ENORMOUS ENERGY EXPENDED BY OUR JAWS.

Dr. G. V. Black, Dean of Northwestern University's Dental School, Gives Surprising Figures Derived from a Series of Experiments Lasting Seventeen Years.

Do you know that it is an impossibility to bite the bread that mother makes? An absurd question, you reply. But if you think you can thrust your teeth through the particles of fluffy wheat bread you make one of the greatest mistakes of your life. Such is one of the latest discoveries of science, announced as a result of a series of tests made to determine the amount of pressure exerted by the human jaw in the process of masticating food.

Do you know that the woman who participates in the ordinary conversation of the gossipfest shuts her jaws together with a force of sixty pounds every time she utters a syllable, while a man in vehement oratory makes teeth crash against teeth with one-hundred-pound blows?

Dr. Greene Vardiman Black is the man who does know. He is the dean of Northwestern University's dental school in Chicago. For seventeen years he has been testing the strength of the muscles of the human jaw to ascertain how hard men and women bite. Of late he has directed his experiments to the number of pounds pressure exerted by the lower jaw in the mastication of different kinds of food.

The earlier experiments were carried on by means of the gnathodynamometer, which Dr. Black invented. This resembles a pair of pliers about five inches long. The jaws of the device are held open by apparatus similar to that of a spring scale, which is inclosed between what might be termed the handles of the pliers. To this apparatus is attached a pointer that registers the number of pounds pressure exerted on the jaws of the instrument in closing or partly closing them. The test with this instrument is simple. The subject opens his mouth half to three-quarters of an inch, enough to admit the insertion of the jaws between his teeth, then bites as hard as he can on the jaws of the gnathodynamometer, which are covered with hard rubber for the protection of the teeth. The pointer denotes the number of pounds pressure exerted, just as a pair of scales indicates the weight of a pound of sugar at the Custom House since the government investigation began there.

With a class of six students Professor Black obtained results showing wide differences in the power of the muscles to close the human jaws. One student registered 150 pounds pressure, another 155, a third 190, the fourth 220, the fifth 225 and the sixth 250 pounds. In tests with other classes there were subjects whose maximum pressure was as low as 100 and as high as 300 pounds. One student brought the jaws of the gnathodynamometer together with a snap repeatedly. The instrument he used, the only one available at the time, had a maximum capacity of 275 pounds. The ease and rapidity with which he closed it convinced Professor Black that his jaw muscles were capable of at least 350 pounds pressure.

A feature of these tests which surprised experts in anatomy was that the shape of the jaw and the physical appearance of the subject proved no guide in guessing at the strength of the bite. The common impression was that the "square jawed" man would do best. Professor Black found that the man—and the woman as well—whose jaw bones were not "square" often gave the stronger bite.

All these tests and many others of the same kind had a specific object relating to the construction of false teeth and the filling of natural ones. In fact, it was in furtherance of the scientific practice of dentistry that Dr. Black investigated the subject at all, and the same purpose led him on to the study of the pressure of the jaws in the processes of mastication and conversation. To obtain definite results he invented the phagodynamometer, or chewing machine. In a general way this is like the gnathodynamometer, but is more intricate. It is designed to record the pressure employed in eating without interfering with the natural motion of the under jaw. In the tests made with this Dr. Black ascertained that the pressure required to masticate beefsteak—the thick, juicy cut that makes your mouth water as it lies steaming on the platter—ranges from forty to sixty pounds. What is commonly accepted—or rather rejected—as tough steak can be masticated only with the exertion of sixty to eighty pounds of pressure.

Pork chops are eaten with the greatest ease. It takes a pressure of only 20 to 25 pounds to bite through this delicacy. To masticate mutton chops necessitates the expenditure of enough muscular energy to produce 30 to 40 pounds of jaw pressure, while broiled ham requires 40 to 60 pounds pressure. Filberts cannot be eaten except with a pressure of 100 to 150 pounds—that is, if they are to be thoroughly masticated. Some of the cereals require the expenditure of even more force, and one of Dr. Black's pupils suggests that perhaps their chief efficacy lies in the exercise consequent on masticating them rather than in their inherent food qualities.

Bread, says Professor Black, is the most difficult and damaging food the teeth have to contend with. Even with a pressure of 300 pounds it is impossible to bite bread. In attempts to bite bread the teeth are often broken. Its mastication is made possible only by reason of the fact that the jaws of man are so fashioned that the teeth come together with a grinding motion. There is a scientific reason, then, for breaking bread into small pieces with the fingers before attempting to grind it in mastication. Even then all the strength of the jaw muscles, whether capable of 50 or 300 pounds pressure, will be put forth in mastering it, according to Dr. Black.

The tests with the phagodynamometer brought forcibly to the attention of scientists the fact that many persons do not really masticate their food at all. Some of the subjects produced records of only 50 pounds pressure. Such persons, says Dr. Black, merely "pat their food into a bolus with their teeth and swallow it without chewing it." Often a big man did not chew his food with as much force as a small woman did hers. In fact, the doctor's conclusions were that stature gave no indication of jaw pressure and chewing ability, but that the strongest chewers enjoyed the best health.

Since the full power recorded by Dr. Black's machine can be brought into play only when the jaws are nearly closed, we may take one-eighth of an inch as a conservative estimate of the distance they can be pushed in one chew against 300 pounds of resistance.

One-eighth of an inch is almost exactly 1-100th of a foot. We may assume that a healthy man can chew one hundred times in a minute. Thus, since at every stroke he develops energy enough to raise 300 pounds 1-100th of a foot, in a minute's chewing he furnishes the power to raise 300 pounds one whole foot. This is the equivalent, approximately, of 1-100th horsepower.

Knowing that the Mauretania's horsepower is 70,000, it takes no expert to compute that 7,000,000 people, each developing 1-100th horsepower, would supply as much energy as her engines develop. Further, if we assume that the normal, everyday rate of chewing at mealtimes is only one-sixth of the maximum, so that each person develops only 1-600th horsepower, it is evident that every time the 42,000,000 inhabitants of the British Isles sit down to dinner they create the energy required to drive the monster ship at her highest speed.

To come nearer home: The battleship Oregon, on her famous long voyage around Cape Horn during the Spanish-American War, needed only 11,037 horsepower for her propulsion. The population of the United States was at that time approximately 80,000,000 souls. Each of these may be assumed to have devoted at least two hours a day to mastication. Some unquestionably spent less time than that at their regular meals. But we must remember that the government had levied its war taxes on gum and chewing tobacco, thus exalting the use of those commodities into an act of patriotism. The enormous energy which was concentrated upon these two substances alone by the men and maidens of our nation would more than compensate for our habits of hasty eating.

We may assume, then, that each of the 80,000,000 Americans chewed for two hours daily, or for one-twelfth of the time. Distributed evenly through the day, this would mean that an average of 6,666,666 pairs of loyal jaws were working every hour of the twenty-four, day in and day out. If each supplied only 1-600th horsepower, as we have supposed, this would give 11,111 horsepower, or more than enough to have carried the Oregon over her 12,000-mile journey.

The weight of the new Manhattan Bridge, more than a mile in length, with its cables, its towers, its three spans and its two approaches, is about 55,000 tons, or 111,200,000 pounds. Yet the man whose jaws would raise 300 pounds one-eighth of an inch could, if the force were only transmitted through a hydraulic lift, raise the whole structure .000,002.7 inches every time he clenched his teeth.

To contemplate such a waste of energy is shocking.

DR. BLACK.

ONE OF DR. GREENE VARDIMAN BLACK'S ASSISTANTS REGISTERING A 275-POUND BITE ON THE GNATHODYNAMOMETER.

NO ESCAPE.

A. J. Drexel was annoyed during his recent visit to New York because he had to pay at his hotel $1 75 for a breakfast of two eggs and a cup of coffee.

"It is all very well," Mr. Drexel said to a reporter, "to talk about the rising prices of foodstuffs, labor and what not; but the high cost of living over here is so excessive that I can't but think some one isn't playing fair.

"Some one seems to be interpreting the rule of fair play as a little Philadelphia girl interpreted the Biblical rule.

"This little girl was pushing her dolly's coach in Rittenhouse Square. A gentleman came out of a great, pale house fronting the square, and stopping the little girl, whom he knew, he began to tease her.

"He teased her till he was tired; then, taking leave, he said:

"'Goodby. I don't love you.'

"'Oh, but you've got to!' the little girl cried.

"'Got to? How?' he asked.

"'Doesn't the Bible say,' she demanded, 'that you must love them that hate you? Well, I'm sure I hate you.'"

OPERA A LA MODE.

Mark Twain had a deep love for good music. One night he accepted an invitation to hear "Tristan" from the box of a great woman. The opera was beautifully performed, but from the rise of the curtain to its fall the great woman talked to the humorist steadily.

As he took leave at the end, his hostess said:

"Won't you share my box again to-morrow night? They're playing 'Aïda.'"

"Yes, thanks," said Mark Twain, "I have never heard you in 'Aïda!'"

THE MAKER.

"James A. Patten has a fine house in Chicago," said a New York broker. "I dined with him there one night last month.

"After dinner I admired a superb statue in the drawing room.

"'Splendid statue, that,' I said. 'What's it made out of—bronze or copper?'

"'I made it out of cotton,' said Mr. Patten."

AN AMERICAN VENICE

Plan to Reclaim Jamaica Bay Islands for Pleasure Resort.

Few of the regular throng of Sunday pleasure seekers who crawl on trains across the long trestle over Jamaica Bay to Rockaway Beach in summer time picture in place of the wide desolate tract of marshes a fairyland of artistic beauty, with picturesque buildings, towers, arches and bridges, crossing and recrossing a maze of canals, recalling when lit up at night the complex glory of Venice itself. Such a transformation of the bay, nevertheless, is possibly in store if the city of New York, which has already approved an expenditure of $1,000,000 to begin work on the proposed Jamaica Bay Harbor, indorses a plan to utilize the central part of the bay for recreation purposes.

Numerous arguments are being advanced in favor of such a plan. In the opinion of the Jamaica Bay Improvement Commission and various experts who have studied the possible future commercial growth of New York City, it will be probably one hundred years or at least several decades before the centre of the bay can be used to commercial advantage. In the bay is a total water area of 16,170 acres, or 25¼ square miles. In the middle of this are about 4,000 acres of marshes, a monotonous stretch of low islands awash at high tide.

To build a channel 1,500 feet wide and 30 feet deep between the islands nearest the shore and the shore itself, and erect a series of docks along the shore front as already planned, will cost about $12,000,000 all told, and it will involve a vast amount of labor. To deepen the numerous small channels and creeks which intersect the thirty or forty islands of the bay for the passage of seagoing vessels would involve much further expenditure, and it will be long, despite the rapid growth of New York's commerce, before the middle of the bay will be needed for the same purposes now assigned for the shore.

It has therefore been suggested that this area be transformed into a great pleasure park for the public. Winding waterways and bridges connecting the main islands, upon which all the popular enjoyments of the day might be combined with water sports, offer possibilities for a modern Venice such as would be hard to find at any other point so conveniently near this metropolis.

Provided proper restrictions could be enforced so that a second-rate Coney Island might not spring up like a mushroom before the park became a month old, a recreation centre of the most refined and improved sort could be established in the bay as an attraction for city residents and as a means of building up the adjacent territory on the mainland. The bay is reached at present by the Long Island Railroad. The New York, New Haven & Hartford Railroad is aiming that way. By these routes pleasure seekers in thousands could be accommodated in the spacious islands of the bay. These islands, raised a few feet above mean tide by dredging the waterways, would be permanently safe against the intrusion of the sea, and by a careful system of filling in and strengthening the earth suitable foundations could be supplied on most of the islands for the erection of buildings.

MORE GENTEEL.

"King Edward," said an English visitor to the Knickerbocker Club, in New York, "hated snobbishness. To show how ridiculous snobbishness was he used often to tell about an alphabet book of his childhood.

"This book had alliterative sentences arranged under each letter, thus:

"'Callous Caroline Caned a Cur Cruelly.'

"'Henry Hated the Heat of Heavy Hats.'

"Under the letter 'V' came the facetious sentence:

"'Villiam Vilkins Viped his Veskit.'

"But the young prince's snobbish tutors thought this sentence too vulgar and low for their charge, and accordingly they substituted for it the more refined and genteel line:

"'Vincent Vining Viewed a Vacant Villa.'"

OUR PENSIONERS.

Colonel W. P. Brownlow, secretary of the National Soldiers' Home, said at a dinner in Brownsville, Tenn.:

"They are great wags, the old soldiers in our Johnson City home. I heard one of them describe the other day a very fierce and famous action. Two hundred men had been pitted against three hundred, and after the fighting only sixty brave fellows—thirty on each side—remained alive.

"Then the old soldier paused solemnly.

"'Of that sixty, boys,' he said, 'there only survive to-day'——

"Overcome, he blew his nose violently.

——"'There only survive to-day, by actual statistics, 417.'"