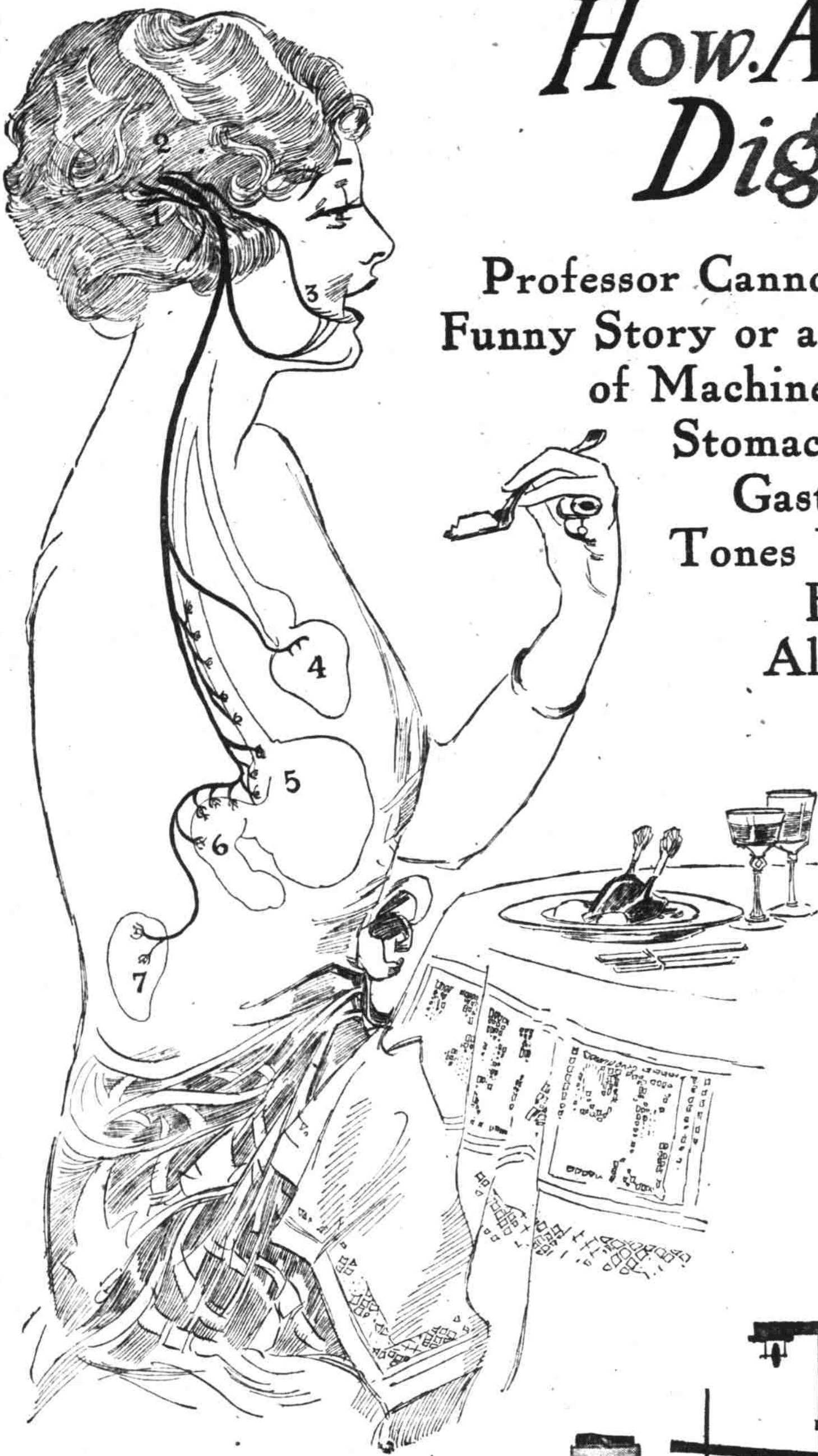


How A Good Laugh Helps Digest Your Dinner

Professor Cannon, of Harvard, Explains How a Funny Story or a Good Joke Starts Going a Chain of Machinery That Gingers Up Your Stomach, Stimulates the Gastric Juices and Tones Up the Digestive Engines All Along the Line



Diagram, Based on Professor W. D. Cannon's Experiments, Showing How the Mental Stimulus of a Good Story Co-operates with the Organs of Taste to Help Digestion: (1) Beginning of Great Pneumogastric Nerve, Which Conveys Stimulating or Depressing Messages to the Digestive Chain. (2) Higher Brain Center, Where Mental Conceptions Are Formed and Where Appreciation of Story or Joke Causes a Sympathetic Stimulation of the Pneumogastric Nerve. (3) Nerve Controlling the Salivary Glands Which Are First to Respond to the Stimulation. (4) The Heart, Which Pumps Blood to the Digestive Organs and Whose Work Is "Punched Up" by the Stimulated Nerve, Causing an Increased Flow of Blood to the Stomach. (5) The Stomach, Whose Muscular Movements Are Strengthened and Increased by the Stimulation of the Same Controlling Nerve. (6) The Pancreatic Duct to Which the Beneficial Stimulus Passes, Aiding in the Digestion of Fats and Starches. (7) The Kidneys, With the Important Adrenal Glands.

SCIENCE has proved by many experiments upon the bodies of men and animals that fear, anger and disagreeable emotions retard digestion by stopping the secretions of the digestive glands, while pleasant emotions such as those produced by a funny story, a good joke, music or delightful surroundings stimulate digestion.

Professor W. B. Cannon, George Higginson Professor of Physiology at Harvard University, is one of the scientists who have been studying the effects of emotions on the glands, and in his interesting book "Bodily Changes in Fear, Hunger and Rage" he tells the results of his observations.

Professor Cannon cites the remarkable case of a refined Massachusetts woman who went to a Boston physician for treatment for digestive troubles. The doctor gave her a test breakfast, and an hour later was surprised to find it in the stomach entirely undigested and much of the previous evening's meal still there. Then the doctor learned that the husband had become uncontrollably drunk the night before and had caused her cruel anxiety.

Pleasant feelings assist digestion, provided the emotion does not become violent. Professor Cannon shows that there is a chain of nerves—"the autonomic system"—which stimulate the stomach and digestive organs when pleasant feelings are experienced and depress them when disagreeable ones are experienced.

What seems to happen is this: The story or joke sets up a pleasant emotional disturbance in certain brain centres. Through the desire to laugh the nerves which control the muscles used in laughing—the mouth and throat—are stimulated in a peculiar fashion. This stimulation passes along the pneumogastric nerve, toning up the digestive mechanism all along the line. The salivary glands controlled

by affluents of this nerve are stimulated. There is a greater flow of saliva. The digestive movements of the stomach's walls—what are called the peristaltic movements—are subjected to acceleration, as they are also controlled by this same nerve.

The gastric juices in the stomach then pour out an increased flow. The heart feels the effect and pumps an increased flow of blood to the digestive areas. The liver, whose activities are absolutely essential to good digestion feels the pleasant stimulus of rippling mirth and pours forth bile in abundance and good quality. The infectious stimulus passes to the pancreas and stirs it up to furnish its fluid.

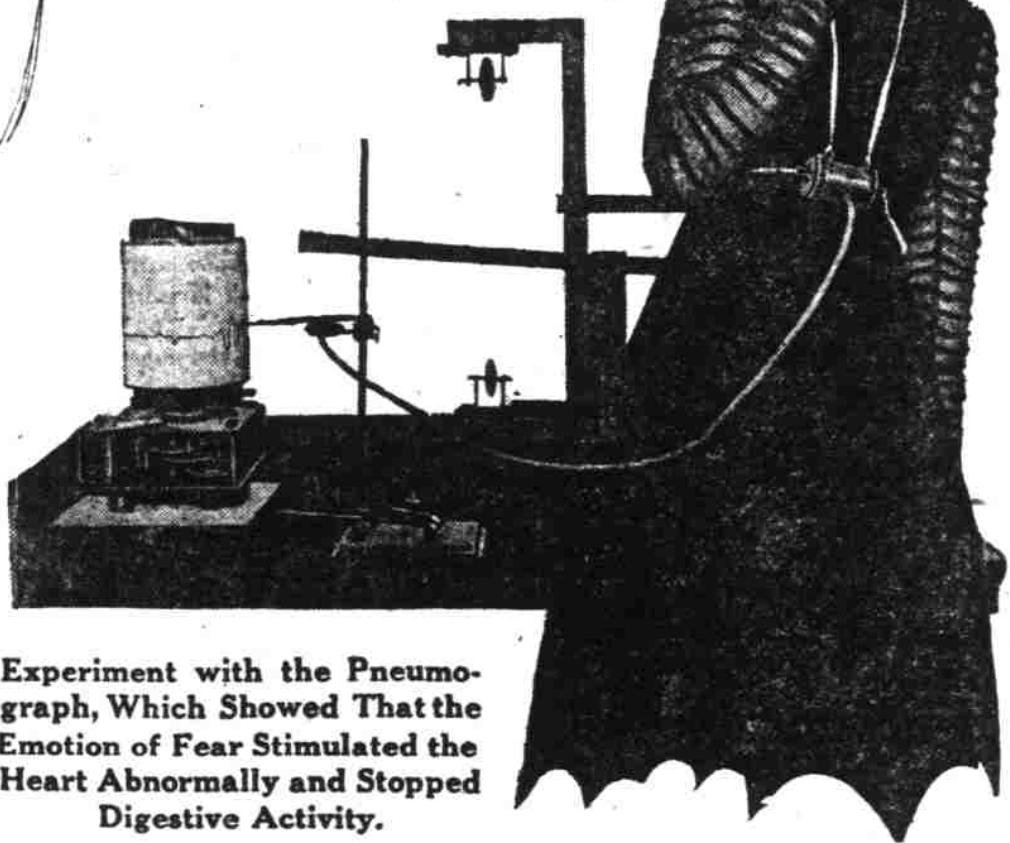
The same beneficent impulse passes beyond the stomach into the duodenum and increases the flow of juices necessary for the digestion of fats and starches. All the secreting glands of the body are in fact beneficially affected.

Conversely, an unpleasant story or sadness or quarrelling has an effect the reverse of stimulation on the pneumogastric nerve. It seems to deaden it and, therefore, all the digestive processes are similarly checked and retarded.

The stimulus to good digestion given by the higher mental centres, in response to a good story, acts in harmony with the mechanical apparatus of digestion.

The elementary emotions which help digestion are the sight, smell and taste of good food, and after that pretty surroundings that are agreeable to the eye and sounds that are pleasing to the ear. Professor Pawlow, of Petrograd, in his famous experiments, divided a dog's gullet so that food taken into the mouth did not pass into the stomach, but dropped out through an incision in the throat. The taste of food

Experiment with the Pneumograph, Which Showed That the Emotion of Fear Stimulated the Heart Abnormally and Stopped Digestive Activity.



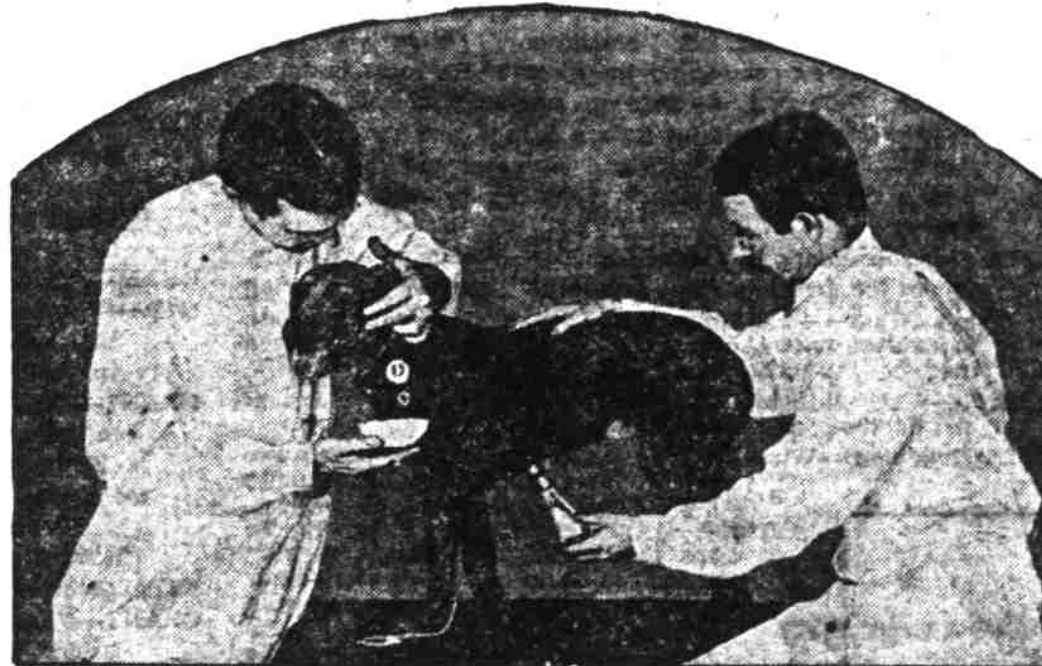
in the dog's mouth or the sight and smell of the food alone caused gastric juice to flow in the animal's stomach, although no food went there.

The facts that have been observed in the lower animals have an application also to man, and they give us an insight into the working of his higher and more complex mental organization.

Professor Cannon summarizes the experiments of Pawlow, Richet, Hornberg and others on animals and human beings in connection with his own to show the causes that favor and hinder digestion.

"All these observations," says Cannon "clearly demonstrate that the normal flow of the first digestive fluids, the saliva and the gastric juice is favored by the pleasurable feelings which accompany the taste and smell of food during mastication, or which are roused in anticipation of eating when choice morsels are seen or smelled."

"These facts are of fundamental importance in the serving of food, especially when through illness the appetite is fickle. The degree of daintiness with which nourishment is served, the little attention to aesthetic details, the arrangement of dishes, the small portions of food, the flowers beside the plate—all may help to render food pleasing to the eye and savory to the nostrils and may be the deciding factors in determining whether the restoration to strength is to begin or not."



Experiment on a Dog, Proving That Food Tasted, but Not Swallowed Causes Digestive Juice to Flow from the Stomach.

The influence of the mind on digestion is shown by Cannon to be extensive and always at work.

"The secretions of the digestive glands and the chemical changes wrought by them are of little worth unless the food is carried onward through the alimentary canal into fresh regions of digestion and is there thoroughly exposed to the intestinal wall for absorption," writes the professor.

"In studying these mechanical aspects of digestion I was led to infer that just as there is a psychic secretion, so likewise there is a 'psychic tone' or 'psychic contraction' of the gastrointestinal muscles as a result of taking food."

The agency through which a state of mind is conveyed to the digestive organs is the autonomic nervous system already referred to. It is provided with fibres that stimulate the digestive glands and fibres that check them. Acting through these a cheerful and contented frame of mind releases the secretions of the glands and starts up the rhythmic contractions of the stomach, while a violent or unhappy frame of mind closes up these aids to good digestion.

Professors Bickel and Sasaki made very interesting experiments with a dog to learn the influence of anger on the animal's digestion. They divided the dog's gullet so that food would fall out and not pass to the stomach and an opening was made in the stomach in order that they might watch the gastric secretions.

The professors then placed a cat before the dog, which enraged him furiously. They gave him good food, and it was seen that the gastric juices were restrained from flowing by his anger for twenty minutes!

Professor Cannon notes after this: "If a child has experienced an outburst of passion it is well not to urge the taking of nourishment soon afterward."

Professor Cannon found that the influence of emotions on the stomach varied with sex and age. He tied male cats and watched the contents of their stomach with the X-rays. The restraint angered them and digestion ceased. Female cats, especially if elderly, submitted with calmness to the restraint and digestion proceeded as usual. A female cat, separated

from her kittens, showed restlessness and ceased to digest her food.

"Pain interferes with digestion by lessening appetite and by producing various forms of dyspepsia, with arrest of gastric digestion, and with vomiting," says Cannon.

Music, Professor Cannon finds, has a profound influence on digestion and muscular energy. While pleasing light music will favor the digestive functions, martial music will put energy into the muscles but stop the stomach's activities.

"For the grim purposes of war," he writes, "the reed and the lute are grotesquely ill-suited; to rouse men to action strident brass and the jarring instruments of percussion are used in full force."

"The influence of martial music on some persons is so profound as to cause the muscles to tremble and tears to come to the eyes—both indications of the deep stirring of emotional responses in the body, and when deeds of fortitude and fierce exertion are to be performed the effectiveness of such music in rousing the aggressive emotions has long been recognized."

Fear and anger and the violent emotions, while they retard digestion, have their value, for they increase muscular energy by pouring secretions from the ductless glands into the system.

Professor Cannon describes the remarkable effects of these secretions as our bodily activities. Above the kidneys there are two glands, called the adrenal glands, which play a most important part in stirring the body to action. Adrenin, the secretion of the adrenal glands, Professor Cannon explains, "plays an essential role in calling forth stored carbohydrates from the liver, thus flooding the blood with sugar; it helps in distributing blood to the heart, lungs and central nervous system, while taking it away from the inhibited organs of the abdomen; it quickly abolishes the effects of muscular fatigue and it renders the blood more rapidly coagulable."

Each of these responses to strong emotion, Professor Cannon shows, is useful to the man or animal undergoing severe muscular exertion or suffering bodily injury. The increased blood sugar increases muscular energy. The shift of blood to the heart, lungs, central nervous system and limbs increases the man's muscular power and endurance. The increased coagulability of the blood protects him to some extent from the wounds he suffers while in a state of fighting anger or terror.

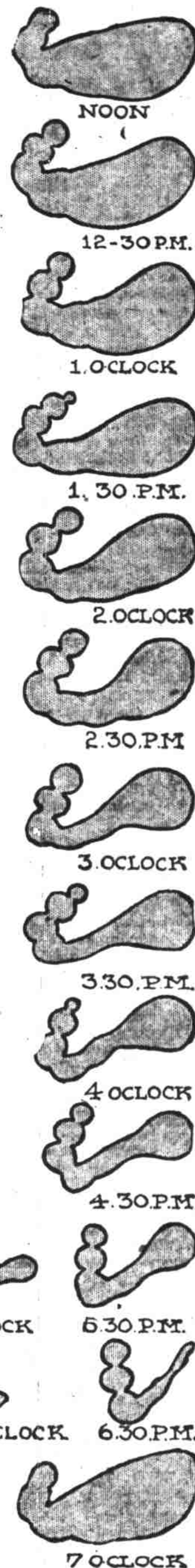
Thus we understand why a soldier in the rage of battle is able to perform feats of strength which would be quite impossible at ordinary times, to fight with fury for an almost incredible length of time, to climb up the face of stone walls and to do other apparently superhuman feats, such as were often observed in the American army during the late war. Men who fought for four days or more without sleep, as the American soldiers frequently had to do in the Argonne, could not have done so without the help of unusual quantities of stimulating secretions poured into their blood and muscular system by their glands under the influence of the fighting and patriotic spirit.

The presence in the system of these powerful stimulating substances explains also the indifference to pain shown by many men in a fighting rage. It explains the astonishing episode, which Dr. E. S. Crile witnessed, of the sergeant who did not notice any pain when his leg was shot off below the thigh during the battle of Ypres; who did not indeed discover his wound until he tumbled over and who even after that was so much under the influence of the fighting secretions that he was able to bandage the stump, to hop about on his remaining leg, to give orders to his men and to go without hospital treatment for eight hours.

We always knew that men could do strange things under excitement, but it is a modern discovery that the adrenal and other glands at such times pour a specific chemical substance into the blood stream.

But it must be noticed that while the adrenin sends the blood to the muscles and central nervous system, it takes it away

Your Stomach Every Half Hour Between the Noon Dinner and 7 o'clock Supper, Showing the Shape of the Organ During the Digestion of a Meal.



from the abdomen. This is a part of a chain of effects, including also lessening of the gastric secretions and cessation of the stomach's contractions, which hinder or stop digestion. Hence strong emotion, while it assists muscular effort, must have a bad effect on digestion.

The Harvard professor's experiments proved that many kinds of excitement produced a flow of adrenin into the circulation. Cats were tied up in the presence of a barking dog for ten minutes. An artery had been opened before the experiment and a test of the blood showed that adrenin had entered it during the fit of fear and anger.

Pain also caused the discharge of adrenin into the blood. When an electric current was applied to a dog's sciatic nerve causing pain, adrenin was found in the blood, but when an anesthetized dog was subjected to the same pain, there was no adrenin.

Cats and dogs subjected to pain and restraint showed an excess of sugar in the blood. This explains why men who have been subjected to violent emotions, as must happen in war, sometimes suffer permanently from excess of sugar in the circulation.

Professors Cannon and C. H. Fiske found sugar in the blood of twenty-five members of the Harvard football team in 1913. Five of them had not taken part in the game and excitement must have been the sole cause of sugar.

After a dog's muscles had been artificially fatigued by tying a weight to them it was found that the application of adrenin restored their strength.

Other experiments showed that adrenin hastened the coagulation time of the blood in a very marked and definite manner. For half an hour before the experiment the clotting time of a dog's blood was 4.6 minutes, while after adrenin had been injected the clotting time was 5.3 minutes during one hour.