A CHAPTER ON TROUT.

BY DANIEL C. BEARD.

Brook trout are always associated in my mind with delightful scenery, clear, swift running water, and bracing air, and I am sometimes tempted to think that it is the association that lends such a delicate flavor to their meat. As Aldrovandus quaintly expresses it, "The salmon, the grayling, and the trout, aud all fish that live in clear and sharp streams, are made by their mother nature of such exact shape and pleasant colors purposely to wite us to joy and contentedness in feasting with her." St. Ambrose of old called the grayling the "flower fish." While making a drawing of the *Thymallus Americanus* at Fulton Market, Mr. Seth Green said: "Can you paint the rainbow? If not, do not attempt to reproduce the beautiful tints that glisten and flash upon the dorsal fin of the grayling." Not being able to "paint the bow upon the bended heavens," I was compelled to content myself with black and white, hoping at least to give some idea of the shape and form of this and other graceful and odd fish exhibited at the opening of the trout season by Mr. Eugene Blackford at his place in Fulton Market.

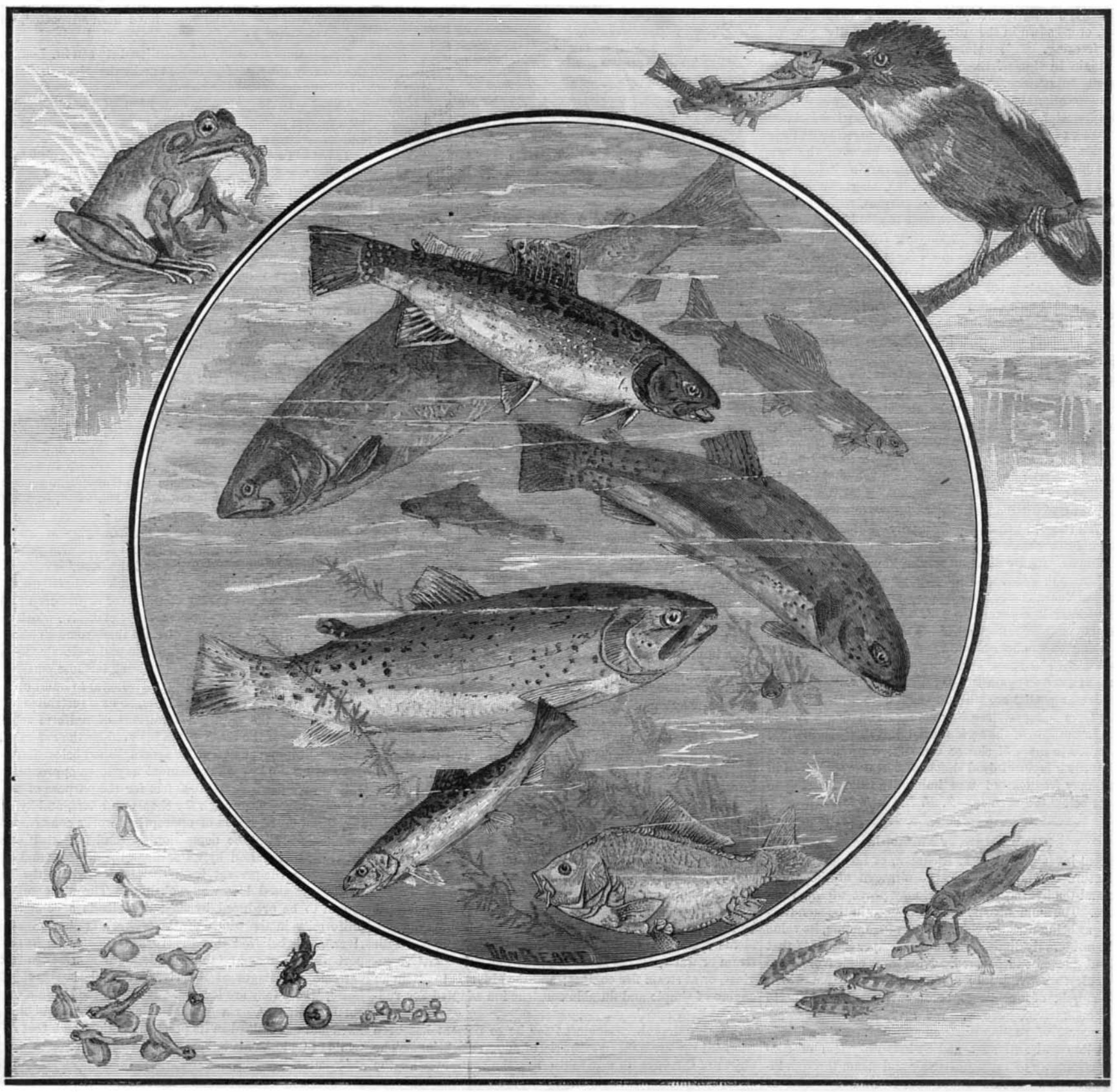
With the energy and goaheaditiveness for which Mr. Blackford is noted, he collected for the inspection of the pisciculturist, naturalist, and angler, all the procurable varieties of trout specimens of the *Salvelinus fontinalis* from England, Scotland, Ireland, France, Germany, Canada, Maine, New Hampshire, New York, Long Island, New Jersey, Wisconsin, Pennsylvania, Illinois, California, Maryland, Utah, and Colorado. There could also be seen trout from all the leading fish-culturists and fish commissioners of the United States, eggs and live trout, from those who just escaped the egg with the abdominal sac still attached, to the full grown fish disporting themselves in glass jars and tanks of crystal waters.

The first fish laid before me was a male trout from Shaster County, California, sent by B. B. Redding, Commissioner of Fisheries, measuring a little over two feet in length and weighing five and three-quarter pounds, well shaped and plump; on its body a paucity of red spots, but large black dots are sprinkled thickly upon the shoulders and tail; the operculum is decorated with a bright red tint, vanishing or blending into a greenish brown or olive toward the eye. A broad red dash of color extending from tip of tail to cheek gives this fish a very gaudy appearance. "Here," said Mr. Blackford, "is a remarkable fellow from the hatching house, McCloud River, California. It is called the 'Dolly Varden.'" And he placed before me a five and a half pound trout, round and dumpy, large odd head, an abnormal adipose fin, the other fins and tail short. In the place of the usual markings of his family, this fish was covered with large red semi-annular blotches. A slit cut in its back by Mr. Seth Green showed the flesh to be a rich salmon color. After making a careful drawing of this odd Western trout, Mr. Green placed before me an interesting hybrid, a cross between the California salmon and the common brook trout of New York. It was two years old when killed, and measured nine and a half inches in length, of a bluish slate color, no red, but a few yellow dots sprinkled sparsely along each side of the lateral line; a rather small head and graceful body, it partook of the nature of both its parents, with a strong leaning to the brook trout. Another three year old hybrid, measuring fourteen inches, looked more like a salmon.

The *S. fontinalis*, from France, is a well shaped fish, the one drawn measuring fourteen inches in length. A few red spots dot the space between the dorsal fin and the tail; dark spots commence at the gills and scatter over the space above the lateral line on its side and back to the caudal fin. Hon. Thomas Clapham sent some very graceful dark colored trout, averaging about twelve inches in length and two and a half inches in width at the dorsal fin. Hugh McGovern's trout were very like Clapham's, but lighter in color. The fish from the South Side Club, Oakdale, are much lighter in color, broader, and prettily marked. The specimen given me to sketch measured eleven inches in length and three and one-eighth inches greatest width. The silvery sheen of its abdomen contrasted strikingly with the carmine hue of the abdomen of some of the wild trout from Canada. It would be an interminable task to mention, much less describe, all the fish that lay upon the marble slabs or swam in the aquariums. Says Isaak Walton: "I am certain if I catch a trout in one meadow he shall be white and faint, and as certainly if I catch a trout in the next meadow he shall be strong and red and lusty," and such is the case. Even the same trout that is light colored upon a white pebbly bottom will, chameleon-like, change to a duskier hue if he swim over a dark mud bank.

At the bottom of the group of fish in the illustration is a picture of the German carp (*Cyprinus carpio*) sent to Mr. Blackford by the Smithsonian Institution. This fish will live in almost any half stagnant pond, and it is proposed to introduce it largely into this country. I have also drawn the portraits of a few of the marauders that pillage the fish ponds. It is wonderful, amid so many mortal foes, that a wild trout ever reaches maturity, but once gaining that age he revenges himself by feeding upon many of his former tyrants. Frogs, toads, lizards, aquatic insects, beetles and bugs, land rats, water rats, mice, minks, wild and tame ducks and geese, heron, and even cats never miss an opportunity and are ever upon the alert for a chance to devour the young trout or ova. Man lends a helping hand in this wholesale slaughter by turning the refuse of saw and paper mills and tanneries or other deleterious material into the streams. However, the sensible laws being enacted and enforced, and the efforts of a few enterprising men, will go far to counteract the mischief done.

The engineer of the Baltimore and Ohio Railroad who transported young black bass in the water tank of his engine and restocked barren streams, furnishes a noble example.



EXHIBITION OF FISH AT THE OPENING OF THE TROUT SEASON.

White Fish under the Microscope.

At a recent meeting of the Griffith Club of Microscopy (Detroit), Mr. J. C. Holmes, assisted by D. J. McGuire, M.D., gave a demonstration of the circulation of blood, illustrated by young whitefish from the Detroit "hatchery." The young fish, less than a week old, and looking not unlike a pair of eyes propelled about by an exceedingly active tail, were found, under the microscope, to be possessed of all necessary "interior" arrangements. As they are nearly as transparent as glass, the action of the heart in receiving and propelling blood, and the stream of blood corpuscles down one side to the tail, and back on the other, could be distinctly seen and examined.

The whitefish that are caught for this market are largely made to recognize their obligation to posterity, by passing through the "hatchery," where the *modus operandi*, as described by Mr. Holmes, is as follows: The eggs are stripped from the females by pressing the sides with the hands, and deposited in a large tin pan partly filled with cold water. Into this are placed two or three drops of milt, which is obtained by a similar process from one of the male fishes, and which contains the male principle of life—the microscopical spermatozoa. Each drop of the milt contains several thousands of these minute organisms, that would remain undeveloped but for the favorable conditions found in the female egg. These spermatozoa penetrate the eggs, and curling themselves up comfortably await the necessary five months to incubate. It is now the hatching season, and the unhatched eggs resemble a small pea, of a nearly transparent color, but with two distinct black dots on one side, which the microscope shows to be the eyes of the fish.

Temperature of the Soil during Winter.

The French physicists, Edmond and Henry Becquerel, took advantage of the intense cold prevailing at Paris last December, to study the changes in temperature below the surface of the soil under various conditions. It is a widely spread belief among farmers, that when protected by a layer of snow, crops sown in the autumn are effectually guarded against freezing. This opinion, however, must lose much of its weight in view of these late observations, which we will briefly summarize.

The observations were made by means of Becquerel's electric thermometer, which consists simply of two wires isolated by a coating of gutta percha, and soldered together at their extremities. Differences in temperature between the two places of junction cause electric currents varying in intensity with the greatness of the difference. A magnetic needle, brought under the influence of the current, registers on a dial these differences. The wires were inserted in the Jardin des Plantes at various depths, varying from 5 to 60 centimeters, and observations were made from November 26 to the close of December. Frost first appeared in the garden November 26. December 3 snow fell in abundance, and the temperature of the air sank to —11° C. The layer of snow was 25 centimeters deep. December 10, the temperature had sunk to —21°, and commenced then gradually to rise. December 15, the snow was 19 centimeters in depth.

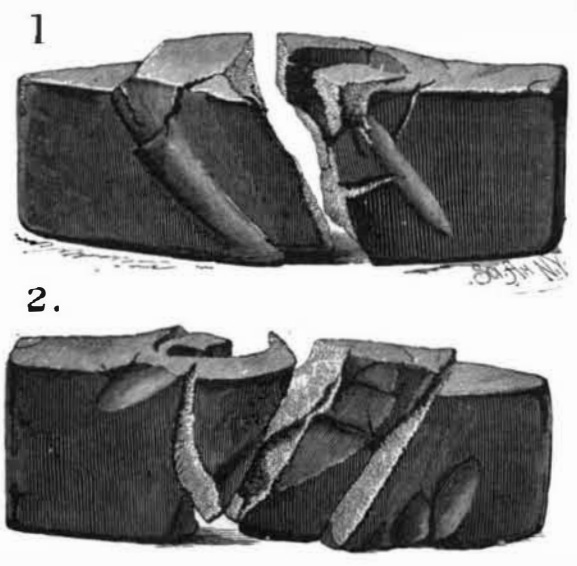
Coming now to the observations made below the surface of the ground under the above circumstances, we find at once a striking difference between the results obtained in soil covered with grass and those obtained below a bare surface of the ground. In soil protected by grass, before as well as after the snowfall, at all depths below that of 5 centimeters, the temperature never descended below 0° C. Registering 3·5° at the depth of 5 centimeters on November 26, it slowly sank to 0·18° on December 14. The presence of grass would appear, then, to effectually protect the earth beneath it from freezing at the lowest temperatures attained in our climate. Quite different results, however, are yielded in the absence of grass. In this case, at a depth of 5 centimeters, the thermometer sank below zero on November 27. Two days later it registered —2·6°. On December 3, just before the snowfall, it reached its minimum of —3·17°. After being covered with snow it registered —0·8°, and later —1·4°. The snow here appears to act in a certain measure as a screen against changes in temperature, but its conductive properties are still too marked to prevent these changes from being felt sensibly at a certain depth in the earth. In the case of the agriculturist, this slow conduction, when united to the still slower conductive properties of a tolerably thick layer of dead shoots of cereal crops sown in autumn, may frequently insure immunity from freezing to the roots below the surface.—*J. H. N., in Nature.*

Manufacture of Ammonia.

A recent invention of J. P. Rickman, of London, for the manufacture of ammonia from the nitrogen of the atmosphere and the hydrogen of steam, may prove of some importance. The ammoniacal liquor produced in the manufacture of gas being now the chief source of ammonia, its value would considerably diminish should a cheaper source of that useful substance be discovered. Numerous endeavors have been made to convert into ammonia the nitrogen which forms the bulk of our atmosphere; but none have hitherto been a commercial success. We may mention Maxwell-Lyte's process of passing nitrogen and steam over an alloy of potassium and antimony, and Swindell's system of conducting a mixture of atmospheric air and steam through incandescent coke. Rickman's process is similar to that of Swindell. A series of inclined retorts are filled with coke and heated to 550° C. A mixture of twelve parts by volume of steam and five parts of atmospheric air is then introduced, and ammonia is formed and afterwards condensed in water. The most important point in working this apparatus is to maintain uniformity of temperature. Should the apparatus be too cool, no ammonia is formed; if the heat be too great, any ammonia which may have been produced is dissociated, and again resolved into the elements to which it owed its origin. This regulation of temperature was found to be so difficult to attain that an improvement has been devised which promises to overcome the chief obstacle to the successful working of the process. It is well known that chloride of ammonium is less easily decomposed at a high temperature than ammonia alone. Mr. Rickman, therefore, converts the ammonia into chloride of ammonium at the moment it is generated, which is effected by mixing common salt with the coal or coke used. It is claimed that by these very simple means ammonia can be produced at less than 1*d.* per pound.

Novel Test for Stone and Ore Breakers.

The annexed engravings are perfect representations of opposite sides of a hardened steel stone hammer which accidentally fell into the jaws of one of Marsden's improved stone and ore crushers manufactured at the Farrel Foundry and Machine Company's Works, at Ansonia, Conn., and doing work at South Easton, Mass.



Hammer Crushed by a Stone and Ore Breaker.

This machine has positive motions and is constructed without springs or cushions to modify the action of the jaws. Nothing could exhibit the prodigious strength of this machine or its immense crushing power better than the sample of work presented in the engraving.

The hammer is of cast steel, hardened and tempered. It is eight inches long, three inches wide, two and a quarter inches thick, and weighs ten pounds.

The fractures and indentations in this solid piece of steel were made without the least injury to the machine.

ENGINEERING INVENTIONS.

Mr. John R. Jones, of Clarksville, Ia., has patented an improved railway car brake, the object of which is to give to the engineer of a train full control of the brakes without interfering with their operation by hand on each car. The invention consists in a pronged lever hung at each end of each car, the levers on each car being connected together and to the brake chains, and the levers being fitted for continuous contact throughout the train, so that when the brakes are applied on the tender by power from the engine there is a continuous or successive application of the brakes from the first to the rear car.

An improvement in governors, patented by Mr. William E. Crane, of Waterbury, Conn., consists in reciprocating a slide valve to regulate the supply of steam and the speed of machinery by connecting a pinion between two straight racks directly with the sleeve of the governor mechanism so as to raise and lower the pinion.

Mr. James N. Winn, of Darien, Ga., has invented an improvement in car couplings, so constructed that they may be readily adjusted to couple cars of different heights, that they will couple the cars automatically as they are run together, and will be readily uncoupled.

Mr. Allen A. Munson, of La Grange, Mich., has invented a combined elevator and carrier for unloading hay and depositing it in the mow, for loading and unloading vessels and cars, and for other uses.

Some improvements in steam engines have been patented by Mr. Samuel N. Silver, of Auburn, Me. These improvements relate to engines and pumps adapted for use with steam or water, and as stationary, marine, or locomotive engines, or as steam fire engines; and the object is to attain an engine of simple and durable construction adapted for running at high speed.

A spring draught attachment for horse powers has been patented by Mr. Asher E. Morris, of Janesville, Minn. The object of this invention is to connect the draught with the sweeps of horse powers in such a way that both the teams and the machines will be protected from jerk or strain should there be a sudden application of power.

The Mississippi River Commission.

The commission of engineers appointed to investigate the subject of levels and improvements along the Mississippi have submitted their reports.

The thirty-three navigable rivers of the Mississippi system comprise 14,000 miles of navigable waters, intersecting or bordering on eighteen States and two Territories. The extent of territory subject to overflow was, in 1874, estimated to be 41,193 square miles, an area as great as the combined areas of New Hampshire, Vermont, Massachusetts, Rhode Island, and New Jersey, and much more productive under proper conditions. Up to the year 1878 Congress had made for the improvement of the Mississippi river and its various tributaries about two hundred appropriations, amounting in all to the sum of $18,500,000.

The commission consists of Brevet General Q. A. Gillmore, president; Major Charles R. Suter, United States Engineers; Brevet Brigadier General C. B. Comstock, United States Engineers; Professor Henry Mitchell, of the Coast Survey; Captain James B. Eads, B. Harrod, and Benjamin Harrison, civilians.

The work assigned to them was:

First—To direct and complete such surveys of the Mississippi river between the head of the Passes, near its mouth and its headwaters, as were then in progress, and to make such additional surveys and examinations of said river and its tributaries as might by it be deemed necessary.

Second—To take into consideration and mature such plan or plans as will correct, permanently locate and deepen the channel, and protect the banks of the Mississippi river, improve and give safety and ease to the navigation thereof, prevent destructive floods, and promote and facilitate commerce and the postal service, and with such plans to prepare and submit estimates of the cost of executing the work.

Third—To report specifically upon the practicability, feasibility, and probable cost of the plans known as the jetty system, the levee system, and the outlet system.

Many plans for the improvement of navigation and the protection of the alluvial lands have been advocated, chief among them these:

First.—Improvement of navigation between St. Louis and the Gulf by the use of jetties to make the river of uniform width and scour out the channel.

Second.—Drainage and reclamation of the alluvial lands by a system of outlets which divide the great river into several lesser streams.

Third.—To cut away the bars obstructing navigation by building a wall across the river at its mouth.

Fourth.—Construction of an entirely new line of levees a mile or more back of present ones.

Fifth.—Repairing existing levees, closing all the outlets with wing dams to turn aside the current where the curves of the river are apt to cave in the banks.

There are also three other plans proposed:

First.—The cut-off plan for straightening the course of the river.

Second.—The diversion of tributaries, like the Red river, diverting them from pouring into the Mississippi.

Third.—The reservoir plan, the creation of basins or reservoirs at the sources of the Mississippi and its tributaries to gather the surplus water in flood time and reserve it to add to the current at low water periods.

The majority report of the commission, signed by the president and engineers Suter, Mitchell, Eads, and Harrod, states that, "in a restricted sense as auxiliary to a plan of channel improvement only, the construction and maintenance of a levee system is not demanded. But, in a larger sense, as embracing not only beneficial effects upon the channel, but as a protection against destructive floods, a levee system is essential; and such system also promotes and facilitates commerce, trade, and the postal service."

The plan of improvement recommended is based upon the fact that the bad navigation of the river is produced by the caving and erosion of its banks and the excessive widths and the bars and shoals resulting directly therefrom. The work to be done, therefore, is to scour out and maintain a channel through the shoals and bars existing in those portions of the river where the width is excessive, and to build up new banks and develop new shore lines, so as to establish as far as practicable the requisite conditions of uniform velocity for all stages of the river. It is believed by the commission that this improvement can be accomplished below Cairo by contracting the low water channel way to an approximately uniform width of about 3,000 feet for the purpose of scouring out a channel through the shoals and bars, and by causing, through the action of appropriate works constructed at suitable localities, the deposition of sand and other earthy materials transported by water upon the dry bars and other portions of the present bed not embraced within the limits of the proposed low water channel. The ultimate effect sought to be produced by such deposits is a comparative uniformity in the width of the high water channel of the river. It is believed that the works estimated for in the report will create and establish a depth of at least ten feet at extreme low stages of the river over all the bars below Cairo, where they are located. It is also the opinion of the commission that, as a general rule, the channel should be fixed and maintained in its present location, and that no attempts should be made to straighten the river or to shorten it by cut-offs.

THE medicinal rule is that an elevation of 4,000 feet above the level of the sea confers immunity from yellow fever.