Scientific Museum.

Lightning and Lightning Conductors.

(Prepared for the Scientific American.)

No. 1.

Sheet lightning is the vivid discharge of electricity amongst the clouds reflected from their surfaces; this gave the appearance of one blaze of flame, the spark or jet from its momentary existence itself is rarely seen, in consequence of the strong light produced by its reflection, and its being occasionally hid by the dark, dense, intermediate mass of clouds. The appearance termed fire-balls or globular lightning is similarly explained but possibly from a denser state of the atmosphere and the resistance offered to its passage collects and condenses the charge at its point, as it were, forming a knob. Appearances of zig-zag and forked lightning are produced; the first, by the passage of an ordinary discharge from the clouds to the earth, the air being gradually condensed before it, offers so great a resistance to its passage in a direct line at one point that it is turned aside, if it may be so expressed, tending however constantly downwards, it gets out of the sphere of condensation, finds an easy passage onwards to the earth for a time; the same effect again takes place, and so on till it reaches the surface of the earth or some projection from it. If in its passage down it meets with currents of air inferior in conducting power to the medium in which it is travelling, or if in its approach to the earth it finds two or more points on which it can discharge itself within limited distances of each other, it divides, and the appearance is denominated forked lightning. It would be a labour of time to recite the records of so vast a number of cases of the serious effects of disrupted discharges of electricity upon unprotected buildings &c., as are collected.

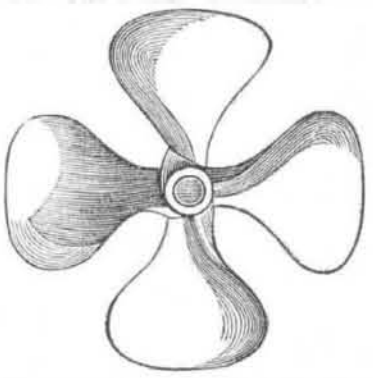
For the suggestion of the application of metal conductors to buildings, &c., we are undoubtedly indebted to the celebrated Dr. Franklin, for his own words where he proposed "for protecting houses, churches, ships, &c., from the stroke of lightning, to fix on the highest part of these edifices upright rods of iron, made sharp as a needle, and gilt to prevent rusting; and from the foot of these rods, a wire down the outside of the building into the ground, or down round one of the shrouds of a ship, and down her side till it reaches the water. Would not these pointed rods probably draw the electrical fire silently out of a cloud before it came near enough to strike, and thereby secure us from that most sudden and terrible mischief?" He however subsequently recommended iron rods of about one-half to three-quarters of an inch diameter, which were to be fastened to the wall, chimney, &c., with staples of iron. He adds "The lightning will not leave the rod, a good conductor, to pass into the wall, a bad conductor, through the staples. It would rather if any were in the wall, pass out of it into the rod, to get more readily by that conductor into the earth. If the building be very large and extensive, two or more rods may be placed at different parts, for greater security. Small ragged parts of clouds suspended in the air between the great body of clouds and the earth, often serve as partial conductors for the lightning, which proceeds from one of them to another, and by their help comes within the striking distance of the earth or a building, it therefore strikes through those conductors; a building that would otherwise be out of the striking distance. Long sharp points communicating with the earth, and presented to such parts of clouds, drawing silently from them the fluid they are charged with, they are then attached to the cloud, and may leave the distance so great as to be beyond the reach of striking.—It is therefore that we elevate the upper end of the rod six or eight feet above the highest part of the building tapering it gradually to a fine sharp point which is gilt to prevent its rusting, thus the pointed rod either prevents a stroke from a cloud, or if a stroke be made conducts it to to the earth with safety to the building. The lower end of the rod should enter the earth so deep, as to come at the moist part, perhaps two or three feet; and if bent under the surface so as to go in a horizontal line, six or eight feet from the wall, and then bent again downward three or four feet, it will prevent damage to any of the stones of the foundation."

History of Propellers and Steam Navigation.

[Continued from page 328.]

Fig. 65.

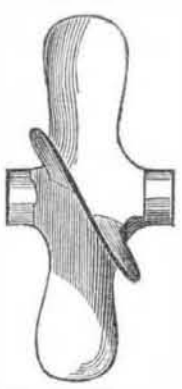
FOUR BLADED FRENCH PROPELLER.



This is a propeller which was employed on a French Mail Boat, named the Napoleon, in 1842. Fig. 65 exhibits a front, and fig. 66 a side view. This propeller was fixed in a space or opening abaft the usual stern-pot, (to which, in an ordinary vessel, the rudder would be hung) and within side another stern-post which was erected on a prolongation of the keel, farther aft, for sustaining the rudder, so as to leave a space between the two posts, for the reception of the propeller. The centre of the propeller was 6 feet beneath the surface of the water; its diameter was 7 feet 6 inches, and the highest point of its pheriphery was 2 feet 3 inches below the water line, when the mean draught of water aft was about 11·82 feet.

Four propellers of the same diameter, but of different forms, were made, in cast-iron, and were tried with various success. The propellers had been altered several times; and it was found that within certain limits, by cutting away the ends so as to shorten the length of the screw, which had also the effect of diminishing the surface of the blades, the speed of the vessel was increased, and the vibration was reduced; a portion of this effect had, however, been attributed to using four arms. A propeller with three blades, occupying the whole of the circle, was first tried; others which presented less central surface answered better; and the best, which was still in use, had four blades, which occupied six-tenths of the area of the circle, when viewed in the direction of the axis, leaving four-tenths of that area vacant for the free escape of the water between the blades, whose obliquity was such as to produce an advance of 10 feet 3 inches in a revolution.

Fig. 66.

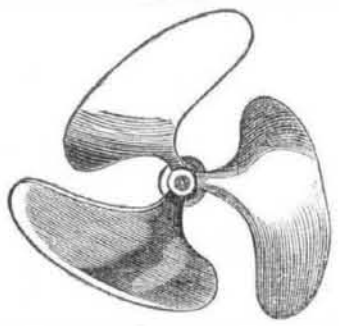


The motion was communicated to the propeller by a spur wheel of 126 teeth, working into a pinion of 20 teeth, which gave nearly 6½ revolutions for each stroke of the engine, or about 120 revolutions of the propeller per minute. The ordinary speed of the vessel, without any sails being used, was 10 knots or 11½ statute miles per hour.

CONOIDAL SCREW PROPELLER.

This is a screw of three blades, invented by Messrs. Rennie, of London, and applied by them, in 1839, to a steamer named the Dwarf Friction wheels were first used for giving motion to the propeller, but on account of their noise and slipping, they were abandoned, and spur wheels, with wooden teeth substituted. It made about 150 revolutions per minute. The advantage of this form of screw over the one represented last week, is an increasing pitch, so formed that while the propeller is rotating on its axis, the vessel is advancing—thus making far less slip. These blades are curved conoids, therefore they have variable curves approximating to angles from 27° to 30°. It was 5 feet 10 inches diameter, and had an area of about 15 square feet, and in smooth water propelled the vessel at the rate of 12 miles per hour,—the vessel being 164 tons burden, with engines of 70 horse power. In 1843 this vessel ran 200 miles in 23 hours, and used 10 tons of coal in 27 hours, from the time of getting up the steam. This propeller had a slip of one-eighth. The superiority of the conoid propeller was set forth to be the best, as being formed after nature's laws and the swiftest of fishes. The opening towards the centre of motion by reducing the arms of the screw blades, as far as strength would allow, (as the rotative motion towards the centre is less than the circumference,) therefore reduced a tendency to centrifugal action on the water. The gradual alteration of the angle of the blade to the axis of the screw or outward path of the vessel, affords a greater onward action of the blade at the entrance, whilst it gradually curves round to nearly a right angle with the path, so as to leave the water without causing a revulsion. The salmon, when it makes a run, puts down all its side fins, and solely by the oblique action of the tail, is propelled forward with great force

Fig. 67.



and speed, the flexible nature and curving form of the tail, so as to leave the water without revulsion, contributes to this object.

Curious Facts in Natural History.

It is but a little more than twenty years since the first crow crossed the Genesee River westwardly. They, with the fox, the hen-hawk, swallow, and many other birds and insects, seem to follow civilization.

The locust borer is not of more than thirty years introduction into the United States, and has not yet reached the native groves of the locust-tree at the south and west. It commenced its ravages on the east side of the Genesee River in 1830, and it was seven years before it crossed to the west side.

The grain worm, or weevil, began its course of destruction in Vermont, about the year 1828, and it progresses in the course it takes from ten to fifteen miles a year. It has not yet reached Western New York to any extent; but the destroyer is on its march, and desolation will follow its track in this great wheat-growing region.

Rose-bugs have been so common in some of the Eastern States, that on the sea-shore they have floated in winrows on the sands, having been driven into the sea by winds, and drowned. They have only made their appearance in this region, in any quantities, within two or three years.

The cedar or cherry bird was first noticed west of the Genesee River in 1828, and now it is so great a pest as to induce many to give up the cultivation of cherries, especially if near woodland.

The plum-weevil, or curculio, which is indigenous to America, being unknown in Europe, was first discovered by Mr. Goodsell, the first editor of the Genesee Farmer, since which time it has disseminated itself over the whole continent.

The gopher, a spices of ground squirrel, with pouches on the outside of its cheeks to carry the dirt from its hole, is very plenty on the west side of Mississippi, in Missouri and Iowa, but has never yet crossed the river into Illinois or Wisconsin. It only works in the night, burrowing in holes and run-ways under ground—subsisting on the roots of trees, grasses, and vegetables. There are persons who have suffered by their depredations for twenty years, who have never been able to catch, or even see one, of these nocturnal depredators.

The cut-worm is of recent origin. The first it was noticed as doing much damage, was during 1816 and 1817, noted as the cold years, when the whole northern country approached the very brink of famine. They are now universal.

The Hessian fly was introduced, it is supposed, by the foreign mercenaries in 1777, on Long Island, from their baggage, or in the forage for their horses.

If salt hay is placed around goosberry bushes, it is said to be a preventative of mildew. The bushes should be kept in a cool moist place. Hay with salt sprinkled on it will absorb the moisture.

The steamer Pacific arrived in this city from Liverpool at 9 A. M., on Monday last. Time 11½ days.

LITERARY NOTICES.

Gallery of Illustrious Americans.—We have received from Messrs. Brady & D'Avignon the sixth number of this great American work. It contains a splendid likeness of Col. Fremont, together with a well written biography of his eventful life. The engravings and letter press are among the most beautiful specimens of the art we have ever seen. When complete it will be a publication of extraordinary merit, a proud ornament to American history and a lasting fame to its projectors. The work is to be completed in 24 numbers, at $1 each. Edited by C. Edward's Lester.

American Cottage and Villa Architecture,—a series of views and plans of residences actually built: intended as models for those about to build, as well as Architects, Builders, etc., with hints on Landscape, Gardening, Laying out of Grounds and Planting Trees. By J. C. Sidney, Architect and Engineer.—Appleton & Co. publishers: price 75 cts. per number. The design of this new work is fully stated in the caption above, and the first number now before us is very beautiful both in text and illustrations, not surpassed by any similar work upon the subject. It is to be issued monthly, and will be complete in 10 parts.

Holden's Dollar Magazine, July Number.—Four spirited engravings and several excellent contributions; "The Literary Cocked Hat and Transcendental Tea Pot," is a most amusing conglomeration of subjects—something after the style of "The Buncomb Flag Staff." The number is good.

Iconographic Encyclopedia.—Part 9 of this splendid work is just issued by Mr. Garrigue, No. 2 Barclay st., this city. This part treats of Botany in its various branches. It contains plates from 23 to 42, being maps of the principal cities of Europe. As each part is only one dollar, a single map costs only five cents, and the letter press into the bargain,—how cheap!