must be slaked the same as quicklime before it can be used, and is reduced to powder in this way. No grinding machinery for reduction is used. The slaking is much slower than is the case with quicklime, and as the proportion of impurities increases it becomes slower and slower, until at last a point is reached where the resulting substance passes from hydraulic lime to natural cement. The reduction must be done by grinding and the hydraulicity becomes a prominent characteristic.

"Cement.—Cement as used in an engineering sense means such a combination of lime, silica, alumina and iron, that when properly calcined, reduced to powder, and gaged with a proper amount of water, has the property of setting under water and in places where it is not exposed to the action of the air. It also has the property of setting when in contact with the air.

"For good results to obtain, the proportion of the requisite constituents must be within certain narrow and well-defined limits. These proportions have already been given.

"The cements used in building construction can be divided into two general classes, natural cement and artificial or Portland cements.

"The term Portland cement means an artificial cement as distinguished from natural cement.

"Natural Cements.—In many parts of this country and Europe there have been found immense deposits of impure limestone, that contain with more or less accuracy the necessary constituents for the making of cement. These constituents have been mixed by nature and for cement making must be used in the proportions found.

"The difference between the natural and Portland cements as to the raw materials used is this:

"The desirable constituents in each are the same.

"In making natural cements, some impure limestone that contains as nearly as may be the correct proportions of lime, silica, and alumina is used, and the value of the resulting cement depends upon the correctness with which nature has mixed these ingredients. It is found good, bad, and indifferent.

"With the raw material for Portland cement, however, nothing is left to chance. It is known, within certain narrow limits, what the constituents should be and in what proportions they should be present. This being known, such materials are used as contain these constituents in a more or less pure state, and then these comparatively pure raw materials are mechanically mixed in the correct proportions.

"The mere fact that the raw materials are nearly perfect does not insure good cement, as the best of raw material may be rendered useless by improper burning or grinding. But, on the other hand, no good cement is possible unless the raw materials are good. Of course any mechanical mixture of lime, silica, alumina, etc., within the limits named, will give good Portland cement if properly burned and ground. But in selecting raw material there is one other, most important, question that must be considered, viz., that of cost.

"In order to make a perfect mechanical mixture the materials must be reduced to an impalpable powder. The harder the materials, the more expensive this is; consequently, in selecting the raw material, the question of the cost of reduction must be considered.

"The advantages of Portland cement over natural cement are two, viz.:

"1st. The Portland cement is much better per se. The best natural cement never attains the hardness nor has the strength or durability of the most ordinary Portland.

"2d. Where proper care is used, Portland cement of any one brand possesses a uniformity of quality that can never be attained in the making of natural cement.

"Examine almost any stone quarry, and the impossibility of obtaining a uniform quality of stone in any quantity will be seen at once. The quality of the stone varies in different parts of the quarry and in different layers of the stone, no two layers containing the same chemical constituents. As the stone is used in the condition in which it comes from the quarry, it will be seen that there will be an unavoidable variation in the quality of the resulting cements.

"With Portland cement this is different. The raw materials are practically pure, and after experiments have given the proportions of mixing and the subsequent methods of treatment, there is no excuse for any irregularity in the results.

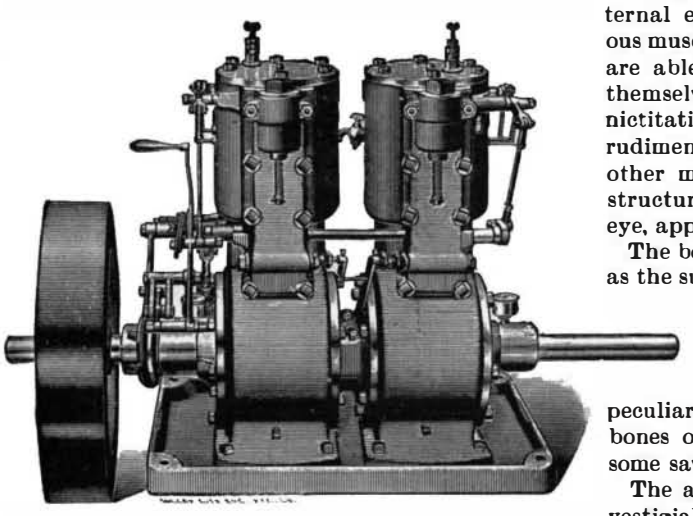
"This uniformity in results is the one great point to be worked for in cement making. It can only be accomplished by the exercise of the greatest care in the selection and treatment of the raw materials. In the process of making there are some radical differences between natural and Portland cements. In the calcination the natural cements require a temperature but little above that required for lime burning, while the Portland cements require a temperature just short of that required for vitrification. The mixing, grinding, etc., all increase the cost of the Portland until at last the finished product brings about $3 per barrel on the market, while the natural cement sells for 50 cents.

"True economy in the choice of cements consists in using the one best adapted for the work in hand. When the work is such as to justify the increased expense on account of required durability or strength, then the best Portlands should be used. But on less important work or masonry of a cheaper character, the natural cements should be used. Nothing has done more to improve the character of all masonry work during the last twenty-five years than the cheapness and excellency of these light-burned natural cements."

The author then presents interesting historical data relating to the uses and manufacture of cements, the processes relating thereto, the machinery employed, the various tests of cement, abstracts from specifications, directions for using cements in various kinds of works, making of concrete for roads and foundations, cement sidewalks and pavements, etc. The practical information contained in this work is of rare value.

A NEW GASOLINE MOTOR FOR BOATS AND LAUNCHES.

A motor which can be started without turning the fly wheel by hand, by simply using the reverse lever, and which may be handled the same as a steam engine, without requiring a boiler, feed pump, etc., is shown in the accompanying illustration. It has been recently brought out at the Wolverine Motor Works, Grand Rapids, Mich. These motors are perfectly balanced, the cranks being directly opposite each other, and one going down as the other goes up, permitting them to be run at a very high speed without jarring the boat. There is no gearing on the engine or propeller shaft to make a noise, and the engine can be reversed by simply moving one lever. It is free from any possibility of fire or explosion, requires no licensed engineer or pilot, and can be operated by any one, man or woman, after an hour's instruction, or from the printed directions. It can be run slow or fast by the use of the throttle lever. Preferably the common solid propeller wheel is employed, made in one piece, rigidly connected to the propeller shaft, the latter being rigidly connected to the crank shaft of the motor.



WOLVERINE DOUBLE CYLINDER MARINE MOTOR.

It is claimed that this motor is not only one of the simplest to operate, but that it embodies more valuable features than it has heretofore been considered possible to combine in a gas engine.

Some Vestigial Structures in Man.

BY W. E. ROTZELL, M.D., NARBERTH, PA.

The term vestigial is used in anatomy as being more convenient in describing those parts generally known as rudimentary, abortive, atrophied, or useless. There are many vestigial structures in man, and an attempt to more than mention some of the most interesting of them would far exceed the limits of this article.

The appendix vermiformis is a vestigial structure, and, like all such structures, has no function to perform in the organism. "Not only is it useless," says Darwin (Descent of Man, New York, page 21), "but it is sometimes the cause of death."

The vermiform appendix is, doubtless, the remains of the much elongated caecum that is found in the majority of the herbivorous mammals. The usefulness of the tonsils is also doubtful. They are, as we all know, frequently the seat of disease, and after removal the individual realizes no inconvenience from the loss. Of what utility are the cervical auricles that occasionally occur in man, or the supernumerary legs, fingers, and toes, as well as all the other abnormalities that frequently occur?

Among the lower animals there are numerous instances of useless organs, such as the clavicle of the cat, the teeth of a whale, or the sting of a bee or wasp, which when used, as a rule, causes the death of its owner. Referring to insects, Professor Graber (Die Insecten, Munich) says: "There are also numerous structures and organs which may, with absolute certainty, be pointed to as perfectly useless." "But seeing that so enormous a number of specific peculiarities are in the same predicament, it surely becomes the reverse of reasonable so to pin our faith to natural selection as to conclude that all these peculiarities must be useful, whether or not we can perceive their utility. For by doing this we are but reasoning in a circle. The only evidence we have of natural selection is furnished by the observed utility of innumerable structures and instincts which, for the most part, are generic, family, or higher order of taxonomic value. Therefore, unless we reason in a circle, it is not competent to argue that the apparently useless structures and instincts of specific value are due to some kind of utility which we are unable to perceive."

The third molars, or wisdom teeth, are becoming vestigial in civilized man. These teeth are now, as a rule, the last to come and the first to disappear; they are smaller and more variable than the other molars and have only two separate fangs.

The body of adult man is always more or less covered with hair; this hair is the remains of the more extensive hairy covering possessed by his ancestors. An interesting fact in relation to this hairy covering is that the hair on the arm and forearm is directed toward the elbow—a characteristic which occurs only in the anthropoid apes and the American monkeys. The explanation of this has been given by Wallace (Natural Selection and Tropical Nature, London, page 194), who states that the orang, when resting, holds its long arms upward over its head, so that the rain flows down both the arm and forearm to the long hair which meets at the elbow. In accordance with this principle, the hair is always longer or more dense along the spine, often rising into a crest of hair or bristles on the ridge of the back. In the entire series of the mammalia, from the monotremata to the quadrumana, this character is very prominent.

It is a well known fact in embryology, that at about the sixth month the human fœtus is frequently covered with rather long dark hair over the entire body, except the soles of the feet and the palms of the hands. This covering of hair is shed before birth, and so it is apparently useless except as being an evidence of evolution.

Other vestigial structures are the muscles of the external ear, and the panniculus carnosis, subcutaneous muscles by which a large number of the mammalia are able to freely move their skin, thus protecting themselves from insects. The plica semilunaris, or nictitating membrane, the semitransparent eyelid, is rudimentary in man and other mammals, while in the other members of the vertebrata the function of this structure is to sweep over the external surface of the eye, apparently to keep the surface clear.

The bones of man present such vestigial peculiarities as the supracondyloid foramen, which occasionally occurs; it is normal in the lower quadrumana. There is also the intercondyloid foramen, which occurs in man and the anthropoid apes, but is not constant in either. These peculiarities are found to be more common in the bones of the ancient races of mankind, and also in some savage races.

The anatomy of man presents a large number of vestigial structures, each of which throws some light on the long line of his ancestral history, and that can only be accounted for as explained by evolution.—Abstracts from the Hahnemannian Monthly.

Fish and Game Laws.

Here is a summary of the law of New York State relative thereto, as revised and amended by the last legislature:

Fish.—Polluting streams or taking fish by drawing off water or by dynamite, or taken from a stream to stock a private pond or stream prohibited. No fishing through the ice in waters inhabited by trout or salmon.

Trout.—Open season from April 16 to August 31, with 6 inch limit.

Salmon, Trout, and Landlocked Salmon.—Open season from May 1 to September 30.

Bass.—Open season from May 30 to December 31. Bass 8 inch limit.

Pickerel, Pike and Wall-eyed Pike.—Shall not be fished for, caught, killed or possessed, except from May 1 to January 31, except as provided in section 141 of the game laws.

Deer.—Open season August 16 to October 31. Limit, two deer to each person.

Squirrels, Hares, and Rabbits.—Open season from September 1 to November 30. Ferrets prohibited.

Birds and Wild Fowl.—Web-footed wild fowl, open season from September 1 to April 30. Quail, open season November and December. Woodcock and grouse, open season from August 16 to December 31. Plover, snipe, and English snipe shall not be shot or possessed during May, June, July, or August. Snaring, netting, or trapping of game birds prohibited.

As to private parks or grounds, the law is not changed from last year.

Dealers may have game or birds in possession out of season provided that they can show the same was shipped to them from a point over 300 miles from the borders of this State.