

Thus she was enabled to ascend the rapids. Three miles farther up the river another rapid similar to the last was found, and ascended in the same way. The next obstacle was by far the most formidable one. Several islands situated in the river are connected with the banks by rocks, over which the river falls. Here the 'En Avant' had to be unmounted and unloaded, and the hull was hauled up the fall with great difficulty. Captain van Gèle describes this region as follows:—

"The country is beautiful. The banks of the river are bordered by hills of gentle slope, with woods and prairies, plantations of bananas, and fields of maize. Most of the villages are situated on the slopes of the hills. Seen from afar, the huts give the impression of Swiss cottages. If there were herds of cattle grazing on the prairies, the illusion would be complete. The country seems to be of great fertility, the grass attaining in some places a height of twenty feet.

"The fronts of the villages situated on the banks of the river are fortified by stockades. On high trees of cottonwood, guards are stationed in rudely constructed huts, which have given rise to the legend of aerial villages. I have not seen any manioc or palms in this district, while bananas, sugar-cane, and maize abound. Up to the third rapid the natives are of the same type as those living farther south on the river. Their heads are shaved, and their heavy mustaches give them a military air. Their faces are not tattooed. We were very kindly received by this people. Above the third rapid a new tribe was met with,—the Bakombe, who are said to occupy a great part of the territory between the Obangi and Kongo. They have a very remarkable fashion of dressing their hair. Some wear enormous chignons; others, forms similar to those worn by the Mombutu; still others, long and slender tresses, sometimes as long as six feet."

At the last rapid the waters of the river come from the northeast. The view is grand. The river is about twenty-eight hundred feet wide, and free from obstacles. Farther east its course was found to be westerly. No tributaries were discovered above the rapids. On the northern bank the country is level, while in the south a few low hills may be seen. Although not a single house is seen from the steamer, the country is densely inhabited, numerous villages being situated a few hundred steps distant from the banks of the river. The latter are called 'Dua' by the natives. There are numerous islands, most of which are inhabited and cultivated. Captain van Gèle states that the country is one of great fertility, and that more provisions were offered him than his party was able to consume. Beautiful work in iron is made by the natives, while ivory seems to be little valued. It is worth remarking, however, that it is used for labrets worn in the upper lips.

At Bemay a new rapid was met, which, however, was passed by the help of the natives. A few miles above Setema, the first tributary, the Bangaso, was seen. It is a remarkable fact that neither on the north nor on the south side are there any tributaries. The same scarceness of tributaries is observed on the Kongo: therefore it seems probable that the region between the Shari and the Chuapa is throughout occupied by rivers running east and west. After the Bangaso was passed, a new tribe was met, the Yakoma, who attacked the steamer. On Jan. 1, 1888, the 'En Avant,' which steamed along the north bank of the river, met a line of rocks forming a rapid. The steamer separated from the canoe in order to search for a pass. Immediately numerous natives attacked the canoe. At the same time the steamer struck a rock, and it was necessary to unload and to make a landing among the hostile natives. Lieutenant Liénart, who was charged with this task, was kindly received, but only to be attacked the more vigorously later on. In the ensuing struggle two of his men were killed. After all, the steamer was reloaded and repaired on an island; but the hostility of the natives, and the fact that the water of the river was falling rapidly, made it necessary to return at once. The expedition had reached 21° 55' of longitude, the distance to the farthest point of Junker being some seventy miles. It is in this unknown stretch that the Mbomo empties itself. The return was effected without casualties.

The important result of this expedition is to show that the Welle belongs to the Kongo system; for it would be unreasonable to doubt its identity with the Obangi any longer. There is also some prospect of having the western boundary of the Kongo basin explored ere long. Two German expeditions are pushing eastward from

Kamerouns, while the English missionary Brooke is ascending the Obangi, intending to strike north-westward from Zongo.

SCIENTIFIC NEWS IN WASHINGTON.

The Work of the United States Fish Commission on the Atlantic Coast; the Migrations of Fishes governed by the Temperature of the Water; Isothermals to be constructed.—A Great Work by the Bureau of Ethnology; the Dictionary of North American Indian Tribes completed.—Shall the Arid Lands be reclaimed? a Magnificent Undertaking.—A New Law for the United States Fish Commission proposed.

The Work of the 'Grampus.'

ONE important fact has been established by the investigations of the United States Fish Commission, and that is, that the movements of the great masses of food-fishes that visit the bays and rivers of this country in summer are not governed by a desire to return to the localities where they were born, nor by the scarcity or abundance of food, but by the temperature of the water in which it is suitable for them to spawn. For instance: the shad never enter one of our bays or rivers in the spring until its temperature has become 60° F. Then they pass into the rivers, and up towards their sources, always seeking the warmer waters. They move up stream when the difference of temperature is so slight that it can only be detected by the use of a differential thermometer; but so sensitive are they with their whole bodies immersed, that they easily discover the direction in which the warmer water lies.

The reason why the attempt to plant shad on the Pacific coast failed is now known. Large quantities of little shad were planted by the United States Fish Commission in the Sacramento River. Very few of them returned, and all the attempts to stock the Pacific coast waters with shad have resulted only in distributing the fish in small numbers along the coast to Vancouver's Island, a distance of sixteen hundred miles. A few now enter the small rivers that have their sources near the coast, but nowhere do they show a disposition to come in great bodies, as on the Atlantic coast. The explanation is, that the bay is fed by rivers rising in the mountains, and bringing down melted-snow water, so that its temperature during the spawning-season for shad is only 55° or 60°. Fishes that were placed in the Sacramento River one year, therefore, never come back. If they approach the bay, they find it too cold to pass.

California salmon, on the other hand, require a temperature of from 40° to 45° for spawning. As they go up the rivers from the Pacific Ocean, the water becomes colder, and they finally reach that which is just right. But young California salmon placed in Eastern rivers do not become acclimated; in fact, they rarely come back. Of fifteen million young ones so planted by the United States Fish Commission, not more than three or four have ever been caught or seen in the rivers it was desired to stock. The water of the rivers is warmer as they go up stream, and they avoid it. The attempt to stock the rivers of southern Europe flowing into the Mediterranean Sea with California salmon has been successful for two reasons: they have not been able to get out of the Mediterranean and find other spawning-places if they desired; and they have found streams which, being fed by melting snows in the mountains, furnish the conditions sought.

Menhaden never enter rivers the temperature of which is below 50°. These fishes visited the coast of Maine in great numbers for forty years, but in 1878 suddenly disappeared. The same year the mackerel did not enter the Bay of Fundy. It is now believed that this strange phenomenon was caused by a change in the temperature of the water.

These facts being established, it becomes very important, from an economic point of view, to ascertain what changes take place during the season in the temperature of the ocean off our coast and of the bays enclosed by it, to plot isothermals, and to lay down upon charts the migrations of these isothermals as the season advances. It is believed, that, when this is done, the migrations of our summer food-fishes will also be discovered, and that their movements can be accurately predicted. This work has been assigned to the 'Grampus' for the present season. Her field will be from the capes of Virginia north. She will make careful obser-

variations of the temperature of the surface and bottom of the water, and try to plot the isothermals of 50°, 55°, 60°, 65°, and 70°. The reports of a vast number of former observations made with other ends in view, but which included temperatures, are now being examined in Washington, and the results plotted upon charts; so that the amount of data available for constructing the isothermals will, by the end of the season, be very large.

Another duty assigned to the party in the 'Grampus' is to discover, if possible, the spawning-grounds of the bluefish and mackerel. To this end the great masses of floating fish-eggs found upon the ocean at certain seasons will be examined for the purpose of determining what they are. Small hatching-apparatus have been supplied; and samples of the eggs will be hatched, and the young developed sufficiently to enable the embryologists to determine what they are. This work, if it is successful, is also expected to be of great economic value. In order for Congress to be able to legislate intelligently for the protection of food-fishes, it is necessary that their habits should be understood. If the mackerel and bluefish, for instance, spawn out at sea, where there is no danger that they will be disturbed by fishermen, it will be unnecessary to make laws restricting the capture of them on the grounds where they are usually taken. It is not probable that the capture of these fish for food or other purposes makes any perceptible difference in their numbers, unless they are stopped on the way to their spawning-grounds.

Dictionary of North American Indian Tribes.

The Bureau of Ethnology has substantially completed the dictionary of North American Indian tribes, upon the preparation of which it has been engaged for many years; and it is probable that the work, comprising a volume of about five hundred pages, will be published within a year. For practical as well as scientific uses, this will be the most important product of the bureau since its organization; except, perhaps, the map showing the geographical distribution of the linguistic families of Indians, a notice of which was recently given in *Science*. The material is now in the form of cards alphabetically arranged. Each card contains one title, and of these there are between forty thousand and fifty thousand.

The plan of the work is to give alphabetically the name of each linguistic family, tribe, and village of the North American Indians at the time of the settlement by Europeans, with all the known synonymes for them. The work has involved the long and patient labor of a great number of specialists under the direction of Prof. H. N. Henshaw, and could not possibly have been undertaken by a private individual.

A word as to the method of preparation. The literature of the North American Indians is very voluminous. Early and later explorers, travellers, missionaries, traders, pioneer settlers, and soldiers have written about them, or have referred to them in their books. Very rarely have they been careful to be exact in the spelling of the names of the tribes they have described; and, when they have done so, typographic errors have crept in, which have been perpetuated and often added to by other writers, until the synonymes have been multiplied almost without end. For example: the number of different names and different spellings of the same name found in literature to designate the Mohawk tribe is about two hundred. The most of these would not be recognized by the ordinary reader, and many of them not even by the student of Indian ethnology. In fact, even the scientific man can hardly read five pages of an old book on the North American Indians without encountering the name of an Indian tribe that he never heard of.

Many writers have misunderstood the names the Indians gave them; others, thinking from the form of the name as they have found it in some book that it must be incorrect, have guessed at what it ought to be, and have generally corrupted it still more; still further variations have been caused by typographic errors, as has already been noted, until there was almost inextricable confusion. For instance: one writer speaks of the 'Roundaxes' Indians; an earlier one, of the 'Rondaxes'; one still earlier, of the 'Orondacks'; and the true name is the 'Adirondacks.' In another case the 'Round Head' Indians are mentioned; a French book, which was probably this author's authority, calls the same tribe

the 'Tête de Boule'; he probably got the name from an English writer who had spoken of them as 'Bullet Heads'; their true names was 'Bull Heads.' In still another instance the reader encounters the name 'Pickpocket' to designate a tribe. This came from 'Pickwocket,' which was itself a corruption of 'Pigwolket,' which somebody wrote for 'Pigwacket.' The last writer misunderstood the true name 'Pâgwâki.' The following is very funny: The 'Kouani' tribe are first called 'Kuhus,' then 'Ku-un,' then 'Kun' (pronounced 'Coon'), and then 'Raccoon.' The 'Sundowns' of a certain author are the 'Samdams.'

By a careful examination of the literature of the North American Indians, all these names have been collected and arranged, first under the linguistic families, and then according to tribes. When thus brought together, the origin and relations of the different synonymes have been discovered, although previously they were not at all apparent.

In the dictionary the name of each linguistic family will be given in its proper alphabetical place, followed by a short history of each, a description of it and of the country it inhabited, and a list of the tribes that composed it, and of the villages in which they lived. The name of each tribe will be found in its proper place, with a list of all the synonymes for it; each of which, in turn, will be entered in alphabetical order with a cross-reference to the correct name of the tribe, a statement of the linguistic family to which it belongs, and a list of the villages it occupied. Finally, the name of each village will be entered, followed by a brief description and a statement of the tribe and linguistic family of its people, and the number of its inhabitants.

The publication of this dictionary will make intelligible much in the literature of the North American Indians that has heretofore been vague and confused; it will enable the reader of books referring to them to identify the tribes and villages; it will simplify the labors of investigators in all other branches of Indian ethnological research. For example: a great number of skulls have been collected at the National Museum, where they are classified and arranged for study. The collectors are many of them army officers, Indian agents, and voluntary contributors, not special students of ethnology, who have given the names of the tribes represented as they have heard or understood them. The dictionary will enable the curators to identify these tribes, and thus make the classification easy. Dr. Yarrow of the Army Medical Museum is preparing a book on the mortuary customs of the Indians. Until this dictionary is published, or he has access to it in its present form, no thorough classification can be made. The dictionary will also enable the government to determine the boundaries of lands ceded by Indian tribes, and in many other ways clear up doubtful and disputed questions.

Reclamation of Arid Lands.

Congress has been asked for an appropriation of two hundred and fifty thousand dollars to pay for the preliminary work of damming up the cañons of the Rocky Mountains, from the Dominion line to Mexico, and thus forming vast reservoirs of water to be used in the irrigation of arid lands, and preventing the disastrous floods on the lower Mississippi. The area of arid land in the United States is about 1,300,000 square miles; and Major Powell, director of the National Survey, estimates that at least 150,000 square miles of this might be reclaimed, — a territory exceeding in extent one-half of all the land now cultivated in the United States. The plan is to build dams across all the cañons in the mountains, large enough and strong enough to hold back the floods from heavy rains and melting snows, and then to let the water down, as it may be needed, upon the lands that would be reclaimed.

The preliminary work for which the appropriation is asked is to pay for surveys to determine the sites and locations for the dams, reservoirs, canals, and irrigation areas; the total volume of water susceptible of storage, and the loss through evaporation and seepage in the reservoirs and canals; the area of land to be served by a unit of water; the value of the redeemed land for the growth of the crops adapted to the climate and soil; the expense of constructing the dams and canals and the expense of maintaining them; what vested rights, if any, exist.

With ample appropriations, at least two years will be required

for this preliminary work: Major Powell, who has probably studied the Rocky Mountain and arid region more carefully than any one else, declares that the scheme is a perfectly feasible one, and that the cost, though very great, will be but a small fraction of the value of the land reclaimed. While the western portion of the United States is not yet crowded when compared with Europe, or even with other parts of our own country, it is no longer true that "Uncle Sam is rich enough to give us all a farm." But, if 150,000 square miles of the arid lands of the United States could be reclaimed, the limits of our agricultural development would be enormously extended.

Re-organization of the United States Fish Commission.

The bill prepared by Professor McDonald, and introduced in the House of Representatives, to re-organize the United States Fish Commission and to define its duties, declares "that it shall be the duty of the commissioner of fish and fisheries to continue the systematic investigation of waters of the United States, and of the biological and physical problems they present, with the object of determining the character, abundance, geographical distribution, and economic value of the inhabitants of the waters, both salt and fresh, as also their migrations, and the cause influencing or regulating the same. This investigation is to be conducted on a broad and comprehensive plan, so as to arrive at the life-history of all species having economic value, as well as those species to which they are intimately and essentially related.

"That he will continue the investigation into the history of the methods and apparatus of the fisheries and for the preservation and utilization of fishery products now in use, and will cause careful study to be made of new methods and apparatus introduced from time to time with the object of determining their effect upon production, and furnishing the information upon which to frame intelligent legislation regulating the conduct of the fisheries and improving their methods and apparatus.

"That it shall be the duty of the commissioner of fish and fisheries to provide for the collection of the statistics of the fisheries of the United States, especial reference being had to the fisheries of the Great Lakes and of the New England and North Pacific coasts of the United States, which are of international importance, and may influence or become the subject of treaty stipulations. The statistical inquiry hereby authorized and directed shall be comprehensively planned to accomplish the purposes for which it is instituted.

"That it shall be the duty of the commissioner of fish and fisheries to continue the work of artificial propagation of food-fishes and other useful inhabitants of the water with a view to their introduction into and establishment in the interior and coast waters, and to the maintenance and improvement of the important commercial fisheries of the coast and interior lakes and rivers. To this end he will, in his annual estimates transmitted to Congress, provide for the maintenance and operation of the existing stations of the commission, and for the maintenance and operation of such additional permanent and field stations as may be from time to time authorized and directed.

"That the commissioner of fish and fisheries shall appoint such employees as Congress may from time to time provide, with salaries corresponding to those of similar officers in other departments of the government, and he shall, as Congress may from time to time provide, employ other persons, of expert knowledge, for such time as their services may be needed, including chemists, naturalists, and physicists, for the conduct of the researches and investigations required in the performance of the duties devolved upon this department, or which may be from time to time authorized and directed by Congress."

HEALTH MATTERS.

CONTAGION IN COURTS. — The State analyst of New Jersey, in a recent trial, when called upon to take an oath as witness, avoided kissing the Bible on the ground that he might contract disease by so doing, saying, "So many different persons have kissed that book, that I do not think it safe to touch my lips to it." The court held that the witness must kiss the book, and he reluctantly did so. This seems like a trifling matter, and yet it might be a serious one.

The danger of contracting disease in this way is not imaginary. Until courts so disinfect the Bible on which oaths are taken as to make the act of kissing it safe, we would advise the practising of a device which the writer has for years employed; viz., to kiss the fingers with which he holds the book.

EDUCATING THE WHITE BLOOD-CORPUSCLES. — Dr. Ray Lankester, in an address on 'The Struggle for Life' (*The Hospital Gazette*), in speaking of the function of the blood-corpuscles, said that the corpuscles could be educated to deal with the bacteria, and the future of preventive medicine would be the education of the white blood-corpuscles. The fact that one man, by constant use, could without injury take a dose of arsenic that would kill six ordinary men, was due to the fact that he had by weakened doses been educating and training the white corpuscles. They could be taught to eat and flourish under conditions which, if not commenced gradually, would be destructive to them, and that was the principle underlying protective inoculation. As a preventive of many fatal diseases in sheep and oxen, inoculation had been remarkably successful. The corpuscles first received a weakened breed of disease by inoculation, and thus when a violent attack came they were ready to receive and dispose of it. This education of the corpuscles, it seemed to him, was the explanation of the success of vaccination. They received a weak dose of the poison from the vaccine, and were in that way prepared for a stronger dose in the way of small-pox. He believed the white corpuscles could be trained to receive the most virulent poisons, and he hoped this training would be carried on so as to deal with a great number of diseases.

ELECTRICAL SCIENCE.

Sir William Thomson's Electrical Measuring-Instruments.

FOR some years past Sir William Thomson has been working on electrical measuring-instruments with a view to perfecting some means of accurately and easily measuring the heavy currents and the potentials used in commercial work. Mr. J. A. Fleming, in *Industries*, describes the latest forms Sir William has produced. The ammeters are six in number. The different types are, —

The Centi-ampère balance from	1 to	50 centi-ampères
" Deci-ampère "	" 1 "	50 deci-ampères
" Ampère "	" $\frac{1}{2}$ "	25 ampères
" Dekka-ampère "	" 2 "	100 "
" Hekto-ampère "	" 10 "	500 "
" Kilo-ampère "	" 50 "	2,500 "

All of these instruments are on the same general plan. The attraction between two coils carrying the current — one movable, the other fixed — is balanced by a weight sliding on a scale-beam. Heretofore the difficulty in such an arrangement has been in getting heavy currents to the movable coil without greatly decreasing the sensitiveness of the apparatus. In these instruments there are two movable coils, fastened on the two ends of a light frame, and below each of them is a fixed coil. The frame has an axle in the middle by which it is suspended, and it is in the suspension that the chief novelty and improvement lie. The axle ends in two semi-cylindrical trunnions. Above them are two similar fixed trunnions. The two sets are connected by a number of extremely fine copper wires bearing on the rounded surfaces of the lower trunnions. This arrangement allows a free though limited movement of the frame, and the numerous fine wires will carry a heavy current. The winding of the two coils are such that one end of the frame is repelled, the other attracted, when a current passes. There is a scale-beam attached to the frame, and a weight moving on this is shifted until the frame is horizontal. The reading on the beam opposite the weight gives the current that is flowing. The great advantage of this arrangement, as in other forms of electro-dynamometer, lies in the fact that the readings are independent of any change in the strength of magnets, such as are used in ordinary commercial measuring-instruments, and also of the value of the earth's magnetism. The instruments, however, are not so portable as many other forms, and are somewhat difficult to adjust. They will be useful for standardizing the ordinary forms of voltmeter and ammeter.