### STEAM CATAMARAN.

The boat consists of two pontoons each 2′ x 30′ and 1′ 8″ deep placed 4′ apart. Beams 2′ from centers connect rigidly the pontoons; on these is laid a floor of ¾″ matched boards. These beams are secured by ⅜″ bolts 25″ long extending from bottom of boats to top of deck beams. The pontoons are covered water tight, and each divided into two tight compartments. The upper works are formed by stanchions with carline beams, on which is the upper deck of ⅝″ timber. The pilot house is well up, so wheelsman can see fore and aft. An opportunity is also provided for stearing in cabin, which is inclosed with canvas curtains secured to stanchions, as are carriage curtains, only stronger. In the cabin extra stanchions are set up when wanted to support folding cots, all of which takes but little room, by day, when not wanted.

The boats are nearly straight on inside lines, gathering enough water, as as I find on trial, so that, with the draught back, caused by the wheel, the water remains same height between the boats, when running, as outside. This is my second experiment in steam catamarans, and I am convinced it is the best plan for steam yachts up to 60′ and perhaps longer, for the following reasons:

1. It is not cranky—"stiff as an island" they say—half a dozen men on one side scarcely change the level even of this small boat.

2. Safety from sinking—the four air tight compartments must all be filled before it will go down.

3. Cleanliness—all ashes and cinders go direct from the fire box to the water below.

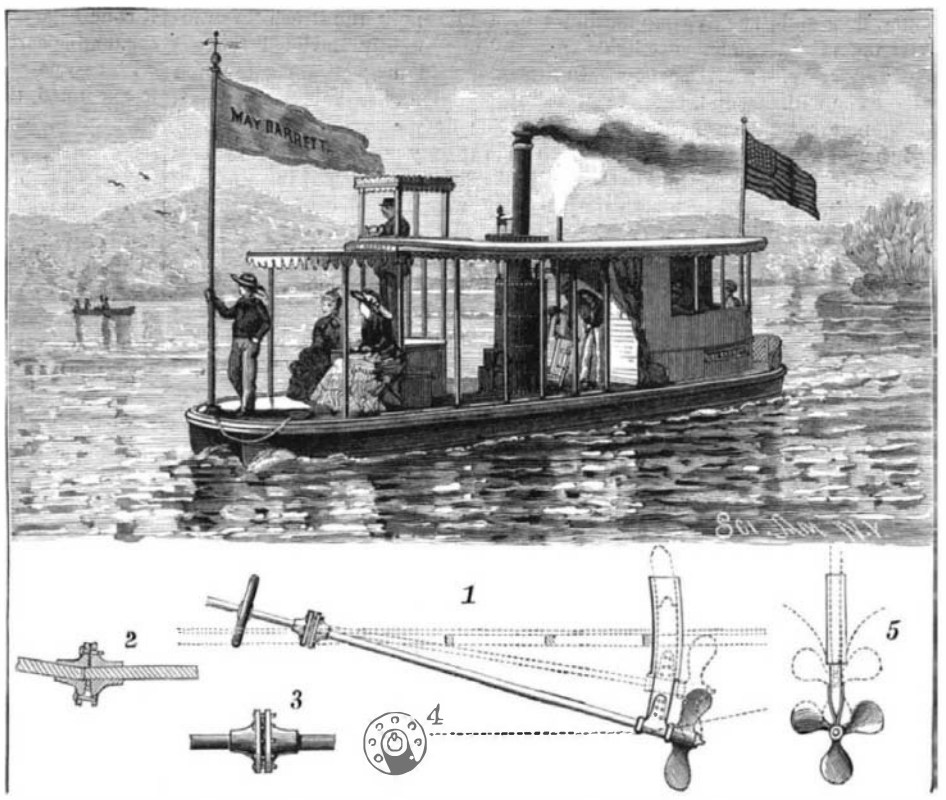
4. Speed—nine miles an hour in still water. 5. Protection of boats from weather—the floor forming a sun shade.

6. Roomy—place for six to sleep in cabin; ice box, lockers, oil stove box, and coal bunker forward, and all accessible.

The power is a 4 x 6 engine and upright steel boiler with seventy 1½″ flues 24″ long submerged. I think that with 120 pounds boiler pressure I obtain about 260 revolutions, which gives about 5 horse power. The engine is faulty in construction in that the exhaust is but two ¾″ pipes from either side of steam chest, the area of both but little more than one 1″ pipe. With 60′ of heating surface more steam could be made, with poor wood, than the engine would use.

The boiler is all above the furnace. The grate is hung in center, and dumps into the water between the boats. My plan for feeding boiler I think is novel. From the deck pump the water is all forced through the feed pump, thus facilitating "starting" the feed pump, making it almost a certainty. When at dock with steam up, the waste of water is very easily supplied by hand, and more surely than with any small inspirator I have seen. By a simple device the leverage is changed when pumping by hand against a head of steam. The feed pipe coils around fire, and only hot water enters boiler. The inlet is in center of lowest point in boiler, taking place of one tube. An outside vertical circulating pipe secures good circulation.

The wheel is 3 bladed, 24″, and is arranged to be raised in shallow water, being attached to main shaft by universal joint which is shown in Figs. 1, 2, 3, 4, and 5. The flange faces are 7″, turned to segment of sphere with length of propeller shaft as radius. Eight steel pins, ⅝′ diameter, 3″ long, are riveted into the flange attached to engine shaft and work in holes reamed tapering in flange attached to wheel shaft. Wheel shaft extends into flange on engine shaft, about ¾″, thereby helping to keep wheel flange in place. The wheel shaft is hung in bearing secured by a steel plate bent around and riveted to lower end of a piece of oak 2½″ by 4½″, tapered like a wedge at lower end, curved with length of wheel shaft as radius, and sliding vertically in a similarly curved casing securely bolted to deck beams. The wheel blades, when at highest point, just clear deck, and are not submerged entirely. Engine shaft is inclined so as to bring wheel shaft in line when in ordinary use, *i. e.*, down. This pitching wheel shaft has not proved objectionable, thus corroborating the views of that party who urged the inclined shaft so strongly before one of your New York societies two or three years since. By the way, does this universal joint coupling happen to be new? I never saw it. I know it is good.




THE STEAM CATAMARAN MAY BARRETT.

For cruising I have never seen a more comfortable rig. A party of seven last summer were out weeks with it, and were certainly very comfortable. With a mosquito net around the cabin, and when hot with the curtains down a little, the nights were delightful.

WM. B. REED.

Hastings, Minnesota, June 24, 1884.

### TWELVE-WHEEL FREIGHT LOCOMOTIVE.

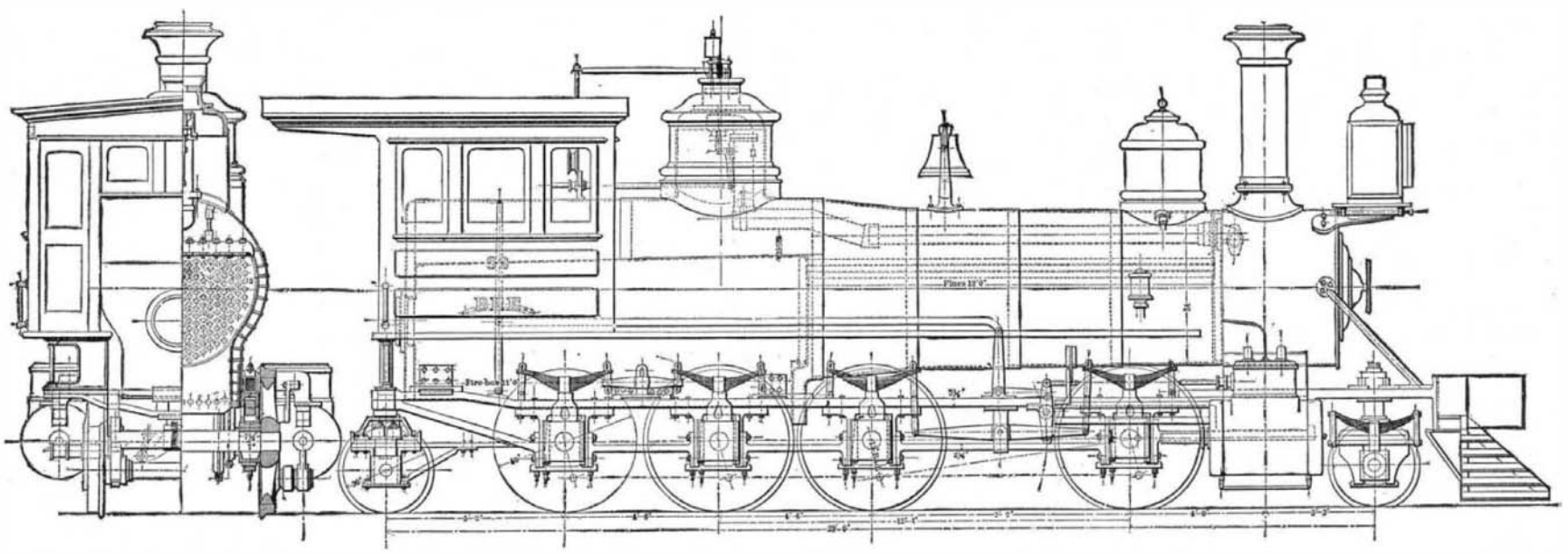
At the Long Branch meeting of the Master Mechanics' Association, the Committee on Improvements of the Locomotive exhibited, among other things, a photograph and some sketches of an engine built by Mr. Alex. Mitchell, of the Lehigh Valley Railroad, but which by no means attracted the attention which the novelty of the design and the performance of the engine deserved.

It made its first appearance upon the track, says *The National Car-Builder*, as a ten coupled fourteen-wheeler, having a pony truck at both ends. The weight of the engine, however, was but 108,000 pounds, and experiments showed that while the design was satisfactory, so great a number of drivers was not necessary for an engine of this weight. One pair of wheels was therefore removed, and the positions of the others arranged so as to make the rigid wheel-base of the engine similar to that of an ordinary Mogul. As will be seen from the engraving, the engine now has two trucks and eight driving wheels, differing from the Consolidation in having a pony truck at each end and the first and second drivers more widely separated. Instead of a blank tire on the main or second pair of drivers, the trailing drivers are used without a flange, making the rigid wheel-base the same as that of a Mogul.

This arrangement is possible because the trailing truck guides the back end of the machine. The rigid wheel-base is but 12 feet 1 inch, the total wheel-base 29 feet, or 6 feet more than that of the Consolidation engine, while its rigid wheel-base is 3 feet shorter.

As would be expected, the engine is much easier on the curves, and at the same time runs with much less danger of getting off the rails. The forward truck is of the usual pony pattern, with half elliptic springs. The trailing truck has volutes under the side bearings and spirals in deep pockets in the center.

The frame of the engine differs from the ordinary type in having jaws and braces in separate forgings, which are bolted together. The main bar is straight to the back end, where it is slightly turned up. The first and second pair of drivers are equalized with each other, and can be equalized with the pony truck if necessary. The third and fourth pairs are also equalized together. The latter pair have seven-inch plain tires. The driving wheels are 60 inches in diameter, and have 88,000 pounds upon them, or but little more than that which is placed with safety on an ordinary car journal. The leading truck has 11,000 pounds, and the trailing truck 6,000. The cylinders are of an unusual size, at least for this part of the country, being 20 inches in diameter by 26 inch stroke. They have De Laney balanced valves, and two relief valves on the steam-chest cover. The boiler to supply steam to the cylinders is of Otis steel, is 54 inches in diameter at the smallest ring, and has 288 2-inch flues 12 feet long. It is fed by pumps driven in the usual way from the cross-head, but there is a small injector in the cab for use in case of emergencies or when the engine is standing. The fire-box is 11 feet long on the bottom and 33 inches wide inside at the grate. The Bee, as the engine is called, has gained for itself a very enviable reputation on the road, and has demonstrated that the principles involved in its construction are correct.



TWELVE WHEEL FREIGHT LOCOMOTIVE—LEHIGH VALLEY RAILROAD.

### Nuremberg Metal Exhibition of 1885.

This international display of precious metals and alloys, organized by the Bavarian Industrial Museum, promises to be of remarkable interest. The Government has decided upon giving medals of gold and silver. Free entry will be granted to all works which are again exported, and a lottery will take place in which the prizes will consist of objects which have been exhibited. A guarantee fund of £5,000 has already been arranged, and the various German consulates in other countries will assist in the work. It is stated in the *Metallarbeiter* that Indian metal work, as well as Persian and Kabyle specimens, will be exhibited. In America, Spain, and Portugal the idea has been warmly taken up, and the participation of Japan is considered certain. France, Italy, Belgium, and Austria have been applying for space in an encouraging manner. As to Germany itself, it would seem that the old metal working towns, Hanau, Pforzheim, Stuttgart, Gmund, etc., will be represented in a special manner. The historical department will be of great interest. The light will partially be obtained from above, the objects shown being thus exhibited under favorable circumstances.

### The Proper Weight of Man.

Prof. Huxley gives the following table of what a full grown man should weigh, and how this weight should be divided: Weight, 154 pounds. Made up thus: Muscles and their appurtenances, 68 pounds; skeleton, 24 pounds; skin, 10½ pounds; fat, 28 pounds; brain, 3 pounds; thoracic viscera, 3½ pounds; abdominal viscera, 11 pounds; blood which would drain from body, 7 pounds. This man ought to consume per diem: Lean beefsteak, 5,000 grains; bread, 6,000 grains; milk, 7,000 grains; potatoes, 3,000 grains; butter, 600 grains; and water, 22,900 grains. His heart should beat 75 times a minute, and he should breathe 15 times a minute. In 24 hours he would vitiate 1,750 cubic feet of pure air to the extent of 1 per cent; a man, therefore, of the weight mentioned ought to have 800 cubic feet of well ventilated space. He would throw off by the skin 18 ounces of water, 300 grains of solid matter, and 400 grains of carbonic acid every 24 hours, and his total loss during the 24 hours would be 6 pounds of water and a little above 2 pounds of other matter.

In this connection we read that Dr. Schweninger, of Munich, has discovered a new mode of reducing the bulk of the human frame. It is, never to eat and drink at the same time, but to let two hours intervene. He has, it is said, cured Prince Bismarck of a tendency to obesity in this way.

Fat people have now their choice between four systems: 1. The original Banting, which consists of eating nothing containing starch, sugar, or fat. 2. The German Banting, which allows fat, but forbids sugar or starch. 3. A Munich system, which consists of being clothed in wool and sleeping in flannel blankets instead of sheets. 4. Noteating and drinking at the same time.

### The New Cunard Steamship Umbria.

This new ship is expected to reach New York about Nov. 6. On her recent trial trip the vessel steamed a distance of thirty miles at a speed of twenty-one nautical miles an hour. A marked increase of speed may be looked for when her machinery is in thorough working order. The Umbria is the largest vessel afloat, with the exception of the Great Eastern. She is 520 feet long, 57 feet 3 inches breadth of beam, and 41 feet depth of hold, and measures over 8,000 tons. The vessel was built in the Fairfield yard at Govan, where a majority of the fast steamers of late years have been constructed. Her great breadth affords room for a wide saloon, which is 76 feet long, 9 feet high, and lighted by a lofty cupola skylight. The whole of the saloon is paneled with oak, slightly carved. The electric light is used. The Umbria will carry 720 first class passengers, and has no steerage accommodations. The engines of this magnificent work of marine architecture are the most powerful in the world. The center high pressure cylinder is 71 inches in diameter, and the two low pressure are each 105 inches, with a 6 foot stroke. The screw is made of manganese bronze, cast in the Fairfield yard. The qualities of manganese bronze, combined with the development in practice of the true proportions of the screw propeller, are computed to add upward of a knot an hour to the performance of the old fashioned cast iron blades. The vessel is fitted for the Admiralty service, and can carry coal for 16 days when moving continually at a speed of eighteen knots an hour.

### Freezing of Seneca Lake.

A correspondent writes us, mentioning circumstances and witnesses, of the freezing over of Seneca Lake two successive years on May 5, 1860–61, with a thin sheet of ice like window glass. Appleton's Cyclopædia also mentions its having frozen over March 22, 1856, although, aside from these instances, it has never been known to freeze over even in the coldest winters.

The lake is situated in the western part of New York State, is 37 miles long and two to four miles broad, 630 feet deep, its surface about 200 feet above Lake Ontario, and 450 feet above the Atlantic.

A STATE Association of Inventors was organized in Kentucky, Sept. 17, as a branch of the National Association formed at Cincinnati last March.

### THE LIVING ORGANISMS OF THE ATMOSPHERE.

As well known, the depths of the ocean were for centuries regarded as abysses inaccessible to the sight, and it was taught that no living being could exist in the darkness that reigned therein. Yet it was only necessary to cast the lead and trawl into the submarine valleys to discover therein an entire flora of wonderful richness and beauty, and an entire fauna of singular beings regarding whose form and nature there could have been no suspicion. On another hand, the microscope has revealed the existence of innumerable animalcules in the least drop of water taken from any spot whatever on the surface of the ocean, and, in the very place where it was believed that there could be nothing but inert matter, the presence of life has been discovered in its completest development.

It is the same with the atmosphere. In that transparent, invisible, ungraspable air in which for centuries nothing has been seen but winged birds and insects, the microscope shows us to-day a whole world suspended, unbeknown to us, amid the dust that is continuously floating about. The air is no less peopled than the ocean, and, just as we see sediment, infusoria, and algæ in a drop of ocean water, just so we find in the least volume of air collected near the earth dust, vegetable debris, living organisms, and infinitely small animalcules, which live, feed, develop, and reproduce themselves, and germs of fermentation and putrefaction—those noxious organisms in which Mr. Pasteur has found the cause of so many maladies that afflict humanity.

In recent years the question of atmospheric dust has been studied by the aid of new methods, by a learned investigator, Dr. P. Miquel, chief of the micrographic service of the Montsouris Observatory. This gentleman has collected together a description of his processes and analyses, and the results that he has obtained, in a remarkable work which we shall now make known to our readers by extracting therefrom a few interesting and little known facts.

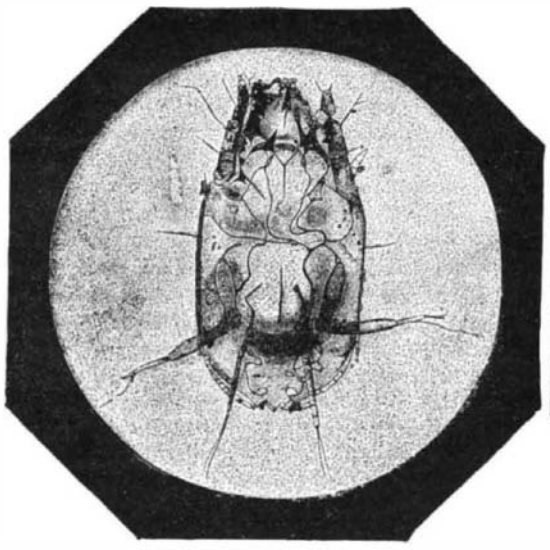


Fig. 1.—REMAINS OF AN ACARUS × 250.

Fig. 2.—SPORES OF ALTERNARIA × 400.

We shall not speak of the methods by means of which we may collect atmospheric dust and aerial sediments; it will suffice to say that they are usually based upon the filtration of a certain volume of air, and upon the condensation of the aqueous vapor which it contains and which carries along the dust in suspension, or else upon an examination of the sediment from rain or snow water that has been collected in special vessels.

We shall give at present a few specimens of the productions that Dr. Miquel has found in atmospheric dust during the course of his long and patient researches. Cadavers and debris of animal and vegetable nature are very frequently met with in the corpuscles of the atmosphere. Herein we find butterfly scales, down from the bodies of birds, parts of insects' bodies, and sometimes even the entire carcasses of acarians (Fig. 1). The nature of the organized corpuscles of the atmosphere is exceedingly varied, and starch grains, spores of cryptogams, and complete unicellular plants are very abundant therein. Fig. 2 shows, under a magnification of 400 diameters, two spores of *Alternaria* near a blackish mass, which is nothing else than a lichen spore that did not come within the focus. Fig. 3 represents a few very common types of aerial spores. At *b* is seen a large number of young and tender cryptogams that are very abundant after rains. Fig. 4 shows a few other specimens which Dr. Miquel collected from the air of the Montsouris Park.

Since Mr. Pasteur's great labors in this field, the study of the animalcules of the atmosphere, and of the bacteria, bacilli, and vibrios that are found in suspension therein, has offered great interest, and Dr. Miquel has succeeded in throwing much light upon it. In order to collect atmospheric bacteria, it is necessary to have recourse to delicate methods, and notably to examine under strong magnifications the liquid formed through the artificial condensation of the aqueous vapor of the atmosphere—that which, for example, stands upon the surface of an internally cooled glass vessel. For our part, we have also often met with bacteria in drops of dew that we had gathered in the country upon herbs at daybreak.

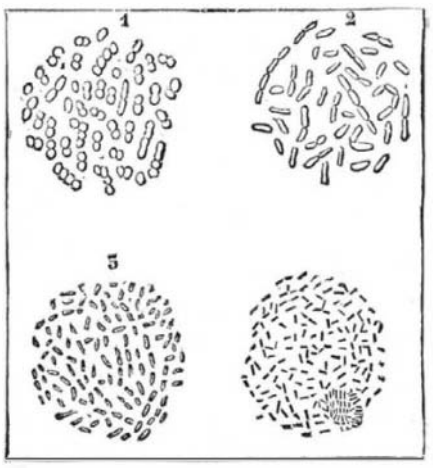



Fig. 5.—ATMOSPHERIC BACTERIA × 1000.

Fig. 5 shows, according to Dr. Miquel, four specimens of atmospheric bacteria. "The first," says the learned observer, "approaches the *Micrococci* in appearance and the *Bacteria* in mobility. The second might serve as a type to the species; its adult articulations, four one-thousandths to five one-thousandths of a millimeter in length, are about one one-thousandth of a millimeter in thickness; it appears to be the same thing as the *Bacterium lineolum* of Cohn. I have met with it quite frequently in the dust of hospitals. The third has the appearance of the *Bacterium catenulum* of Dujardin. The air shows several varieties of this, and one of them, which I have cultivated, has the singular property of converting one gramme of sulphur into hydrosulphuric acid in forty-eight hours in 4 liters of boiled water, to which has been added tartrate of ammonia and an excess of sulphur. The bacterium marked No. 4 is a microbe of exceedingly small size, and it is necessary to accustom the eye for a long time to the light of the microscope in order to see it detach itself as a shining or black object upon the field rendered luminous or dark. It is found quite frequently in the course of development in the matter secreted by several micrococci."

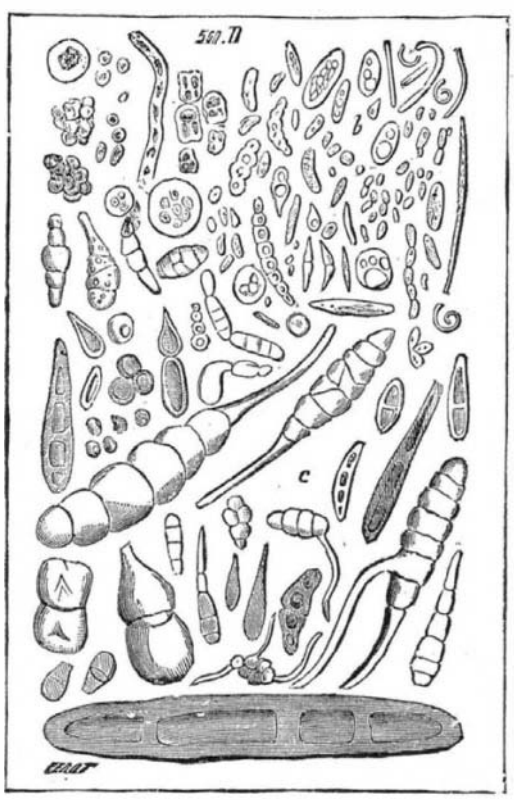



Fig. 3.—SPORES OF CRYPTOGAMS × 500.

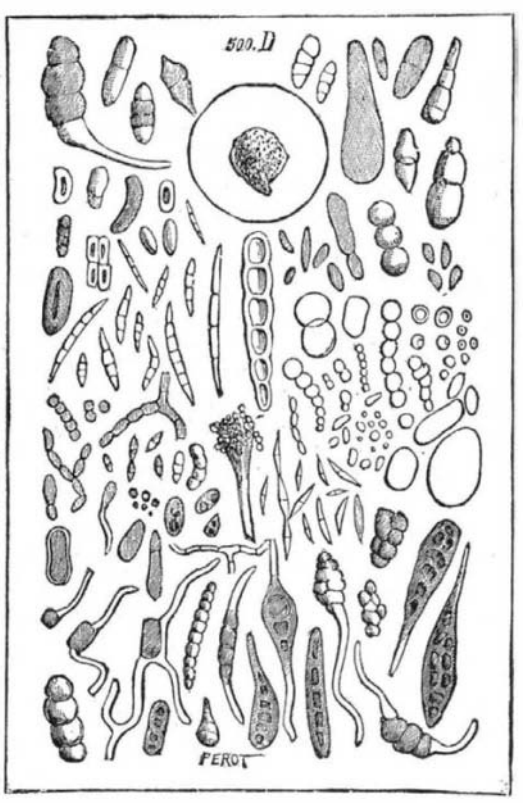



Fig. 4.—SPORES OF CRYPTOGAMS × 500.

Such are the living organisms that belong to the class of microbes whose existence and role has been revealed by Mr. Pasteur. When we consider these infinitely small objects—true dots in motion—under the microscopic objective, we cannot rid ourselves of that singular impression that Michelet, in his poetic language, has so well called "the vertigo of infinity." What would