Correspondence.

Were the "Small Motors" Wrong?

To the Editor of the Scientific American:

Your correspondent "Alia," etc., takes me up about my fourteen foot boat that was going out fishing so nicely with its store of compressed air, laid in a pipe along her gunwale. I never intended to have her driven in any such way as "Alia's" experience in boating indicates. His engine has a 3 x 3 cylinder; this, with a 100 pound pressure, is surely good for a full horse power, and can easily be crowded to double that and more; and yet he can get but a mile in nine minutes.

Now, we will say nothing about increasing that rate, but we will only look for the power needed to attain it. My boat—perhaps his boat is different—but my boat I can pull, with a steady stroke—not the "Yale jerk"—at very nearly that rate, and not expend over one-tenth part of a horse power. Haud inexpertus loquor. What has become, then, of the remaining immense proportion of his engine's power? Plainly it has been wasted some way; mostly, perhaps, by indirect action. Taking the commonly received estimates of the bulk of steam required for a given power and time, one cubic foot of air compressed to the degree assumed by me is sufficient to drive my boat, on the basis of what I can do myself in rowing, not less than seven hours. The length of gunwale of a 14 foot boat is not 28 feet as stated by "Alia," at least I never saw any boats built that way; it takes about 35 feet to go around mine. That length of 2 inch pipe measures over three-quarters of a cubic foot.

By using direct pneumatic propulsion I think I am justified in asserting that the boat can be driven as I formerly stated.

A.

Storage of Wind Power.

To the Editor of the Scientific American:

For quartz, saw, flouring, and other mills, so situated that they can be built on a hill side, so as to furnish a sufficiently strong foundation, there is no power so easily stored, used, and restored as perfectly dry fine sand. The mill can be easily and cheaply arranged with buckets to carry the sand back into the bins, from whence it is taken as wanted through spouts and conveyed to an overshot water wheel of sufficient size to run the machinery required. The sand costs little or nothing but the hauling, is to be had everywhere, sustains but very little waste by use or restoring, and works as well if not better than water. This applies to all the deserts and plains of the West and Mexico. I know of one mill now run by dry sand, and it does good work.

True, water can be used, where it can be had to pump, but the pumps and tanks cost much more than those necessary for sand. Air pumps and compressed air can also be used, but the first cost of the plant is too great. Any carpenter can make all the appliances required for using dry sand, and any farmer, ranchman, miner, or manufacturer who owns a side hill, so as to have a solid foundation for his sand tanks or bins, can use this power with but very small outlay to start with.

X. Y. Z.

The Washington Monument and the Axial Motion of the Earth.

To the Editor of the Scientific American:

Nearly forty years ago the French physicist Foucault furnished a direct proof to enable us to see the earth go round. His famous demonstration caused a great sensation at the time, and will always be known as Foucault's experiment. It is based on the fact that a pendulum once set in motion will continue to swing in the same plane, if it is suspended in such a way that the pivot can turn around and still leave the pendulum free to swing in the same plane, instead of turning with the pivot. The pendulum must be a heavy one and the point of suspension as free as possible from friction. We will suppose such a pendulum placed at the North Pole. If the earth rotates, it would carry round the point of suspension once in twenty-four hours, and also the surface of the earth under the pendulum. If the pendulum did not partake of this motion, but kept steadily swinging in the plane in which it was started, we could see the surface moving round beneath it, though it would appear as if the direction of the pendulum were constantly changing. The pendulum would seem to swing round the circle once in twenty-four hours, while the building in which it hung and the earth on which the building stood would seem to be at rest; but we could have no doubt as to which was the real and which was the apparent motion. At any place between the pole and the equator the experiment would not be so simple, as the point of suspension would be carried round by the rotation, but the direction in which the pendulum swings would seem to be constantly shifting, though it can be calculated just what the change ought to be in any given latitude. If, then, the observed motion agrees exactly with the calculated one, the demonstration is as complete and satisfactory as it would be at the pole.

Foucault made his experiment in the church of St. Genevieve, in Paris. Here he suspended under the dome a pendulum some two hundred feet in length, performing its vibrations in eight seconds. A graduated circle was drawn on the floor beneath it, and hour after hour and day after day the measured swing of the heavy ball was found to be precisely in accordance with the theory that the earth turns on its axis once in twenty-four hours. The apparent changes in the direction of its motion were explicable in no other way, and the hypothesis was thus demonstrated beyond the possibility of doubt. The globe on which we dwell was seen to go round, and Foucault was the scientific hero of the day.

The idea recently occurred to the writer while viewing the Washington Monument that a grand opportunity was there presented for repeating Foucault's experiment, as a pendulum of any desired length could be employed, and with the aid of our most perfect appliances it could be carried out on a scale which would secure the most satisfactory results, and it would add another feature to the many attractions which already bring visitors thousands of miles to the capital of the nation.

S. L. DENNEY.

Strasburg, Lancaster Co., Pa., December 24, 1883.

Blowing up Tornadoes.

To the Editor of the Scientific American:

In your issue of December 8, John F. Schultz has a scheme for changing the track of tornadoes—by blowing them out of existence. A cyclone is meant, I suppose, for a tornado is properly a "straight blow." There are several objections to his method of changing a cyclone's course. If one of these whirlwinds traveled in a straight line, and always on the ground, his plan would be feasible; but as a cyclone often jumps or bounds along, and seldom travels in anything like a direct course, one would scarcely know where to locate his keg of powder; and if he knew, he would not have time to do it. In fact, by the time the powder was in place the cyclone would probably be in the next county. How are we to do if the cyclone comes at night, when it cannot be seen? Even if some one had nerve enough, on seeing a cyclone, to put a keg of powder, as near as he could judge, in its path, the whirlwind would probably miss the powder and blow the man out of existence. About the best plan is to get into a "dug out" when there is danger of a cyclone, and in the western and central parts of this State almost every farmer has one.

BERT DAVIS.

Topeka, Kansas, December 17, 1883.

"The Brandy Bread Company."

To the Editor of the Scientific American:

In your issue of the 22d is an article with the above heading. The object of the Brandy Bread Company is to obtain alcohol from bread in the process of baking.

In the course of fermentation the dough passes through four processes, if the fermentation is allowed to go on, viz.: saccharine, vinous, acetic, putrefactive. The dough should always be put into the oven before it passes through the first fermentation; the bread in that case will be good, having the sugar in it. If allowed to pass into the vinous fermentation, so as to obtain alcohol from it, the bread will be poor in flavor and in quality.

N. D.

Portland, Me., December 22.

Cost of Producing Beef.

The report of the Committee on Cost of Production, at the late Chicago Fat Stock Show, goes extensively into the question of the proper basis on which awards at such exhibitions should be made. In order that the results might be determined solely upon the quantities of the various kinds of cattle food used, as well as the skill of the feeder, the price of each article of food named in the statements was determined upon an equitable and uniform basis to all the competitors, as follows:

Value of calf at birth	$5.00
" milk, per gallon	.04
" shelled corn, per 100 lb	.71
" corn in ear, per 100 lb	.53
" soft corn, per 100 lb	.50
" oats, per 100 lb	.75
" corn meal, per 100 lb	.80
" corn and oats, per 100 lb	.80
" shorts, per 100 lb	.70
" bran, per 100 lb	.60
" oil meal, per 100 lb	1.25
" oil cake, per 100 lb	1.25
" hay, per 100 lb	.30
" pasturage per month, up to 12 months	.75
" " " 12 to 24 months	1.00
" " " 24 to 36 months	1.25
Expense for care, feeding, salting, and interest, up to 12 mos.	4.00
" " " " " 12 to 24 mos.	6.00
" " " " " 24 to 36 mos.	9.00

The great diversity of articles consumed by the competing animals, as well as the methods of handling stock, made it somewhat difficult to determine upon the comparative value of some of the articles of food named for the most rapid production of beef, the quality of which could not be satisfactorily determined until the carcasses are displayed upon the block. The prices of grain, etc., named were not the present market price, but a fair average for a term of three years. The value of calf at birth, pasturage consumed, and expense for care, etc., were rated the same with each exhibitor.

The committee recommended that for the future greater care be given by exhibitors in their statements as to quantity of each article of food consumed, exact time that animals were on pasture or stock fields, and details of expense for care, etc., to enable a more careful comparison to be made of the various methods of feeding and the effect of same upon the animals. Attention was also called to one of the lessons to be learned in the statistics presented, viz.:

If feeders desire to keep their cattle for feeding beyond two years, the most profitable results have been obtained where the animals have been liberally fed the first year on a coarse diet that will develop bone and muscle upon which to build the matured carcass. The most economical production of beef does not always result from strong feeding of grain or concentrated food during the first twelve months of age of the steer.

The committee strongly urged upon feeders the importance of liberal feeding from birth of calf, and giving more attention to the important matter of early maturity. The figures clearly demonstrate that the greatest profit results of the feeder in marketing cattle at an early age, not exceeding twenty-four months.

Our Losses by Fire.

According to the *Fireman's Journal*, which quotes from the *Commercial Bulletin*, the losses by fire in this country during the first eleven months of the present year have been about ninety-two millions of dollars, and it is probable that the total of losses for the year will reach the round sum of one hundred millions. If we add to this the expense of maintaining insurance offices and agents, we shall find that the cost of combustible construction, carelessness, and incendiarism in the United States has this year been at least one hundred and fifty millions of dollars. We are often told that by the "blessings of insurance" this enormous burden is "distributed" so as to be "unfelt." In other words, the man who builds the cheapest and most combustible warehouse that he can, fills it with valuable goods, and then sets it on fire, either intentionally or by carelessness, gets back the value of his building and goods in cash from the underwriters, and they again collect what they pay out, together with as much more for their own salaries and expenses, by levying a tax upon all the buildings and goods, which is finally added to the price of the goods, and paid by the consumer. To take a single example, the cotton manufacturer pays, in the price, the cost of insurance on the raw cotton until it is delivered at his mill, and a further premium upon the same while in process of manufacture, and upon the buildings in which it is manufactured, with the machinery in them. All these form a part of the cost of manufacture, and are added to the price of the product. From the manufacturer the goods go to the commission merchant, who also pays a premium for insuring them and the building in which he stores them; and from him they go to the jobber and the retailer. Each one of these keeps them, as well as his own warehouse, covered by insurance, and adds the cost to the price of what he sells. Supposing a year to elapse between the gathering of the cotton and its delivery in the shape of cloth to the consumer, the enhancement in cost, to pay the expense of insurance alone, will be, as a rough average, about two per cent. Every other manufactured article bears a similar tax, in many cases, where the production and sale are slow, amounting to 10 or 15 per cent instead of two; and even raw produce is somewhat burdened. Since the impost bears upon all alike, each person endeavors to reimburse himself by asking a little higher price for his labor, so that in the end the insurance burden diffuses itself as a nearly uniform tax of about two per cent upon the total annual expenditure of every family in the country.

Viewed in this light, the insurance tax is not so "insensible" as some would have us believe. To state the case in a little different way, every man or woman in the community who is paid for his or her labor works one week in every year as a gratuitous contribution toward paying the salaries of insurance agents and the fire losses caused by carelessness or crime. Returning again to the original estimate, and setting the total cost of fires and insurance in the United States at one hundred and fifty million dollars a year, we will divide this sum by the number of families in the country, which would be, by the usual reckoning, about ten millions. Ten million families, to raise a hundred and fifty million dollars a year, must pay fifteen dollars apiece, on an average. Taking into account the climate and circumstances of all portions of our territory, it may be safely asserted, we imagine, that fifteen dollars for each family would pay the cost of all the wood and coal used for household cooking and heating throughout the United States; and a transformation in methods of construction, by which conflagrations would be rendered, if not impossible, at least as rare as in some countries, would be a direct pecuniary benefit, equaling in value a perpetual gift to every family in the republic of all the fuel needed for domestic use.—*American Architect.*

Crushing Properties of Wet Snow.

Wet snow on roofs has been causing much inconvenience and many accidents of late. The extra weight to be supported in such contingencies seems not to be sufficiently calculated upon by builders. The snow is so light as it generally falls, taking eight to twelve cubic inches to equal the weight of a cubic inch of water, that people do not generally realize how this same snow, becoming saturated by gentle rains, and added to by successive snow falls, may finally pile up an aggregate weight. Old and leaky roofs, and especially those which are flat, or have only a slight pitch, should be promptly relieved of this extra burden on the occasion of every considerable fall of snow, for if not crushed they may, nevertheless, be deflected enough to crack or loosen the covering, and thus develop leaks. Flat roofs especially, should be promptly relieved of their weight of snow, and it should also be seen to that all gutters should be kept free from snow and ice. This precaution will keep the leaders open, and prevent their bursting.

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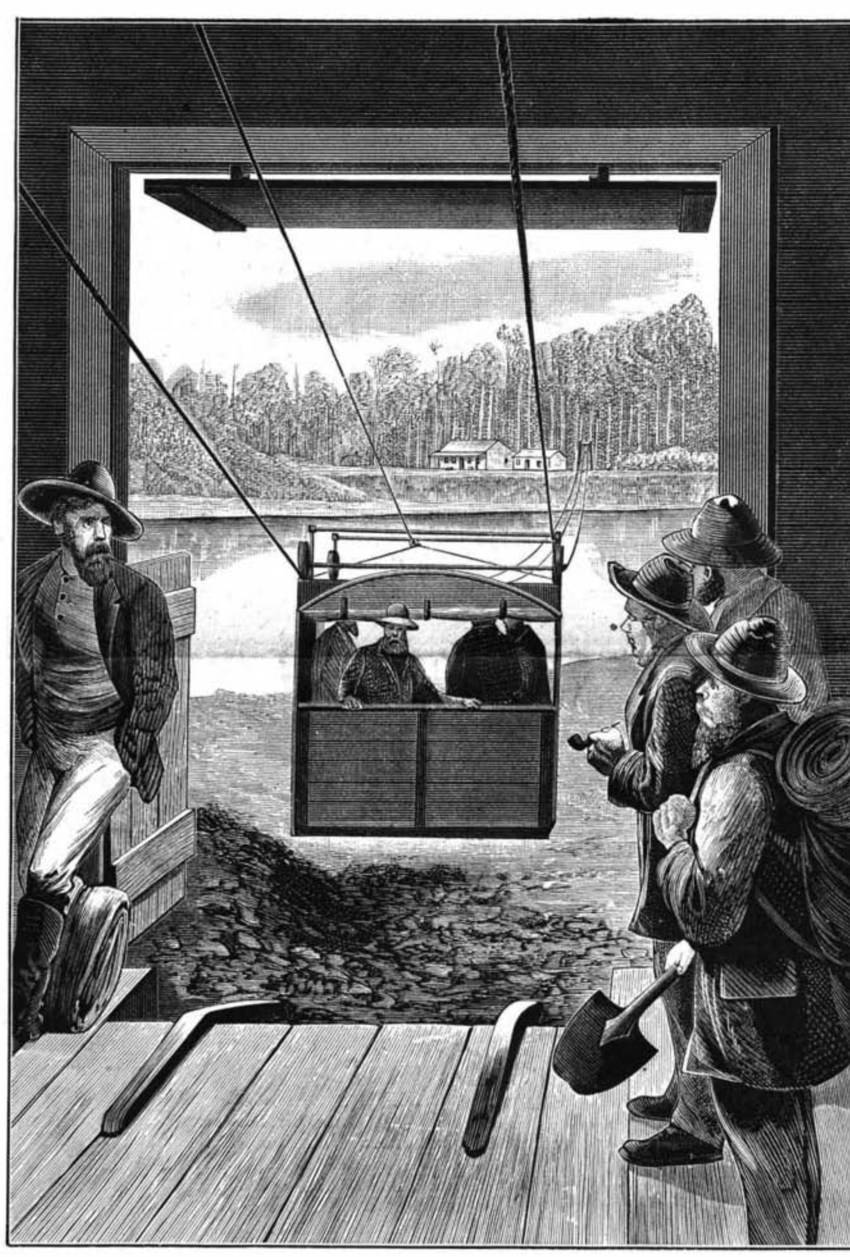
Vulcanizing India Rubber.

Accidents have frequently occurred, especially in dental workshops, from the use of too high a temperature in melting and vulcanizing India rubber. Moreover, complicated apparatus is required for vulcanizing by dry heat. According to the *Moniteur Produits Chimiques*, this apparatus can be replaced by a bath of any liquid boiling at 140° or 150° C. (285° to 300° Fahr.), at which temperature the sulphur unites with the India rubber.

The cheapest salt for such a bath is chloride of calcium; but other solutions, such as acetate of soda and carbonate of potash, can be employed; also glycerine, oils, and paraffine. These liquids can be used in ordinary metallic vessels. Of course, the India rubber and sulphur solution must be in an air-tight vessel, as before.

WIRE TRAM ACROSS THE TEREMAKAU, N. Z.

The Teremakau River is situated in the Middle Island of New Zealand, in the district of Hokitiki. The stream has no great pretensions to size during the summer months, but in winter it rises to a considerable height, and not unfrequently floods the adjacent country. A wire tramway has been constructed for the purpose of crossing the river. The contrivance is ingenious, and saves both time and inconvenience. As will be seen by our sketch, the passengers are seated in the car, which is being conveyed over the river by an arrangement of wire ropes, which works with precision and facility. It is also perfectly safe, a fact that could not be urged as regards a ferry boat at certain periods of the year. Contrivances of this kind are numerous in South America.—*Town and Country.*



WIRE TRAM ACROSS THE TEREMAKAU, N. Z.

Physical Education of Girls.

We are pleased to find that increased attention is being paid to the question of the physical training of young and growing girls. The Swedish physical exercises have found general favor, while many games and athletic pursuits are now permitted which formerly were proscribed by prudish schoolmistresses and timid mammas. There can be no doubt that the present movement is in the right direction so long as it is kept within reasonable limits; for the extension of competitive athletic sports to our girl schools would be a great mistake. But, short of this, the daily employment of systematic exercise will prove of the greatest service in after life by developing the frame and obviating those ills which so frequently supervene in the passage from girlhood into womanhood. The disorders which occur at that period are generally to be referred to imperfect development and to defective nutrition. When the girl is naturally healthy, little is wanted but to encourage, or we might say insist on, ordinary systematic exercise being taken daily. This should consist of certain gymnastic exercises, which ought to be practiced each day as part of the school work, supplemented by such games as lawn tennis, rounders, golf, etc. Swimming is an exercise that every girl should indulge in, and it ought to be taught systematically at all our girl schools. Rowing, too, is an exercise which greatly strengthens the muscles of the trunk and abdomen, and is therefore serviceable, when employed with judgment, in giving grace and elegance to the figure. Schools at the seaside or near a river should avail themselves of the opportunity, and have rowing taught by same trustworthy boatman. Riding has always been an exercise in favor with the profession; the expense attending it, however, debars its pursuit in many cases. With delicate girls, or those rapidly growing, some of the above named exercises may prove unsuitable; in these cases it is best to rely at first entirely on gymnastics till the frame is strengthened. Until recently dress proved a great barrier in preventing the free exercise of the limbs and body, but the introduction of a more sensible costume for the playground will in future, it is to be hoped, remove the disadvantage. The costume in use consists of a short skirt of blue serge, draped with a crimson scarf, blue jersey, short trousers, and long stockings. Such a dress is quite suitable for girls under fifteen, and we fancy those who are educated on this system will not as they grow older readily submit to the bondage of high-heeled boots and tight lacing, though probably they would have to adopt a more lengthened skirt.—*Lancet.*

THE Clyde shipbuilding for 1883 represents a tonnage of 419,664 in 329 vessels. Twenty-five years ago the Clyde yards turned out only 35,709 tons in one year. For the past four years the business of shipbuilding there has steadily and largely increased. There are those who predict a falling off during 1884, on account of low freights and the many "ocean tramps" now in the business, but in answer to this it is claimed that the recently built ships are so economical of fuel, compared to carrying space provided, that they will continue to crowd out those of older build.

New Mode of Constructing Small Ships.

Sheet metal boats form the subject of a patent recently issued to a firm of boiler makers at Barrow-in-Furness, England. Sheet metal sides are bent under pressure to the required shape, having flanges on their lower edges for riveting to the keel bar, and the stern ends may be joined either with or without a stern plate. The bent plates forming the boat's sides may be readily packed in small space for transportation, and easily put together on reaching their destination, the design being to so construct boats lighter than of wood, or of numerous plates of metal riveted together.

Earthquake and Volcanic Eruption in Alaska.

On the morning of October 6 a settlement of fishermen on English Bay heard a heavy report, and looking in the direction from which the sound came saw immense volumes of smoke and flame burst forth from the summit of Mount Augustine. The sky became obscured, and a few hours later great quantities of pumice dust began to fall, some of it being fine and smooth and some gritty.

At 3¼ P.M. on the same day an earthquake wave 30 feet high came rushing in over the hamlet, sweeping away all the boats and deluging the houses. The tide at the time was low, and this saved the settlement from utter destruction. The wave was followed by two other waves about 18 feet high, which were succeeded at irregular intervals by others. The pumice ashes fell to a depth of 5 inches, making the day so dark that lamps had to be lit. At night the surrounding country was illuminated by flames from the crater. Ordinarily Mount Augustine is covered with snow, but this year it is completely bare.

Upon examination after the disturbances had subsided, it was found that the mountain had been split in two from base to summit, and that the northern slope had fallen to the level of the surrounding cliffs. Simultaneously with the eruption a new island made its appearance in the passage between Chernaboura Island and the mainland. It was 75 feet high and a mile and a half long. So violent was the volcanic action that two extinct volcanoes on the peninsula of Alaska, lying to the westward of the active volcano Iliamna, 12,000 feet high, burst into activity and emitted immense volumes of smoke and dust. Flames were visible at night.

Tin in California.

An article in the *Mining Review*, by E. N. Robinson, C.E., states that the mine of Cajalco, in the Temiscal range, California, has assayed 13·1 per cent from the ore, of a purity of 0·98. This mine is believed by Cornish miners who have examined it to be a true and permanent vein, probably increasing in richness as it increases in depth.

Great Ships of War.

According to the official report submitted to the French Chamber of Deputies concerning the condition of the French fleet, the iron clad squadron of France may be divided into three groups. The first comprises three heavily armored ships, the Duperre, Devastation, and Redoubtable. These are protected by armor 22 inches in thickness, and are armed with 13 3·8 inch breech loading rifled guns. The second group consists of seven iron clad vessels with 8 5·8 inch armor and carrying guns similar to those of the preceding group. This class of ships will be superseded in a few years by vessels of the same magnitude as the three first mentioned. The third group is composed of seven vessels having an armor of but six inches, but these will, with the exception of one of them, remain but a short time longer in service.

There are at present launched and in course of completion, and almost ready for service, two heavily armored iron clads, the Admiral Baudin and the Foudroyant, while seven more of a similar type are being constructed. Besides these, says the *Army and Navy Journal*, there are available two armored coast guards, constituting formidable engines of war, and five more have been launched and are in rapid process of completion. In addition to these there are two new coast guard iron clads, of an inferior type, in process of armament for immediate service, and these will be supplemented in a few months by an additional vessel of the same class.

The report includes, as a reserve, six coast guard iron clads of the old type, which will remain available but for a few more years; also six floating batteries belonging to the same class. In addition to the foregoing the French fleet is provided with five fast cruisers of the commerce destroying type.

The writer says: "If we compare the effective force of our navy with that of other maritime powers, we find that England has 33 iron clads, of which 16 only have an armor varying from 17½ to 24 inches in thickness. Five iron clads of the first class are in course of construction. Besides these, England has 11 station iron clads,* 10 iron clad coast guard ships, 2 station iron clads of inferior size, 44 cruisers, and 180 torpedo boats of all grades.

"Italy has afloat, at the present date, four iron clads of the first magnitude. These gigantic war vessels are armed with 100 ton guns. Three iron clads of lesser proportions are in course of construction in the Italian dockyards, and will be launched next spring. These will take the place of the 8 iron clads of a past type at present belonging to the Italian navy, and which are destined soon to disappear.

"Germany, especially, has constituted her navy with a view to coast defense and running warfare (*guerra de course*). She possesses 4 large iron clad coast guards; 13 iron clad gun boats, adapted also for torpedo warfare; 24 fast armed cruisers (rams), capable of steaming 14 knots.

"The principal Russian war vessels are: 1 turreted iron clad; 1 central redoubt iron clad; 5 station iron clads; 3 iron clad coast guards, with heavy batteries; 7 turreted iron clad coast guards; and 10 turreted monitors. Russia has in process of construction 5 turreted monitors and one station iron clad."

The appropriation asked for by the French Admiralty amounts to 197,835,017 francs, or $39,567,003.40. This amount has been approved of by the Commission, with but a slight reduction on points of minor importance and not exceeding 54,000 francs —$10,800.

List of French war vessels in course of construction in the French naval dock yards, and to be available in the early part of 1884: One gun boat, La Comete; one iron clad, Vauban, at Cherbourg; one iron clad, Terrible; one cruiser, Iphigene, at Brest; one tender, Alcian, at Lorient; one iron clad, Tonnant; one tender, Ibis; one tender, Vigilant, at Rochefort; one iron clad, Caiman; one iron clad, Foudroyant; one cruiser, Arethusa, at Toulon. Total, 11 vessels.

A Dry Galvanic Battery.

Electro-piles without fluids were among the earliest forms invented, but they had but very little power, and although they last a long time have very little value. They are now beginning to attract attention again, and C. Schneler, of Dresden, has invented one consisting of a copper cylinder open at both ends, in which is placed another open cylinder of amalgamated zinc. For filling, he mixes up plaster of Paris with a saturated aqueous solution of chloride of zinc containing 7 per cent of common salt. A stiff paste is made in this way, and poured in the annular space between the two cylinders, where it soon hardens and sets. The electro-motive force is not stated.—*Poly. Notizbl.*, p. 381.

* Cuirasse de Station, a ship, in European navies, ranking second in the list of fighting ships.

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