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Contents.

(Illustrated articles are marked with an asterisk.)

Advice, good, Rufus Cook's..... 86
Apparatus, track-laying, Herman's*..... 82
Appliances, railway..... 90
Atrato, screw steamer..... 81
Bicycle, Spencer's*..... 89
Boats, driving, by water jets, etc. 81
Books and publications, new..... 91
Business and personal..... 90
Cement for belts..... 85
Ceremonies, funeral, in Paris..... 84
Chemistry, easy experiment in.... 84
Compass, rumor about..... 80
Cultivator, Laudes'*..... 83
Elba, phylloxera in..... 83
Electricity, advances of, in 1888... 88
Electricity, horse killed by..... 86
Electric light system, Ball*..... 85
Enquiries to be answered..... 90
Exposition, U. S. of Colombia..... 81
Friction of steam engines..... 84
Gallery, machine, Paris exhibition*..... 82
Gases occluded in coal..... 89
Gold, to precipitate..... 85
Gout, recipes for making..... 80
Guard, burglar, window, Harris'*. 83
Guns, machine, in shore defense.. 80
Heal, Chesley, centenarian*..... 89
Hemp vs. iron in ocean cables..... 80
Homes, country, unsanitary condition of..... 83
Homes, ventilating our..... 84
Houses, underpinning of..... 84
Indicator, elevator, Hayward's*. 86
Inventions, agricultural..... 90
Inventions, index of..... 91
Inventions, mechanical..... 90
Inventions, miscellaneous 90
Mill, cane, Hughes'*..... 83
Mill, rolling, of St. Jacques works* 87
Mill, rolling, St. Jacques works, elevation and plan*..... 87
Net, life saving, Hunter's*..... 83
Notes, astronomical 81
Notes and queries..... 90
Physics, simple experiments in*.. 84
Pipe, tobacco, Colquitt's*. 84
Poles, telegraph, testing..... 88
Power, water, utilizing, Maginn's device for*..... 83
Railways in Chili, American..... 86
Railways, Peruvian..... 85
Replies to enquiries..... 90
Restrictions, insurance, on oil fuel 85
Ruins, Mexican, more..... 81
Saccharine prohibited in France. 85
Seven, sacredness of..... 84
Sulphite in Germany..... 82
Telephone Co., Metropolitan..... 82
Tie, railroad, Maloney's*..... 82
Valve, safety, pop, American*.... 86
Ventilator, sewer, Worthington's* 86
Wars, naval, of the future..... 80
Water works, Vancouver..... 81
Works of Ball Electric Light Co.* 79

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 684.

For the Week Ending February 9, 1889.

Price 10 cents. For sale by all newsdealers.

PAGE

I. BIOGRAPHY.—Professor Rudolph Julius Emanuel Clausius.—Biographical note of the great investigator in thermo-physics, with abstract of his life, discoveries, and papers published and read by him..... 10934

II. BIOLOGY.—Yeast: Its Morphology and Culture.—By A. GORDON SALAMON.—Conclusion of the third lecture of this interesting course, including a review of the protoplasmic state of matter, with analysis of the lower form of vegetable tissue..... 10932

III. CIVIL ENGINEERING.—Automatic Registering Dynamometer.—A true power meter registering the power transmitted by a line of shafting.—6 illustrations..... 10924
The A. J. Hartford Steel Railway Tie.—A new steel tie, offering perhaps the desired substitute for the wooden tie now in such extensive use.—5 illustrations..... 10922
The Canadian Pacific Railway.—Note of the picturesque scenery upon the route, snow sheds, canons, and other graphic features.—2 illustrations..... 10920
The Canadian Pacific Railway.—By THOMAS C. KEEFER.—A review of the importance of the new Canadian enterprise, its finances, prospects, and route.—Geological and other features of the ground passed over, with map.—1 illustration..... 10920
The First Chinese Railway—China, Tientsin, and Kaiping Railway.—A graphic account of the first railroad built by the Chinese government, officially opened in September of last year..... 10927

IV. EDUCATION.—Dairy Schools and "Working Dairies."—By J. S. WOODWARD.—The English and Irish schools for teaching butter making.—Scope of the instruction, including programme of one day's work.—A butter making contest.—1 illustration..... 10933

V. NAVAL ENGINEERING.—New System of Towing.—A new system of towing vessels devised by Admiral Albini, of France, involving the application of a tube in place of a rope for towing vessels at sea.—2 illustrations..... 10922
Progress of Our New Navy.—A most timely article on the progress of the United States navy, with list of vessels, their tonnage, guns, condition, etc..... 10923

VI. PHYSICS.—Electricity, Light, and Heat.—By Prof. C. F. BRACKETT.—Continuation of this important paper, treating of the relations between the three vibratory forces and the significance of the recent experiments of Prof. Herz..... 10931

VII. TECHNOLOGY.—An Improved Blow Pipe.—An improved blow pipe for producing a strong flame from benzoline with perfect safety from danger of conflagration.—1 illustration..... 10930
Improved Gas Engine and Pump.—A full description, with abstract of results attained, cylinder curves, horse power, etc., of the Atkinson gas engine.—12 illustrations..... 10927
Improved Ice Making Machine.—An ice machine of the vacuum type fully described and illustrated, one adapted for making ice on board ship or in confined places.—8 illustrations..... 10930
Machine for Branding Wood.—A machine for marking trade designations upon wood for boxes or other purposes with a hot iron.—1 illustration..... 10929
The Compressed Air Company of Paris.—The company organized for the distribution of power by compressed air, with description of its plant, system of distribution, motors, etc.—6 illustrations..... 10924

A RUMOR ABOUT THE COMPASS.

The London *Electrician* has a dispatch from Berlin to the effect that a means has been discovered of using electricity for ascertaining the true north, instead of the magnetic needle; that, in short, the new means will be altogether superior to the compass, and is likely to supersede it.

If this is true it will be welcome news to the mariner, for since the coming of iron and steel ships the needle has played many fantastic tricks; requiring a fairly good knowledge of magnetism and other phenomena to understand it. The liquid or "Ritchie" compass, that came with the monitors, in which the needle is submerged in spirits of wine or alcohol, is, of course, a great improvement on the old-fashioned and wabbling "card;" and the lines of deviations, and the corrections for the same, laid down on all the ocean charts, are powerful aids to the mariner. But there are times—during magnetic storms or because of curious conditions of cargo—when, on an iron ship, the compass in the binnacle may say one thing, the "tell-tale" compass swinging in the cabin another, and a third in the tops still another—"pointing three ways for Sunday," as the phrase goes. Aboard a man-o'-war it is not so bad, for there they have plenty of technical talent. But the master of a merchantman is more likely to be a sailor than a scientist, and all he can do, if near the coast under such conditions, is to turn her head hard off.

"RECIPES FOR MAKING GOUT."

Under this title, an English society journal, having exhausted, and it infers without avail, its best advice as to the prevention of this dread malady, lays before its epicurean readers some specimen compounds peculiarly adapted to develop gout in those previously free and to excite its most virulent symptoms in the already afflicted. It has medical authority for its promise that the recipes it gives are really among the most exciting causes yet discovered in scientific or even what might be called haphazard cusine; taking no account of the lesser causes, no doubt crediting the gouty with sufficient intelligence to foresee the effect upon the metatarso-phalangeal joint of the great toe of the midnight lobster and the after-dinner port. It introduces a certain Dr. Hunter, whom it seems to regard as an authority on gout, and one can almost see a testy little doctor, rotund, red-faced, short-winded, with good living, and knowing his subject from sensation as well as study, as he takes up a famous cookery manual and reads: "Giblet soup, par excellence: veal stock, lemons, yolk of egg, forced meat balls, and Madeira." This, he says, contains a considerable amount of gout and scurvy. Of an unusually rich mock-turtle soup, he says: "A dangerous dish, and will soon bring a man to his crutches." Another of the same he declares most diabolical—only fit for the Sunday dinner of a rustic who is to work the six following days in a ditch bottom; while of a third, mock-turtle soup made with beef, ham, giblets, lemon-peel, truffles, eggs, orange-juice, forced meat, and Madeira—a dish much admired by the patrons of a famous London restaurateur—the doctor says testily: "There is death in the pot."

It has often been observed of those afflicted with gout—the tone of the letters addressed to the society journal in question furnishes still another evidence of it—that they appear more concerned to discovering new remedies to lessen the pain when they shall be again attacked than in adopting a practical means for preventing its recurrence. They try colchicum, soothing topical applications, acetate of potash and other alkalies, and perhaps nitro-muriatic acid, the latter for supplying the oxygen necessary for the conversion of the excess of uric acid from which they are suffering into oxalic acid, and the latter into carbonic acid and urea—always with the hope, so it would seem, of accomplishing by chemistry what regular habits, air, and exercise would ordinarily yield.

HEMP VS. IRON IN OCEAN CABLES.

A timely and instructive letter it is that Judge R. L. Weatherbee, the manager of the cable companies' repairing service, sends to the Halifax (N. S.) *Chronicle*. He refers to the rapid impairment of ocean cables, and asserts that the cause of this is to be found undoubtedly in the use of iron, which rots away where hemp would stand. That is to say, the gutta-percha which enwraps the copper core should, to his way of thinking, have a serving of hemp alone instead of hemp and iron, as now. He says that down in those depths of ocean where the cables lie, there is not enough motion to part a gossamer thread; it is chemical action, not motion, that is to be feared—an action which hemp will readily withstand, but softening iron so that one may pare it as he would a piece of cheese. Any one who has ever tried a jack knife on a propeller or other iron that has been in salt water several years without repainting, will well understand this. He says that for eight years Halifax has been connected with the town of Dartmouth by a submarine core covered with hemp only, and it is as good as new, so far as is known, and the hempen rigging taken not long ago from the wreck of the Royal George, sunk in 1782, "is as perfect as when submerged."

How important this subject is may be understood from the fact that thirteen cables have been laid across the Atlantic at a cost of $75,000,000, which, so far, have cost $25,000,000 for repairs; 7,000 miles of this is, at this moment, lying abandoned because of unsubstantiality; the average life of a cable of the present construction having been estimated at twelve years.

MACHINE GUNS IN SHORE DEFENSE.

A discussion is now going on in the English press regarding the defenselessness of the British coast, notably the southern and eastern portions, the dangers of invasion, and the best means of protection. The latest theory is advanced by Captain Willoughby Verner, and described in the current number of the *National Review* (English); the author being evidently an artillerist, and of the land forces rather than of the marine; his theory, like most of those preceding it, sound or shaky, according as it is regarded from the land or the sea. He would have the British coast marked off into districts, each possessing a battery of the type of machine guns devised by that ingenious Yankee Hiram Maxim, and the districts so connected by telegraph that 32 of these pepper-boxes could be assembled at short notice at a threatened point. It would not be necessary to have heavy guns on the coast line, he says, because, where the intent was invasion, men would have to be landed in boats, and these he would open on as soon as in range.

He says that at many points of the coast ships could not come close in shore for the rocks, a statement abundantly supported by the soundings, as given on the admiralty charts; that it would require time to launch and man the boats, and still more to get them to the beach, thus affording time to prepare the defense. But let us suppose that the enemy, instead of obligingly making ready to fall into this cleverly constructed mouse trap, should select a bold portion of the coast for his enterprise, occupying himself during the day hours with making things lively about the shore, and, at short range, playing upon everything having the appearance of a battery, and when night came, and under cover of a hot enfilading fire, embarking his expeditionary force in boats armed not only with machine guns, but as well with shields to protect them from the fire of those in battery ashore. Captain Verner speaks of the American dynamite gun in high terms, and believes that, too, would prove useful on such occasions as those he would prepare for. Indeed, it would seem as if he might profitably make this his main reliance should the enemy come up within a mile and a half of the shore, but in case he did not, perhaps he could not put in the day hours to better advantage than by telegraphing for torpedo boats and carefully measuring distances and finding ranges to make them effective when night should set in, even if such preoccupation risked the completeness of the machine gun battery.

Admiral Porter and other high authorities have recorded the opinion that the result of the coming naval war, let it be between powers whose relative forces have heretofore been well defined, is likely to be uncertain, because of the introduction of war material of a novel description and the necessity for a complete change in tactics. Because of this change in conditions and the lack of data gathered from the operations of actual war, it is not easy to suggest a theory of attack or defense which does not contain a self-evident fallacy. One military authority tells us that shore batteries, unless of the most powerful and elaborate description, cannot hope to beat off big modern ships. Another explains with careful detail how that torpedoes in the channelways and torpedo boats in the roads may be looked to to stop the advance of anything that can be floated. Both arrange the details of their plans under the most favoring conditions, and each seems plausible, perhaps conclusive, until the other is examined.

NAVAL WARS OF THE FUTURE.

When the English heard of the Monitor and Merrimac fight, they realized that their magnificent steam war ships, the finest in the world, were obsolete. Hampton Roads signaled the appearance and prescribed the type of the ship that was to be; or, as the Admiral of the Navy, David D. Porter, says in his recent paper, whose title is quoted above, "the guns at Hampton Roads sounded the death knell to all these grand vessels" (the British fleet). For, if the Yankees had ships that could stand to the heaviest guns (then) known for more than three hours at close range without sinking, of what avail would oak be against them?

The "wooden walls" of Britain were thereupon changed to iron and steel, and little by little she constructed what the Admiral is inclined to regard as the greatest fleet now afloat; but so uncertain are the chances of naval war now become, that even so great an authority as he is unable to say whether or no this greatest fleet could stand against the French. His reasons for doubt are as logical as they are interesting. The French are the most scientific people in Europe,

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he declares, and since now the machinist is become more important than the sailor, since even courage and seamanship will not avail against science, the question of supremacy on the high seas has, to his mind, apparently resolved itself into one of relative efficiency of material—which has the more destructive engines, which the means of most effectually working them. Before the advent of the French Jesuit and sailor, Paul l'Hoste, who wrote that famous work on naval tactics which, the Admiral says, has been made the foundation of all subsequent books on the subject, the French had no means of withstanding the terrible impact of the British advance. The British would lay their ships alongside, and the Frenchmen had no stomach for such fighting. L'Hoste showed them a way to successfully meet the shock. Instead of getting out of the way, the French fleet thereafter coolly waited for the enemy to come up, reserving its broadside for close quarters; raking him fore and aft, and then, while he was repairing damages, running down the wind and keeping away till he was ready once more to advance, when the maneuver was repeated. And so it was that though the Frenchman was invariably on the defensive, 'twere easier to beat him off than to capture him.

It is a curious fact, though the Admiral does not mention it, but any one can learn for himself by referring to American naval history, that it was this description of close fighting that brought the Yankee sailor to the front in the war of 1812. The Yankee captains invariably laid their ships alongside the enemy and boarded, reserving their fire until close up; and it was by their skill at this kind of work and their successes that a fleet so insignificant in point of numbers that, at the opening of the war, many wise men thought it should be destroyed to save capture, won great renown; a part, at times, showing itself along the English coast, to the great discomfort of the Liverpool merchants, who called the attention of parliament to the increasing boldness of the Yankee cruisers.

"France," says Admiral Porter, "has made great improvements. Perhaps the English are destined one day to encounter a foe that may snatch from them the laurels won since 1588, the year of the invincible Armada. Some future French admiral may avenge the humiliation inflicted on his country by Howe, Hyde Parker, Hood, Rodney, Collingwood, and Nelson."

Let us suppose that, in the days of these famous captains, there had been ships of steel and iron, the metal belting sometimes two feet thick, as now, and marine guns that, like those of to-day, could pierce any armor that it were possible to float! How then? Admiral Porter admits that, under such conditions, results might have been quite different. He says: "Had Nelson's ship (the Victory) been struck between wind and water by a 12 in. rifled shell, exploding on impact, as is generally the case, the ship would have had a hole torn into her side through which a good-sized whale might enter, and she would go to the bottom in five minutes."

Though early in his paper the Admiral declares that the result of a sea fight between English and French would be uncertain, he later on pays a deserved tribute to the naval discipline and bulldog tenacity of the British, and one may reasonably infer from what he says that when the call "To arms!" echoes along the English cliffs, our English cousins will be found equal to their occasions. He instances the affair of the Armada as illustrating what determination and, above all, discipline will accomplish, even against the greatest odds. Four years it had been in preparation, the English being in ignorance till, a few months before the blow was ready, they were apprised through the French king. Yet with so short a notice as this, with a fleet ludicrously inferior both as to number, armament, and size of ships, they literally tore it to pieces, the coasts being strewn with its wreckage, while the English suffered only a trifling loss.

The Admiral says that a sea fight to-day between modern ships might be like two undisciplined armies, mixed in confusion, dividing itself into hostile groups that should fall a-clubbing each other with the butts of their muskets.

More Mexican Ruins.

An interesting antiquity has recently been discovered at Palenque, in the Chiapas district of Mexico. The monument is situated upon the River Xhupa. Although it is now a complete ruin, it was originally a structure of considerable height, as three distinct stories are still distinguishable. The ground floor is very large, measuring some 120 ft. by 75 ft. The floor above is attained through holes in the ceiling or vault, and here a room is found measuring some 27 ft. by 9 ft. The openings referred to are natural and have been formed by the disintegration of the stone and the sinking in of the roof. On stone slabs set into the wall are bass-reliefs of human figures, warriors, etc. Although these stones are in a very bad state of preservation they are to be sent to the capital of Chiapas. Near this ruin are a row of houses forming a street, and not far from these the vestiges of a quite large town, all of course in a state of complete ruin.

The Screw Steamer Atrato.

The steel screw steamer Atrato, built by Messrs. R. Napier & Sons, Glasgow, for the Royal Mail Steam Packet Company, London, went on her official speed trials on the Firth of Clyde on December 13, 1888, when during four runs on the measured mile a mean speed of 17·20 knots was attained. This result was considered exceptionally satisfactory by Captain Bevis and Mr. Bowers, the company's representatives, the speed being one knot in excess of the guarantee. The vessel afterward proceeded on a six hours' run at full speed. This ship has been specially designed for the requirements of the company's Brazil and River Plate service, and has very fine lines, her appearance being enhanced by a clipper stem with figurehead. The general dimensions are: Length on load line, 400 ft.; breadth, extreme, 50 ft.; depth to spar deck, 33 ft. 4 in.; with a gross tonnage of 5,300 tons. There are staterooms for 200 first-class passengers. The dining saloon, which is seated for 100, is on the spar deck forward of the machinery. The fittings and decorations are in the Italian renaissance style, the walls being of polished walnut in panels, with balusters under the beams. From the saloon doors there is a double stairway, with carved teak balustrades, leading to the promenade deck, which is 200 ft. in length. At the head of the stairway is the music room, in bird's-eye maple and satinwood and dark peacock blue upholstery with gold silk tapestry. In the center there is a large well covered with a skylight of etched glass, which helps to light the dining saloon. Beside the music saloon is the ladies' boudoir, similarly treated. Aft on the promenade deck is the smoking room. A dining saloon, ladies' room, smoking saloon, and staterooms have been provided for 40 second-class passengers, while 400 third-class passengers can be accommodated. The machinery consists of triple-expansion engines of 6,000 horse power, steam being supplied by eight single-ended boilers, working to a pressure of 150 lb. per square inch. A complete installation of electric light has been supplied by Messrs. Siemens Brothers (limited), London. Refrigerating chambers of 10,000 cubic feet capacity are fitted on board. The cargo will be worked by hydraulic gear. The Atrato left on her first voyage on the 17th January. Messrs. Napier have in course of construction, in their yard, a sister ship to the Atrato.—*Engineering.*

Driving Boats by Water Jets, Air Propellers, and Gas Jets.

A correspondent of the *English Mechanic* says: The report on the trial of Thornycroft's torpedo boats was—In the screw boat the efficiencies are: Engine, 0·77; screw, 0·65; total, 0·5. In the hydraulic the efficiencies are: Engine, 0·77; jet, 0·71; pump, 0·46; total, 0·25. The jet as a propeller may be taken as a little better than the screw, but the loss in the pump is a dead loss, and represents about half of the power. In other words, before a hydraulic boat can be made to compare favorably with one driven by a screw, the pump producing the jet must work without loss.

The German experiment by employing the steam to act direct as a piston on the water shows the possibility of getting rid of both steam engine and pump by a sort of combination of both. For fair trial it should be tried in the same boat with the same power, and unless there are losses that it would be impossible to cure, it should certainly beat the screw. The above value of a water jet was of the particular one used. It does not follow that this is the most efficient one possible. At the discussion in the Royal Institution there was a great difference of opinion about the best kind.

Regarding the air propeller: The canal boat tried at Boston, being 62 feet long, with a bluff bow and stern, would not differ much in size from the torpedo boat; then as an 8 H. P. engine gave a speed of four knots, and the propelling power for greater speed increases as the cube of the velocity, we can easily compare the water jet and air propellers as used in the torpedo and canal boats. The question may be stated thus: The cube of 4 knots is 64, then as 8 H. P. is to 64, so is 170 H. P. to 1,360; the cube root of this is 11·1, which is the speed in knots that the canal boat would be propelled at by a Root's blower driven by an engine of 170 H. P.

Now, since this boat was propelled by a jet of air, it is equally certain that it could be driven by a jet of steam, so the engine and blower are quite unnecessary, and removing them would more than fulfill the conditions required in the official report for making the jet more effective than the screw.

From the preceding the question arises, Which will be more effective—air or steam? An examination of the possible work of the fuel and steam in a steamer consuming 240 tons of coal per day may give us some idea. Ten tons of coal, or 22,400 pounds per hour, will convert 224,000 pounds of water into about 6,048,000 cubic feet of steam at atmospheric pressure; this reduced one-sixth, or 1,008,000 cubic feet, shows the amount of steam available at 100 pounds pressure per square inch. This is about the utmost possible from the boiler for one hour's work.

The 22,400 pounds of coal will require 300 cubic feet of air for each pound, making 300×22,400, or 6,720,000 cubic feet of air. This, in passing through the furnace and mixing with the hot gases given off by the coal, will expand to at least five times the volume, or 33,600,000 cubic feet. This, compressed to one-sixth, or 5,600,000 cubic feet, will be about the amount available at 100 pounds pressure to the inch from the furnace, showing an available power of over five times the amount from the boiler.

If we suppose the immense funnels of such a steamer reduced to a suitable size (and placed fore and aft) to have this large volume of expanded air delivered through them at a high pressure, as a jet, we can realize the possibility of propulsion in this way. This shows that Mr. Secor's method of compressing air, rendering it inflammable, expanding it by explosion, and delivering it as a jet, was a correct one. This being the case, why was it a failure? In my opinion, the method had two serious faults. First, the discharge pipes were a long way too large. Four square feet of section to a discharge nozzle would be large enough for a 3,000 ton steamer. It matters not that the space the charge was discharged from was a small one. This may be seen by supposing a gun to have only the chamber for the powder of the usual size, and the remainder of the barrel from 100 to 200 times as large. This would be clearly inefficient. Second, the discharge under water was a mistake. This has been proved by experiment to be wrong, even with a water jet, which has nothing to condense, but in this case it would be delivering force from a heat generator at one end of a tube into a condenser at the other, and the only possible movement would be that due to the greater efficiency of one over the other. It seems surprising to me that Mr. Secor got any speed at all from his vessel, but I firmly believe he was working in the right direction, and that his experiment is the commencement of a new departure in ship propulsion.

Vancouver Water Works.

The city of Vancouver, B. C., is soon to have a high pressure water system, with a supply derived from the river Capilano, a precipitous stream taking its rise in the snow-capped mountains of the Coast Range of British Columbia.

A submerged water main, 1,100 feet in length, with flexible joints, has been laid across Burrard inlet, being part of the main line of the Vancouver water works.

The manner of laying and appliances were somewhat novel. A skidway of fir logs was built in a trench on the shore, reaching 1,200 feet back from the water's edge. The whole line of 1,100 feet was then made up on the skidway with the Ward flexible sockets. Three cables were then attached, one at each end and one at the middle, the forward and middle cables being carried across the stream and attached to the drums of separate engines. The cable from the rear end was attached to an engine drum at the water's edge, on the same side of the stream, and floats were provided for partially buoying the pipe, and lashed to it as it entered the water.

The weight of the whole length of pipe, including lead joints, was 55½ tons; the three engines having an aggregate of 130 horse power. With this arrangement the pipe was drawn steadily and safely to its place without accident, and was examined for its whole length by a diver, who cut the buoys loose. The pipe was tested and accepted by the city.

The successful accomplishment of this work is due to the local contractors of the water works, Messrs. Keefer & McGillivray, under the advisement of the resident engineer of the water works, Mr. Henry B. Smith, C.E.

Astronomical Notes.

THE CANALS OF MARS.

From forty careful drawings of this planet at the Lick Observatory in July and August, 1888, showing the details of the canals as seen through the great telescope, none has been seen *doubled*, as asserted and drawn by European observers of late years. The submerged continent had also reappeared in the great telescope in its former contour. Can it be possible that double sight or telescopic ghosts have been troubling the astronomers over the water?

SUN SPOTS.

There were only two sun spots during November and December last, this being the year of sun spot minimum. What relation may this have to the unusually mild December and January?

National Exposition, U. S. of Colombia.

During February and March a national exposition will be held at Carthagena, U. S. of Colombia, and Mr. W. B. MacMaster, the U. S. consul at that port, offers his services to such American houses, not having representatives there, as desire to participate. It is stated that the commerce between that port and the United States has increased over 400 per cent during the last ten years.

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