the sparrow--He puts into the sparrow's mind the thought where to find his food. The same God that cares for the sparrow cares for every hair of our heads,--and he cares more for us than for sparrows, and he is certainly anxious to hear us and to help us when in trouble. I wish you would every one read the 107th Psalm --how the poor man got into trouble; how wicked he was and thus brought trouble upon himself; how he became so wicked that he fell down and there was none to help, and then he cried to God in his trouble

and the Lord heard him and delivered him. We are apt to say when a man is in trouble, "He got into trouble by his own fault; and now let him get out in the way he got in." It is a common saying of the world in regard to such a man, "He has made his bed, now let him lie in it." That is the world's cold way of looking at things, but that is not God's way--when that man cries to God, He hears him and He puts thoughts into his mind as to what course to take. When even a hungry little sparrow cries, God has food for it and he puts the thought into his mind where to get it,--and God puts good thoughts into our minds; the mind cannot have one of these thoughts without God,--yet he has given us a will to direct these thoughts if we will exercise that will--God has given us the power to direct those thoughts and we can apply them to any purpose we chose although God is at work making those thoughts and in guiding us. And there is nothing in the way of God, except our own wills, hence our wills should cooperate with God. So when we look out into the world and see how He paints the skies of a beautiful sunrise with the magnificient hues of the rainbow and other beauties, some of which we have seen displayed in a small way, in these little flasks, we have a faint suggestion of the infinite power and beauty which is spread through the world. Whenever a lightning flash strikes the earth we have illumination of all the metals--the same influences as displayed in the Aurora Borealis would make an inconceivably gorgeous display in the earth, if we could see it.

Now this power is working in us in a marvelous way: There is a wonderful thought that I might refer to, that has been re-

cently brought out by recent researches: When a man thinks of something which he has once seen before --recent studies of this subject have seemed to show that when a man recalls a thing there is a picture of it formed in his eye. Now when you look at objects there are pictures of them formed in the eye, and they are made in the same way as the photographer makes his pictures only the photographer's picture is stained upon the negative while the picture formed in the eye is bleached upon the negative,-- in the one case it is bleaching, and in the other, staining--the color fades out; that picture is formed in the eye and the counterpart is in some way registered in the brain,-- the brain is changed a little by that; the connection is so close that when we recall a thought a picture is formed in the eye. It was only two or three years ago that a man actually succeeded in taking a photograph of the picture formed in his eye; he looked at a brilliantly illuminated object for a minute and then put out the light and looked at a photographic plate a few minutes and then there was a complete picture formed of the thing which he had been looking at--this picture was displayed upon a photographic plate .

Now if what I have been telling you is true--if the picture formed in the eye is reproduced in the eye when you recall the object it seems to me that we ought to be able to reproduce that picture --although it is difficult to do . A man had a cat with whom he was acquainted and whom he looked at until the picture was impressed upon his mind and formed in his eye, by looking straight at a photographic plate the picture of the cat

was reproduced but as the man's eye could not remain perfectly still there were several distinct heads of cats,--a somewhat confused picture of the head, but there was one sharp and distinct picture in the center, so the complete picture was reproduced.

Now the fact should be considered that the very structure of the brain is changed by the things we look at,-- and this change is not an etherial thing but an actual thing; so the apostle Paul said "By beholding we become changed." That is an actual fact--that what we look at we assimilate--we become like that; our brains are actually changed by this means, and as our brains are changed our whole body is more or less conformed to that standard, hence it is important that we should be careful what we look at and what we see. Now here we have in our brains a will,- we have in our organization, somewhere, a will, and this will is able to coöperate with God. God is trying to make every one of us as perfect as he can be; he wants every one of us to be as good, as pure, as noble, as beautiful, as he can be, and this power of God is working in us the same as it is working in the trees and flowers, and now he all askd of us is that we shall coöperate with him; that we shall yield our wills to be in harmony with him instead of opposing him; that is the real sum total of religion,--to be in harmony with God.

Now the question comes, How can one be in harmony with God? When we see the evidences of God about us; when we see such power manifested about us, and know that that power does not come from us, and know that it could not originate in itself,

but must have some source--one great source to which we trace it, and which Mr. Herbert Spencer says is unknowable; that great source is God. If we should say it must be something else we know that could not be so because we would go back to one great cause, and that must be God, because God is the first great cause.

Now the only thing necessary to become in harmony with God is, as I have said, to submit our wills to God,-- to be willing to coöperate with God in making the best of our opportunities in this world. God don't want anyone to have a hard time in this world. I don't believe that God ever required a man to sacrifice his own best good for any cause. When a man has made what he thought was a sacrifice for a cause, for a principle or for someone else,--when he made that sacrifice in doing his duty , it was not a real sacrifice, it was only what seemed to be a sactifice. The thing that is really best for a man to do is the thing that he ought to do. That is the way he would have each one work to attain individual success; God makes his plans so great, so comprehensive that a man never has to sacrifice his own best good for anybody or anything, because God's plan is so great that it comprehends everything and adjusts every atom to every other atom in the universe; that same God is capable of taking care of every man woman and child and of adjusting all circumstances in such a manner that the best good of each individual shall be attained if he only coöperates with God.

What a comforting thought that is; a man can feel abso-

lutely sure that the God that is building the trees, the plants and the flowers and caring for them and for all the worlds,--who keeps the sun shining and keeps the earth revolving around it on its orbit--that same God is looking after him and is interested in him and is interested in making him the greatest possible success. Now there is none of us so ambitious to make something of himself as God is to make something of him; God is vastly more anxious to make a success of him than he can be to make one of himself, because God comprehends not only what the man may enjoy here, but throughout all eternity, so God understands better than any man can the value of this privilege and the best means of attaining to it. So a man makes no sacrifice when he says "I will be on the right side," because when he gets on the right side, he gets on the side of power,--the power that is able to heal broken hearts and broken spirits.

I was much interested in a little incident in Chicago, the other day --last Sunday night--I have been going down to Chicago, every week or every two weeks for two years the first of May working among the poor men down among the slums there, and I think that it is the most interesting thing that I have ever done in all my life is to help those poor fellows, and I want to give you a few illustrations to show you that this mighty God, the evidence of whose power I have been trying to give you, that he is taking care of everything on the earth--now ~~the~~ an illustration: Three or four weeks ago, in Chicago I met a young man and shook hands with him; I found him at work in our coat room; the reading room is about as large as this is; and there is a railing and a coat room further back, and as I stepped around

behind the desk and went into the coat room to leave my coat I was introduced to this young man who had dropped into the mission. He had no friends in the city and he had taken such an interest in the work and shown such evidences of genuine conversion that he had been kept at work and he was taking care of the coats. Last Sunday when I went down there I talked upon the 107th Psalm, and when I had finished, an opportunity was given to all who wanted to make a start to serve God and get on the Lord's side and be Christian men, and ten men held up their hands and one little boy eight years old held up his hand. I was interested in him. He had an opportunity to testify with the others and he arose and said--"I am on the Lord's side and I am going to stay there." I inquired into his history and found that he was an orphan boy; that he was born in Holland Mich.; he lived with an old bachelor and was badly treated; he had a friend in Chicago and he ran away and went to Chicago, but when he got there, he didn't find the friend that he was looking for. Last Saturday night he was on the corner of Van Buren Street looking for his friend and while waiting for him, he became very cold. After he became very tired and half frozen he entered the mission and asked permission to get warm and as he walked up to the desk to get permission to get warm I noticed that the little fellow's head was just high enough to come to the top of the desk, and he peeped over it and there he saw his friend in the coat room. There the Lord had whispered that thought to him to go in there. Mr. Morse was there also, and the little boy feels certain that the Lord led him in there--he is sure that the Lord led him down to that corner--that the

Lord had led him to Chicago to get him to go down to that corner at that particular time. He had his Bible in his hand when speaking,--I didn't see him many times without his Bible in his hand, and every minute when any one was talking to him, he had his Bible open refering to passages,--and he is going to keep on the Lord's side. I tell you, my friends, there is no place so safe as being on the Lord's side,--and that means that you are in harmony with God, and not working at cross purposes with Him. If he does not do this the Lord has to let him "Fall down", and to humble him until he feels that he is not God; that he is not Deity; that he is not capable of holding himself up all alone; that he cannot do as he pleases in this world where the mighty God is doing everything,--keeping his heart going--he depends upon God for every drop of blood and every partical of food he eats--he depends upon God for everything, and this being so, it is important for that young man that he should find out that he cannot have his own way and so God lets him learn some lessons by experience and he has a hard time of it. . But the Lord is looking after him all the time and just the moment he is ready to put himself on God's side when trouble is brought upon him--even if he has brought it upon himself--and he turns to God he is rea y to hear him; if you will read the 107th Psalm you will be convinced of that. You read that chapter,-- how many will promise to read that 107th Psalm before tomorrow night? I am glad to see you hold your hands up; you will find that that is a blessed Psalm; you will see that even if you get into the worst trouble in the world, if you will just turn your eyes of faith to God in real sorrow for your sins are really convinced in your heart that sin has brought on your trouble--as ~~Job~~ the Psalmist says,

the Lord is ready to hear you if you turn to him. This same Psalm says "They that go down to the sea in ships, that do business in great waters; these see the works of the Lord and his wonders in the deep. For he commandeth and raiseth the stormy wind which liftetb up the waves thereof. They mount up to the heaven, they go down again to the depths: Their soul is melted because of trouble. They reel to and fro and stagger like a drunken man and are at their wit's end. Then they cry unto the Lord in their trouble and he bringeth them out of their distresses." When speaking on this Psalm on the occasion to which I have referred, (there were about as many present as there are here now) I read these verses, and asked how many of them had been sailors. About a dozen hands came up. Then I asked how many of them had been in a storm at sea, and some eight or ten hands came up. Then I asked, "How many of you thought you were going to the bottom in the storm and prayed to God for deliverance?" Six men held up their hands. Then I said to them, "This psalm means you. Are you now in trouble about your sins? God is ready to deliver you from your sins,--he is as ready to deliver you from your sins as he was to deliver you from the sea. The fact that you are here to-night is evidence that God has delivered you from the sea and that he is now ready to deliver you from sin. If you lie and steal and cannot stop God is just as able and willing to deliver you from those sins as he was to deliver you from the waves." Well there was eight sailors (including the little boy) who decided that they were going to start for God; they were convinced that God wanted to save them and they gathered into the side-room to be saved . There was

one young man,--I seem to see him now--he was a very sober looking young man about twenty years of age,--he was a very honest looking young fellow; he arose the last of all, and he said, "My friends, I have nearly all my life been on the deep sea,and have never had a chance to see much of the works of God, but I want to be on the Lord's side,--pray for me." That man had been down in the trough of the sea, and he thought he was going to the bottom and he got on his knees and cried to God to save him,--just as the little boy did who was looking for his friend. I said to them, "That same God wants us to come to him where there is peace and satisfaction and salvation." There was fifty men who rose and testified in,about seven minutes. We have a line of prayermeetings connected with our mission, and one of these men came in a few months ago, and he was very much put out because he heard so much disturbance (and he was a poor, wretched, drunken fellow) but he drank liquor till he hadn't any shoes and stockings left, and then he came to the meetings and made a start to serve the Lord; and when he told his expeeience he said the Lord had taken the appetite for whisky and tobacco from him,--said he, "I don't want whisky and tobacco any more; my appetite for these things is entirely gone; I am now on the Lord's side and I am going to stay on the Lord's side. Now the Lord lets us have trouble just to show ~~them~~ us that it don't pay to have ~~their~~ our own way. We are poor creatures surrounded by these mighty forces which could overwhelm us in a second, but God will not take his power from us, for if he did, we would die. God in his mercy gives us life, hoping that by and by we will turn

to him and cease to contend against him and be willing to work in harmony with him.

God will save any one that will be saved. I used to think God wouldn't save any one if he could help it; that was the picture of God that I had in my mind. When I was a boy I didn't have any one to tell me what the real Gospel was, and I didn't know what the Gospel was until I went down to Jerry McAuley's Mission some years ago, and I really think I found the Lord there more than anywhere else. I was baptized when a small boy. I was led to be baptized because I heard my mother praying for me,--she was praying that "John" might be "a good boy and a useful man." So I started out and groped along as well as I could and, in answer to prayer I believe God made me "a good boy," but I found none who gave me ~~xxxxx~~ much light on the Gospel, so I thought I would have to fight it out alone, and if I succeeded, I would be saved, and if I didn't I wouldn't. But that is not the idea of the Gospel; God is willing and ready to help,--yes, he is anxious to help the man who wants to be helped, and when I see what he has done for these poor fellows in the Chicago slums it makes me feel anxious for these young men in Battle Creek who have not gone the road that those poor men have travelled. Now there may be some of you who are kept away from God by the idea that it is hard to get to him, but just the moment that you begin to feel ~~xx~~ in trouble about your sins, just that moment God is only too willing to help you. Come to him, then, and he

will help you; whatever you cannot do for yourself God will do for you. You see a man trying to get rid of evil habits,--liquor drinking, tobacco using, etc., and he does not succeed, but when he turns to God he takes away these appetites at once. I am glad you have invited Br. Sadler to come up here and give you his experience. I am glad to know that the Gospel does this wonderful work; that it is not preaching ~~alone~~ but the word of God that saves men, and if you will all get that word into your hearts this town will be revolutionized, for if this is done, these young men will be saved and become ardent workers.

I want to give you a little incident which occurred in our Sanitarium branch in Chicago. I sent Br. Sadler to Br. Moody's school some time ago; I had felt the impression that I ought to send him there; I had been for some time looking for some one to send, and at last followed out the impression that I had, and sent Br. Sadler.,--his work seemed to be at a standstill and I asked him how he would like to go to Moody's school, and he burst into tears and asked me how I came to think of that, and I told him it must have been the Lord, as he told me he had been praying and longing for that very thing. We organized a settlement in the mission, and when Br. Sadler goes there, he gives them the first principles of faith (we have vastly more truth to tell them by and by) but they have some of the practical work, and they have enthusiasm and faith--for these are necessary--and then Br. Sadler comes back and reports the progress of the work. I have been much interested in that work, and it has been serviceable to me.

The workers bring in their reports. One little colored

boy who had been converted after having been discouraged because he couldn't get work among the white people, was called upon for his report. There was a colored man sitting beside him ,and he said, "This man will give my report." So the man said: "When I was going up the street the other day, this little boy looked up into my face and said, "Are you a Christian?" And I said 'No, I'm no Christian." Then the boy said, "Why not?" I could not tell why not, and I kept saying to myself "Why not? and why am I not a Christian?' My father is a Christian and my mother is a Christian,' and I really had to stop and think, for the question struck right to my heart. So I told the little boy I didn't know. Then he told about the Lord Jesus and how he wanted me to be a Christian, and that went to my heart and made me feel as though I ought to be a Christian right away. Then we went down into an alley and knelt down by an ash-barrel and asked God to forgive my sins, and he did, and he saved me from the appetite for tobacco, etc. and now I am going to stand by the Lord.

Our folks there are thoroughly engaged in this work. Some one went down to see the fireman in the basement, but he was not there; he had been out in an alley and found two men, and they were found by a freight wagon praying to God for mercy. Why, when you get hold of this idea you will find that the greatest thing in the world is to go out into the highways and hedges and be fishers of men . That is the greatest scheme in the world,--to catch a soul and save it for all eternity. Think of it, my friends ! It is the biggest thing in all the world; there is nothing like rescuing men. I am glad to see that our workers in Chicago are getting hold of this idea, and that you are getting

hold of it. This is the very thing necessary to help you. But if your desire is simply to get into a better place yourself, and so are praying only for yourself, you will dry up spiritually, because you are selfish; you are anxious to get the best thing for yourself,--to get the best of it; you would have a sort of Pilgrim's Progress sort of religion. Mr. Drummond, whose wonderful books you have read, said, upon a certain occasion,--and astonished me when I heard him say it--"Now I am going to say something that will surprise you,--I don't believe in Pilgrim's Progress religion, for Christian got out of the City of Destruction as fast as he could; he got to Heaven before his family, but he had a hard time getting there; he got into Heaven all alone by himself." That is the model selfish Christian,--and he has a pretty hard time of it. But you go to work for some one else and the Lord works through you to help some one else. You watch a stream and you will see where there is a sharp point or some other obstruction; the stream wears it away and carries it off; it keeps modelling the bed of the stream until it becomes perfectly straight. So the spirit of God working in a man changes him until he becomes a channel for it. That is the way transformation of character takes place,--and the only way. If you want to be thoroughly happy just go to work trying to save some one,--and in order to do this well, the first thing you should do, is to get nearer to God yourself; you have got to believe this truth,--that this work is to be done, and get down on your knees and ask God to show you how to do it; you have got to read your Bible so as to be full of information. Some

time ago we had a call boy who could repeat thirty or forty texts adapted to his own condition,--I don't believe there is a teacher in the town who could repeat as many texts ~~ada~~ exactlya adapted to human conditions as that boy, could. It was exceedingly interesting to see that boy's interest in saving some one, and to help some one; it made it easier for himself to be helped and saved while saving others. I feel anxious that you should get hold of this thought, that this great and mighty God that is carrying on the world and all the universe is reaching down his hand to every one of us, wanting to help us,--wanting to save us and to render us instrumental in helping somebody else; that is the real object of living after all,--to help somebody else. I used to think,--"What is the use of praying? God knows all that is going on. It used to take me a long time to solve that problem,--I couldn't really understand why I had to pray, but I know sometimes I did pray; when I got into awful trouble I was ready to pray; I used to pray when I thought things were all going to smash,--I would then flee to the Lord and pray almost every minute when I wasn't doing anything else--and the Lord would help me, too. I couldn't understand it then, but now I can see through it. So this principle is illustrated in my case, ~~xxxx xxxx xxxxxxxxxxxxxx xx~~ a gentleman came to me just before coming down here, and I said, "Why, I have more faith now than I ever had before. Six weeks ago I found my clothes wearing out,--I was in Chicago, and found that my clothes were wearing out, and I asked the Lord to send me a suit of clothes--I didn't know what else to do, for I hadn't any money. The next morning Dr. Kyett came to me and asked me if I wanted a suit of clothes, and I

said I did, and so I got the suit of clothes." He asked him how he came to do it, and he said the Lord sent him,--and I knew he did, ~~He said~~ for me ~~he~~ had been talking about giving him ~~me~~ the suit of clothes for some time before that. Then you might ask why he should pray for them, since it had been decided to give them to him ? The point is, The suit of clothes were already provided, and then God put it into his heart to pray for them, so that he would be expecting them and ready for them when they did come. Now the Lord has good things in store for every one of you, and when it is time for you to have one of these things he will put it into your minds to pray for it and thus you are prepared to receive it.

When we wander away from God, God inspires us to return to him and to pray to him, and in this way we are brought into harmony with God again,--when we get on our knees and forget ourselves we get in harmony with God, and the more time spent on our knees (that is called " knee drill") during the time spent on your knees submitting your own wills to God, you are in a condition to receive his spirit and to get in harmony with him, and then this great power that is upholding the whole world--you are getting in harmony with that power which will bring you in line with this great intelligence and are being prepared for all that this all-loving God wants to do for you . That was a good illustration of this poor brother,--and also for me, for I knew that God put it in my heart to answere his prayer.

What ground this gives for faith. When you feel your need of God's help and get down on your knees and cry to him, you may be absolutely sure that God is going to answer your prayer. You

may not get the very thing you ask for, but your prayer will be answered; it may be that you don't need that particular thing but God will give you what you do need; he will send you that which is best for you. He knows just what we need and he gives the thing that will really answer our prayer--he will truly answer prayer,--but you must absolutely believe that you will receive what you really need, and when you thus ask, God will answer you. I am glad to see the earnestness of this society to do something for God and humanity, and I wish you great success.

SANITARIUM LECTURE, June 15, 1897.

# RATIONAL MEDICINE.

J.H.Kellogg, M. D.

--- X ---

. . . . . .

(Reading Dr. Bigelow's Parable.) See article in Mod. Med.

This parable must have been an eye-opener to the doctors of forty years ago. I might here mention the fact that Dr. Oliver Wendell Holmes was associated with Dr. Jacob Bigelow in this reform; these two men really started rational reform in medicine fifty years ago, and, by way of contrasting the old methods with the new, Dr. Holmes read a poem at an after dinner meeting of the Massachusetts Medical Society entitled "The Rip Van Winkel Doctor." Considering the fact that these two papers were written and read forty or fifty years ago, you can see that these men were really heroic in their efforts to introduce rational medicine. In those days it was rare to find physicians who did not resort to physic, bleeding, etc. It was the large use of these drastic methods which caused the introduction of water-cures, which were first established in this country at Northampton, Mass.

I want to call your attention this morning to a few fundamental thoughts which I hope each one of you will get his attention thoroughly focused upon, so that you will comprehend the principles presented and incorporate them into your knowledge in such a way that you cannot possibly forget them. The knowledge which you gain here should be thoroughly crystalized into a few fundamental principles which you cannot easily forget, and which will be a continual means of guiding you in the right line.

First, I want to call your attention to the fact that one of the most popular, widespread and fundamental errors in the minds of the public in relation to the practice of medicine is the idea that it is

the duty of the doctor to cure disease. Well, what is the duty of the doctor, if it is not to cure disease? The duty of the doctor, while it is not to cure disease, is, to investigate disease to discover what is it its cause, and to do what he can to guide the patient to a safe recovery. "Well, if the doctor does not cure disease, who does?" Nature . It is the same force in man which cures disease as that which grows trees, or a crop of corn, wheat or potatoes,--precisely the same power. Of course, when we say "Nature," we mean God, for nature is simply an expression of God. It is the habit of the world to speak of nature as a power, whereas nature is simply a picture,--it is simply an external or material representation of the power which is behind nature and in nature--and it is this power that cures disease. The same power cures the man that makes the man. The curative process is a recreative process; it is a tearing-down and building-up process; it is the removing of old material and the substitution of new material in its place,--it is a reconstruction.

This is a process which cannot take place of itself;it is a process which cannot be set in operation by means of inert material or poisonous substances. It is impossible to believe that a drug can cure in the sense of curing a man who is sick; we may say that a drug cures disease, but when we consider the subject from a rational standpoint, we see that it is not the duty of the doctor to cure the disease,--in fact in the majority of cases we don't want the disease cured, but we want the patient cured.

Now let us note the difference between the curing of disease, and th curing of the patient. Here, for instance, is a man who is suffering from a pain,--how easy it is to cure that pain. A dose of morphia, or of some other narcotic drug or the administration of an anesthetic will at once relieve the pain,--but, has it cured the patient? It has cured the pain, but not the patient. Now we desire to cure, not the pain but the patient. The thing that is constantly leading us astray, is the practice of using drugs as a sort of remedy, (and this is a principle that applies to all remedies,) to cure disease. A bath does not

cure disease; we do not administer certain classes of foods to cure ~~disem~~ disease; we do not administer massage or electricity t o cure disease, but to cure our patient, and I think it is the duty of the medical profession to educate the public upon this subject, to explain and to elucidate this idea, that is is the patient that is to be cured, and not th disease, and that it is the duty of the doctor, not to cure the disease but to cure the patient; that it is the duty of t e doctor to cure the individual to cure the individual,-- to educate the patient in the practice of health; to investigate his habits of life and find out what is the cause of his sickness and to aid him to recovery by the aid of these principles. But so long as there are people who believe it is the duty of the doctor to cure disease, they will put themselves into the hands of those doctors who make the greatest pretensions for their drugs and their remedies. That is what gives rise to the great faith of many persa in stimulants. Alcoho l is relied upon by thousands of people as a stimulant. A man taked a certain drug , and he considers it a valuab le drug, because it sures his weakness, but it does so simply by obtunding the nerves which gave expression to those symptoms so that they can no longer express the weariness of the body . And so of alcohol ,--it cures weariness, hunger, cold, poverty, or any othtr trouble, because it rendes him oblivious of his condition,--for the same principle applies to artificial conditions as to physical conditions,--and the principle that applies to almost every other medicinal remedy, applies to germicides, parasiticides, etc. All so-called constitutional remedies, alteratives, and the whole class of symptom-curing drugs open to the same objection, which we make use of of alcohol, and for the very same reason,--they cure patients without curing the patients; they remove the symptom, or mitigate the symptom, without removing the cause which produces the symp tom.

Now I consider it an important duty of a medical man, to educate the people in relation to their ideas of the duty of the doctor towards a patient, and the proper use of remedies, and the true power of remedies,- the true power of the use of medicine as an art-- that it is not to be

that it is not to be exercised to cure diseases, but rather to cure patients. Let us try an illustration,--we will consider the case of a watch that has fallen into the water, if you please, and left there for a day or two, until its works have become rusty, and the watch has ceased to go-- or the face of the watch has been broken, or it has been stepped upon and bruised, or the mainspring has been broken or the watch has been neglected until it has become filled with dirt. Suppose you take that watch to the dealer, and he examines it and then says, "I have got a plaster or a liniment to put on the outside of this watch, which will make it go," or " I have gt some fluid that I can inject into it, and that will start it off." Perhaps for some unknown reason the watch will start off and run a little, four or five times out of a hundred cases, after the application id made, and some will suppose that it is the application of the plaster or the liniment or the injection of some fluid had power to cure th at watch because it began running immediately after the application,-- it might happen that the watch, for some unknown reason, had stopped for a short time, and then started again, directly after the application of the so-called remedy, and so it might be supposed that the dealer had cured the watch; that he had something that he could a ply to the outside of the watch, or that he could inject into the watch, that would stop it if it had started when it should not start, and start it if it had stopped when it should go. the watch-maker does not do this; on the contrary, he cleans it and repairs it if it needs repairing, and instructs the man to take better care hereafter.

The condition of the watch when it stops for some unknown reason, and, as I said, in four or five times out of a hundred starts off again without any apparent reason, is what might be called a self-limiting condition of the watch,--the same condition is found in human beings. You might say the same thing of a storm at sea,-- after raging for a time the gale will pass over, and if the ship is not destroyed by the violence of the storm, it will sail on as usual after the storm is over; but if it cannot withstand the strain, it must go to the bottom,--and that is what may happen to human beings suffering from pneumonia, and

other self-limiting diseases--the storm of disease may rage to such an extent that the masts are br oken, and the sails are riddled, and at last the ship goes un der, before the storm is over.

Now to use one of Dr. Bigelow's illustrations, suppose the owner of the ship, while seeking a proper man to act as captain of his ship, should find a man who wouldsay to him, "I have got a medicine in a bottle and if a storm arises I can turn out a teaspoonful of it upon the water, and the storm will subside, and the ship will ride on safe." What sort of a ship-owner would he be, who would apply to such a navigator instead of applying to the,one who understands the winds and the waves, the strength of masts and sails, and how to guide the ship during a storm? You would say that a ship-owner was idiotic or an imbecile, who would apply to such a man . That is exact ly true of the treatment of disease in the majority of cases. The sick man applies at once to some charlatan some one who claims to have a medicine or a drug, a few drops of whih will antidote the results of all the violations of the laws of hygiene. We find advertisements of drugs or remedies which will cure dyspepsia, without attention to diet,--which will cure disease, with out the removal of the cause of the disease. The use of all such remedies is pernicious, because it is fallacious; it cannot cure disease, any more than the man can cure the storm at sea by pouring a little of his medicine upon the water.

Sometime ago a missionary had an experience along this line: A native had obtained a clock by s ome means, but itwould not go, so he brought the hands of the clock to the missionary and said, "I want you to fix these hands." The missionary was a physician, and the native had a idea that medicine will do everything-- and so the native said to this doctor, "I want you to fix these hands, so they will go around." But the missionary said, "I can not fix these hands, without the clock." Said the native, " There is no trouble with the clock, the trouble is with the hands,--they stop; they won't go around, and I want you to fix them so that they will go around," and he refused any explanati on, and started off for another missionary to fix the hands of his clock so that they would go around. It is precisely upon the same principle that

people are treated with drugs,--for instance, if the bowels are inactive, a cathartic is taken to start them. Now the trouble is, that the rythm of the bowels is stopped, and it is only necessary to restore the rythm of the bowels, by removing the causes which have stopped it. But instead of doing this, the patient is satisfied by taking some drastic drug, which will compel the action of the bowels.

The same thing is true with reference to pain, gastric neurasthenia or nervous prostration,--it is true of a great long list of maladies which come to this institution for treatment. I think there is n ot a single malady which you can name, which is not treated in some irration al way by somebody. The use of tonics, anodynes, hypnotics , etc., is a lmost entirely based upon this same principle. Here for instance is a manwith a temperature of over a hundred, using antifebrin, or other drug of the same class, for the purpose of lowering his temperature. There are several of these drugs that will lower the temperature, phenacetin, acetanilid, and the whole aromatic series of coal tar products, are capable of reducing the temperature.

Why do t ese drugs lower the temperature? Because they are all poisons, which have a powerfully para lyzing effects upon the heat producing centers,, and at the same time that they poison the heat-producing centers, they poison every other center. While of the heat-producing centers manifest the influence of this toxic power more than others, the patient who se thermic centers are paralysed, shows evidence of the same influence upon other centers,--for instance, he shows irritation of the vasomotor centers , paralysis of the sympathetic nerves,-- and he also shows evidence of paralysis of those centers which control nutrition, he does not secrete gastric juice, the activity of th liver is lessened-- the whole man is paralyzed., The patient whose temperature has been suddenly brought down by antipyrin, is in a state of collapse. The ner ve centers which dontrol the heart are paralyzed to a large extent; the heart is weakened; the respiratory centers are in the same condition; a ll these processes of the body by which oxidation takes place, and all the nutritive processes, of the body, are paralyzed, and this man, when you see him under the influence on antifebrin or any other antipyretic drug, you will see him with blue lips and tremb-

ling hand and a blue skin, giving evidence that all the processes of life were paralyzed. Now the drug has cured thesymptom, but it has not cured the disease.

So it is of the utmost importance to get this principle in your minds,--that it is not the duty of the doctor to cure disease, but to cue the patient; that it is not his duty to employ drugs to cure the symptoms; that it is not the province of the physician to use remedies that cure the symptoms,--although they may be used as palliatives when certain symptoms become so aggravated as to endanger the patient's life. It is their duty to apply remedies in such a way as to aid the patient on his way to recover.

It is an astonishing thing that our physicians are so little aware of the importance of this principle; a good many of them are still in darkness, and an old doctor down in a Southern State,-- it is the same kind of darkness and the same error that this doctor was labouring under,- there was a young physician who had just graduated from college, and was beginning to practice; he had been practicing for only a few months, andwas looking forward in terror to the time when some patient would be in such a critical condition that some wise old doctor must be called in for consultation, and he fairly shivered with fright at the thought that the old doctor would come in, examine the patient, find that he had overlooked some of the main features of the case, and applied the wrong remedy, and the wise old doctor would understand the case, apply the right remedy and the patient would get well, and he would get the credit for it, while he himself would be left disconsolate. Finally he had a case of pneumonia which became so serious that the friends of the patient wanted "Old Doctor Jones" to come in for consultation. You can imagine the relief that came to the mind of that young doctor, when the old doctor, after making the usual examination, looking at the tongue, feeling the pulse, looked wise, rolled his eyes, and, after a moment's very serious reflection said, "Young man, have you applied the skin of a black cat in this case?" The young man felt wonderfully relieved when the old doctor made that remark, for he saw that he was not likely to be overshadowed by his magnificent knowledge, so he replied, "No,

Doctor, I have not." "Well," said the old doctor, "I would recommend the skin of a black cat to be applied in this case, and I think that if it is applied now, the patient's life may be saved; I have found this remedy to be very effective in a large number of cases." Well, the balck cat was found and killed and the skin applied, but the patient died. The old doctor came in at the post mortem examination and ex pressed the thought, that if the skin had been applied a little earlier, or if the cat had been a little blacker , the patient might have lived.

Now the popular idea with refere nce to the use of drugs is just as rational as that of this old doctor,--and no more; this doctor 's recipe f or the skin of a black cat for pneumonia is just as good as the use of quinine, opium, etc.,--when you come down to the rational consideration of this subject you will find that the idea of this old doctor was based upon just about as rational and sensible grounds as the use of opium, quinine, and whisky, and other drugs which have been recommended as remedies in most of our text-books, and advocated in nearly every medice al school from ancient times down to the present time.

The world is coming to its senses upon this subject, however; medical men are coming to see more and more clearly that the causes of disease must be treated and not simply symptoms that are to be cured; that it is the patients that are to be cured, and dot simply their maladies.

SCHOOL OF HEALTH LECTURE SERIES. (No. III.)

The Quality of Food. July 24/07.

J.H.Kellogg, M.D.

--- X ---

Ques. Are fruits and nuts very nourishing foods?

Ans. Fruits are a complete nourishment if you have the right kind, but nuts are fruits, or a species of fruits. The banana is 24 per cent nourishment; cherries have about 10 per cent; apples are quite nourishing, having 7 to 8 per cent; the plantain has 24 per cent, which is almost as much as beefsteak, which is only 26 per cent nourishment. It is possible to produce on an acre of land more strength-sustaining material in the form of bananas than in any other food; there is no other form in which so great an abundance of strength-supporting material can be produced on a given quantity of land as in the banana. The date and the fig are very nourishing,-- the fig is one of the most valuable and nourishing of foods . The Arab of the desert merely lives on figs and dates, and his animal also lives on the dates,-- the date palm that grows on the edge of the desert abundantly is sufficient to support the entire population of animals and human beings. Fruits have an abundance of nourishment if you have the right kind, but if you include nuts with fruits you have a complete nutrient material.

Ques. Why is it that in some cases that hydrochloric acid is absorbed, and in other cases it is increased in quantity?

Ans. When the glands of the stomach are capable of producing an excess of hydrochloric acid they will continue to produce it as long as the food remains in the stomach, and the stomach will be subjected to an excess of irritation, but when the glands become exhausted, as t

they do in cases of hypopepsia, slow digestion, and weak stomachs, etc., then therefore is that then the glands cease to produce the hydrochloric acid the hydrochloric acid already present is absorbed in time and then the germs swallowed with the saliva after the food has been eaten will set up the process of fermentation. Prof. Bouchard says, that food commences to decompose if allowed to remain in the stomach more than five hours. We are making some experiments in our laboratory upon the same point, and I think there is no doubt but what the results will be the same from observations already made.

Ques. You say the germs are all destroyed by the hydrochloric acid, and afterwards they all reappear ?

Ans. They do if the food remains in the stomach too long a time. When we examine the stomach fluid we find that at the end of an hour, in a healthy stomach, the germs are all dead,--none of the germs are dead, but the spores are dead. The hydrochloric acid kills the germs so that there are none of them present; there might be cases in which the hydrochloric acid is present and prevents the germs from growing, and yet some of the spores live over, so that later, in the process of digestion, they develop. A weak solution of carbonic acid will prevent germs from growing,--it will not kill them, but it will prevent their growth. When the carbonic acid is removed, the germs will grow,--it takes more to kill germs than it does to prevent their growth.

Ques. After the killing of the germs, will not the chief source of contamination be from the swallowing of germs with the saliva?

Ans. Why, there is a constant influx of germs taking place all the time from the outflow of saliva. Millions of germs get caught in the air and get into the stomach in this way.

Ques. That is where the animal crop of germs come from?

Ans. Yes; the saliva is so full of germs that it is deadly. Dr. Sternberg, of Washington, has made this discovery. He went to New Orleans, and then he came home to make some experiments and he found that a drop of saliva added to some beef tea, would, in a day or two, kill a rabbit. He thought he had got some fever germs from New Orleans, but the saliva contains germs of putrefaction which grow in the mouth, and without is the reason why the breath is so foul in the morning.-- It contains such a quantity of germs they get on the tongue and on the teeth, and they grow there.

Ques. Are frugivorous animals vegetarians?

Ans. The frugivorous animal is a vegetarian animal. The word frugivorous comes from the original word meaning strong, agile, brave, vigorous, courageous, spry, and nimble,-- that is what the word "vegetarian" comes from. The word vegetable is a sort of second cousin to the word vegetarian, as it comes from the same root; but vegetarian does not come from vegetable; the word "vegetarian" does not mean "vegetable eater." It means a person who is vigorous and healthy and strong, and who lives upon the original diet.

Ques. Do you call grains seeds?

Ans. Yes, grains are seeds.

Ques. Do you say that fruits and nuts are a good diet?

Ans. Fruits and nuts are the highest diet of man; The 1st chapter of Genesis gives man everything that grows in the shape of trees, the tree producing fruit, and the herb in which is the seed thereof. That is the primitive diet of man from a Bible standpoint, but zoologists and comparative anatomists tell us that man is naturally a frugiverous animal. Man could certainly live upon grains and fruits in the native state; he could live on fruits and grains, but fruits and

nuts seem to be the best adapted to the constitution of man. A great many people labour with, and we have to limit them to fruits and vegetables, and after they have lived a few days on fruits and nuts the digestive organs return more rapidly to the normal condition than under any other circumstances. If I ever find myself worn out from my rounds, I live on fruits for a day or two. But we will take this subject up later on.

purifies the surface of the earth; that is the way the dead animal is disposed of naturally. The same thing happens that does when cheese gets old enough to have a bad smell ; certain kinds of flies find it and deposit their eggs and these hatch out into maggots, or more politely , we shouldsay "skippers". These are not always to be found in cheese, because the cheese sometimes becomes so old and hard and sorid that the larvahannot live in it,--the skippers have skipped. Perhaps you have heard the story of Charles Lamb: One time he went down to a cheesemongers' to get some cheese for his sister. It is quite a habit in London to eat roasted cheese for supper, andhe went about half a mile to get some cheese for his sister/ who lived alone. The cheese-monger cut off the piece of cheese, and as he was doing it up Mr. Lamb noticed that it was somewhat lively, and the merchant asked if he should send it home. "No," said Mr. Lamb, "lend me a string and I will lead it home." This is one of my stock cheese stories. It is a good plan to pick up such stories for illustrations. I think I read a story in the newspaper the other day about cheese, like this: A gentleman asked for some cheese; the cheese not being forthcoming, he called again pretty soon, for some cheese, and the second waiter when he asked for cheese said, "The waiter brought the cheese in a little while ago," and the [redacted] said, "I did not find any horse" Said the waiter,--"Perhaps it has wandered away." And it is quite possible that it might have wandered away.

Q. What becomes of the larva, after the body is consumed?

These larvae hatch out in a few days, into flies. First we have the egg, then we have the larva , and this larva, after passing through various transformations becomes a fly, and it only requires a few days for that to take place, and wherever you find the maggots, you will find a great swarm of flies. The skipper of the cheese if is well to

know , for very few people know it, the skipper of the cheese is the maggot or larva of a small fly, when the fact is, that fly lays its eggs in the cheese. , You never find a skipper in fruits, potatoes, or bread, because they know that ~~[illegible]~~ they are not going to rot and become offensive, so as to become necessary to be removed off from the face of the earth as soon as possible as quickly as p possible; they do not furnish a good for maggots; but the fly, one of nature's scavengers, picks out the cheese as a proper kind of meat for its ~~[illegible]~~, and it lays its eggs in the cheese, and the skippers are the evidence.

Ques. How about the a pple worm?

Ans. The apple worm is not a maggot, is it? It comes from an insect. I do not think this worm eats the apple, at any rate. I have never found an apple swarming with maggots like a piece of flesh, at any rate,--I would not say anything about the apples, it seems to me . (Laughter.) I confess I never thought of the apple worm in that light, but I confess, I would not mention the apple.

Ques. How would you get through it, if the question were asked you?

A. I never found an apple full of skippers,--put it in that way--that you never found an apple or a potato full of skippers. A single worm only is present in the apple,--I do not know but what you may find two sometimes, but I think that investigation would show that the case was similar to that of the oakball; a certain insect stings the oak tree or the leaf or the twig, and you soon get the ball that forms the nutgall . You know we have worms of various kinds that bore in plants, but they are not skippers, or maggots; whereas the skipper is a maggot, and belongs to that class.

Mr. Otis: The moth lays its egg or pupa right on the flower. There is a little maggot which cuts a direct way out of the apple and the apple itself is left.

Dr. Kellogg: That is what I say; I have never seen anything but a passage way out of the apple, as I got it starts in the center; the worm is there because it was laid there in the embryo of the fruit.

Mr. Otis: When the skin of the apple is broken decay begins.

Dr. Kellogg. Yes; the decay begins after the injury by the worm and not before. I think the worm does not dabble upon it, it simply bores its way out.

Q. Then shall we speak of the apple?

A. If any one asks you about it; that the egg is laid, not in the apple but in the flower.

Q. What is it laid there for?

A. So that it will be taken care of. So it won't be eaten up by the insects; that is a remarkable thing, that the egg is taken care of all the time within the fruit. By and by when the fruit gets ripe the egg develops into larva, and it bores its way out into the sunlight.

Q. Does it come out in the form of a maggot and then become a fly?

A. It becomes a moth; it does not belong to the class of skipper flies.

Q. Why are fruits and vegetables not good combinations?

A. We will take up that subject by itself.

Mr. Jones: The worm gets larger in the apple, does it not?

Mr. Otis: The fruit has to be there for some time, and it must eat a little of the apple so as to get its muscles strong enough to bore its

way out.

Q. We never find this to be the case until the apple is mature, do we?

A. They bore their way through soft apples rather than through green apples.

Q. What is the means by which the growth of the worm is produced?

A. It probably absorbs a little of the nourishment of the apple; it does not remain in the apple so as to consume it, however.

Q. It generally eats the seeds; it eats around the core of the apple.

A...I have often noticed that we find a little web spun near the core; I have never found anything but a straight line out of the apple.

Q. We never find this web in a green apple.

A. No; in the green apple the animal is not developed yet. The embryo has a certain time to go through all its different changes, so the apple ripens and the worm matures at the same time.

We were talking about the necessity of eating food entirely sterilized and free from germs, and I have shown you that this is the kind of diet that is eaten by the animal which man most resembles in his functions and his structure,-- in the shape of his teeth and the length of the alimentary canal and the whole shape of the digestive apparatus.

I have shown you also that we do not require germs for the digestion of our food, and that in the healthy normal digestion, there are no germs in the stomach for the first hour of digestion; that the healthy stomach makes itself perfectly free from germs so that the products of digestion shall not be contaminated with the products of decomposition and putrefaction so that the pure foods shall be converted into pure blood,-- and that rules out cheese, because it is simply the product of old de-

I might mention another practical fact, and that is that decomposition in milk is perhaps the most prolific of all kinds of intestinal disturbances in the summer time ,---milk which has become stale or a trifle sour, or in which the germs are present, in unsterilized milk,--in which the germs have grown and developed until the milk is full of them. Milk is perhaps the filthiest of all the ordinary food we take under ordinary circumstances. The condition in which milk is taken is such that it is inevitably infected with germs to a enormous degree. The cow does not always have a nice bath before she is milked;

the milkman does not always mop the stable floor just before milking time, and he does not always wash his face and hands and have his clothes as clean as they ought to be before milking time. The consequence is that, as everybody knows, the dirt is visible to the naked eye, and must be strained before being used; I do not think anyone would think of drinking milk just as it comes from the dairy; it must be strained,-- and some are so fastidious that it must be strained twice-- first through an ordinary strainer milk pail, and then through a cloth. The second straining brings out an even larger amount of black specks, which, upon examination, prove to the the excreta of the cow, and which, when examined bacteriologically, prove to be surrounded with germs that are deadly in character. These germs found in the excreta of the cow have among them in greatest abundance a germ known as the bacillus coli communis, or common bacillus of the colon. It is a bacillus found in the colon of all warm-blooded animals or mammals; it gets in there through the mouth, and is found in the colon. It is not found in the colons of unborn infants or of animals just born. This guinea pig that I spoke of was killed after it was 20 days old; the experimenters got tired of taking care of it as they had to sit up nights and feed it every three hours and give it water, so at the end of the days they killed it and made a minute examination of it and did not find a single germ in the animal anywhere. It was absolutely free from germs. Now the colons of animals when born are absolutely free from germs, but the germs get in from the air. This bacillus is capable of producing disease,--abscesses, pleurisy, pneumonia and a disease closely resembling typhoid fever, if it is not typhoid fever, and other diseases closely resembling cholera morbus and a variety of

other maladies which have been directly traced to this germ.

Now milk that is unsterilized, as it comes from the dairy always contains this germ which is capable of producing these deadly poisons, and if it were not for the fact that the stomach is capable of destroying germs,--and this germ, the bacillus coli communis,-- if it were not for the fact that the gastric juice can kill them, everybody who takes unsterilized milk would be made sick by it. But the stomach is capable of destroying germs, and ordinarily does destroy them. But suppose a child eats too much milk, then how can the stomach destroy the germs? I might mention a fact that is familiar to all of you, and that is that new milk is more readily digested than milk a few hours old. How many of you know that babies can take milk still warm, who cannot take it any other way? This is simply for the reason that when the milk first comes from the cow it only contains the germs which have been dropped into it. But these germs multiply enormously, so that at the end of 24 hours there may be as many as several million germs in a very few drops of milk; I have seen as many as 500,000 germs; more than that-- I have seen cases in which there was to be found nearly a million germs in every drop of milk. Now see what an enormous quantity that is. At first there would be only a few thousand, perhaps a in the whole pint of milk, but at the end of a few hours there would be millions to be found where before there were perhaps but hundreds. You know you can taste milk when it is only a few hours old; This flavor is produced by the germs which have been crowding and swarming in-- this is due to the action of the germs in the milk. You have sometimes noticed that your milk is not sour, and yet it is quite thick; the milk becomes thick without being sour; how many of you know that? There are some germs which will curdle the milk, but do not sour milk.

There are germs that are capable of doing that: Sometimes the milk acquires a peculiar color; it sometimes becomes blue; but when I speak of this milk I do not mean milk that has been skimmed top and bottom three or four times, but I speak of milk that has not been skimmed, and that was recently fresh. That peculiar blueness is due to a certain kind of germ that gets in and produces a blue color when the germs grow. There is another germ that produces a red color. There are three or four different kinds of germs in milk. Sometimes there is a germ that produces a blue color all the way through, and there is a germ that produces red color in little islands. Some germs produce a red color when certain germs are present, but do not when other germs are present.

There are always germs in the stomach when the food is not sterilized, and they grow in the intestines, and these germs cause a great share of the stomach disorders among young children and grown people also, in the summertime. Germs are more numerous in the summer time than in the winter, because in the summertime the milk is not kept so clean as in the winter, and so the germs develop and grow very rapidly. Another reason for this is, that the germs are bred in the summer, and there is more dust in the milk in the summer, and the dust is swarming with germs. And so we have a larger variety of germs and of putrefaction, germs in the summer than in the winter.

Buttermilk and sour milk is preferable to sweet milk. Many people can eat buttermilk and sour milk when they cannot eat sweet milk. Why is that? The lactic acid that is produced from milk when it is sour destroys a great many germs, and prevents the growth of germs. The acid forming germs, which are comparatively harmless,

in their struggles with the multitudes of germs which are more dangerous, get the start and the other germs die and disappear. So with sour milk,--we have a comparatively harmless class of germs. These germs when taken into the stomach do not grow there; the same is true of buttermilk to some extent. We might say that in the case of buttermilk the larger part of the germs have been taken out with the cream and the butter, for the viscid fat of the cream catches the germs, so that in butter we have a larger proportion of germs than in the milk. In the first place the germs grow by contact with the air; the germs rise to the top of the milk and get entangled in the cream, so that the cream has more germs than the milk does, and when the cream is churned the germs get together, so that there is more germs in the butter than any where else. For these reasons butter is the filthiest thing there is on the table, and the next filthiest thing is sour milk, and the next in order so far as filthiness is concerned is meat, which must be just "that gamey", and the cheese, which might sometimes carry off the palm for filthiness, for it is composed of milk that is so old that it is swarming with germs--

Q. Will sour milk form curds in the stomach?

A. No; that is another reason why sour milk should be taken instead of the ordinary milk, because the curds are broken up by churning, whereas fresh milk taken into the stomach may form large hard curds, and this creates hard digestion. But we will take up the subject of milk further on. We have not gone through with this subject of errors of diet; we will spend a little more time with that at another time.

SCHOOL OF HEALTH LECTURE SERIES. (No.II.)

Common Errors in Diet. July 26/97.

J.H.Kellogg, M.D.

--- X ---

Ques. There are several who did not understand what was said in regard to the albumin being converted into a soluble element in the stomach, and then converted into a soluble element, and then converted back into an insoluble element again.

Ans. Stomach digestion is acid digestion, and the albumin is converted by the action of the hydrochloric acid into acid albumin,--syntonin. When the peptone from the stomach passes into the intestine it meets the alkaline gastric juice and the pancreatic juice which precipitates the peptone and it is again dissolved and converted into an alkali. Properly the peptone produced by the pancreatic juice is a different peptone from that produced in the stomach ; it is then ready for absorption into the blood. The process of digestion is completed by the absorption ofthe food; While the peptone, or soluble-dissolved-albumin is passing through the wall of the intestinal canal and getting into the blood and passing into the blood, the last act of digestion takes place, so there is no peptone to be found in the blood ,--and when it gets into the blood it is blood --how many of you can tell what I have just said?

Now we will take up the subject of "Common Errors in Diet," and we will begin right where we began with the study of digestion--in the mouth. You remember that we found, in stomach digestion, that the saliva digests starch, and that this digestion of starch takes place not in the mouth, altogether, but in the stomach; the food does not remain in the mouth long enough to be thoroughly digested, although the saliva

acts upon the starch with a very great rapidity, the conversion of starch into dextrin and sugar takes place almost instantaneously in the presence of a sufficient amount of the digestive principle, but if the amount of digestive principle present is small in the mouth, then this process is very slow. A small amount of saliva will convert a large amount of starch, but a large amount of saliva will convert it very quickly, if there is enough saliva. The ptyalin, which is the active principle of saliva will digest more than a million times its weight in starch, but it will take it a long time, and we should take away the digested starch as rapidly as digested, because the presence of a large amount of digested starch interferes with the further digestion of starch; so in order that the starch shall be quickly digested we must have a large amount of saliva, and we should take this as a practical thing, that saliva actually does upon starch. Saliva acts upon the food after it enters the stomach. This action continues for about forty minutes after entering the stomach; the stomach contents become more and more acid as the gastric juice is formed, until after a while the contents of the stomach become intensely acid and then the saliva no longer continues to act upon the starch, and starch digestion ceases; so that starch digestion is the first part of the operation of digestion.

Food should be properly chewed in order to be properly insalivated, , and it is not only important that it should be properly chewed, but it also should be dry. This has been demonstrated in the Laboratory of Hygiene in the Battle Creek Sanitarium. Some two or three years ago it was found that any amount of chewing moist food does not produce an outflow of saliva; it is the dryness of food rather than

its hardness that produces this outflow. I have a pamphlet on salivary digestion that I will put in your hands. When Grumose, a perfectly dry and sterilized food was chewed in portions for five minutes one ounce of Grumose was found to have increased in weight about three ounces-- in other words there was two ounces of saliva produced by chewing one ounce of dry grumose; whereas the chewing of an ounce of grumose produced only a half an ounce of saliva. The chewing of an ounce of ordinary bread produced one ounce of saliva; the chewing of soup produced only a very small quantity of saliva. The chewing of an ounce of water produced almost no saliva at all. Do you see there is a reason for this,-- nature does not produce saliva when there is no use for it; she does not throw away any efforts. For this reason the fish has no salivary glands; it would be wasting the saliva for a fish to have salivary glands; the saliva would be washed out in the water. Any little fact of this kind in anatomy is interesting to people. The fish has no salivary glands because he lives in the water; he lives in the water and consequently his food is always moist, so the salivary glands would not be of any use to him and he gets along without any salivary glands. It would be impossible for us to live without salivary glands.

Mr. Gladstone required his boys to make forty movements of their jaws with every mouthful of food, in order that it might be well masticated. Remember that it is the dryness of food that produces the outflow of saliva; the contact of the dry food with the mucous membrane of the mouth stimulates the nerves that control the secretion of the saliva in the salivary glands; so the contact of the dry food with the mucous membrane of the mouth is the thing that causes the saliva to flow. The

movements of mastication have something to do with the outflow of the saliva, but not everything; it is the reflex action set up by the presence of the dry substances in the mouth which causes the abundant secretion of the saliva. I suppose you knew that this is a new discovery. I do not remember of running across this fact in any work on Physiology,--do you? I remember that leading physiologists used to state that the salivary glands were stimulated to activity by the movements of the jaws. Have you noticed any statement in works on physiology to the effect that the outflow of saliva is due to the presence of dry food? ("Yes, sir; it is stated that the dry food produces the most saliva,--Foster says so.")

DR. PARLOW: Thirteen years ago the Testimonies state that fluid taken at meals diminishes the flow of saliva.

DR. KELLOGG: But at that time there was no physiology that contained that statement. But fluid taken with the food not only washes the food down without proper mastication, but it actually stops the flow of saliva. You have an experience of that kind,-- you notice that when you are taking dry food, if you take a sip ofwater, occasionally, the mouth seems to be dry, and you have to keep moistening your mouth and washing the food down; whereas, if you do not take any water in your mouth, but eat dry food, after a while the salivary glands act freely. A certain gentleman came to this town who had the world's prize for riding the bicycle [illegible] of dry food exclusively,-- he ate vegetable food-- a vegetarian like [illegible] came to [illegible] the [illegible] while. [illegible] said, "I understand that the horse is one of the swiftest animals, and he eats dry food, and that caused me to adopt that practice." Said I, "Don't you find it hard to eat absolutely dry food?"

"Why," said he, "it seemed at first as though the food would choke me, until after two or three days, when the saliva begunto flow freely, and after three or four weeks I had more saliva than I knew what to do with--I had a surplus of saliva." This you see, was simply the result of the salivary glands accommodating themselves to the circumstances of the case. This is a good story to tell, if you remember it. It is a good plan to pick up little illustrative stories like this. You will have the same experience,--eating dry food will seem to choke you at first, but after a few days nature begins to pour out an abundance ofsaliva. Here are these two points,-- that dry food, not necessarily hard food, causes the flow of saliva-- a small quantity at first, but an abundance of saliva afterwards,- and the amount which is required to secure the quick transformation of the starch. This is important for persons suffering from hyperpepsia,--they have too much hydrochloric acid, and a soreness of the stomach and a burning in the stomach, etc., which is due to excess of hydrochloric acid. In such persons, you can readily see that the matter of eating dry foods is one of great importance, because it will cause a large outflow of saliva, it will secure a quick digestion of starch and at the same time delay the development of an excessive degree of acidity in the stomach because the saliva is alkaline and will neutralize the hydrochloric acid, and hence will, in the same degree, lengthen the time before the contents of the stomach become too acid for the saliva digestion to proceed. Remember these two things--it is the dryness of the food and the abundance of saliva that will secure the quick digestion offstarch.

You can see them, in this way, that by drinking copiously of water at meals, the food will be rinsed down into the stomach without being properly masticated and commingled, , and then there will not be sufficient saliva to disintegrate the food in the stomach so the gastric juice cannot do its work well, because the food is in chunks and lumps instead of fine particles and the food will therefore remain in the stomach for too long a time, and the stomach will not do the work which the mouth ought to do. There are some insects and animals which have their teeth in their stomachs there are some creatures which live in the sea and the walls of their stomachs have a regular system of knives and hatchets which pick and hatchel the food all to pieces. These creatures swallow their food whole. You know the chickens and all herbivorous and carnivorous birds have a gizzard, and in that gizzard are always pebbles which the animals swallow; and the gizzard is a powerful muscle which grinds this food between these pebbles, and it might be called a pebble mill. You go into a manufacturing pharmacist's or druggist's and they have a drum into which they put pebbles and they cause the drum to revolve, and the drugs are rubbed against the drum and against the pebbles, and this continues until they become an impalpable powder. Now the chicken grinds his food in very much the same way in a sort of pebble mill. But we have no such arrangement for grinding food and if our food is ever ground it must be ground by nature in the stomach or ground by the teeth, and after the food has entered the stomach, the stomach will do the work of mixing the saliva with the food, so that every particle of food is exposed to the action of the digestive fluids.

Now if the food enters the stomach in coarse particles and the saliva is not present in the proper amount so that the stomach can do its work of breaking up the food and it remains too long in the stomach, and if the thing which is of the greatest disadvantage to digestion occurs,--fermentation takes place and decomposition begins. Germs are smaller with the food and these germs are digested by the hydrochloric acid of the gastric juice.

The hydrochloric acid has another principle besides that of digesting food,-- and that is that it preserves the food while it is in the stomach; that is a most important point,--, that the stomach is to be regarded as a portion of the digestive tract in which the food is prepared for digestion, not only by being reduced to fine particles but by the destruction of the germs and disinfection . If you give a dog a piece of meat it would be found fresh two or three hours after the dog was killed. The stomach has perfectly disinfected the meat. It is because we have this disinfecting power of the gastric juice in our stomachs which is capable of destroying germs that we are able to eat such foods.

Now if the food remains in the stomach for too long a time, after a while the hydrochloric acid is absorbed,--this disinfecting power of the gastric juice is absorbed into the stomach then the germs reappear and the processes of fermentation and putrefaction begin in the stomach.

The another evil arising from the too long continued presence of food in the stomach the hydrochloric acid is an irritant. A physician in Germany some time ago made this experiment he made a little window in the stomach of a dog, the same as that in the stomach of Alexis

St. Martin, and he took a live frog, and he put his hind legs in the stomach of the dog and in a short time the legs were found to be dissolved entirely off by the action of the gastric juice. The gastric juice will dissolve any living thing taken into it. The gastric juice has the power, also, to attack the mucous membrane of the stomach. The mucous membrane of the stomach is endowed with the marvelous power to protect itself to a certain degree, but if the gastric juice is present in the stomach for too long a time, and becomes intensely acid, the power of the mucous membrane to resist the digestive action of the gastric juice is lost, after a while, and then ulceration takes place. Irritation and other disorders result from this cause so that we frequently find persons suffering from ulceration of the stomach in consequence of the action of the gastric juice. So if our food remains too long in the stomach, the long-continued presence of the hydrochloric acid in the stomach irritates the mucous membrane.

Another injury which comes from the presence in the stomach of this food which has been imperfectly chewed is that by the irritation of the stomach and the prolonged congestion of the stomach resulting, it finally produces catarrh of the stomach, and when these imperfectly digested particles come down into the small intestines they irritate them, and the continual congestion of the stomach is communicated to the small intestines so that we have catarrh of the small intestines resulting,--intestinal catarrh, as it is termed--and catarrh of the bowels, and this sometimes extends to the liver, so that persons addicted to hasty eating are like to suffer from jaundice as the result of catarrh of the bile ducts, which causes a closure of the bile ducts so that the bile cannot readily escape from the liver, so we have jaundice, etc.

So that there are three things that we must from eating too hastily so that the foods not perfectly chemically--are in the fermentation of food in the stomach. The first thing is that the food is retained too long a time in the stomach that we have fermentation in the stomach, because it is retained too long in the stomach, the hydrochloric acid being neutral and the gastric secretion, the second is that the long-distilled products of the hydrochloric acid in the stomach, that is not neutral by the stomach, cause irritation of the stomach and the third the difficulty is that unfavorable irritation of the stomach by the rubbing of the sharp particles of food against the mucous membrane of the stomach causes an'ers of the stomach, and this extends down into the duodenum and produces intestinal catarrh, and after a while we have the liver catarrh, consisting of the bile ducts, and jaundice.

Another evil resulting from the imperfect mixture of the saliva with the food that is called amylaceous, or starch, indigestion,-- an inability to digest starch. This is a very common complaint among Americans this is what has given rise to the almost universal dyspepsia among the American people. There are so many people who find themselves so uncomfortable after eating anything hard that they cut much. So many people say, I can not eat meat, bread or vegetables which contain starch,--potatoes, for instance.' For these foods were swallowed too quickly, and the stomach has lost its power to digest starch. The first result of starch being taken into the stomach is that it undergoes fermentation. It is converted into sugar and gases and a small amount of alcohol is also formed by alcohol fermentation, so the patient complains of gases swelling, etc.

We might give a large number of evils growing out of imperfect

[illegible] which starts a train of [illegible] [illegible] through the whole alimentary canal. The process of digestion might be compared with a [illegible] of bricks each one set about three inches from the other, the top being [illegible] with a slight tap of the first brick it topples over against the second brick, and that then against the third, and so on until the whole row is toppled over, by the tipping of the first brick. It is exactly so with the process of digestion. If the mouth digestion or salivary digestion is well performed the gastric digestion will be well performed, and if the gastric digestion is well performed, the pancreatic digestion will be well performed. And so on with the remaining processes of digestion. We never find a person suffering from indigestion from disturbances in the lower part of the alimentary canal, but we have them in the stomach,-- there is where they all start. So in the treatment of disturbances of the digestion you must begin in the stomach. As I said, if the salivary digestion is imperfectly performed all the digestive processes following will be imperfectly performed. The drinking tea and coffee, and cold water, and the use of chops, soft boiled eggs, etc., has the result of producing the almost universal condition of dyspepsia that exists in the world. All the forms of indigestion may be cured by a dry diet; a person adopting a dry diet, no matter what form of indigestion he has, he will be benefitted. If a person is suffering from indigestion, dry food will most certainly help him. I do not know of any other prescription so universally helpful as the eating of dry food. It might be a dry diet of [redacted] bread and fruits,--that is, dry bread--ordinary fermented bread is not dry, it is moist, and it is not a very good diet.

Perhaps the worst thing that people can do in the way of vegetable food is milk, oatmeal, white potato, crushed wheat improperly cooked, which has the effect of laying the foundation for indigestion,-- and especially when sugar and milk and other things are added, it seems about the worst combination of food that can be put into the stomach, and yet they are believed to be the best we have to use.

I shall say a word further here in reference to indigestion,-- that the saliva can act only upon cooked starch. The pancreatic juice digests raw starch, but the saliva only digests cooked starch. It is important then that in order that the stomach digestion should be well performed that the starch should be cooked, otherwise it will not digest in the stomach, but it may ferment in the stomach, because the gastric juice in the stomach are capable of digesting raw starch, although the saliva cannot digest raw starch. Now you will ask the question, perhaps, why is it then that we must eat grains? Man in his original state did not have a fire and did not burn things. He did not know how to cook. This does not militate against the idea that man is naturally a vegetarian. By because the natural diet of man is fruits and nuts man is naturally a frugivorous animal, and these articles of [illegible] food contain no starch, and consequently do not require the action of the saliva to convert the starch in the stomach.

One further point is of practical interest, and that is that the digestion of starch which is the result of the action of the saliva-- this digestion of starch in the stomach stimulates the flow of the gastric juice. We have in nature that are known as peptones, and these peptones stimulate the flow of the digestive fluids; the sweetness of fruit is a peptone; the acids and sugars contained in fruits cause the outflow of the saliva to some degree; the flavors of foods are peptones,

but the dextrin that results from the action of the saliva upon the starch or cellulose is a very powerful psychic. The flavors of food are very powerful psychic stimuli, and appear to be the most powerful, and they are claimed by to be all. Bad odors and sight are powerful psychic- that by they stimulate the stomach to pour out the gastric juice.

I might say further, that the smell of the gastric juice also stimulates the liver to pour out bile, for the smell of the gastric juice begin in the duodenum, the liver contracts and its vessels are emptied; the gall bladder contracts and pours out a flow of bile to neutralize the outflow of the gas hydrochloric acid. See that an interesting arrangement this is- the saliva acts upon the starch and converts it into dextrin and sugar, and this stimulates the stomach to pour out gastric hydrochloric acid; the gastric juice does digest the albumin, and then the gastric juice acts in the stomach it stimulates the bile to digest the fat, etc.; but if the saliva is deficient in quantity there will be a defect in this process following, so that one difficulty produces another.

OBVIATE

# THE DIETETIC VALUE OF FRUITS.

D. Vergely, who has made a careful study of the diet of infants and young children in this class ofdisorders, finds that one of the most important features of the dietetic management of gastro-intestinal diseases is the proscription of meats. Beef tea, beef juice, animal broths, raw meats, and similar meat preparations, which have been so generally employed in all kinds of conditions, he finds to be highly injurious in these cases. It must be remembered that the kidneys are taxed to an enormous extent by the elimination of ptomains and toxins which are formed in abundance throughout almost the entire intestinal tractin these cases. A meat diet greatly increases the quantity of these poisons by furnishing a medium in which germs grow with the greatest rapidity and virulence. The diet, during the acute stages at least, should consist ofwell-boiled, carefully strained gruels, fruit soups, fruit juices, and malted nuts.

Fruits are so generally regarded as a luxury that their dietetic value as a food seems to have been largely overlooked. Fruits without doubt formed a leading constituent, perhaps the chief element, in the original bill of fare of the human race, just as they now do that of the gorilla, the chimpanzee, and the orang-outang, the classes of lower animals which come next to man in the scale of being, and the majority of savage tribes whose habits have not been modified bu contact with civilized man.

The many popular errors concerning the indigestion of fruits are perhaps responsible for their sparing use. Lack of knowledge respecting their great value in a variety of diseased conditions must also be held responsible to a considerable degree for the fact that they occupy so small a place in the usual bill of fare of civilized nations.

The value of the "grape cure" in certain forms of intestinal disease has long been known. The "apple cure," the "peach cure," and the "strawberry cure" have each had its advocates as a rival to the "grape cure."

A recent writer on medical dietetics remarks that the rationale of the "grape cure" and other forms of fruit cures is not yet understood. We think the reason is plain, since the bacteriological investigations reported in this journal some months ago have shown clearly that those micro organisms which are most abundant in certain forms of indigestion, particularly those accompanied by so-called biliousness, coated tongue, bad taste in the mouth,etc., do not thrive in fruit juices, and die quickly in grape juice. This fact shows quite conclusively that the value of a fruit dietary in indigestion is chiefly due to the germicidal properties of the fruit juices.

This action of fruit juices is doubtless due to the acids which they contain. Professor Koch, of Berlin, has conclusively demonstrated the fact that a small quantity of citric acid added to a glass of water is capable of destroying all pathogenic germs which it may contain. Other fruit acids seem to have similar properties. At any rate, the writer's experiments show that the juices of grapes, apples, lemons, and other acid fruits remain sterile when inoculated with stomach fluid, which gives rise to a very abundant bacterial growth when inoculated into beef tea, gelatin, and other nutrient media of animal origin.

This property of fruits renders them of immense value in the treatment of socalled biliousness, nervous headache, sick-headache, fevers, and the gastro-intestinal disorders of both children and adults. It is necessary, of course, to adapt the particular kind of fruit eaten and the form in which it is presented, to the digestive organs of each individual case. It is also necessary to note that fruits are not compatible with all other kinds of foods. For example, fruit and vegetables constitute a poor combination for persons suffering from slow digestion as the result of dilatation or prolapse of the stomach, or hypopepsia. Acid fruits and cereals are not a good combination in cases of hyperpepsia, because of the excessive acidity of the stomach which already exists, whereby the gastric digestion of starch is seriously interfered with.

Fruits are, however, of great value in many forms of disease, because ofthe acids which they contain. These acids when taken into the blood break up some of the compounds of waste substances which have been formed, and thus give rise to an increased excretion of these substances through the kidneys. In this way fruits are a great advantage in the treatment of rheumatism, gout, gravel, and all the different morbid conditions which accompany the so-called urice-acid diathesis. The observations of Haig respecting the relation of uric acid to neurasthenia give to fruit a great dietetic value in this disease. He has shown that neurasthenia is almost always the result of the accumulation within the system of tissue wastes, largely in the form of uric acid. The free use of fruits aids in the elimination of these poisons, not only by breaking up the compounds which they form within the body, but by stimulating the kidneys to increased normal activity.

Remembering the interesting fact pointed out by Bouchard, that rheumatism is really a toxemia, resulting from the decomposition of food-stuffs in a dilated or prolapsed stomach, we may also attribute the beneficial effects of a fruit diet in rheumatism and allied conditions to its value in suppressing the formation of poisonous substances in the alimentary canal in the manner already pointed out.

Obesity, which is, like rheumatism, a diathesis, may be successfully treated by a fruit dietary. Tysi is due not only to the fact that fruit is a natural food, and thus aids the system to establish normal tissue metamorphosis and a normal balance between the processes of assimilation and disassimilation, but also because it affords a very confortable means of reducing the amount of nutrient material received to a minimum quantity.

Fruit is chiefly water, the amountof nutrient material it contains varying from five to eight or ten per cent in most dried fruits, such as dried grapes, prunes, dates, etc. The writer has succeeded in reducing excessive weight in the most satisfactory manner, by prescribing a diet consisting almost exclusively of grapes or apples, allowing only a small bit

In some xases the fruit may be allowed as often as three or four times a day, if necessary to relieve an uncomfortable sensation of emptiness.

In fevers, fruits, especially in the form of fruit juices, are a most convenient and certainly the most appropriate of all foods. It is now almost universally recognized that beef tea and meat preparations of all sorts should be wholly proscribed in cases of fever, as the patient is already suffering from the accumulation of waste matters to such a degree that the addition of even the small amount contained in beef tea or a small piece of meat, may be sufficient to give rise to an exacerbation of the disease and lessen the patient's chances for recovery.

German physicians make great use of preparation of fruits in fevers, particularly of fruit soup, which is made by boiling for some time one part of dried fruit of some sort with four or five parts of water. In cases in which considerable gastro-intestinal irritation exists, the soup or decoction thus prepared should be carefully strained, so as thoroughly to remove the skins and all other extraneous matters. The juice of oranges, grapes, raspberries, blackberries, huckleberries, tamarinds, currants, or cranberries may beadded to water as a beverage in fevers. Thus used, they not only increase the quantity of water which the patient is enabled to drink, by giving to it a distinct and agreeable flavor, but also aid the elimination of poisons with which the system is struggling, by a slight diuretic action. Fruit juices used in the same way are likewise highly beneficial in Bright's disease and other forms of kidney disease in which it is desirable to increase and maintain the flow of urine. The grape-fruit, the lime, the shaddock, and the pomegranate also afford aggeeable acid juices which may be used in the same manner. The anteseptic value of fruit juices must be recognized as a positive benefit in these cases.

There is no single article of diet of such great value in the treatment of intestinal inactivity or constipation as fruits. For this purpose fruits must be eaten freely, being taken, as a rule, in cases of this

sort, at the beginning of the meal or a little while befor it. Fruit is most effective when taken by itself in this manner. Raw apples, steamed figs, peaches, apricots when not too ripe, prunes, oranges, and tamarinds are of the greatest calue for this purpose. Tamarinds or pomegranates furnish an acid from which a very pleasant beverage may be prepared. Tamarinds used in this way sometimes serve a useful purpose in cases of constipation.

Persons who employ a fruit diet for the releif of chronêé symptoms such as rheumatism, neurasthenia, sick-headache, etc., should not, however, expect to be cured in a few days or a few weeks, but should adopt the free use of fruit as a regular practise. In cases of periodical sick-headache, which is almost always connected with dilatation of the stomach, the patient may advantageously adopt the plan of sytematically confining himself to a fruit diet for one or two days preceding the time of the expected attack; or it may be sufficient to confine the diet to fruit for a single one of the daily meals, as for breakfast. Persons who require a fruit diet are generally benefited by an adoption of the two-meal-a-day plan, nothing being taken after three or four o'clock in the afternoon, so that the stomach may be prepared as thoroughly as possible for the reception of fruit the next day. As regards the particular fruit to be eaten fro special conditions, the most important thing to be said is that fruits, if possible, be taken fresh and as soon after reaching maturity as possible. Canned fruit and d dried fruits are inferior tofresh fruit; still they are far better than none, and if properly prepared they may render very great service. Each fruit has its own special adaptation and limitations. A few points in relation to each of the principal fruits commonly employed as foods may eb of practical inrerest.

The banana is, aside from the date, the gif, and the raisên, the most nurishing of all fruits. The amount of nutrient material contained in a pound of bananas is almost equal in sustaining value to that found in a

pound of beefsteak. The amount of nitrogenous or albuminous substance found in a banana approximates five per cent. In the dried banana the proportion is bacut twenty per cent., or one-fifth. Humboldt calculated tha t the bananan, grown in sutiable soil and properly cultivated, is capable of producing more food to the acre than any other plant. When well matured, the banana is easily digestible.

According to Sergeant Parks, Stanley and his white associates subsisted almos exclusively upon banana flour for two years in the Ulds of tropical Africa. The writer is inclined to attribute to this fact, in a large degree at any rate, the success of these intrepid explorers in withstanding the almost innumerable dangers to lufe and health from disease, incident to travel in that portion of the world in which Stanley has rendered such great service as an explorer.

A gruel made of dried bahana flour is not only highly nutritious, but in the highest degree wholesome, and is often tolerated when ordinary farinaceous preparations, such as milk, buttermilk, etc., are promptly rejected. The bananana contains a small amount of starch; but this is so easily digested by the saliva that within an almost incredibly short space of time the stomach contents is found to contain a larger proportion of well-digested starch and similar substances previously existing in the banana and not requiring digestion, than can be produced in the same length of time in any cereal substance placed under the same conditions. Bananaswhich have been picked so green that when found in the market they are wilted and tough are entirely unfit to eat. Green hananas may be baked the same as apples, and are by some greatly relished when thus served; indeed, the fruit is, on the whole, much better used in this way.

Apples may be eaten either raw, stewed, or baked. If eaten raw, they should be thoroughly ripened, else in mastication large masses will enter the stomach in a condition to interfere with the process of digestion, giving rise to fermentation or other disagreeable symptoms.

Pears may be cooked in the same way as apples, but are less useful in relieving constipation, and are not usually so readily obtained. Pears, however, have the advantage over apples that they are usually of a more mild and palatable flavor, sot that they do not require the addition of sugar, which is often added to sour fruit in such excessive quantity as to render the fruit entirely unwholesome. Instead of adding cane-sugar to sour fruit, the better plan is to mingle together sour and sweet fruits.

The pineapple, as well as the lemon, orange, grape-fruit, tamarind, guava, pomegranate, sapota, and other tropical fruts are as valuable as they are palatable, and ought to be freely used when obtainable.

There is perhaps nothing better for checking hemorrhage from the stomach than the pure juice of one or two lemons, swallowed quickly. Nose-bleed may be stopped by snuffing lemon juice into the nostrils from which the blood issues; and it has long been known to obstetricians that lemon juice is one of the most effective means of checking uterine hemorrhage after childbirth.

Pineapples, when allowed to mature upon the plant, are extremely palatable and luscious, and almost as easily digested as the starch-peach, although containing considerable more woody matter; but in the form in which they are usually obtained in this country, they are usually quite indigestible if eaten raw, and only the juice should be swallowed. The juice of the pineapple contains a digestive principle similar to pepsin. It may be used with advantage as an application to the throat in diphtheria.

The strawberry, which is ont of the most popular favorites of all the various kinds of domestic fruits, is generally well received by the most delicate stomachs, if care is taken to avoid rendering it indigestible by the addition of cream and sugar, ice-cream, etc. The better varieties of strawberries are sufficiently sweet, and require no sugar. They are best when fresh, being less well adapted to canning than almost any other fruit. The strawberry is said to contain a larger proportion of iron in its water--

free constituents than any other fruit. There is occasionally a person who cannot eat strawberries because of some idiosyncrasy, as tge result of which an exceedingly troublesome rash appears whenever this fruit is eaten.

A combination of fruits with nuts which have been thoroughly cooked and completely disintegrated is found of great value. "Fig bromose," "banana bromose," and a number of other similar products have proved of great value in the treatment of chronic constipation and various other conditions in which a fruit-and-nut diet is especially indicated.

~~SCHOOL OF HEALTH LECTURE SERIES.~~

~~Our Foods and How We Digest Them. July 25/97.~~

~~By J.H.Kellogg, M.D.~~

From Bread to Brain

There are five digestive organs, the mouth, stomach, liver, pancreas & intestines. The salivary glands in the mouth make saliva

The stomach makes gastric juice; the liver makes bile, the pancreas makes pancreatic juice, and the intestines make intestinal juice. ~~How many~~ There are five digestive fluids are there? ("Five.") Name them. (Class name them.) That is all there is of the anatomy of digestion.

Now we must know what these different fluids do to the various food substances, making a study of foods by the aid of the microscope and by chemical experiments. ~~By this means~~ we find that food is made up of five different elements,--starch, albumin, fats, sugar and salts,- ~~Foods contain~~ contain these five elements only,--all animal foods and all vegetable foods--if you examine them all you cannot find anything except these five things in them. × Tr. from pg 3.

(× See pg 3-4) ~~Now~~ It may be interesting to know a little something about these different elements. Starch is found in vegetables that grow under ground, ~~and~~ if is found in seeds, but is not found in fruits and nuts. ~~Starch is found in vegetables that grow under ground--~~ like the potato, carrot, etc.--they are composed largely of starch; ~~while~~ wheat, rye, and other grains are about half starch. Starch constitutes the greater part of vege-

table foods, but nuts and fruits contain no starch. ¶ Albumin is represented by the white of egg; it is also represented in grains in the form of gluten; if, for instance, you chew ~~a little~~ raw wheat a little while you will have left a little rubber-like mass; this is the gluten of wheat which corresponds to the albumin of egg. We also have albumin represented in the lean of meat, also in the casein of milk. These are the principal forms in which we find albumin in foods. ~~So we have two elements,--starch and albumin--~~the next food element is fats. ¶ cap.

~~We are all familiar with fats.~~ ~~We have~~ There are animal and vegetable fats; ~~we have~~ animal fats in the form of lard, tallow, cream, etc., and ~~the~~ vegetable fats in nuts; olive oil and cottonseed oil are fats.

~~Then we have~~ ¶ Sugar is also a food element. There are many kinds of sugar, the most common of which is cane sugar. ¶ The sugar however which is found in greatest abundance in nature is not cane sugar, but fruit sugar; ~~Cane sugar~~ which is obtained from the beet, sorghum, from the maple tree and from a few fruits, ~~like~~ but in the watermelon and the date , the most abundant food element is fruit sugar, which is more nearly allied to that formed in our bodies than is cane sugar; it is also a better kind of sugar.

~~We have another food element,--~~ ¶ Salts, the ashes left after

Now every well proportioned meal should contain each of the food elements,

the destruction of the ~~organic elements~~ other food substances,—

~~It~~ is an inorganic element and useful in building up the bones.—

~~It is interesting to notice that~~ this whole food-subject is based upon the plan of fives,--there being five digestive organs, five digestive fluids, and five digestible food elements.

and ~~Now~~ the practical thing ~~to know~~ is to know how the digestive fluids act upon the food elements, and upon which element each digestive fluid acts. Starch.— Salive digests starch; it converts it into sugar. Here is some flour or wheat. I will put some in my mouth and chew it until it ~~has~~ the form of paste; coating it I will chew it for a little while and then put it in a test tube and examine it. I find ~~no~~ sugar in it, whereas, before, it contained no sugar. So the saliva ~~converts~~ digests starch into fruit sugar,-- ~~salive digests starch~~ by converting it ~~into sugar. Now what does the saliva do? (Class repeat.) What is the element?~~ (Albumin.) When the food reaches the stomach the gastric juice ~~it~~ comes in contact with the albumin which it is able to digest and render soluble. Nature makes food insoluble so that it will not ~~waste~~ waste away and dissolve. If apples, for instance, were soluble, a shower of rain would dissolve them, as it would a lump of sugar. So, our bodies are insoluble; if they were not so, a man would waste away and disappear if he should fall into the water; but neither the apples nor the man dissolve when exposed to the action of water, because they are insoluble.

purpose of the render the food substances

Now the process of digestion is to ~~take~~ insoluble ~~so as to render it~~ soluble, and then to convert ~~it~~ them into the insoluble bodies of men. ~~So we have insoluble food made soluble on the one hand, and insoluble man on the other hand.~~ Raw starch dissolves in water; cooked starch will not dissolve in water. Starch will separate in water. Cooked starch is not soluble, but after this starch has been converted into sugar it will dissolve in water, and being soluble in water when taken into the stomach it will be absorbed ~~and~~ taken into the blood; then being carried by the blood it is carried into all parts of the body.

The next food element is albumin, which is insoluble. The gastric juice converts this insoluble mass,--the white of egg, perhaps, that has been boiled and hardened-- or a mass of gluten from which the starch has been separated-- when this has been taken into the stomach the gastric juice dissolves it just as warm water dissolves a cake of ice; it can then be absorbed into the blood. So the gastric juice digests albumin.

What is the next food element? (Fats.) Now as the starch of the albumin reaches the stomach the gastric juice and the saliva work together for twenty-five minutes or half an hour, until their work is done... After passing down into the intestine it finds the bile, which is poured out in the liver, and the bile acts upon the food, but it does not act upon

the starch or the albumin; it acts upon the fat and it emulsifies the fat. I still make that experiment,--have a little gum water and oil. Pour in the gum water first and the oil and the gum water will separate. Shake them up and they are no longer separate; that is an emulsion. That is, the oil is divided into small particles. That is what the bile does with fat, it makes these small particles, so small that the lining cells are able to take up these particles and carry them through in the same way as other food elements are carried through the circulation. (Diagram.) It passes on into the blood in this way, so the little particles of fat are actually to be found in the blood. There are no holes in the intestinal walls, but these cells take up the little particles of fat and pass them on into the blood.

Now we come to another digestive fluid,--what is that? (Pancreatic juice.) What is the next food element that we are to take up? (Sugar.) The pancreatic juice does not have anything at all to do with sugar,-- it does not digest sugar, but it digests starch; the pancreatic juice digests albumin, the pancreatic juice digests fat,-- in other words , it does what the saliva does, and what the gastric juice does, and what the bile does . The pancreatic juice digests what the saliva and the gastric juice and the bile have commenced doing before it. The bile acts with the pancreatic juice;- it digests all three of these foods; it converts starch into sugar ; it converts

albumin into peptone; it dissolves fat,--it converts it into an emulsion. It thus digeststhree of the most important food-elements. What is the next ~~food~~ - ~~digest~~ digestive fluid? (The intestinal juice.)

The intestinal juice digests cane sugar,--and it is the only one of the digestive fluids that will do this; it digests starch albumin and fats as well as cane sugar, but cane sugar is the one food-element which the intestinal juice will digest, and which no other digestive fluid will digest. What is the next food-element ? (Salts.)

Salts are digested by all the digestive fluids,--some part of the salts by one fluid and some part by another. Now let us recite in concert. (Class repeating.)

Having learned this much of the physiology of digestion, we really have the groundwork of the whole subject, and from what we have learned, we may find all the important principles relating to the hygiene of dietetics.--

Q. Why does the pancreatic juice digest the first three food- elements ?

Q. (Dr. Paulson.) What is the use of the saliva and the gastric juice,--I am asking from one side of the question,and he, the other.

A. This brings out the important fact that the stomach is not absolutely necessary to digestion,--although it is a convenient thing

to have a stomach--but we could get along without it. The stomach is a convenient place for storing away food, but it is not essential. A German investigator some time ago made an operation upon a cat by which he removed its stomach, and the cat was seen just as happy without a stomach as it had been with it. Another gentleman made an experiment upon a dog by removing the stomach and the dog got along very well without it. ~~I imagine, however, that dog had to be very careful what he ate (although the record does not say so)~~: the dog probably by his natural instinct recognized the situation and was careful as to his diet,--~~I dare say he didn't eat out of the garbage box. Then why do we have a stomach?~~ The stomach is a sort of antechamber of the digestive apparatus, ~~and~~ the work done ~~in the stomach~~ here is simply the preliminary ~~work of digestion~~. There is no food which is wholly digested in the stomach. Recent discovery has brought out the fact ~~which harmonizes with this, wonderfully well, and that is the fact~~ that there is no absorption by the stomach--~~that the stomach does not absorb anything;~~ the absorbing organ is at the other end of the alimentary canal; ~~the~~ the colon ~~is the great absorbing organ~~. The stomach will absorb alcohol, but there is almost nothing else that it ~~the stomach~~ will absorb. ~~Some of you have noticed that~~ after ~~you have drunk~~ drinking heartily of water ~~you will feel~~ it may be felt or even heard plashing around in the stomach

for some time afterwards; ~~the stomach does not absorb the water~~; it passes out of the stomach and is absorbed by the intestines. You will remember, if you have studied ~~the anatomy of the in-~~ testines (this question is in parenthesis, for it is not a question that would be asked by common people, or those whom we might be lecturing in the woods) you remember ~~that the stomach~~ the mucous membrane of the intestines are ~~is~~ all covered with ~~these~~ little projections ~~which are~~ called "villi" (or "villians" as one old gentleman called them.)--~~the whole of the mucous membrane is all covered over by them.~~ (You must keep your audience goodnatured in order to make their brains receptive); ~~the whole inside of the intestines is covered with~~ these small villi or small projections,(-these are the absorbing organs,) but ~~the stomach is not an absorbing organ~~; it is simply the preliminary chamber of digestion in which the food is broken up and reduced to liquid form and brought into such a state that it can be acted upon and prepared for the action of the more ~~powerful and more efficient digestive fluids.~~ The natural food of man is vegetable ~~food~~ origin as,--fruits grains and nuts ~~are the natural food of man.~~ Now in the stomach we have two fluids at work--the saliva and the gastric juice. Now if you examine food chemically (illustrating by diagram) suppose this to be a mass of ~~fat~~ gluten,--these spaces are all filled up with starch. Now if this were in the stomach and there were only saliva present, it

see pg 10.

would eat out this little pocket of starch on the outside, and it would leave all the rest shut up in these little cells of albumen,--the albumin outside of it would protect the inside from the action of the saliva. Now suppose there was no saliva present, but that there was only gastric juice present ; the gastric juice would dissolve the film of albumin and work down on the outside a little ways eating out the pocket of albumin; but when it came to the solid mass of starch it could no go any further. So neither gastric juice acting alone nor saliva acting alone in the stomach could break up both these food elements into a pultaceous and pulpy mass; it would be simply eroded by the action of the digestive fluids,--the saliva would eat into it in one way and the gastric juice would eat into it in another way, but neither of them could get into the interior of the mass because it is made up of both kinds of material. But when gastric juice and saliva are both present in sufficient quantity the saliva dissolves the starch and the gastric juice eats away at the gluten; then the saliva dissolves some more starch and the gastric juice takes away the gluten and so they work at these food-elements until they are both reduced to a pulpy mass which is soluble in water, and most of it is broken up into thin menstruum and this is carried into the intestines; then the pancreas complete the digestion of starch. It is not

necessary in order that the starch shall become soluble that it should become sugar; the starch is first converted into dextrine and then the acid is neutralized and its work undone so that the soluble peptone becomes insoluble again; then the pancreatic juice redissolves it. Now the pepsin of the stomach breaks up the fat, and then the fat flows down free into the intestine, and when it gets there the pancreatic juice acts upon all three of these food elements. The pancreatic juice is the one important digestive fluid; it will digest everything but cane sugar; it will not digest that, --but we can get along without cane sugar.

Q. If the stomach is not an absorbing organ why is it that immediately after eating, we feel stimulated?

A. The stomach does absorb a little, although every mucous membrane absorbs a little, but the stomach is not a great absorbing organ. There is a little food absorbed in the mouth, but the strength that we feel immediately after eating does not come from the absorption of food, for there has been but little digestion of food, but ~~it is because there had been~~ the nervous irritability caused by hunger, ~~and after~~ is allayed by eating the nerves ~~were~~ steadied ~~and this nervous irritability had ceased.~~ The man who smokes his pipe when hungry finds that this answers the same purpose when he can't get his meal in time; so a man takes a glass of grog when hungry and it has the same effect,--these

things obtund the nerves and the irritation ~~relie~~ is relieved .

I will appoint Dr. Paulson, Dr. Winegar and Br. Palmer as a committee to consider more fully the plan of organizing this work.

It would be well for you to present these subjects: You want to get the fundamental facts and present them in your own language and in your own way, and not imitate somebody else. I want to give you a little lesson to start with. This subject that has just been gone over with will give you something to study upon. Find some illustrative anecdote, if you can,--get two or three illustrative anecdotes from your experience or some thing that you have read or something that you have heard which will illustrate some points in your lecture or talk. You ought to have three or four striking illustrations ; I have given you two or three that have come along to me,- and you can perhaps think of something better. You must keep your audience in a good-natured frame of mind, or they wont learn anything. It won't do to present a subject to your audience in such a cold, formal way that ~~they will like a~~ it will seem like a funeral; but you want to have things pleasant, easy and agreeable.

We want all who take hold of this work to feel that the Lord has called you, and your hearts are burning to go out and

tell some one these life-saving truths; and if that is the case, the Lord will open the way for you to do it, and the committee will organize a class which I jope will do something. We can certainly spare thirty or forty, and not break up the business at the Sanitarium. It seems a pity to keep so many here while the world is lying in darkness and ignorance. If the Lord wants you to spread these truths in a certain town nothing can prevent your getting there, if you are prepared to go.