

Building a River

GERMANY IS SHOWING THE WORLD HOW TO MAKE RIVERS FLOW—SCIENCE IS THE MOTHER OF PROFESSIONS—PROFESSOR ENGELS IS SOLVING THE PROBLEM OF RIVER FLOW—ACTUAL EXPERIMENTS IN LABORATORY—VAST SUMS OF MONEY NOW EXPENDED TO NO PURPOSE WILL BE SAVED—EFFECTS OF SAND DEPOSITS, DREDGING, NEW EMBANKMENTS, BARS AND CRIBS—THE RIVER ELBE IN MINIATURE SHOWS THE WORKINGS OF THE PLAN—A NEW PROFESSION, RIVER MAKING.

BY RAY STANNARD BAKER. (Copyright 1900 by R. S. Baker.) Speaking of the development of the scientific spirit in Germany, an English wit said recently: "Why, gentlemen, even the winds of the fatherland blow scientifically." If he had said, "Even the waters of the fatherland flow scientifically," his joke would have been as

effective and at the same time, curious as it may seem, he would have had the honor of announcing the first news of an important scientific departure. For German science has been grappling with the problem of making the rivers of the entire flow according to rule, and with this in view an extensive experimental station, called the Flussbau Laboratorium (river building labora-

ing dams and piers placed in its way to keep it in order. Vast sums of money have been spent by all the great nations, and spent judiciously, as the Germans believe, in dredging channels, filling in a channel there, sometimes undermining a tower and often breaking and protecting the banks of rivers. Professor Engels called attention to our own Mississippi river, and spoke of the great cost of keeping it within bound and at the same time of making it safe for navigation. In Germany the question is even more important than it is with us for the reason that the country is more densely populated, the land is more valuable and changes in the course of flow in a river are therefore more destructive and costly. Moreover, the rivers of Germany are not generally speaking, so swift and long as they are in America, and it is needful to keep them at the height of effectiveness as to navigability.

The River-Building Laboratory. It was with the idea of bringing scientific methods to bear on these problems that the Flussbau Laboratorium was established about three years ago. Professor Engels began his work in the typical German way; that is, by investigating his subject thoroughly in the light of science, before attempting to offer any practical suggestions. A large room is set aside in the basement of the Dresden Technical school, and here, Professor Engels has had constructed an iron trough or tank about seven feet in width and two deep, reaching the full length of the room. At the upper end of this trough a large river tank is placed with appliances for per-

speed, and Professor Engels studies closely all those places where the sandy bottom is washed out, where it is filled in, where the banks have a tendency to creep, and where the banks are building up. As the water flows it naturally carries much sand entirely out of the trough. All this Professor Engels called attention to in a most ingenious manner. As the water leaves the trough it is carried over tin ribs



Prof. Engel's Building of Rivers.

behind which the sand is deposited, finally falling, entirely clear of all soil into a large tank at the lower end of the trough. Here a pump is constantly at work drawing the water back to the upper tank, thus using it over and over and enabling the river to flow on without interruption for weeks at a time.

The Effects of Sands.

Professor Engels showed me sands of various colors which he used for showing the exact position of deposit of sand in his river. A red sand fell slowly into the "mouth" of the river would show in bars and banks which were protected by a dam, indicating exactly where the river was, at any given time, adding land. A little later, blue sand used in the same way might show the formation of still other bars, and the removal of the red sand bars previously produced. Controlling the water as he does, Professor Engels can have a freshet at any time he sees fit, noting its effect on his river, or he can imitate the sluggish flow of dry autumn. If the river is exceedingly crooked he can produce a new channel artificially as it might be produced by a sudden great flushing of water, and he can make a breakwater, pier, dock, bridge, and so on, and note in each case the exact effect which these produced on the river, whether they tend to deepen or to obstruct the channel, the influence of each as regards the formation of bars and banks and so on, and how deep plugging must be driven into the trough and caught by the tin ribs can be gathered up and measured, the quantity thus obtained furnishing valuable data as to the rate of deposit of rivers of various volume

and velocity of flow. Professor Engels also studies the effect of flow not only in rivers having sandy channels, but he also uses gravel and stone, constructing islands and gravel ribs and watching the effect of each on the river.

The Elbe in Miniature.

Many of the rivers in Germany have been plotted with great accuracy, not only as to their shore lines, but with regard to the contour of their channel beds. With these maps and contours in hand, Professor Engels is now engaged in laying out to an exact scale various sections of the more important German rivers. He duplicates exactly every curve, builds in every crib and breakwater, and then turns on the water at the ordinary rate of flow of the river, under investigation. When I visited the laboratory a stretch of the Elbe had just been completed, and a beautiful model of work it was, the cribs all accurately placed and the banks held in place with bags of shot. Professor Engels began his work in the typical German way; that is, by investigating his subject thoroughly in the light of science, before attempting to offer any practical suggestions. A large room is set aside in the basement of the Dresden Technical school, and here, Professor Engels has had constructed an iron trough or tank about seven feet in width and two deep, reaching the full length of the room. At the upper end of this trough a large river tank is placed with appliances for per-

Establishes a New Profession.

The keynote of the whole work is, as Professor Engels expresses it, to make the river regulate itself, to put down cribs and other river-building devices in such a way that the river will keep its own channel clear and deep enough for navigation purposes, thereby saving dredging and at the same time fill such spaces as the engineer wishes filled. He believes that a more thorough knowledge of rivers and a careful series of experiments with actual river courses will enable man to do almost what he wills with rivers, and do it much more cheaply than ever before. The work, as he says, is only just beginning, but he and other distinguished engineers and scientists who are interested in the work (I talked especially with Professor Walter Hempel of Dresden) believe that there is a great future for the work. They are of the opinion that all rivers will be regulated by the advice of river-building experts, who have laboratories such as the Flussbau laboratorium, in which tests and experiments can be made. Verily a new profession is born—river building.

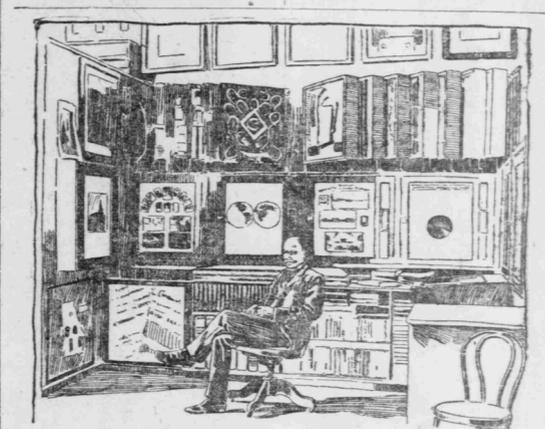
RAY STANNARD BAKER.

The Palais De Congres.

BY VALERIAN GRIBAYEDOFF.

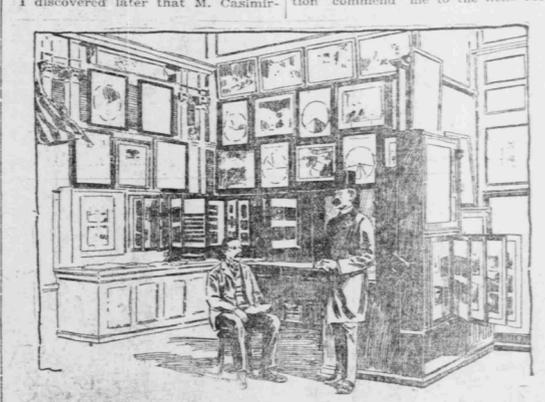
(Copyright 1900 by V. Gribayedoff.) Near the Pont de l'Alma and on the opposite side of the Seine from the representative buildings of the nations stands a large whitewashed, severe and almost solemn looking edifice which attracted my attention at the moment I was settling an exorbitant account for a midday breakfast at the restaurant La Feria. The sepulchral structure, I was informed, was the Palais des Congres. I inquired what was a Palais des Congres. The obsequious waiter shrugged his shoulders and said that it is a palace where they have congresses.

EDUCATIONAL INSTITUTION OF THE PARIS EXPOSITION.



THE NEGRO SECTION IN THE U. S. DEPARTMENT OF SOCIAL ECONOMY.

He told me that I had come at rather an unfavorable hour. The Palais des Congres was often much gayer. I fully ever would have been a step toward lightness of spirit. My Japanese friend, after assuring me that "Progress and Poverty" would soon be a great problem in Japan—always an enterprising people, you see—gave me a programme. Certainly, as to education, there was no lack of it here. The range of congresses extended from homeopathy to the study of old coins; from vegetarianism to the care of the teeth. It was unfortunate, I thought, that these congresses were reserved to the select. Improvement in Labor Classes. I descended again, resolved this time to unravel the mystery of each section of exhibits. I will note a few points that struck me, so that intruding visitors may be encouraged to persevere. The general idea running throughout the section, may well be that of the improvement of the condition of the working classes. Each country, therefore, put its best foot forward, and the optimism of the charts displayed was calculated to convince one that this world was rapidly becoming the best of all possible spheres. Statistics demagogues of them are concerned, and the charts seemed to be crushing poverty out of existence. Even Russia, luxuriated in all kinds of modern buildings and model institutions, and all names of societies, represented by pictures and by graphics for increasing the well being of the subjects of the czar. Italy has more than her fair share of space, and has fully taken advantage of it to prove that the favored peninsula is a land of milk and honey, high art and exceeding comfort. Hungary has a brave show, wherein the life of the workman, principally the agriculturalist and the vintager, is exhibited in the most glowing colors. This must be taken literally, for the scenes are depleted in oils. The artist has, however, selected cadaverous volumes, or his colors have betrayed him, and the effect is not altogether happy. A picture of "Sunday" (reposed) particularly gloomy. The tired and workmen seemed to have no better idea of bliss than to sit limp and aimless on garden seats staring at vacancy. The French section occupies 60 per cent of the entire space. This is not understood, for there is so much evidence of thought, of work and of high efficiency displayed in their instructive "object lessons" that the section might well serve as a model of how to do these things. The note mainly placed upon is that of the improvement of the condition of the workman by means of co-operative unions and mutual benefit associations. The workman has greatly wrought out his own salvation; helped, however, by light from above. He is shown in "before" and "after," and we become reconciled to the nineteenth century. For a quiet little nook in this exposition commend me to the little room



THE WHITE MAN'S HALF OF THE U. S. DEPARTMENT, DR. TOLMAN IN CHARGE.

Perier was there on account of having to preside over the congress of "public charity and private benevolence" of the respected and American women. Chicago seems to be especially favored, for he has entertained at different times the Chicago women of the Misses Letter, Miss Fairfax, Miss Baek, who is my aunt and myself. The maharajah is about 40 years old and as dark as a Spaniard. He is a good conversationalist and told us at dinner given for me some excellent stories about him. I am fond of deer hunting. This seemed to interest him. He was surprised that a girl could shoot well and laughingly remarked that American girls can do anything. He invited my aunt and myself to go to India hunting next year. But we cannot. Our recent dinner party was at Kapurthala where the maharajah now lives, five miles from the maharajah's camp. Dr. Bodier of Paris, my aunt, Miss and myself. "No matter how interesting he may be, I do not think any American girl should marry an Indian prince." The Failure. (Post Wheeler in New York Press.) The end of the most successful looks from cloud-rifts in the west; The end of lagging labor girls the sweetest of the respect and American women. The end of weary waiting calls two lips for love to kiss. The end of long journey true lovers' meeting is. The gale has bludgeoned my breath away and smitten me with hail. The toll of life has taken up has left me like to fall. The wooing that I cherished, it broke my soul apart. And love's long journey's ended and I'm burying my heart! At the Outdoor Club. (Indianapolis Journal.) "Mrs. Goughly, did Mrs. Deepdie had a fine paper on Buddha?" "Indeed she did; I just wish you had heard her rip him up the back."

From Ship to School.

HOW THE FORE-AND-AFT RIGGED VESSEL IS CROWDING THE OTHERS OUT.

BY MORGAN ROBERTSON. Author of "Sloop Yacht," "Where Rivers Go to Sea," "The Yacht," etc. (Copyright 1900 by Morgan Robertson.)

In ancient times all craft were lateen rigged—a rig still in use, and practical enough for small vessels, though unlit for large. As hulls grew larger the lateen sail changed in shape, losing a small triangle from its forward end, which allowed the yard to rise from the deck, in the stage of development it had become the sail now used on Malay praus and sirocos could time pass, and the long, slender yard shortened to a small spar, the sail received more hoist, and the lug sail was evolved. From this sail sprung two varieties, the square sail of the Viking, which, later, the nameless, though familiar form used as the principal sail of schooners and sloops—the first best in running before the wind, the other best in tack-

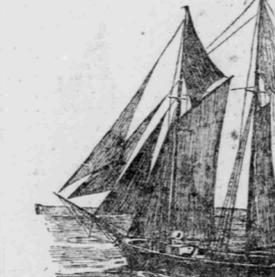
square when practicable. Small ships became barques, small barques became brigantines, the brig evolved into the brigantine, which is now adopting the better features of the topsail schooner—the original topsail schooner long ago relegated into the parent type. But in spite of the advantage gained by the lateen rig, the square rig was gradually driven toward the schooner rig. It had been held in check by the undoubted necessity of avoiding a large sail area into parts small enough to be handled, and, perhaps, also, by the one serious point of the square rig—safety in running before a heavy gale and sea. Brig and topsail schooner have about disappeared; but ships, barques, barkentines and brigantines are still being launched, and it may be certain until ship owners and builders realize the superiority of the one craft yet designed to weather—the multibanked schooner, with its five, six or seven short masts supporting an aggregate sail area equal

er's foremast is placed, and, well aft, a small mast called the jiggermast. That this method of balancing fore and aft canvas is the best known, and the fact that tender racing yachts adopt the rig in crossing the Atlantic. But the early builders of schooners, for some inscrutable reason, perpetuated the lateen rig, and when the three-masted schooner was born, instead of shifting the two masts forward and raising a third smaller mast aft, which would have abolished the weakness, they spread them apart and placed a mast between them of a length intermediate between the fore and the mainmast. In the fashion having been thus established, has been adhered to, even in the sparring of four, five and six-masted vessels.

Evolution on the Great Lakes.

The immense traffic on the great lakes, and the more frequent action of the law of survival coming of the fierce gales in the fall—which destroy whole fleets, or has degenerated into a deck hand. It is a pity that the deep waterway now contains no more than a few sailing craft, for the evolution of the primitive sailing craft through all the various stages until it has finally lodged in the steam vessel. In the early part of the century there were full rigged ships and brig and topsail schooner and large cutter. The best two, fitted to survive in shallow waters, can still be seen; but with a lee shore all about them, the early ship and brig disappeared, leaving bark, barkentine, brigantines and the ship, retaining its feature, then died the bark; later the barkentine, and from the barkentine was evolved the three-masted schooner with short mizenmast, which, for a time retained one feature of her parent rig, a fore yard and brailing square sail, above which she carried a triangular sail called the "reefer." This rig lasted through the period of depression, following the

become a tow barge; and the fresh water sailor, the best hein-mast, the most intelligent and highest type of able seaman in the world, has learned a trade on shore, or has degenerated into a deck hand. It is a pity that the deep waterway now contains no more than a few sailing craft, for the evolution of the primitive sailing craft through all the various stages until it has finally lodged in the steam vessel. In the early part of the century there were full rigged ships and brig and topsail schooner and large cutter. The best two, fitted to survive in shallow waters, can still be seen; but with a lee shore all about them, the early ship and brig disappeared, leaving bark, barkentine, brigantines and the ship, retaining its feature, then died the bark; later the barkentine, and from the barkentine was evolved the three-masted schooner with short mizenmast, which, for a time retained one feature of her parent rig, a fore yard and brailing square sail, above which she carried a triangular sail called the "reefer." This rig lasted through the period of depression, following the



THREE MASTED LAKE SCHOONER

the more conservative salt water builders to the improvement of their masts and methods; for, in the rig of the fresh water schooner, the difficulty of flogging the sparker before a strong wind—was reduced, though the masts were not so tall as called on the lakes—though small enough to be hauled aft by one watch, the foremast and brailing square sail, above which she carried a triangular sail called the "reefer." This rig lasted through the period of depression, following the

WANTS AN AMERICAN WIFE.

Quest of the Rich Maharajah of Kapurthala. (Paris Letter, New York Journal.) The maharajah of Kapurthala, the most magnificent of Queen Victoria's Indian princely feudatories, has become the willing slave of Miss Claudine Sharpe of Chicago. She has succeeded to the honors lately enjoyed by Miss Daisy Leiter. An absolute ruler in his own realm of Kapurthala, the maharajah now knows no greater pleasure than to dance attendance upon the fair Chicago girl. He astonishes Paris by the dinners and balls he gives in her honor.

The American colony believes that the maharajah entertains the hope of taking a Chicago bride back to Kapurthala with him, and that the maharajah now knows no greater pleasure than to dance attendance upon the fair Chicago girl. He astonishes Paris by the dinners and balls he gives in her honor. The American colony believes that the maharajah entertains the hope of taking a Chicago bride back to Kapurthala with him, and that the maharajah now knows no greater pleasure than to dance attendance upon the fair Chicago girl. He astonishes Paris by the dinners and balls he gives in her honor.

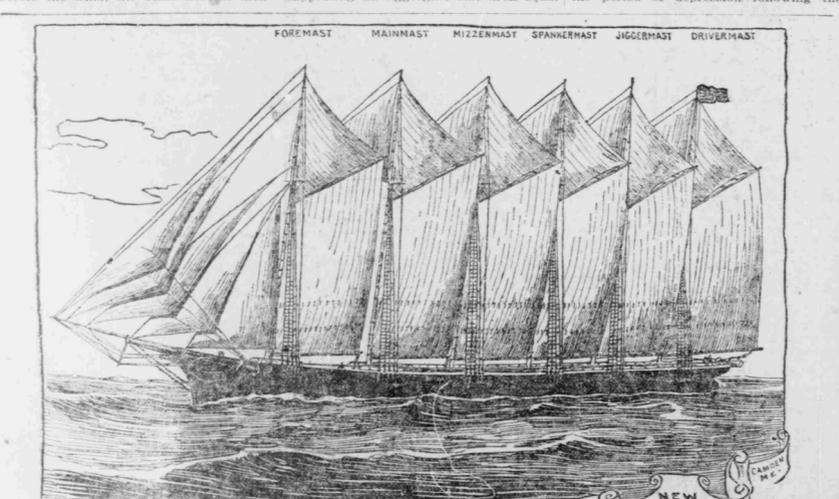
which were presented to the guests after the dinner. "But the entertainment was quite surpassed by the dinner which we gave later at the same hotel in honor of Miss Claudine Sharpe. A company of Indian dancers, whose skill is ordinarily reserved for the royal family of Kapurthala, was introduced after the dinner and gave a performance, the magic and splendor of which will never be forgotten by the guests. Miss Sharpe seems to think the maharajah a very attractive gentleman. She said of him to the correspondent: "The maharajah of Kapurthala is very courteous, especially toward American women. Chicago seems to be especially favored, for he has entertained at different times the Chicago women of the Misses Letter, Miss Fairfax, Miss Baek, who is my aunt and myself. The maharajah is about 40 years old and as dark as a Spaniard. He is a good conversationalist and told us at dinner given for me some excellent stories about him. I am fond of deer hunting. This seemed to interest him. He was surprised that a girl could shoot well and laughingly remarked that American girls can do anything. He invited my aunt and myself to go to India hunting next year. But we cannot. Our recent dinner party was at Kapurthala where the maharajah now lives, five miles from the maharajah's camp. Dr. Bodier of Paris, my aunt, Miss and myself. "No matter how interesting he may be, I do not think any American girl should marry an Indian prince."

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where Holland exhibits her economics. I sat there alone, restfully. A dim, resinous light entered the little sanctuary. Everything was fresh and clean airy. Exhibits were few, and not obstructive, a model school was the principal thing. Not a soul entered to disturb my series and I felt a Rip Van Winkle feeling steal over me. The United States Exhibit. But there was work to be done. Nearby is the American room—a little chamber, "more neat than the little room," as Byron says of Dante's tomb. I was surprised to see all America, even all social and economic America, in so small a space. After what I had observed in the French section I could not believe that the industrial side of

(Continued on page 18.)



THE BIGGEST SCHOONER AFLOAT.

ing the square sail obtaining favor in large vessels from its convenience of lateen rigging to small craft because of its swinging sail, which left the deck unobstructed by anything but the ordinary crew, and a series of small sails set one above the other, could not Hence the continuance of the square rig, in large vessels, to the present day. A schooner's long after seamen knew closer to the wind than a ship, was sweeter and more easily handled in all positions except dead before the wind, and was much cheaper to equip and maintain. Combination Rigs. The best reason, however, the schooner rig was combined with the